A PHONOLOGY OF THE DOMUNG [DEV] LANGUAGE OF PAPUA NEW GUINEA WITH ACOUSTIC ANALYSIS

by

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And last but not least, I would like to thank God for filling this world with so many beautifully diverse and rich languages, but most of all for speaking to us through His one and only Word.

Abstract

This synchronic phonological analysis of the underdescribed language of Domung (ISO 693-3 [dev]) identifies 16 consonant phonemes and six vowel phonemes based on a corpus of 1600+ recorded words collected during original fieldwork. Domung is a Trans New Guinea language spoken in the Finisterre mountains of Papua New Guinea. A brief comparison is made to the phonemic inventories of other related and documented Finisterre family languages. The phonology description includes acoustic measurement and analysis of vowel quality (via vowel formants) and vowel length (via vowel duration). Acoustic analysis confirms the presence of phonemic vowel length in a subset of vowels. Vowel sequences and diphthongs are also identified and characterized using relevant acoustic correlates. Syllable and word structure analysis is provided as well as description of several phonological processes occurring at morpheme boundaries. The accent system is also analyzed via both native speaker intuition assessments and acoustic measurement data.

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Abbreviations

1	1st Person
2	2nd Person
3	3rd Person
CI	Confidence Interval
DL	Dual Person
DS	Different Subject
EGIDS	Expanded Graded Intergenerational Disruption Scale
FFUT	Far Future tense
FPST	Far Past tense
F0	Fundamental frequency
F1	First formant
F2	Second formant
IMP	imperative
IV	Intervocalic
LOC	Locative
NEG	Negation/Negative
n.d.	No date available
NFUT	Near Future tense
RPST	Near Past tense
OBJ	Object (Marker)
PL	Plural
PNG	Papua New Guinea
POSS	Possessive
PRES	Present tense
SBJ	Subject (Marker)
SG	Singular
SIM	Simultaneous (action)
SOV	Subject-Object-Verb
sp	specific type
SQ	Sequential (action)
SR	Switch Reference
SS	Same Subject
T	Token
TNG	Trans New Guinea
vl	Voiceless
vd	Voiced
WI	Word-Initial
WF	Word-Final
WM	Word-Medial
σ	Syllable

1. Introduction

There are 839 languages spoken in Papua New Guinea (Eberhard et al. 2023), making it one of the most linguistically diverse countries in the world. However, many of these languages are endangered and underdescribed. This thesis provides a phonological description of the underdescribed Trans New Guinea language of Domung [dev], spoken in the Madang province of PNG. Domung is one of 40 languages within the Finisterre language group, of which only 16 have been previously described. This thesis is based on original fieldwork but also compiles previous research of these Finisterre languages and includes some updated typological comparisons for the Finisterre language family as a whole. Lastly, this thesis includes much more extensive acoustic analysis of vowel quality, vowel duration, and accent than has been previously available for Finisterre languages.

Chapter 1 begins with a description of the Domung people and their language, including language vitality, dialect mapping data, and a review of previous and related work. Chapter 2 provides a brief overview of the grammar of Domung which remains a topic of ongoing research. Chapter 3 describes the phonemic inventory of 16 consonants occurring at three places of articulation: bilabial, alveolar/palatal, and uvular. Chapter 4 describes the phonemic inventory of six vowels and includes acoustic analysis of vowel quality and vowel length showing that Domung, along with more Finisterre languages than previously thought, exhibits phonemic vowel lengthening. Vowel sequences, including several interesting and typologically unusual sequences, are analyzed in considerable detail as well. Chapter 5 describes the syllable and word structures of Domung while Chapter 6 reviews some phonological processes that occur at morpheme boundaries. Finally, Chapter 7 asserts that, while tone is not present in Domung, a complex variable accent system is utilized with the primary acoustic cue being syllable duration.

1.1 The Domung People and Their Language

The Domung language area measures approximately 8 km from east-to-west and 8.5 km north-to-south and is located within the Finisterre mountains of the Rai Coast region of Madang Province, Papua New Guinea. Refer to **Error! Reference source not found.** below for a map of the language area including the locations of nine of the primary Domung villages. The region is quite mountainous and the elevation of most Domung villages exceeds

1220 m (4,000 ft.). The only way to travel within the language area is on foot or by helicopter. The population of Domung speakers is estimated to be 2,600 (Moe 2022).

The high elevation combined with proximity to the warm and humid coast results in a predominantly cool, rainy and cloudy climate year-round. There is typically, however, a dry season in June-August. Nights are especially cold and every Domung house has an indoor fire pit which is kept burning all night long to provide some heat.

The Domung people are subsistence farmers and typically grow their food in four to six different gardens usually far-removed from their houses. They often keep a few domesticated pigs in pens and sometimes raise chickens as well. They spend at least several days each week working in their gardens and will often sleep overnight in smaller garden houses.

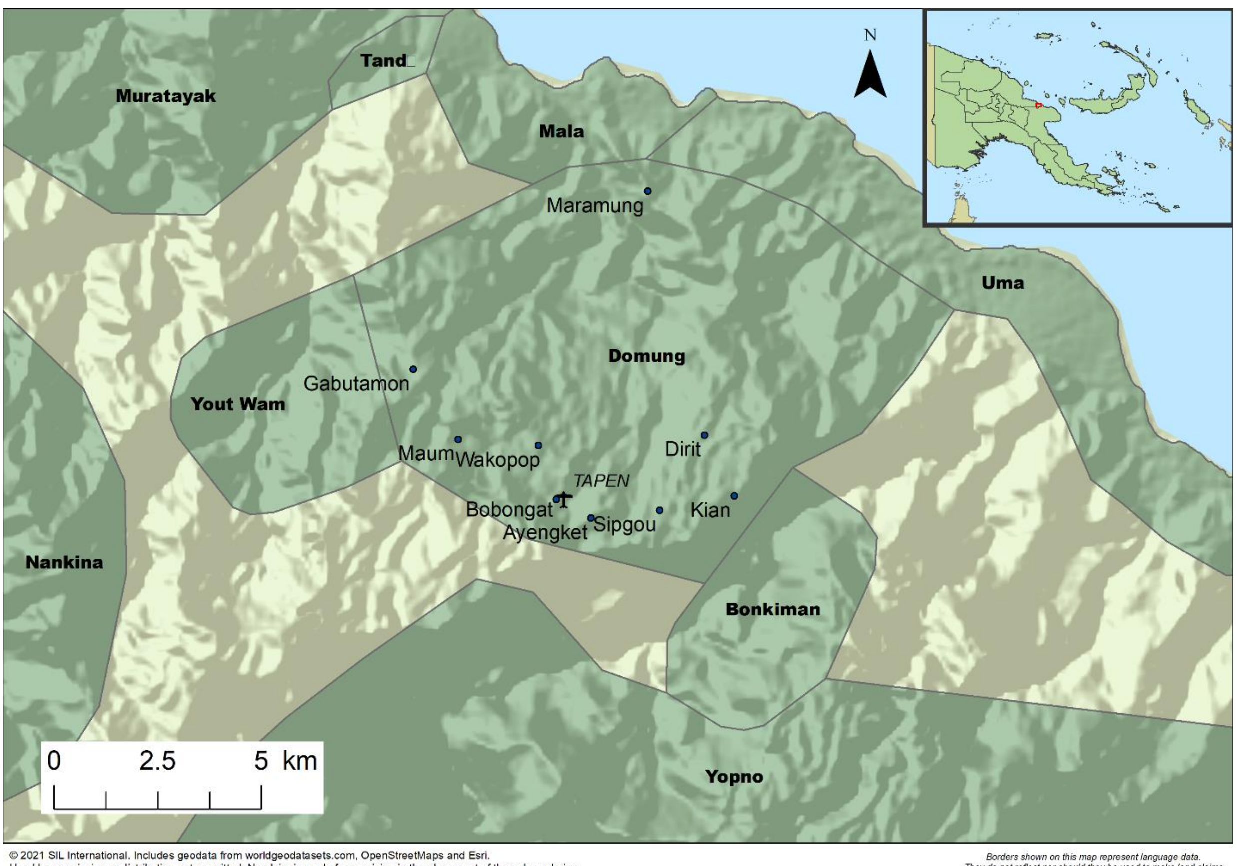

Figure 1 Location of the Domung language area within PNG (Moe 2021b)

The Domung language (ISO code [dev]) is sometimes spelled, using its current orthographic conventions, as <Domíng> and is also referred to by native speakers as 'Domíng Me.' According to the Ethnologue (Eberhard et al. 2023), the Domung language is a Trans New Guinea language belonging to the Yupna sub-family as shown in Figure 2. The Glottolog (Hammarström et al. 2023) provides a similar classification schema with no differences within the Yupna language group and only minor differences at the Finisterre-level of the family tree involving the Warup group of languages.

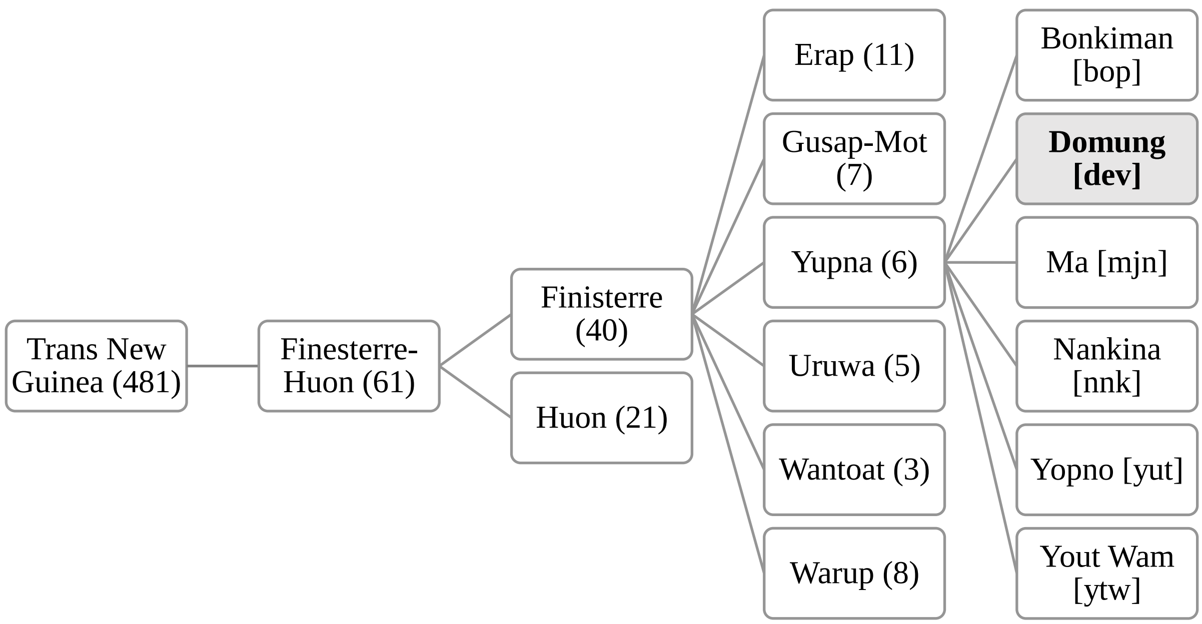

Figure 2 Language classification for Domung

1.2 Description of Research

This paper is the result of field research which I carried out in the Domung language area of Madang Province, Papua New Guinea from August 2019 to April 2023. The field research was conducted during multiple trips, each between two and five weeks in length.

Consent for the study was obtained individually from each of the native speakers who participated in the study and also from the local community as a whole prior to the recording of any data. Table 1 contains basic sociolinguistic data on each of the three audio recording participants but names have been excluded and are treated as confidential data in accordance with the informed consent obtained from the participants.

The description and analyses presented in this paper are based primarily on a lexical corpus containing recordings of 1670 entries consisting of approximately 843 nouns, 588 verb forms (many of which are paradigmatic), and 239 other words recorded by one of three different native speakers as described in Table 2 below. The lexical corpus was analyzed using the Dekereke phonology analysis software (Casali 2023b). This lexical corpus was augmented with additional recordings spoken by all three speakers in order to investigate specific features of the language such as vowel quality (§4.2), vowel length (§4.3), and accent (§7.3).

Table 1 Sociolinguistic profile of recorded speakers

ID for Study	Gender	Age (yrs)	Village of Birth	Village of Residence
M01	Male	51-60	Bobongat	Bobongat
M02	Male	51-60	Bobongat	Wakopop
M03	Male	51-60	Bobongat	Bobongat

Table 2 Distribution of lexical corpus by speaker and category

	Nouns	Verb Forms	Other	All
M01	181	152	26	359
M02	369	281	110	760
M03	293	155	103	551
All	843	588	239	1670

Audio recordings were performed using a Zoom H4n Pro Digital Recorder and an AKG C544 headset microphone. The headset microphone was placed approximately one inch from the corner of the speaker's mouth and the gain of the Zoom digital recorder was adjusted prior to each recording to account for varying levels of speaker volume. The recording format for the digital recorder was set to 24 bits and 48 kHz. Recordings were performed in Bobongat village either in the local Lutheran church building (a single large room with wooden plank floors, wood walls, louvered-glass windows, and a plywood ceiling) or in a bush house (a single room with woven bamboo floors and walls and a thatched leaf roof). Each entry was spoken twice with a short break between repetitions. I typically wrote down each entry to be recorded in a tabular format which included the following information for each entry: a reference number, an IPA transcription, an English gloss, a Tok Pisin gloss, and an orthographic transcription using the current trial Domung orthography. The trial Domung orthography was not known to the native speakers doing the recording and was not utilized by them when making the recordings – they relied primarily on the Tok Pisin glosses which I used to prompt them for the word; when the Tok Pisin gloss was an insufficient prompt, I would pronounce the word in Domung using the IPA transcription.

As is often the case with field recordings, the quality of the audio recordings varied across and even within recording sessions. Rather than conduct a single long recording session, words were elicited and recorded in numerous separate and shorter recording sessions spread over the course of several different trips to the Domung language area. Given the unavoidably close proximity of the field recording locations to the surrounding jungle, wildlife noises are sometimes present in the recordings.

All the audio files along with the xml file generated by the Dekereke software are archived within the SIL REAP system (Moe 2023b). All transcriptions that follow are phonemic unless otherwise denoted as phonetic using the standard square [] brackets. Orthographic transcriptions have not been utilized except where indicated by <> because the orthography is still under development. Each example includes a reference ID number which refers to the Dekereke reference number.

1.3 Multilingualism and Language Vitality

As previously reported (Gray 2007, Moe 2023a) and as summarized in Figure 1 above, the Domung language area is directly bordered by four other Yupna family languages (Yout Wam, Nankina, Bonkiman, and Yopno) and several unrelated Austronesian languages. Some Domung speakers understand and can speak the related languages of Yout Wam and Nankina (particularly Domung speakers living in the western villages of Gabutamon and Moum). Other Domung speakers can understand and speak Yopno. Specifically, Gray (2007: 47) reports that "in Gabutamon everyone, including children, is bilingual in Yout Wam and everyone, except children, have at least passive bilingualism in Yopno and Nankina." Intermarriage between neighboring language groups does occur and serves to facilitate the learning of neighboring languages. To summarize, multilingualism with neighboring languages is rather common, but is not ubiquitous.

Most Domung speakers also utilize Tok Pisin because it is the primary language of wider communication within Madang Province, PNG. Gray (2007: 47) reports that young children up to elderly people are at least passively bilingual with Tok Pisin, but the elderly are reportedly unable to speak it. Tok Pisin is typically acquired when a child attends primary school (grades 1-6) but may be learned from family members prior to, or in lieu of, attending school. Although English is also taught during primary and secondary school, it is my experience that very few Domung speakers know it well and are comfortable using it.

It should be noted that since Tok Pisin is the local language of wider communication and very few Domung speakers are fluent in English, many of the glosses obtained for different words during word-elicitation sessions were obtained in Tok Pisin. Some of the glosses provided in this paper may utilize Tok Pisin rather than English because the meaning is more succinctly captured with a single Tok Pisin word than with a much longer English description. However, wherever possible, English glosses are provided instead of Tok Pisin glosses because most readers of this paper will not be familiar with Tok Pisin.

Language vitality studies were performed in several Domung villages in August of 2019 using a participatory methods research tool called the 'Wheel of Vitality' developed by Grummitt (2014) to assess a language's level on the Expanded Graded Intergenerational Disruption Scale (EGIDS). The results of these vitality studies showed that the Domung language is currently an EGIDS level 6a which is described by Lewis and Simons (2010: 110) as, "Vigorous: The language is used orally by all generations and is being learned by children as their first language." These findings are consistent with the language vitality observed by Gray (2007: 47) who stated that "reported and observed data suggest that Domung is the dominant language among adults and children from the Domung area. Language shift away from Domung does not look likely to happen in the near future."

1.4 Dialect Mapping

Most Domung speakers agree that there are three major dialects of Domung which, using the tentative orthography, they write as: Síkíkon Me, Kian Me (or Buwana Me), and Buwa Me (Moe 2023a). These dialects seem to loosely correspond to the three Domung clans/tribes self-identified by the people: Síkíkon (with Gabutamon as the primary village), Buwa (with Bobongat as the primary village), and Buwana (with Kian/Buwana as the primary village). However, the dialect situation is still rather complex due to evidence of dialect chaining as previously reported by Gray (2007).

A dialect mapping study was conducted in August of 2019 using a participatory methods dialect mapping tool (Moe 2023a). The study was conducted independently within each of eight different Domung village communities: Wakopop, Aunon, Sipgou, Buwana (with people from Dirit also present), Maramung, Gabutamon, and Moum. Each community was asked to list each Domung village and group each of the villages together that spoke exactly the same way. Then the community was asked to self-report on how well adults and children from their village understood adults from each of the other groups of Domung villages.

The results of the dialect grouping exercise revealed that there are at least three dialects (as reported in Aunon) and possibly as many as six dialects (as reported in Sipgou). All villages reported that Bobongat and Wakopop spoke the same and that Sipgou, Buwana, Dirit, and Maramung spoke the same. The remaining four villages (Aunon, Ayengket, Gabutamon, and Moum) were not grouped the same in all cases; however, Aunon and Ayengket were grouped together in four of seven cases and Gabutamon and Moum were also grouped together in four of seven cases.

I have proposed (Moe 2023a) that there are three major dialects of Domung with a dialect chain running in the east-west direction as shown in Figure 3. This proposal is similar to the potential dialect chain proposed by Gray (2007: 32), but also takes more recent research into account; it is based on a lexicostatistical study conducted in several Domung villages by Gray (2007: 36-37), the 2019 dialect mapping study, and the fact that Domung speakers self-identify three main dialects.

Because the Buwa Me dialect is most centrally located geographically and is also best understood by the most villages, it was selected for further linguistic analysis. This phonological description therefore focuses exclusively on the Buwa Me dialect of Domung.

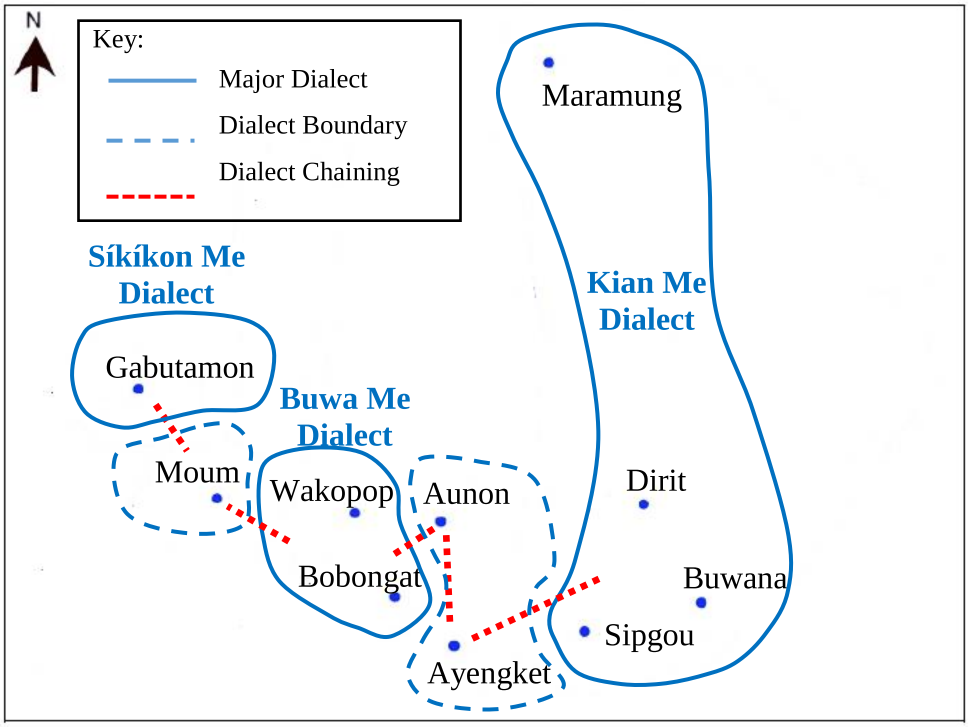

Figure 3 Proposed Domung dialect boundaries with dialect chaining (Moe 2023a: 16)

1.5 Previous and Related Work

Although minimal work has been previously completed to describe the Domung language itself, the literature does contain phonological typologies and descriptions of the Trans New Guinea family and the Finisterre-Huon language group as well as some phonological descriptions of specific languages more closely related to Domung.

This section contains a review of the relevant literature with a special focus on phonology and begins in §1.5.1 with a review at the highest level of the Trans New Guinea language family.[1] Proceeding down the language family tree presented in Figure 2 above, a review of relevant literature pertaining to the Finisterre-Huon language group is provided in §1.5.2 followed by a specific focus on Finisterre languages in §1.5.3. A more detailed review of phonological descriptions for two Yupna language family languages is provided in §1.5.4 and any literature specifically describing the Domung language itself is discussed in §1.5.5.

[1] Moe 2021b provided a list of this literature but did not discuss them in any detail.

1.5.1 Trans New Guinea Languages

The proposal of a Trans New Guinea (TNG) language family originated in preliminary typological analysis conducted by Wurm (1964) on languages spoken in the Highlands of New Guinea. McElhanon and Voorhoeve (1970) subsequently proposed the existence of the TNG family based on the presence of several widespread cognates as well as some typological resemblances. Foley (1986) conducted more deep-level genetic analysis of many New Guinean language families but was not convinced that an overall TNG family could be established based on the available evidence and he referred to them as Papuan languages. However, Pawley (2008) indicates that in recent years, linguists have found compelling evidence supporting a modified version of the McElhanon & Voorhoeve TNG hypothesis.

Although consensus has yet to be reached on its precise membership or status as a phylum, linguists generally agree that the TNG family consists of more than 400 languages, making it one of the larger language groups in the world in terms of its number of member languages (Pawley 2008). Pawley (2018: 31) asserts that the Finisterre-Huon group of languages (which includes Domung) has a relatively strong claim to TNG membership.

The earliest and most comprehensive initial description of TNG languages was performed by Foley (1986) and included a description of typical phonological characteristics of Papuan languages.[2] Foley (1986: 55) asserts that the basic consonantal system of Papuan languages is typified by the Fore language as in (1). Foley notes, however, that while the glottal stop is common in Highlands languages, it is less frequent in other Papuan languages. He also observed that fricatives are not phonemically common in Papuan languages but that "a pervasive feature of Papuan languages is the tendency to weakening and voicing of the stops between vowels" (Foley 1986: 55) which often leads to allophonic fricatives. Foley specifically notes that in Fore /p/ can be realized as [b ~ β], /t/ as [r ~ l], and /k/ as [g ~ ɣ].

(1)	p	t	k	ʔ
		s		
	m	n		
	w	y		

[2] The TNG language family is generally considered to be the largest member of the Papuan language group. Unlike the TNG language family, the Papuan language group as a whole has no genetic basis and is defined primarily as the non-Austronesian and non-Australian languages spoken on New Guinea and the surrounding islands (Lyovin 1997: 245)

Regarding the vowel systems of Papuan languages, Foley (1986: 52-54) asserts that the most basic and common vowel system is a standard five vowel system /i e u o a/. This five vowel system is often extended in one of two common ways to form a six vowel system as in (2a) or (2b). Other six vowel systems have been reported, but are much less common. Seven vowel systems are even less common while eight vowel systems are extremely rare.

(2a) /i e a ɔ o u/ (2b) /i e ə a o u/

More recently, Pawley (2008) provides an overview of the TNG family as a whole. He describes the minimal set of proto TNG segmental phonemes as shown in Table 3 below and also briefly describes the phonological typology of TNG languages. Pawley observes that the phonology of many TNG languages is similar to the phonology posited for proto TNG.

Table 3 Proto TNG phonemes (Pawley 2008 and Pawley & Hammerström 2018)

Consonants	Bilabial	Alveolar	Palatal	Velar
Oral Obstruents	p	t s		k
Prenasalized Obstruents	ᵐb	ⁿd	ᶮdʒ	ᵑg
Nasals	m	n	ɲ	ŋ
Laterals		l		
Glides	w		j	

Vowels	Front	Central	Back
High	i		u
Mid	e		o
Low		a	

Pawley & Hammerström (2018) state that most TNG languages have between 10 and 15 consonants with relatively few fricatives, affricates, laterals, rhotics, and semivowels. They also note that most languages have three contrasting nasals /m, n, ŋ/ and that some languages have pre-nasalized stops. Pawley notes there is more variety in the series of stops with the most common being two series of voiced versus voiceless stops. Most commonly, there are three contrasting points of articulation for stops: bilabial, alveolar, and velar. Some languages evidence a glottal stop and some have an alveopalatal affricate as part of the group of stops.

Regarding phonemic fricatives, most TNG languages only have /s/ but some have /f/ and/or /v/. TNG languages often have a single lateral /l/ and/or a single rhotic (flap /ɾ/ or trill

/r/). It is typical to observe two glides, /w/ and /j/, acting as consonants but usually with phonotactic restrictions. Interestingly, Pawley agrees with Foley (1986) noting that while the phonemic inventory of TNG languages may be relatively simple, the phonetic and allophonic variation of stops in particular can be quite extensive.

Regarding vowels, Pawley & Hammerström (2018) observe that five-vowel systems predominate in TNG languages, but cite McElhanon (1973) and note that seven-vowel systems consisting of the standard five vowels plus an /ɛ/ and an /ɔ/ are common in Finisterre-Huon languages. They also notes that some languages make heavy use of [ɨ] and that in some cases its distribution is predictable and may be best treated as a "consonant release vocoid" (2018: 84). Contrast between short and long vowels is present in some TNG languages and a few languages contrast oral and nasal vowels.

Regarding syllable structure, Pawley & Hammerström (2018) state the syllable pattern for Proto TNG is: (C)V word-initially, CV word-medially, and CV(C) word-finally. Vowel clusters (excluding diphthongs) and consonant clusters are not permitted within a syllable. While many TNG languages do follow the pattern attributed to Proto TNG, many languages do not.

1.5.2 The Finisterre-Huon Family

While there are several previous works discussing phonological typology for TNG languages as a whole, much less typological study has occurred at lower levels within the TNG family, particularly for the relatively large Finisterre-Huon family with its more than 60 languages.

Claasen & McElhanon (1970) first proposed the existence of the Finisterre-Huon language group and its member languages and sub-families based primarily on lexicostatistical comparisons. Four or five languages (including Domung and Kewieng) were identified as belonging to the Yupna sub-family of the Finisterre language family.[3] Regarding the Finisterre stock as a whole, they noted that syllable structure is generally simple with no consonant clusters within the syllable. Most languages allow voiceless stops and nasals to close syllables. Stress was noted to be phonemic in Rawa but probably non-phonemic in Yupna and Wantoat and it was noted not to "carry a heavy functional load" in any of these languages (1970: 66).

[3] Kewieng is a dialect of the Yopno [yut] language of the Yupna sub-family.

A subsequent and more detailed study by McElhanon (1973) compared the grammar of ten different Finisterre-Huon languages and included a discussion of phonological elements. One of the ten languages studied was a dialect of Yopno (called Kewieng) within the Yupna sub-family. McElhanon included a table of the phonemic inventories for each language and made several general observations regarding phonological tendencies including the following:

- All languages have a contrast between voiceless and voiced stops at the labial, alveolar, and velar positions and there are nasals at each of these positions.
- All languages except Rawa have final unreleased variants of the voiceless stops (except the labial-velar stop).
- Most languages have labialized velar variants [kw] and [gw] and double-articulated labial-velar stops [kp] and [gb].[4]
- A six-vowel system predominates but there are five-vowel systems also.
- Vowel length is not a common feature but is sometimes present.
- Syllable structure is generally simple and all languages generally allow any consonant syllable-initially but typically close syllables only with voiceless stops or nasals.

Other literature related to the Finisterre-Huon family as a whole includes Hooley & McElhanon (1970), McElhanon (1975), and Suter (2012).

1.5.3 Phonologies of Finisterre Family Languages

Phonological sketches or descriptions exist for 16 of the 40 languages within the Finisterre language family and two of them are for languages within the Yupna sub-group. Because very few descriptions of phonological typology exist at the level of the Finisterre language family, a brief summary of these 16 previous works was compiled by Moe (2021b) and is presented in Table 4 below. Moe (2021b) also summarized all of the consonant and vowel phonemes of these sixteen languages as shown in Table 5 and provided a brief summary of some phonological features common to Finisterre languages.

[4] Double articulated velar plosives are reported by McElhanon for 3 Finisterre languages: Uri, Wantoat, and Kewieng (a dialect of Yopno). However, subsequent and more recent linguistic analysis has shown that none of these three languages actually exhibit these phonemes; nor in fact do any Finisterre languages, including Domung.

Table 4 Phonological descriptions of Finisterre languages

Language Family	Language Name [ISO]	Reference	Type of Document[5]
Erap	Finongan [fag]	Rice & Rice (2010)	OPD
	Ma Manda [skc]	Pennington (2013)	MA Thesis
	Nek [niv]	Linnasalo (2003a,b)	OPD, Phonology Essentials
	Numanggang [nop]	Hynum (1988, 2001)	Phonology Essentials, OPD
	Uri [uvh]	Webb (1995)	OPD
Gusap-Mot	Iyo / Nahu [nca]	Minter (1998, 2008)	Phonology Essentials, OPD
	Nekgini [nkg]	Lillie (2011)	OPD
	Ngaing [nnf]	Hodgkinson (1998)	OPD
Uruwa	Nukna [klt]	Taylor (2015, 2021)	Grammar Sketch, OPD
	Yau [yuw]	Wegmann (1993, 1994)	Phonology Essentials, OPD
Wantoat	Awara [awx]	Quigley (2003)	MA Thesis
	Tamu-Irumu [iou]	Webb (1997)	OPD
	Wantoat [wnc]	Davis (1994)	OPD
Warup	Gwahatike [dah]	An and An (1990), Price (n.d.)	OPD, OPD
Yupna	Nankina [nnk]	Spaulding (1988, 1992, 1994)	Phonology Essentials, OPD, and Phonology and Grammar
	Yopno [yut]	Reed (1993, 2000a,b)	Phonology Essentials, Grammar Essentials, OPD

[5] An Organized Phonology Data (OPD) paper is a 5-10 page summary of the phonology and orthography of a language while a Phonology Essentials paper is a more detailed analysis of the phonology and orthography of a language and is typically about 30 pages long. Grammar descriptions often include a chapter on the phonology of the language analyzed. These papers are published by the Papua New Guinea branch of SIL International.

Table 5 Phonemic inventories for 16 Finisterre languages

	Language (Source)	Consonants										Vowels			V:
Erap	Finongan [fag]	p	t	k k^w	m n	ɾ	f	s	ʁ	ʔ	w	i	a	u	Yes
	(Rice & Rice 2010)	b	d	g	ɴ						j	ɛ	ai	ɔ	
	Ma Manda [skc]	p	t	q	m n	l	f	s			w	i	ɨ	u	No
	(Pennington 2013)	b	d	g	ɴ						j	e	ə	o	
													a		
	Nek [niv]	p	t	k	m n	l		s z	ɣ		w	i	ə	u	No
	(Linnasalo 2003a,b)	b	d	g	ɴ							e	a	o	
	Numanggang [nop]	p	t	k k^w	m n	l	f	s		h	w	i		u	Yes
	(Hynum 1988, 2001)	b	d	g g^w	ɴ						j	ɛ	ɑ	ɔ	
	Uri [uvh]	p	t	k k^w	m n	r	f	s		ʔ	w	i	ə	u	Yes
	(Webb 1995)	b	d	g g^w	ɴ						j	ɛ	ɑ	o	
Gus ap-Mot	Iyo / Nahu [nca]	p	t	k k^h q	m n	r		s z		h	w	i		u	No
	(Minter 1998, 2008)	b	d	g	ɴ						j	e	ɑ	o	
	Nekgini [nkg]	p	t	k	m n	l		s		h	w	i		u	Yes
	(Lillie 2011)	b	d	g	ɴ	ɾ					j	e	ɑ	o	
	Ngaing [nnf]	p	t	k	m n	l		s		h	w	i		u	Yes
	(Hodgkinson 1998)	b	d	g	ɴ	r		dʒ			j	e	a	o	
Uruwa	Nukna [klt]	p	t	k	m n	l	f	s		h	w	i	ʌ	u	No
	(Taylor 2015, 2021)	b	d	g	ɴ	ɾ					j	e	ɑ	o	
	Yau [yuw]	p	t	k k^h	m n	r	f	s		ʔ	w	i		u	No
	(Wegmann 1993,		t^h		ɴ					h	j	e		ɤ	
	1994)												ɑ	o	
Wantoat	Awara [awx]	p	t	k k^w	m n	l	β	s	ɣ	h	j	i	ɜ	u	No
	(Quigley 2003)	b	d	g g^w	ɴ ɴ^w							e	a	o	
	Tamu-Irumu [iou]	p	t	k	m n			s	ɣ			i	ʌ	u	No
	(Webb 1997)	^{m}b	^{n}d	^{N}g	ɴ			^{n}dʑ				e	ɑ	o	
	Wantoat [wnc]	p	t	k k^w	m n			s			w	i		u	Yes
	(Davis 1994)	^{m}b	^{n}d	^{N}g ^{N}g^w	ɴ ɴ^w			^{n}z			j	e	ə	o	
												æ	ɑ		
Warup	Gwahatike [dah]	p	t	k	m n	l	f	s		ʔ		i		u	Yes
	(An and An 1990,	b	d	g	ɴ	ɾ				h		e	a	o	
	Price n.d.)														
Yupna	Nankina [nnk]	p	t	k	m n		β	ts			w	i	ʌ	u	No
	(Spaulding 1988,	b	d	g	ɴ			dz			j	ɛ	ɑ	ɔ	
	1992, 1994)														
	Yopno [yut]	p	t̪	k	m n	l		s			w	i	ɨ	u	No
	(Reed 1993,	b	d̪	g	ɴ			dʑ			j	e	ə	o	
	2000a,b)												ɑ		

1.5.4 Phonologies of Two Yupna Family Languages

As mentioned above, two other Yupna family languages have been previously described. Spaulding (1988, 1992, 1994) analyzed the neighboring and closely related language of Nankina [nnk] and describes the phonology of Nankina in substantial depth. He notes several features with similarities to Domung such as a high-central vowel 'inserted' between word-initial consonants and the presence of optional fricative allophones of voiceless stops intervocalically (with varying degrees of voicing). Reed (1993, 2000a,b) analyzed the neighboring and closely-related language of Yopno [yut]. While Reed describes the phonology of Yopno in slightly less depth, he does describe several phonetic and phonological features with similarities to Domung such as the retraction or 'backing' of velar consonants and also that some plosives are realized as fricatives between certain vowels.

1.5.5 Previous Work in the Domung Language

A very brief introduction to the phonology and the grammar of Domung was included as part of an initial sociolinguistic survey of the Domung language area (Gray 2007). According to Gray (2007: 29) an alphabet design workshop was held in Gabutamon village in 2005 which resulted in the following trial orthography for Domung: <a, b, d, e, g, i, í, k, m, n, ŋ, o, p, r, s, t, u, v, w, y, z, gw, kw>. Gray also documented some preliminary phoneme charts for Domung.

Two Domung speakers attended a translator training course hosted by SIL-PNG in June of 2015 which resulted in a brief and tentative grammar sketch authored by King (2015). These same two Domung speakers subsequently attended a Discover Your Language workshop hosted by SIL-PNG in October of 2017 which resulted in a short, unpublished manuscript (Kwasík et al. 2017). These two documents contain preliminary and tentative notes regarding the grammar of Domung with a focus on translation principles when translating from English to Domung.

In addition, I have also completed some preliminary analysis of the Domung language as described in Moe (2021a,b), Moe (2022), and Moe (2023). This thesis synthesizes, builds upon, and adds to these previous and more preliminary descriptions.

2. Domung Grammar Basics

This thesis aims primarily to describe the phonology of the Domung language. However, a basic introduction to some aspects of the grammar is helpful because it provides an opportunity to describe other aspects of this underdescribed language and also because it provides some context for the phonological descriptions and glosses contained in the remainder of the thesis.

It should also be noted that no significant or formal analysis of the grammar of the Domung language is available at this time. Thus, some of the grammar descriptions outlined below and some grammatical glosses contained within this thesis are tentative in nature and may be revised as analysis of the grammar progresses.

2.1 Nouns and Noun Phrases

Domung nouns do not inflect to indicate person or number, but do take suffixes which indicate possession (POSS), location (LOC), or other information. A typical noun phrase word order is: Demonstrative-Noun(s)-Adjective(s)-Numeral as in (3) and (4). The order of nouns within the 'Noun(s)' slot and the order of adjectives within the 'Adjective(s)' slot can change when there are multiple nouns or adjectives present. When the intensifier *sənə* is used, it is most often placed before the numeral but its position within the noun phrase can vary depending on what it modifies.

(3)	*no*	*jaɢʷan*	*tam*	*matep*	*ɾuqɾuq*	*bəɾoɴə*
	that	tanget	leaf	big	red	two
	DEM	NOUN	NOUN	ADJ	ADJ	NUM

'those two big red tanget leaves' (King 2015: 10)

(4)	*no*	*bət*	*jut*	*moi*	*sənə*	*qətaɴ*
	that	pig	house	small	very	little
	DEM	NOUN	NOUN	ADJ	INT	ADJ

'that somewhat small pig house'

Personal pronouns in Domung are shown in Table 6 below. Interestingly, there is no unique 3SG or 3PL pronoun and instead the demonstratives *no* 'DEM' and *ma* 'group' are used.

Table 6 Pronoun system for Domung

	SG	DU	PL
1	*naq*	*nit*	*nin*
2	*ɢaq*	*din*	*də*
3	*no*	*nijat*	*ma*

Nouns are classified as either alienable or inalienable and they take similar suffixes to indicate possession with the only difference being the form of the 3SG.POSS suffix; which for inalienable nouns is /-ə/ and for alienable nouns is /-nə/. Inalienable possession includes body parts and blood relations, but not relationships resulting from marriage. Individual parts of living things may also be inalienably possessed (such as the branches, roots, or fruits of a tree), but if these parts are removed, then these objects switch to alienable possession as shown in (5). Refer to further discussion in §6.2 and to the examples in Appendix A. Possession may also be indicated using the possessive enclitic /dasən/ (see examples in §6.1). A number of other enclitics are also utilized in Domung although their specific forms and functions are a subject of ongoing research.

(5) a. /əwom/ 'vine' + /-ə/ '3.POSS.INAL' → /əwomə/ 'vine-3.POSS.INAL'
+ /-nə/ '3.POSS.ALN' → /əwomnə/ 'vine-3.POSS.ALN'
b. /sep/ 'seed/fruit' + /-ə/ '3.POSS.INAL' → /sepə/ 'seed/fruit-3.POSS.INAL'
+ /-nə/ '3.POSS.ALN' → /sepnə/ 'seed/fruit-3.POSS.ALN'

A locative suffix (LOC) may be added to nouns to indicate direction or location. The locative suffix has several different forms, some of which appear to be lexically determined and others of which are phonologically conditioned. Refer to Appendix A for examples.

Nouns are not directly marked for number. Instead, the number of a noun is most often indicated via the switch reference marking of medial verbs and/or the obligatory person/number marking of the final verb in the clause.

2.2 Demonstratives

The demonstrative system is rather complex and is based both on distance and elevation relative to the speaker. Refer to Table 7 below for the system of demonstratives. Some directional verbs (such as 'go' and 'come') exhibit this same uphill/same-level/downhill distinction with different lexically bound root forms depending on the vertical direction of travel.

Table 7 Demonstrative system

	Uphill	Same Level	Downhill
At Hand	←	*qano*	→
Near	*eɢot*	*aɢot*	*meɢot*
Far	*eəɴ*	*ajeəɴ*	*ameəɴ*

2.3 Adjectives

Adjectives in Domung follow the head noun and describe attributes such as colour, size, quality, or number as in (6) and may be intensified by inclusion of the intensifier *sənə* following the adjective. As with other Finisterre-Huon languages (McElhanon 1973), Domung uses an adjectivizer suffix which is the same as the 3rd person possessive suffix to form adjectives from nouns. Also consistent with other Finisterre-Huon languages, reduplication may be utilized to form adjectives in some cases.

(6) *qəep* *jut* *baburə* *sənə* *kwa*
tree/wood house large INT one
'one very large tree/wood house'

2.4 Postpositions

Several postpositions are used in Domung to describe the physical position of nouns in relation to other objects as summarized in Table 8. These postpositions are often used in combination with a locative suffix /-on/ but the relative positions of the locative suffix and the postposition are not always consistent and appear to be lexically determined.

Table 8 Postpositions with examples

Postposition + gloss		Example	
-on	'LOC'	*wabamoq-on*	'valley-LOC'
bin	'inside'	*muqpot-on bin*	'blanket-LOC inside'
pen	'on top'	*mup-on pen*	'taro/food on.top'
daɢat	'beside'	*tap daɢat-on*	'ocean beside-LOC'
baɢaɾoq	'under'	*patot baɢaɾoq*	'bed under'
ɴam	'front'	*jut ɴam-on*	'house front-LOC'

2.5 Verbs and Verb Phrases

As Pawley (2008) observes, many Trans New Guinea languages exhibit a rich verbal morphology and Domung is no exception. Domung is also a typical Trans New Guinea language in that it utilizes medial-final verb constructions. These constructions are described by Foley (1986) and Pawley (2008) as constructions in which clause-final verbs inflect to indicate the person/number of the subject as well as TAM of the verb, while medial verbs (occurring non-finally within a clause) do not carry the same inflections. Domung utilizes anticipatory switch-reference marking on medial verbs to indicate whether the subject of the medial verb is the same (SS) or different (DS) from the subject of the next verb in the clause; if the subject of the medial verb is different, then the medial verb is inflected to indicate the person/number of the medial verb's subject; refer to (12) below for an example.

Domung appears to have at least five tenses: distant past (FPST), recent past (RPST), present (PRES), near future (NFUT), and distant future (FFUT).[6] There are also likely affixes and/or verbal adjuncts to mark other verbal features such as causation, desire, and aspect. The verb paradigm system for Domung is fairly regular, but it does include some irregular forms. There are at least three different 'inflection classes' of verbs and possibly more. Appendix B contains examples of these verb paradigms detailing how they inflect to indicate number (SG, DU, PL), person (1, 2, 3), and tense. In some cases, affixes are somewhat fusional and it can be difficult to determine precise morpheme boundaries. In other cases, irregular lexical forms are utilized. Analysis of the verb morphology is ongoing.

There are two types of transitive verbs, one which uses prefixes to indicate only whether the object is singular or plural, and a second which uses prefixes to indicate the person (1, 2, 3) and number (SG, DU, PL) of the object. See (7) for an example of the former and see a full paradigmatic example of the latter in Appendix B.

(7) a. Ø-əp-ɢə-mat
SG.OBJ-put/leave-FPST-1DU
'We two put/left it'

b. j-əp-ɢə-mat
PL.OBJ-put/leave-FPST-1DU
'We two put/left them'

Interestingly, the distinctions differ between various person and number combinations for subject, for object, and for anticipatory switch-reference marking. These systems are compared in Table 9 through Table 11 below. Similar differences in these affix matrix groupings have also been noted for other Finisterre-Huon languages (McElhanon 1973).

Table 9 Subject marking on final verbs

1SG	1DU	1PL
2SG 3SG	2/3DU	2/3PL

[6] The future tenses may actually represent some form of irrealis and further analysis/research is recommended.

Table 10 Object marking on final verbs

1SG	1DU/PL
2SG	2DU/PL
3SG/DU/PL	

Table 11 Anticipatory switch reference marking on medial verbs

1SG	1DU	1PL
2SG	3SG/2/3DU	2/3PL

A simple verb phrase consists of a negator, an adverb, and/or an intensifier followed by the verb as shown in (8) and (9).

(8) *Jop qəbomən=to taɾa me dəmo sənə ə-n-o-t.*
Jop Lord=PUR/DIR curse talk NEG INT 3.OBJ-tell-FPST-3SG.FPST
'Jop really did not tell a curse to the Lord.'

(9) *Deni qano meəqanə qətaN Ga-n-oja-t dipjaN sənə nut-gwi.*
Deni DEM story little 2SG.OBJ-tell-NFUT-1SG properly INT hear-2SG.IMP.FUT
'Deni, you must properly hear this short story I will tell you.'

2.6 Sentence Structure

Gray (2007) identifies the basic word order of Domung as Subject-Object-Verb which is typical for TNG languages (Pawley 2008). This word order is illustrated by (10) to (12). Note the anticipatory switch reference marking on medial verbs as well as the full person/number and TAM inflections present on clause-final verbs.

(10) *məNae qabə=a təqan p-apt-aN p-əN-qo*
woman group=SM digging.stick PL.OBJ-get-SS.SQ PL.OBJ-get-go.SS.SQ

waG-en kup ningd-e-ng
garden-LOC ground dig-PRES-2/3PL
'A group of women get digging sticks and take them to the garden and they dig ground.'

(11) *qʷəɾəm qʷa jon qo kəban qʷa k-aN*
snake one in.the.house go.SS.SQ rat one look-SS.SQ

əq n-e-q
kill.SS.SQ eat-PRES-3SG
'One snake goes into the house and sees and kills and eats a rat.'

(12) *opma* *qəmtuq* *puw-a-t=da* *pətaq* *jamaq* *qaabə*
yesterday night sleep-RPST-1SG=SM rise.up.SS.SQ banana three

səɴ *n-aɴ* *əɴ* *ɢaq=asən* *yom-en* *wap-o*
cook.SS.SQ eat-SS.SQ and 2SG.PRO=POSS door-LOC come-1SG.DS.SQ

wago *umat*
work make/do.RPST.1DU
'Last night I was sleeping and I rose up and cooked and ate three bananas and I came to your door area and we two worked.'

3. Consonants

Domung has 16 phonemic consonants. The phonemic inventory of consonants with surface realizations are summarized in §3.1. The subsequent sections (§3.2 through §3.7) provide detailed descriptions and examples of each consonant (with each section discussing a different manner of articulation). Lastly, consonant co-occurrence is discussed in §3.8. Preliminary and more abbreviated versions of the phonemic analysis of consonants in Domung have been detailed in Moe (2021a, 2021b, 2022).

3.1 Phonemic Inventory

The phonemic inventory of consonants is summarized in Table 12 below and includes phonetic variations (if present) in brackets. Figure 4 contains a frequency chart of consonant phones. The three major places of articulation are bilabial, alveolar, and a rather unusual post-velar/uvular position. A full set of voiced and voiceless plosives as well as voiced nasals occur at each of the three places of articulation. The only phonemic fricative is the voiceless alveolar sibilant /s/. The voiced affricate /dʒ/ is also present but is subject to significant phonotactic restrictions and only occurs word-medially. The alveolar flap /ɾ/ is also present as are the labial-velar and palatal approximants /w/ and /j/.

Like the closely related language of Yopno (Reed 2000a,b), Domung uses a back-velar or uvular place of articulation instead of the velar place of articulation more commonly present in other Finisterre languages (see Table 5). This uvular place of articulation varies along a continuum between velar and uvular depending on speaker, context, and speed of speech. For example, if the uvular plosive is labialized, then it tends to be more velar. Furthermore, the voiceless plosive tends to have a more uvular quality than the voiced plosive as has also been noted for Ma Manda (Pennington 2013). Ohala (1983) showed that voicing is harder to maintain as the oral cavity size decreases. Domung maintains a voicing contrast between uvular plosives, but allows the voiced plosive to shift to a more velar position to facilitate voicing. However, for the sake of symmetry and to emphasize their unique and noticeable back-velar/uvular quality, I have chosen to transcribe all these consonants at the uvular place of articulation.

In §3.2 to §3.6, three examples of each consonant are provided for word-initial (WI), intervocalic (IV), non-intervocalic word-medial (WM), and word-final (WF) positions, in this order. Phonotactic restrictions on consonant position are denoted by the presence of dashes (---) which indicate that a given consonant does not occur in the noted position.

Table 12 Phonemic inventory of Domung consonants with phonetic realizations

	Bilabial		Alveolar/Palatal		Velar/Uvular	
	vl	vd	vl	vd	vl	vd
Plosive	p [β]	b [β]	t	d	q [ɢ] [ʁ] [χ]	ɢ [ʁ] [q] [χ]
Fricative/ Affricate			s	d͡ʒ [d͡ʒʲ]		
Nasal		m		n		ɴ [ŋ]
Tap/Flap				ɾ		
Glide		w		j		
Labialized Plosive					qʷ	ɢʷ

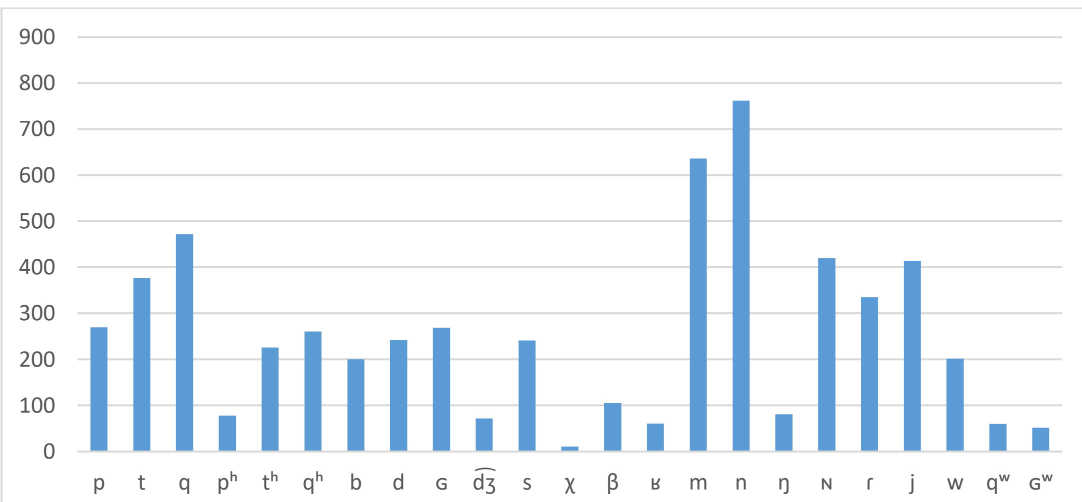

Figure 4 Frequency chart of consonant phones

3.2 Plosives

Domung has a full set of voiced and voiceless plosives occurring at each of the three places of articulation: bilabial, alveolar, and uvular. The presence of uvular plosives but no velar plosives is interesting and unusual cross-linguistically (Maddieson 2013). Examples of each plosive are shown in (13) to (18). Only voiceless plosives may occur word-finally; voiced plosives are phonotactically restricted from occurring in this position. As noted by Claassen & McElhanon (1970), and similar to other Finisterre family languages (Hynum 2001 and Quigley 2003:17), voiceless plosives in Domung are typically, but not always, aspirated word-initially and syllable-initially. Word-finally, voiceless plosives are usually, but not always, unreleased; utterance-finally they are released with a heavy exhalation of air through the nose (depending on speaker). The Finisterre language of Uri exhibits a similar utterance-final nasal release according to Webb (1995). Refer to Figure 5 for an example of the acoustic properties of the nasal aspirated release of a voiceless uvular plosive.

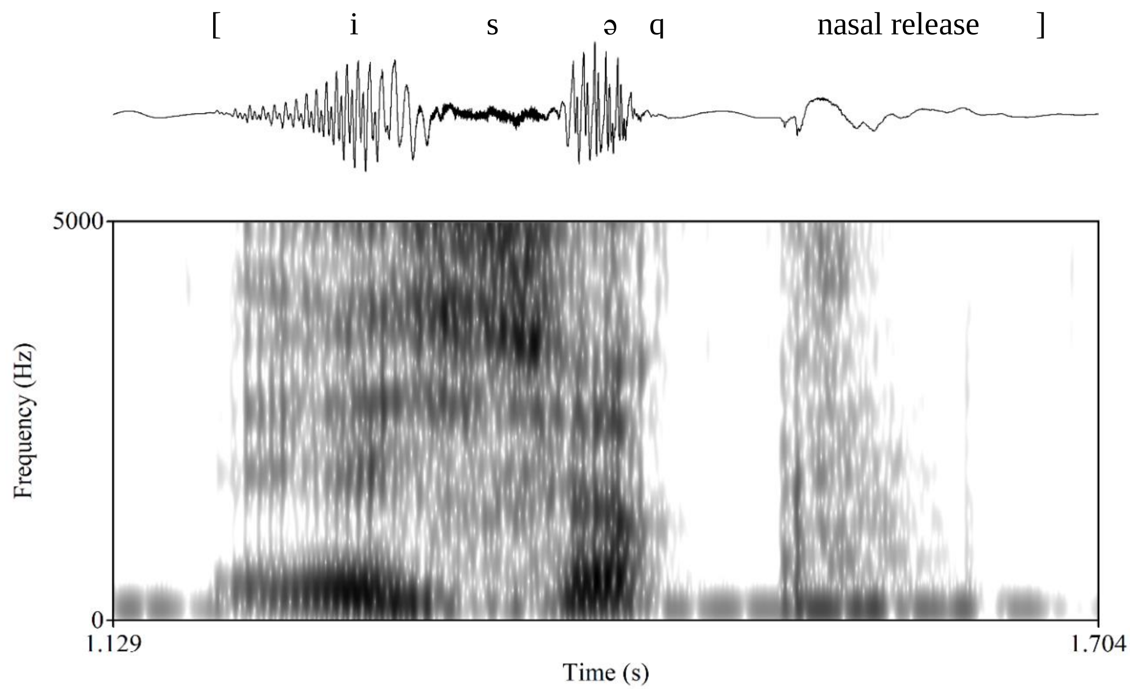

Figure 5 Nasal release of [isəq] ‘trap(sp)’ 0791.4 spoken by M01

(13) Examples of voiceless plosive /p/

WI	[pʰan]	/pan/	‘bamboo pipe/funnel’	1806
	[pʰɛn]	/pen/	‘rain’	1335
	[pʰatʰot]	/patot/	‘bed’	0696
IV	[wapʰisi]	/wapisi/	‘corn’[7]	1200
	[waβemat̚]	/wap-e-mat/	‘come-PRES-1DU’	1399.18
	[qʰəɾaβon]	/qəɾap-on/	‘water-LOC’	1284.1
WM	[apnə]	/apnə/	‘equal/same’	0424
	[muqpot̚]	/muqpot/	‘blanket’	2019
	[aptʰaɴ]	/apt-aɴ/	‘get/hold-2SG.IMP’	0808.16
WF	[qʰaɾap̚]	/qaɾap/	‘cuscus/meat’	1776
	[tʰup̚]	/tup/	‘grasshopper’	1132
	[pʰup̚]	/pup/	‘chicken’	0974

[7] This is a borrowed word which may explain why it is the only instance of an intervocalic /p/ in the corpus.

(14) Examples of voiced plosive /b/

WI	[ban]	/ban/	‘breadfruit’	1741
	[boɾam]	/boɾam/	‘grub’	1788
	[bətʰ]	/bət/	‘pig’	0987
IV	[babu]	/babu/	‘father’s father’	0343
	[baaba]	/baaba/	‘pandanus(sp)’	1737.1
	[qʰabəɴ]	/qabəɴ/	‘yam(sp)’	1229.1
WM	[dambə]	/dambə/	‘strong post tree’	1158.12
	[qʷaɴbe]	/qʷaɴbe/	‘edible green(sp)’	1734.3
	[jambat]	/jambat/	‘banana(sp)’	1208.7
WF	---	---	---	---

(15) Examples of voiceless plosive /t/

WI	[tʰəmo]	/təmo/	‘nose’	0011
	[tʰɛmbuq]	/tembuq/	‘ancestral design’	2066
	[tʰam]	/tam/	‘leaf’	1177
IV	[pʰotəq̚]	/potəq/	‘bald’	0190
	[neitʰo]	/neito/	‘therefore’	2093
	[batʰan̚]	/batan/	‘thigh’	0065
WM	[aptʰat̚]	/apt-a-t/	‘get-RPST-1SG’	0808
	[qʰəmtʰuχə]	/qəmtuqə/	‘dark’	1351
	[jaɴtʰo]	/jaɴto/	‘want’	0287
WF	[boɾit̚]	/boɾit/	‘caterpillar’	1137
	[tɛt̚]	/tet/	‘string’	0652
	[jaomat]	/j-ao-mat/	‘say-FPST-1DU’	0435.4

(16) Examples of voiced plosive /d/

WI	[dəmo]	/dəmo/	‘no/not’	1700
	[deinə]	/dein-nə/	‘friend-3SG.POSS’	0380.1
	[dam]	/dam/	‘wild bamboo(sp)’	1174.4
IV	[idit̚]	/idit/	‘sit down’	0150.1
	[dudu]	/dudu/	‘hunting blind’	1901
	[adat]	/adat/	‘custom’	0932
WM	[dimdim]	/dimdim/	‘type of vine’	1191.9
	[bondaq̚]	/bondaq/	‘bamboo shoot’	1174
	[qʷaapdɛt̚]	/qʷaapdɛt/	‘announcement’	0447
WF	---	---	---	---

(17) Examples of voiceless plosive /q/

WI	[qʰup̚]	/qup/	‘ground’	1261
	[qʰatʰ]	/qat/	‘and/with’	1678
	[qʰəɾoɴ]	/qəɾoɴ/	‘hook on plant’	1193.1
IV	[waqɛn]	/waqen/	‘garden-LOC’	0683
	[weəqupʰ]	/weəqup/	‘whistle’	0882
	[watʰuχ̞ə]	/watuqə/	‘thin’	0193
WM	[daqsɛt̚]	/daqset/	‘hiccup’	0114
	[aq̚pʰaɾaq̚]	/aqpaɾaq/	‘cooking banana(sp)’	1209.1
	[waqtʰɛn]	/waqten/	‘sister’s children’	0341.4
WF	[jəq̚]	/jəq/	‘woven bag’	0624
	[qʰaq̚]	/qaq/	‘pitpit(sp)’	1730.1
	[jamaq̚]	/jamaq/	‘cooking banana’	1208

(18) Examples of voiced plosive /ɢ/

WI	[ɢin]	/ɢin/	‘woven bamboo wall’	0755
	[ɢatʰ]	/ɢat/	‘tree(sp)’	1158.25
	[ɢəɾaɴ]	/ɢəɾaɴ/	‘tusk/horn’	1028
IV	[ɢuɢɛm]	/ɢuɢem/	‘cloud’	1315
	[boɢam]	/boɢam/	‘toad/frog’	1106
	[doʁatʰ]	/doɢat/	‘banana(sp)’	1208.11
WM	[məɴɢap̚]	/məɴɢap/	‘head’	0003
	[dəmɢum]	/dəmɢum/	‘ceiling’	0668.3
	[waɴɢa]	/waɴɢa/	‘ship’	1873
WF	---	---	---	---

As with other Trans New Guinea languages (Foley 1986: 55), including Finisterre languages, Domung exhibits the phonological processes of spirantization and voicing whereby phonemic plosives are often realized as voiced fricatives intervocalically. For Domung, these processes are asymmetric in that they only affect the bilabial and uvular plosives and never alveolar plosives. These processes can be illustrated both by morphophonemic analysis (see §6.4) and by examples of free variation (see below).

With respect to the bilabial plosives, the presence of [β] as a surface form is not surprising based on typological analysis; however, in related languages it is more often an allophone of /w/ (Webb 1995, Hynum 2001) or /b/ (Reed 2000a,b, Taylor 2021), rather than /p/ or /b/ as is the case in Domung. There is a very strong tendency for voiceless bilabial plosives to become voiced intervocalically as there are only three very marginal examples of the voiceless bilabial plosive occurring intervocalically.[8] There is also a very strong tendency for them to be spirantized as shown by (19).

(19) a. /mup/ ‘taro/food’ + /-on/ ‘LOC’ → [muβ-on] ‘taro/food-LOC’
b. /tap/ ‘ocean’ + /-on/ ‘LOC’ → [taβ-on] ‘ocean-LOC’
c. /əp-/ ‘put/leave’ + /-o/ ‘1SG.DS.SQ’ → [əβ-o] ‘put/leave-1SG.DS.SQ’

The voiced bilabial plosives may occur intervocalically, but they may also be spirantized and are thus often in free variation with the fricative [β] as shown by (20). Sometimes the fricative [β] is closer to a voiced bilabial approximant [β̞] than a true fricative. See Figure 6 for acoustic evidence of free-variation between /b/ and [β] intervocalically.

(20) a. [sa**b**eəN ~ sa**β**eəN] ‘chop-2SG.PRES’ 0717
b. [wa**b**aN ~ wa**β**aN] ‘come-2SG.IMP’ 1399.36
c. [jə**b**əq ~ jə**β**əq] ‘handle’ 0631

These processes of voicing and spirantization may lead to a neutralization of contrast between the underlying phonemes /p/ and /b/ in the intervocalic position as both phonemes may be realized as [β].

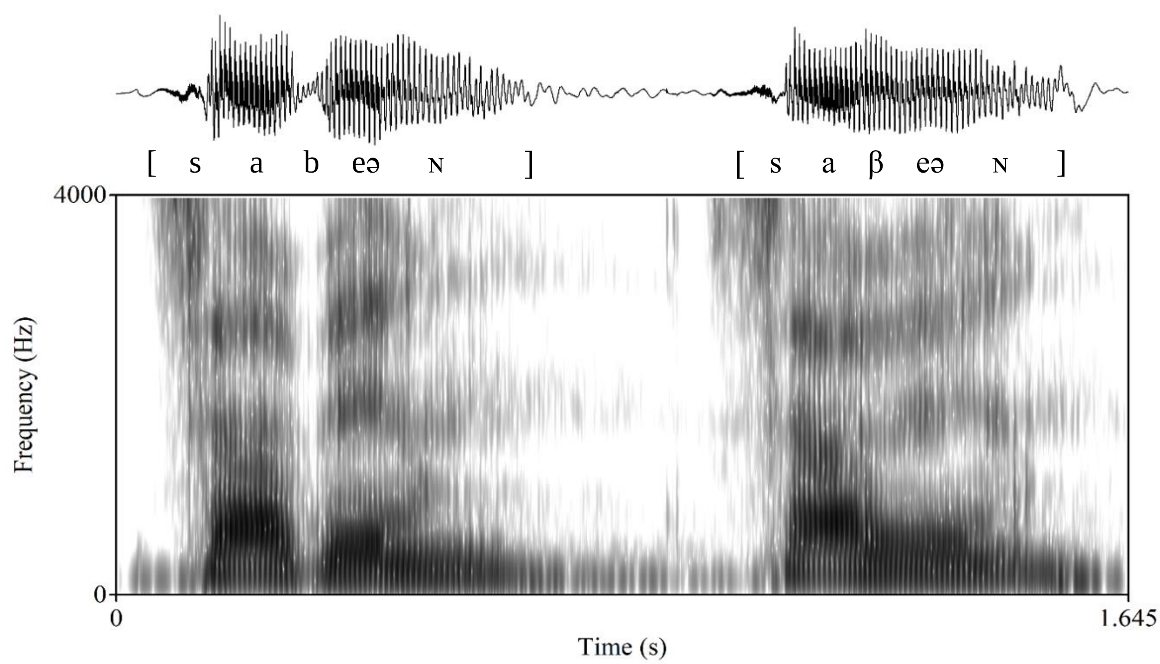

Figure 6 Free variation between two tokens [sabeəN ~ saβeəN] ‘chop.2SG.PRES’

[8] The intervocalic /p/ in example (13) is likely a loanword since corn is not a native plant species and also has an alternate pronunciation [waβis]. The other two instances of intervocalic /p/ involve a reduplicated word and a complex verb form.

With respect to uvular plosives, King (2015: 6) previously noted the tendency in Domung to weaken and/or voice intervocalic uvular plosives. Specifically, he observed that Domung speakers experience difficulty deciding how to spell intervocalic uvular plosives, as in the case of /wago/ ‘garden’ which was sometimes spelled <wako>, other times <wago>, and still other times <wakgo>.

Voicing of voiceless uvular plosives does occur but it is not as productive as the voicing of voiceless bilabial plosives (see Ohala 1983); however the process of spirantization for both voiceless and voiced uvular plosives is still rather productive (but far from universal). Thus, there are many examples of free variation between [q ~ ɢ ~ χ ~ ʁ] in intervocalic position. Refer to (21) and Figure 7 for examples of this free variation.

As with the bilabial plosives, these processes of voicing and spirantization may lead to a neutralization of contrast between the underlying phonemes /q/ and /ɢ/ in the intervocalic position; each of these two phonemes may optionally be realized as [q ~ ɢ ~ χ ~ ʁ] intervocalically as shown by (21), but there are also numerous cases of clear contrast in similar environments.

(21)	a.	[meə**q**anə ~ meə**ʁ**anə]	‘story’	0480
	b.	[wa**χ**o ~ wa**ɢ**o]	‘garden’	0683
	c.	[da**ʁ**at ~ da**χ**at]	‘beside’	1672
	d.	[də**ʁ**ap ~ də**χ**ap]	‘rack over fire’	1802
	e.	[mə**ɢ**an ~ mə**χ**an]	‘breath/spirit/steam’	0092
	f.	[so**q**uwa ~ so**ɢ**uwa]	‘choko(plant)’	1728
	g.	[jə**q**əni ~ jə**ʁ**əni]	‘you all stay’	1403
	h.	[mə**ɢ**əm ~ mə**ʁ**əm]	‘banana (sp)’	1208.1

The phenomena of an underlying voiced uvular plosive /ɢ/ being realized as a voiceless uvular [q] or [χ] is difficult to establish conclusively given the nature of the free variation present at the uvular place of articulation. However, some Domung speakers will maintain that a particular uvular plosive is voiced, even though they may sometimes pronounce it as voiceless. Thus, I believe that an underlying voiced uvular plosive may indeed be occasionally realized as a voiceless uvular plosive as in (21f) where Domung speakers have agreed that the underlying form is /soɢuwa/ rather than [soquwa].

This is an interesting phenomenon worth additional consideration. Hayes and Steriade (2004) observe that the place of articulation affects the difficulty of maintaining voicing in plosives; more specifically, they note that the smaller the size of the oral cavity behind the point of constriction, the harder it is to maintain voicing. Summarizing the work of Ohala and Riordan (1979), they observe that it is easiest to maintain voicing for [b], more difficult for [d], and most difficult for [g]. While they do not address the case of uvular plosives, there is every reason to assume the same articulatory restrictions apply and that it would be even harder for speakers to maintain voicing of a uvular plosive [ɢ] than of a velar plosive [g]. It is therefore less surprising than may be initially expected that an intervocalic voiced uvular plosive [ɢ] may occasionally be realized as and freely vary with a voiceless uvular plosive [q] as in (21f). This phenomenon may also help explain the highly productive voicing of intervocalic bilabial /p/, but the less productive voicing of intervocalic uvular /q/.

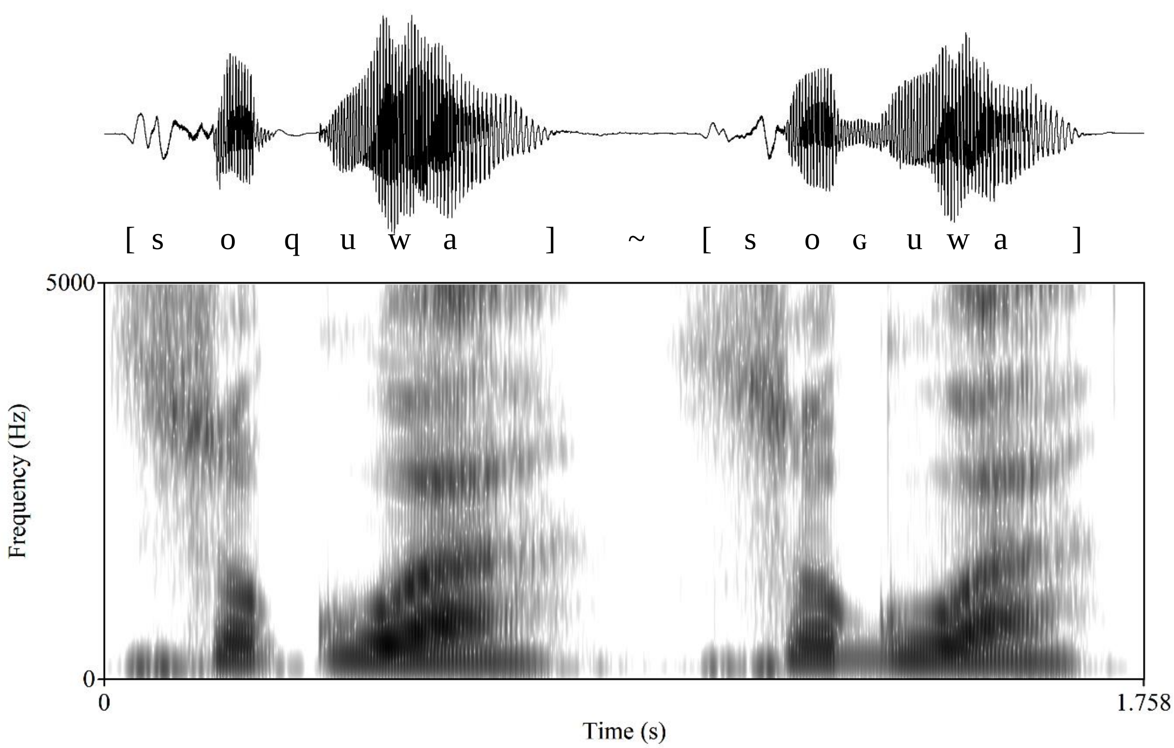

Figure 7 Free variation between [soquwa ~ soɢuwa] ‘choko(plant)’ in (21f)

As previously mentioned, these processes of devoicing/voicing and spirantization are asymmetric in that they do not affect the alveolar plosives /t/ and /d/. The alveolar plosives are never realized as anything other than their underlying forms.

3.3 Fricatives and Affricates

Domung does not exhibit phonemic fricatives other than the voiceless alveolar fricative /s/ which may not occur word-finally as shown by (22). The voiced palato-alveolar affricate /d͡ʒ/ is also present but is less common. Furthermore, as shown by Table 15, /d͡ʒ/ is subject to significant phonotactic restrictions and most often only occurs after the alveolar nasal /n/ in word-medial position (67 out of all 69 instances); there is only a single occurrence intervocalically and a single instance after the bilabial nasal /m/.

(22) Examples of the voiceless fricative /s/

WI	[suwat̚]	/suwat/	‘coconut’	1739
	[səp̚]	/səp/	‘stone’	1272
	[soɾeəq̚]	/soɾeəq/	‘lizard’	1100
IV	[saso]	/saso/	‘chinese taro’	1228
	[wusəm]	/wusəm/	‘pine tree(sp)’	1158.3
	[qʰəsəq̚]	/qəsəq/	‘sharp’	1573
WM	[unsoq̚]	/unsoq/	‘walking stick’	0560
	[daqsɛt̚]	/daqset/	‘hiccup’	0114
	[mumsiin]	/mumsiin/	‘nipple’	1761
WF	---	---	---	---

(23) Examples of the voiced affricate /d͡ʒ/

WI	---	---	---	---
IV	[jid͡ʒit̚]	/jid͡ʒit/	‘moss’	---
WM	[mund͡ʒi]	/mund͡ʒi/	‘male child’	0335
	[qʰund͡ʒam]	/qund͡ʒam/	‘daka for buai’	1899
	[bəmd͡ʒot̚]	/bəmd͡ʒot/	‘corpse’	0953
WF	---	---	---	---

The affricate /dʒ/ may be optionally released with a short palatal glide; this occurs most frequently when the next consonant is a uvular consonant /q/, /ɢ/, or /ɴ/ as in (24).

(24)	a.	[pʰand͡ʒʲəq̚]	/pand͡ʒəq/	‘pig’s tail’	1783
	b.	[qwand͡ʒʲəɴ ɢoɴ]	/qwand͡ʒəɴ ɢoɴ/	‘tree glue’	1181.1
	c.	[band͡ʒʲoq̚]	/band͡ʒoq/	‘tomahawk’	0716

The sequence [nd͡ʒ] could possibly be analyzed as an allophone of /ns/ where the /s/ has been subjected to a process of postnasal fortition. These two sequences are nearly in complementary distribution; /dʒ/ almost always occurs after /n/, while /s/ rarely occurs after /n/ (only 4 instances). Furthermore, /s/ often occurs word-initially and intervocalically, while

/dʒ/ almost never occurs in these environments. However, this analysis is problematic because, as shown by (25), the four instances of /ns/ sequences are both prominent and clear and they are not realized as /nd͡ʒ/. Further research is warranted and however, based on currently available data /d͡ʒ/ is analyzed as a separate phoneme at this time.

(25)	a.	[nonsəp̚]	/nonsəp/	‘cane (for elderly person)’	0560.1
	b.	[səmunsəsət̚]	/səmunsəsət/	‘bird (sp)’	1041.3
	c.	[unsoq̚]	/unsoq/	‘walking stick’	0560
	d.	[donsəp̚]	/donsəp/	‘edible plant (sp)’	1734.5

3.4 Nasals

Nasals occur frequently in Domung, with 1166 different entries (70% of the corpus) containing at least one nasal and many entries containing more multiple nasals. Nasals also carry a high functional load in the language as evidenced by the presence of numerous minimal and near-minimal pairs. Nasals may occur in any position as shown by (26) to (28); however, the phoneme /ɴ/ is always preceded by a vowel unless it occurs word-initially (a rare occurrence in the corpus). In some contexts, the phoneme /ɴ/ is often fronted and realized more as a velar nasal [ŋ]; the context in which this is most noticeable is prior to the palatal glide /j/, although it also occurs to varying degrees prior to bilabial and alveolar consonants. The presence of a uvular nasal is interesting as it is unusual cross-linguistically (Maddieson 2013). As discussed in §4.4, the uvular quality of /ɴ/ is preserved adjacent to front vowels by epenthesis of the schwa vowel.

(26) Examples of bilabial nasal /m/

WI	[man]	/man/	‘name’	0359
	[mam]	/mam/	‘mother’	0345
	[maɴ]	/maɴ/	‘fall.down.2SG.PRES’	1411
IV	[joma]	/joma/	‘door’	0665
	[tʰumot̚]	/tumot/	‘navel/umbilical cord’	0038
	[bamə]	/bamə/	‘ready’	1247
WM	[jombe]	/jombe/	‘love charm’	0924
	[bupmum]	/bupmum/	‘orchid(sp)’	1900.4
	[nomɢʷaq]	/nomɢʷaq/	‘dog’	0991
WF	[tʰam]	/tam/	‘leaf’	1177
	[mijam]	/mijam/	‘pandanus(sp)’	1737.3
	[waam]	/waam/	‘blessing’	0913

(27) Examples of alveolar nasal /n/

WI	[nan]	/n-a-n/	‘eat-RPST-2SG’	0140.9
	[naɴ]	/n-aɴ/	‘eat-2SG.IMP’	0140.16
	[nuɴ]	/nuɴ/	‘axe’	0176
IV	[mənam]	/mənam/	‘bird’	1041
	[bone]	/bone/	‘pitpit(sp)’	1730.6
	[meəqanə]	/meəqanə/	‘story’	0480
WM	[wainɢinɢan]	/wainɢinɢan/	‘spicy/hot/sharp’	2039
	[ɢɛnduq̚]	/ɢenduq/	‘snore’	0108
	[mɪtniəɴ]	/mətniəɴ/	‘cave’	1270
WF	[pɛn]	/pen/	‘rain’	1335
	[qʷan]	/qʷan/	‘vine(sp)’	1191.3
	[waan]	/waan/	‘kwila tree’	1707

(28) Examples of uvular nasal /ɴ/

WI	[ɴam]	/ɴam/	‘face’	0005
	[ɴamon]	/ɴam-on/	‘front-LOC’	1670
	[ɴam ɛɛp]	/ɴam eep/	‘dizzy’	0126
IV	[suɴun]	/suɴun/	‘buttocks’	0044
	[tʰoɴəq̚]	/toɴəq/	‘start’	1501
	[baɴə]	/baɴə/	‘kind/type’	2072
WM	[məɴɢap̚]	/məɴɢap/	‘on top’	1387
	[jəsaɴdə]	/jəsaɴdə/	‘somehow’	2156
	[qʷiŋjaq̚]	/qʷ-iɴja-q/	‘go-FFUT-3SG’	1400.31
WF	[tʰaɴ]	/taɴ/	‘a part of hunting blind’	1901.4
	[qʷaɴ]	/qʷaɴ/	‘earthquake’	1701
	[qʰarərəɴ]	/qarərəɴ/	‘thunder’	1333

3.5 Alveolar Flap

The alveolar flap /ɾ/ does not occur word-finally or in the non-intervocalic word-medial context as shown by (29). Occasionally, the flap can sound more like a trill, but this is due to free variation rather than any phonological process. In the case of borrowed words, the alveolar approximant [l] is typically replaced with a flap [ɾ] as in the case of the Tok Pisin words [lombo] ‘chili’ and [palang] ‘plank’ which, in Domung, become [ɾombo] and [pəɾaɴ] respectively.

(29) Examples of alveolar flap /ɾ/

WI	[ɾup̚]	/ɾup/	‘spit’	0111
	[ɾaqi]	/ɾaqi/	‘green onion’	1731
	[ɾinam]	/ɾinam/	‘trail’	0847.2
IV	[naɾə]	/naɾə/	‘duty’	0499
	[biɾəɴ]	/biɾəɴ/	‘nail’	0724
	[wɛɾuq]	/weɾuq/	‘armpit’	0051
WM	---	---	---	---
WF	---	---	---	---

3.6 Glides

The palatal and labial-velar glides /j/ and /w/ may occur word-initially and word-medially but not word-finally as shown by (30) and (31). While neither of these glides may occur prior to a consonant, the labial-velar glide is more phonotactically restricted in word-medial position in that it rarely occurs after consonants while the palatal glide frequently occurs after consonants.

(30) Examples of palatal glide /j/

WI	[jumə]	/jumə/	‘nothing’	1647
	[jaɢo]	/jaɢo/	‘black/red cockatoo’	1770.2
	[jəq̚]	/jəq/	‘woven bag’	0624
IV	[qʰəjat̚]	/qəjat/	‘bone’	0074
	[qʰuja]	/quja/	‘tree for posts(sp)’	1158.20
	[bijun]	/bijun/	‘jealous’	0307
WM	[amjut̚]	/amjut/	‘orchid (sp)’	1900.6
	[anjin]	/anjin/	‘relative/kin/friend’	0380
	[iŋjaq̚]	/Ø-iɴja-q/	‘make-FFUT-3SG’	1458.31
WF	---	---	---	---

(31) Examples of labial-velar glide /w/

WI	[woɴ]	/woɴ/	‘fence’	0676
	[wɛɛm]	/weem/	‘famine’	1341
	[wip̚]	/wip/	‘bow’	0780
IV	[əwom]	/əwom/	‘rope/vine’	0653
	[mawom]	/mawom/	‘menstrual blood/sorcery’	0240
	[qʰəwɛm]	/qəwem/	‘arrow/spear’	0781
WM	[waɾiɴwaɾiɴ]	/ waɾiɴwaɾiɴ/	‘swallow (bird)’	1769
	[wonwon]	/wonwon/	‘limbum(sp)’	1708.5
	---	---	---	---
WF	---	---	---	---

3.7 Labialized Plosives

The uvular plosive phonemes /q/ and /ɢ/ also have labialized phoneme versions /qʷ/ and /ɢʷ/ which may occur word-initially or intervocalically as shown by (32) and (33) below. As shown by Table 13 and Table 14, these labialized uvular plosive phonemes contrast with their non-labialized counterparts /q/ and /ɢ/ before all vowels except for /u/.

(32) Examples of voiceless labialized plosive /qʷ/

WI	[qʷaɴ]	/qʷaɴ/	'earthquake'	1701
	[qʷɛp̚]	/qʷep/	'string for arrowhead'	0652.2
	[qʷatʰam]	/qʷatam/	'bamboo fire starter'	1305.5
IV	[daqʷan]	/daqʷan/	'bird (sp)'	1041.4
	[ɢuqʷeəq̚]	/ɢuqʷeəq/	'white cockatoo'	1770.1
	[jəqʷi]	/jəqʷi/	'goodbye'	0445
WM	---	---	---	---
WF	---	---	---	---

(33) Examples of voiced labialized plosives /ɢʷ/

WI[9]	[ɢʷi]	/ɢʷi/	'smoke'	0904
IV	[tʰuɢʷan]	/tuɢʷan/	'joint'	2103
	[qʰaɢʷaq̚]	/qaɢʷaq/	'noise'	1327
	[əɢʷa]	/əɢʷa/	'maybe'	1694.1
WM	[nomɢʷaq̚]	/nomɢʷaq/	'dog'	0991
	[diɴɢʷan]	/diɴɢʷan/	'bird(sp)'	
	[wətʰaɴɢʷe]	/wətaɴɢʷe/	'wide'	1519
WF	---	---	---	---

[9] There are no other instances of word-initial /ɢʷ/ sequences in the corpus (other than when the POSS suffix forms are attached to this same lexical root); however, there are nearly 50 instances where it occurs word-medially.

Table 13 Comparison of /q^{w}V/ and /qV/sequences in similar environments

	Examples of /q^{w}V/	Examples of /qV/
_i	/q^{w}im/ ‘fear’ 0276	/qirop paq/ ‘kina shell’ 1828
	/q^{w}ijat/ ‘coconut shell’ 1739.1	/qinat/ ‘bird of paradise’ 1771
_e	/q^{w}em/ ‘ear’ 0013	/qenat/ ‘pitpit plant (sp)’ 1730.5
	/q^{w}et/ ‘cry’ 0272	/pəqeəq/ ‘malay apple’ 1738
_u	---[10]	/quwe/ ‘dry’ 1548
		/qup/ ‘ground’ 1261
_o	/q^{w}oɾi/ ‘younger sibling’ 034y	/qoɾa/ ‘green daka leaf’ 1899.1
	/q^{w}ouq/ ‘owl’ 1054	/qoɴ/ ‘covering’ 2112
_ə	/q^{w}əntaɴ/ ‘lazy’ 0313	/qənam/ ‘sky’ 1313
	/q^{w}əɾəp/ ‘bush fowl’ 1766	/qəsəq/ ‘sharp’ 1537
_a	/q^{w}aɴ/ ‘earthquake’ 1701	/qaaɴ/ ‘bamboo’ 1174.10
	/q^{w}ap/ ‘shoulder’ 0031	/qap/ ‘song/dance (sp)’ 0879.6

Table 14 Comparison of /ɢ^{w}V/ and /ɢV/ sequences in similar environments

	Examples of /ɢ^{w}V/	Examples of /ɢV/
_i	/ɢ^{w}i/ ‘tobacco/smoke’ 0904	/ɢin/ ‘woven bamboo wall’ 0664
	/əɢ^{w}inə/ ‘disabled’ 2148	/seɢiɢi/ ‘limbum plant (sp)’ 1708.3
_e	/tuɢ^{w}eəq/ ‘full’ 0636	/oɢeəɴ/ ‘praying mantis’ 1135
	/ɢuɢ^{w}eəqsan/ ‘decoration (sp)’ 1822.1	/ɢuɢem/ ‘cloud’ 1315
_u	---	/ɢuta/ ‘banana (sp)’ 1208.6
		/ɢuwet/ ‘millipede’ 1139
_o	/paaɢ^{w}oq/ ‘miscarried baby’ 0242	/qoɢot/ ‘flat sticks for cleaning’ 2009
	/n-əɢ^{w}-oja-q/ ‘1SG.OBJ-hit-NFUT-3SG’ 1446a.24.1	/ɢojəq/ ‘dry banana trunk’ 1208.17
_ə	/daɢ^{w}ən/ ‘weaned’ 2081	/məɴɢən/ ‘chicken feather decoration’ 1058.4
	/saɴɢ^{w}əm/ ‘arrow (sp)’ 0781.1	/dəɴɢəm/ ‘black ground’ 1261.1
_a	/tuɢ^{w}an/ ‘joint’ 2103	/soɢan/ ‘bamboo (sp)’ 1174.1
	/əɢ^{w}a/ ‘maybe’ 1694	/ɢandoɴ/ ‘wallaby’ 1779

These labialized uvular plosives are analyzed as separate phonemes for two main reasons. First, there are no labialized versions of other plosives. In fact, analysis of consonant co-occurrence (see §3.8) reveals that the labial-velar glide /w/ only occurs after other plosives in rare cases of reduplication or compound words while /q^{w}/ and /ɢ^{w}/ sequences are

[10] Some native-speaker authored texts include the orthographic sequence <kwu> which would depict [q^{w}u] and which may indicate that while the corpus contains no /q^{w}u/ sequences, Domung may in fact contain this sequence.

very common. If [qw] and [ɢw] sequences were analyzed as CC consonant clusters, then one might expect other [plosive + w] sequences to exist, but this is not the case for Domung.

Second, there is typological precedent for this analysis based on genetic analysis of related languages. Five out of 16 other analyzed Finisterre languages have analyzed [kw] and [gw] sequences as monophonemes /kʷ/ and /gʷ/; see Finongan (Rice & Rice 2010), Numanggang (Hynum 2001), Uri (Webb 1995), Awara (Quigley 2003), and Wantoat (Davis 1994). Six of the remaining eleven documented Finisterre languages have analyzed [kw] and [gw] sequences as underlyingly /ku/ and /gu/ sequences; see Ma Manda (Pennington 2013), Nek (Linaasalo 2003), Nukna (Taylor 2021), Tamu-Irumu (Webb 1997), Yopno (Reed 2000a,b), and Gwahatike (An 1990 and Price n.d.). Analysis of [qw] and [ɢw] sequences as underlyingly /qu/ and /ɢu/ may be feasible for Domung, but there is no evidence from known phonological processes within Domung to support this analysis and it seems unnecessarily abstract and has therefore been rejected. Of the remaining five Finisterre languages, four languages have no reported [kw] and [gw] sequences; see Iyo (Minter 1998), Nekgini (Lillie 2011), Ngaing (Hodgkinson 1998), and Yau (Wegmann 1993) and one language, analyzes [kw] and [gw] sequences as true CC consonant clusters (see Nankina (Spaulding 1994).

3.8 Consonant Co-Occurrence and Distribution

While consonant clusters are not allowed within syllables, Table 15 summarizes which consonants may co-occur across syllable boundaries within words (red italic font highlights marginal cases of compound words or reduplication). Table 16 describes which consonants are allowed to occur word-initially (WI), intervocalically (IV), and word-finally (WF).

Comparing the two tables shows that most consonants occurring word-initially are also allowed to follow a consonant coda with the exception of the uvular nasal /ɴ/. The alveolar flap /ɾ/ may only rarely follow a consonant in cases of reduplication or compound words and the palato-alveolar affricate /d͡ʒ/ is only allowed to follow the alveolar nasal /n/ (with one exception in which it follows the bilabial nasal /m/). Similarly, only consonants occurring word-finally are also allowed to precede a consonant onset (with a few marginal exceptions). The C.C combinations shaded with light gray in Table 15 highlight the cases in which a consonant allowed to occur word-finally precedes a consonant allowed to occur word-initially. As indicated by the shaded rows, there is a strong preference for codas (the first C in a C.C cluster) to contain only the consonants that are only allowed word-finally: /p t q m n ɴ/.

It should be noted that nasal place assimilation is not a phonological process in Domung as evidenced by the co-occurrence of sequences such as /m.d/, /m.ɢ/, /ɴ.q/, and /ɴ.t/ in Table 15. Furthermore, nasals at different places of articulation may co-occur as evidenced by sequences such as /m.n/, /ɴ.n/, and /ɴ.m/.

Table 15 Consonant co-occurrence chart (across syllable boundaries)

C.C	p	b	t	d	q	ɢ	s	d͡ʒ	ɾ	m	n	ɴ	w	j
p		*1*	41	8	*3*	12	*2*		*3*	8	12			*2*
b						2								
t	*2*		*1*	4	*3*	5	*2*			*1*	18		*1*	1+*1*
d														
q		6	6	16		1+*2*			*2*	*1*	8		61*	*1*
ɢ													53*	
s														
d͡ʒ														
ɾ														
m	4	19	6	6+*3*		16	3	1			10		*2*	3
n	*1*	1	10	69	*2*	2+*2*	5	67		*2*			*1*	4+*2*
ɴ	6	6	17	5+*2*	10	45	6			4	8		*2*	85
w														
j														

* *These labialized plosives are analyzed as monomorphemic*

Table 16 Consonant distribution by word position

	p	b	t	d	q	ɢ	qʷ	ɢʷ	s	d͡ʒ	ɾ	m	n	ɴ	w	j
WI	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x
IV	x	x	x	x	x	x	x	x	x	?	x	x	x	x	x	x
WF	x		x		x							x	x	x		

Note: 'x' indicates it occurs and '?' indicates few and/or unusual examples such as reduplication

4. Vowels

The phonemic inventory of six vowels along with relevant examples is provided in §4.1. Acoustic analysis of vowel quality is detailed in §4.2 while §4.3 describes and analyzes phonemic vowel length, including an acoustic analysis of vowel duration. Lastly, vowel sequences are discussed in §4.4. An earlier version of this analysis, particularly the acoustic analysis of vowel quality and duration, is detailed in Moe (2021a,b). This analysis has been updated to include a more robust sampling plan and discussion.

4.1 Phonemic Inventory of Vowels

An overview of the phonemic inventory of vowels is provided in Table 17 below and includes phonetic variations (if present) in brackets. See also Figure 8 below for a frequency chart of vowel phones (note that the chart includes vowels which are part of vowel clusters).

Similar to many other Trans New Guinea languages, Domung utilizes the five phonemic vowels proposed by Pawley (2008) for proto-TNG: /i u e o a/. However, Domung also has the mid-central vowel /ə/ and thus utilizes a six vowel system with two front vowels, two central vowels, and two back vowels. The presence of a second (higher) central vowel is expected because genetic analysis of other Finisterre family languages shows many have a high and/or mid central vowel. See Table 5 for details but note specifically the Yupna branch languages of Nankina (Spaulding 1994), which has an /ʌ/, and Yopno (Reed 2000), which has both a high central vowel /ɨ/ and a mid-central vowel /ə/.

The quality of the mid-central vowel /ə/ fluctuates between [ə] and [ɪ] and [ɨ], but is most often realized as [ə].Similarly, the quality of the mid front vowel /e/ varies somewhat and is sometimes realized more as [ɛ].

Table 17 Phonemic inventory of vowels with phonetic realizations

	Front	Central	Back
High	i		u
Mid	e [ɛ]	ə [ɪ] [ɨ]	o
Low		a	

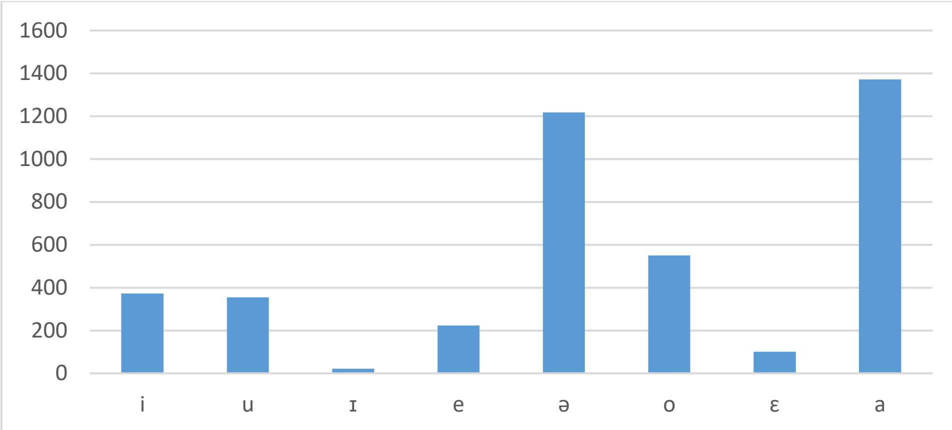

Figure 8 Frequency chart of vowel phones

Several examples of each short vowel in word-initial, word-medial, and word-final positions are provided in (34) to (39). Domung uses vowel alternations extensively for inflectional morphology in verbs and thus many minimal pairs exist for the six short phonemic vowels as shown by (40).

(34) Examples of /i/

[idit̚]	/idit/	‘sit down’	0150
[iɾun]	/iɾun/	‘lips’	0016
[iβip̚]	/ibip/	‘scratch/itch’	1451
[ɢin]	/ɢin/	‘woven bamboo wall’	0664
[bin]	/bin/	‘inside’	1673
[wip̚]	/wip/	‘bow’	0780
[ɢwi]	/ɢwi/	‘tobacco/smoke’	0904
[moɢi]	/moɢi/	‘woven mat’	0697
[qʰasi]	/qasi/	‘wind’	1330

(35) Examples of /e/

[ɛɾaɴ]	/eɾaɴ/	‘laugh’	0269
[ɛt̚]	/Ø-e-t/	‘make-PRES-1SG’	1458.15
[emat̚]	/Ø-e-mat/	‘make-PRES-1DU’	1458.18
[pʰɛn]	/pen/	‘rain’	1335
[tʰɛt̚]	/tet/	‘string’	0652
[memaɴ]	/memaɴ/	‘banana (sp)’	1208.15
[me]	/me/	‘speech/talk’	0430
[qʰuwe]	/quwe/	‘dry’	1548
[bone]	/bone/	‘wild sugarcane (sp)’	1730.6

(36) Examples of /u/

[umat̚]	/Ø-u-mat/	'make-RPST-1DU'	1458.11
[un]	/Ø-u-n/	'make-RPST-2SG'	1458.14
[uɾop̚]	/uɾop/	'shade'	1350
[but̚]	/but/	'tree (sp)'	1158.9
[mup̚]	/mup/	'taro'	1228
[bubu]	/bubu/	'sorry'	0273
[du]	/du/	'dream'	0129
[babu]	/babu/	'father's father'	0343
[qʰənu]	/qənu/	'tree (sp)'	1158.5

(37) Examples of /o/

[omat̚]	/Ø-o-mat/	'make-FPST-1DU'	1458.4
[on]	/Ø-o-n/	'make-FPST-3SG'	1458.2
[opma]	/opma/	'yesterday'	1371
[ɢom]	/ɢom/	'dirty'	1585
[qʰaɾot̚]	/qaɾot/	'cabbage'	1736
[woɴ]	/woɴ/	'fence'	0676
[bo]	/bo/	'or'	---
[qʰo]	/qo/	'go.2SG.IMP'	1400
[saso]	/saso/	'chinese taro'	1228

(38) Examples of /ə/

[əmɛt̚]	/əmet/	'father's younger brother'	0348
[əɴ]	/əɴ/	'make.2SG.IMP'	1458.16
[əɢwa]	/əɢwa/	'maybe'	1694
[bət̚]	/bət/	'pig'	0987
[məp]	/məp/	'floating ash'	1312.2
[səβat̚]	/səbat/	'armlet/anklet'	0551
[tʰəmo]	/təmo/	'nose'	0011
[bəmə]	/bəmə/	'rotten'	1250
[mebə]	/mebə/	'last'	1626

(39) Examples of /a/

[adat̚]	/adat/	'stand up'	0169.2
[aɾon]	/aɾon/	'visit'	---
[am]	/am/	'bird (sp)'	1041.5
[saβat̚]	/sabat/	'wing'	1069
[tʰamo]	/tamo/	'field'	0743
[qʰaɾap̚]	/qaɾap/	'meat/animal'	0570
[səma]	/səma/	'bamboo (sp)'	1174.5
[uwa]	/uwa/	'sore'	0220
[maɾa]	/maɾa/	'gorge'	---

(40) Sample of minimal pair sets for vowels

a.	[apʰat̚]	/apt-**a**-t/	'get-RPST-1SG'	0808.8
	[apʰɛt̚]	/apt-**e**-t/	'get-PRES-1SG'	0808.15
	[apʰit̚]	/apt-**i**t/	'get-FPST.2/3PL'	0808.7
	[apʰot̚]	/apt-**o**-t/	'get-FPST-3SG'	0808.3
b.	[semat̚]	/s-**e**-mat/	'cook-PRES-1DU'	0603.18
	[somat̚]	/s-**o**-mat/	'cook-FPST-1DU'	0603.4
	[səmat̚]	/s-**ə**-mat/	'cook-RPST-1DU'	0603.11
c.	[jaomat̚]	/j-**ao**-mat/	'say-FPST-1DU'	0433.4
	[jamat̚]	/j-**a**-mat/	'say-RPST-1DU'	0433.11
	[jemat̚]	/j-**e**-mat/	'say-PRES-1DU'	0433.18
d.	[sət̚]	/s-**ə**-t/	'cook-RPST-1SG'	0603.8
	[sot̚]	/s-**o**-t/	'cook-FPST-3SG'	0603.3
	[sit̚]	/s-**i**-t/	'cook-FPST-2/3PL'	0603.7

4.2 Acoustic Analysis of Vowel Quality

Acoustic analysis of 747 different vowel tokens from 80 different words (each of which was spoken two times by three different native speakers) was performed using PRAAT (Boersma & Weenink 2018) following the procedures described in Appendix C. Because the acoustic analysis was performed with analysis of both vowel quality and vowel duration in mind, more vowel tokens were measured in total than were strictly needed for either analysis if completed individually. The raw data for these measurements are archived and include the raw audio files, the log files created by PRAAT, and the Excel spreadsheet of the results (Moe 2023b).

For acoustic analysis of vowel quality, the complete database of acoustic measurements was filtered to exclude vowels with adjacent nasals (to avoid potential nasalization effects) resulting in a total of 665 measured tokens. While adjacent nasals were excluded as a best-practice, there is no significant degree of vowel nasalization adjacent to nasal consonants. When measuring vowel length in adjacent nasals, for example, a very clear transition is typically visible in acoustic plots. A statistical summary of the vowel formant measurements for F1 and F2 is provided in Table 18.

The average F1 and F2 formant values are plotted using the FPlot software by Casali (2023a) and are shown in Figure 9. A spectrogram excerpt for each phonemic vowel is shown in in Figure 10; the excerpts were obtained from words with formant values close to the mean F1/F2 values given in Table 18 and Figure 9. Each of the individual F1/F2 formant values are displayed in Figure 11 also using the FPlot software.

Table 18 Statistical summary of F1/F2 values for Domung vowels

Vowel	F1 (Hz)		F2 (Hz)		Sample
	Mean	Std Dev	Mean	Std Dev	Size
/i/	279	32	2175	213	96
/e/	420	48	1842	160	86
/ə/	377	66	1388	265	99
/u/	286	42	771	100	95
/o/	405	60	883	129	116
/a/	642	79	1420	139	168

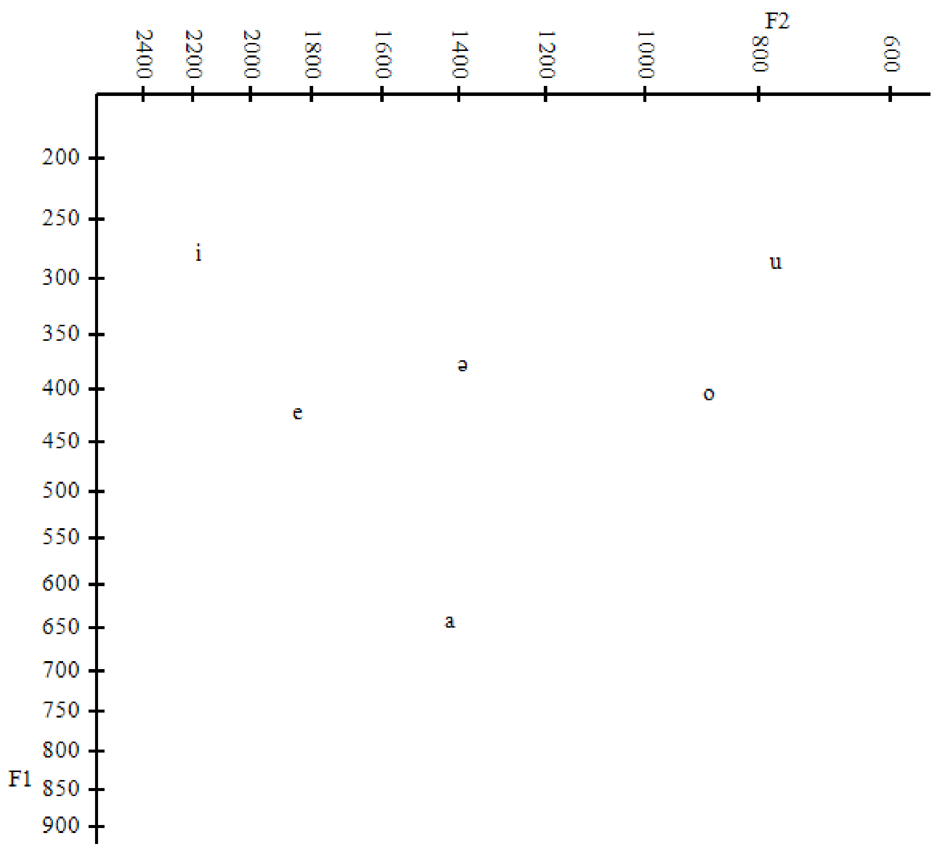

Figure 9 Vowel space plot for mean formant values

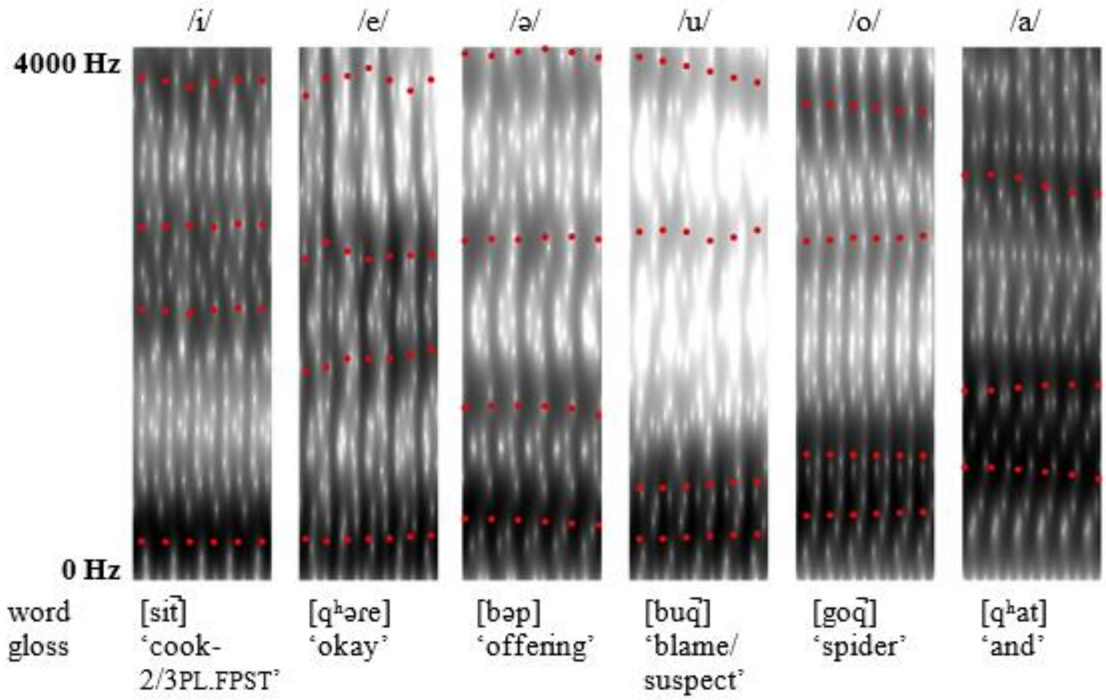

Figure 10 Spectrogram excerpts of representative vowels

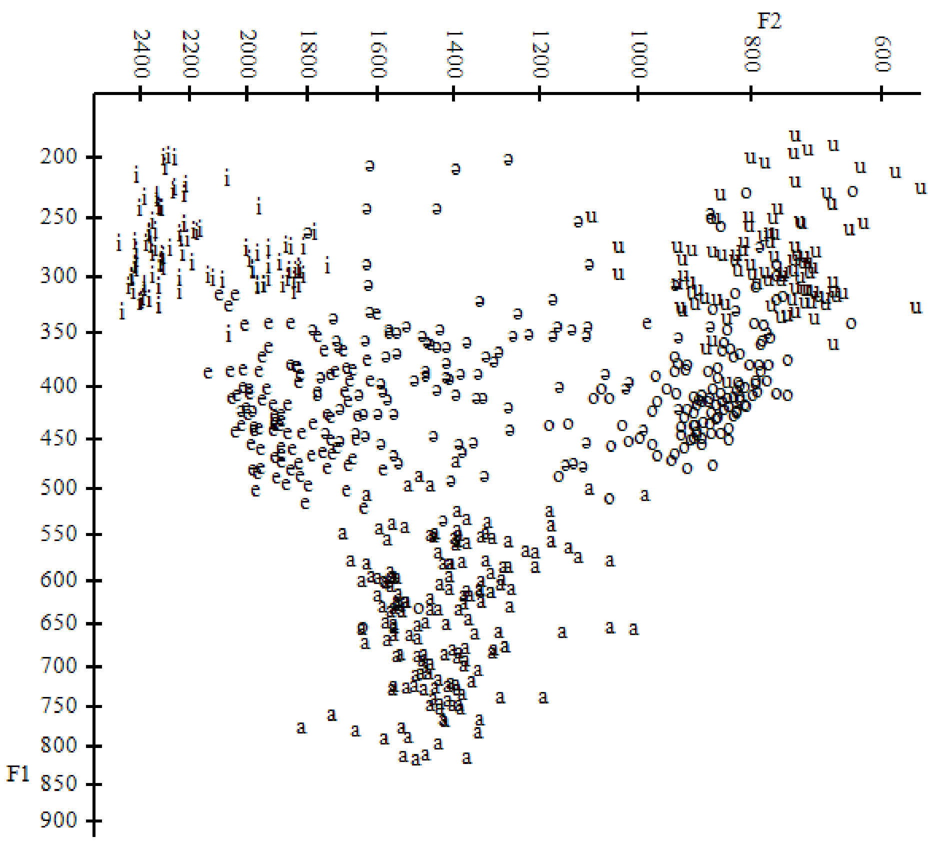

Figure 11 Vowel space plot of all formant values

4.3 Vowel Length

When McElhanon analyzed ten different representative Finisterre-Huon languages, he concluded that “vowel length is not a common feature” of Finisterre-Huon languages (1973: 5). However, my analysis of more recent data specific to the Finisterre sub-family (see Table 5) reveals that phonemic vowel length (in at least a subset of the vowel inventory) is rather common and occurs in approximately 47% of currently documented Finisterre languages.[11] Domung, like many other Finisterre family languages, exhibits phonemic vowel length in a subset of the vowel inventory. This conclusion is based on distribution analysis, native speaker intuition, and acoustic analysis of vowel duration as detailed below.

First, and most significantly, distribution analysis reveals clear contrast between long and short vowels as shown by the minimal and near minimal pairs in (41) below.

(41) Minimal and near minimal pairs for vowel duration

a.	[iibə]	/iibə/	‘spleen’	1763
	[iβip]	/ibip/	‘vine (sp)’	1191.16
b.	[ɢɛɛɾə]	/ɢeeɾə/	‘roots.3SG.POSS’	1183.1
	[ɢɛɾuq]	/ɢeɾuq/	‘knee’	0066
c.	[tʰuuq̚]	/tuuq/	‘vine (sp)’	---
	[duq̚]	/duq/	‘point/tip’	1394
d.	[qʰoot̚]	/qoot/	‘floor’	0670
	[qʰot̚]	/q-o-t/	‘go-FPST-3SG’	1400.3
e.	[qʰaaɴ]	/q-aaɴ/	‘look-RPST.2/3PL’	0133
	[qʰaɴ]	/q-aɴ/	‘look-2SG.IMP’	0133
f.	[tʰaap̚]	/taap/	‘ant (sp)’	1123.1
	[tʰap̚]	/tap/	‘ocean’	1285
g.	[man]	/man/	‘name’	0359
	[maan]	/maan/	‘wrap-around skirt’	0546

Second, native speaker intuition confirmed that some vowels are longer than other vowels. When I encounter vowels that seem to be long, I will often ask native speakers if I should ‘pull’ the vowel when I speak it (in Tok Pisin, I ask them “bai mi pulim [a] o nogat?”). Native speakers sometimes answer affirmatively, sometimes negatively, and sometimes they are uncertain. I will also produce both long and short versions of the vowel to elicit a native speaker judgement on both versions. In some cases, they judge a shorter or

[11] Seven out of 16 previously analyzed Finisterre family languages (44%) or 8 out of 17 languages (47%) including Domung.

longer vowel duration to represent incorrect pronunciation compared to the alternative. This native speaker intuition supports the conclusion that long vowels are indeed phonemic.

Third, acoustic analysis confirms that long vowels exhibit a statistically significant longer duration than short vowels, as described in detail in §4.3.1 below.

The fact that /ə/ is not lengthened is evidenced first by the fact that native speakers did not note a distinction between short and long [ə], but they did for every other phonemic vowel. Second, the standard deviation of vowel duration measurements for /ə/ is similar to, and not larger than, all other short phonemic vowels; if two different distributions of vowel durations (one short and one long) were inadvertently grouped together, the standard deviation of the resulting combined distribution should be larger than that for other short vowels. Since this is not the case for /ə/ we may safely conclude only a single distribution exists.

4.3.1 Acoustic Analysis of Vowel Length

Vowel durations for over 700 vowel tokens from 80 different words (each of which was spoken two times by three different native speakers) were measured using PRAAT (Boersma & Weenink 2018) via the method described in Appendix C. See counts for each measured vowel token by word position in Table 19 which shows between 66 and 164 tokens were measured for each short vowel and between 24 and 42 tokens were measured for each long vowel. Because the acoustic analysis was performed with analysis of both vowel quality and vowel duration in mind, more vowel tokens were measured in total than were strictly needed for either analysis if completed individually.

Each word included in this acoustic analysis of vowel duration was identified as having ‘long’ or ‘short’ vowels based on both input from native speakers and on my phonetic transcriptions. As described in Appendix C, these words were then recorded by native speakers in a randomized order with no written cues to indicate if the target word being recorded had a ‘long’ or a ‘short’ vowel. The raw data for these measurements are archived and include the raw audio files, the log files created by PRAAT, and the Excel spreadsheet of the results, as well as a CSV file which can be imported into R for statistical analysis (Moe 2023b).

The results of the duration measurements for vowels attested as ‘short’ are summarized in Table 19 below for each of the six phonemic vowels in word-initial (WI), word-medial (WM), and word-final (WF) positions. WM vowels tend to be shorter in duration than the same vowels word-initially which in turn tend to be shorter than the same vowels word-finally. This tendency for WF vowels to be lengthened (particularly when words are also utterance-final as when spoken in isolation) is a common phenomenon cross-linguistically (Paschen et al. 2022).

Table 19 Mean duration measurements (ms) by word position for short vowels

	Word-initial (WI)		Word-medial (WM)		Word-final (WF)		All Positions	
	Mean Dur (ms)	Sample Size	Mean Dur (ms)	Sample Size	Mean Dur (ms)	Sample Size	Mean Dur (ms)	Sample Size
i	142	24	97	30	137	24	123	78
u	96	6	88	52	184	24	117	82
e	123	6	119	35	149	25	131	66
o	112	32	112	24	163	24	127	80
ə	71	24	54	48	121	35	80	107
a	106	30	118	110	145	24	120	164
All	108	122	100	299	148	156	115	577

The results of the duration measurements for vowels attested as ‘long’ are summarized in Table 20 for each of the long vowels. All vowels have a phonemically long version except for /ə/ which is noticeably shorter in duration than all other vowels (as shown in Table 19 above). However, other Finisterre family languages, such as Uri (Webb 1995), only lengthen a partial series of vowels, so this is not typologically unexpected. Additionally, no instances of long vowels in WF position were observed. This phonotactic constraint on long vowels not occurring word-finally is consistent with many other languages which report vowel length contrast neutralization in final position (Myers & Hansen 2007).

Table 20 Mean duration measurements (ms) by word position for long vowels

	Word-initial (WI)		Word-medial (WM)		All Positions	
	Mean Dur (ms)	Sample Size	Mean Dur (ms)	Sample Size	Mean Dur (ms)	Sample Size
i	195	6	185	18	187	24
u	189	18	182	18	186	36
e	222	18	212	24	216	42
o	231	18	210	18	221	36
a	233	6	225	18	227	24
All	214	66	203	96	208	162

A comparison of short and long vowel durations in WI and WM positions (pooled together) is shown in Figure 12 below. Figure 13 confirms that all three speakers exhibit similar behavior in terms of lengthening (although speaker M03 does tend to lengthen word-final vowels more than M01 or M02).

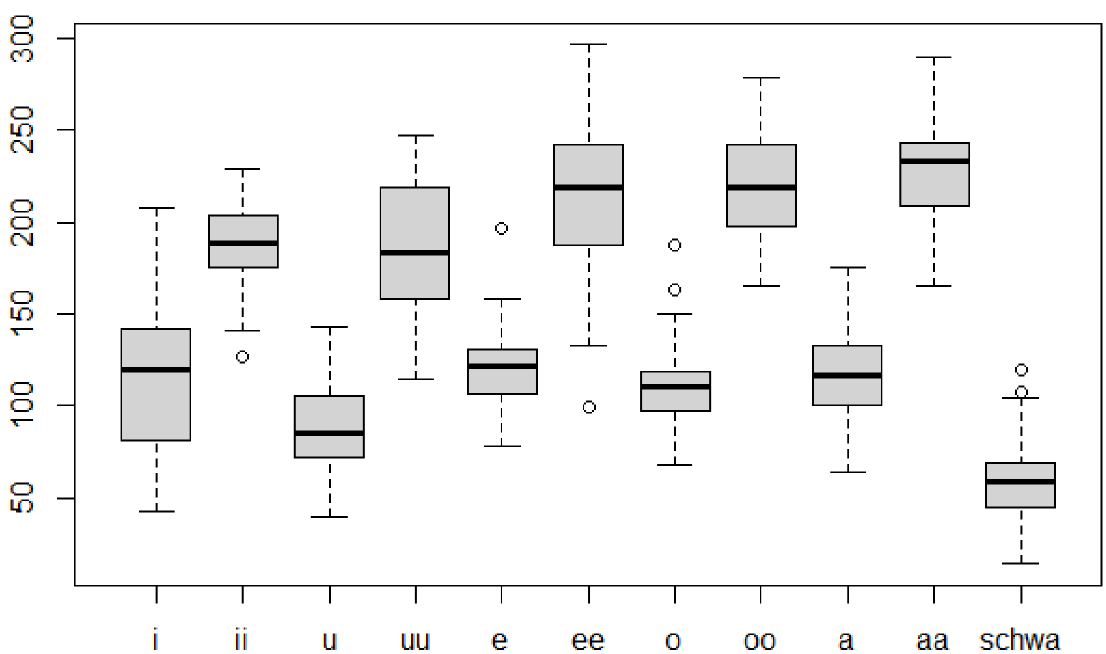

Figure 12 Box plot of durations of non-WF vowels

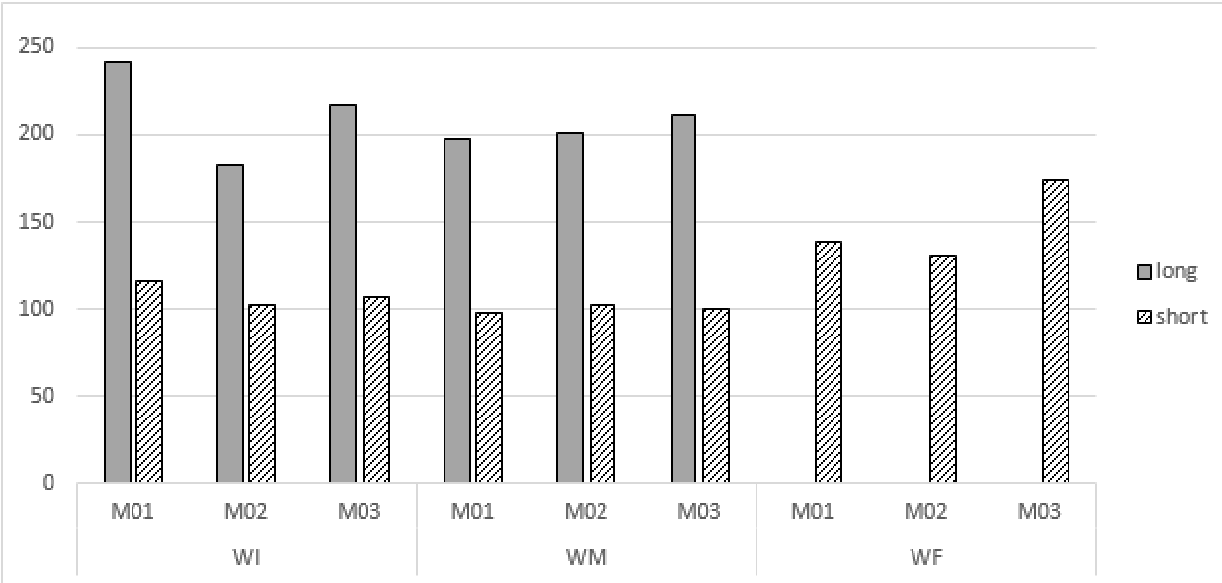

Figure 13 Mean vowel duration by speaker and word position

Statistical testing for significance can be performed using traditional t-tests for each pair of long and short vowels. Joglekar (2010) discusses several advantages to using a 95% confidence interval (CI) to assess the difference in means. The 95% CI for the difference in means between pairs of long and short vowels was calculated using R (see script in Appendix G) and is summarized in Table 21 below. Note, that these calculations exclude WF vowels (both because WF short vowels are inherently longer than non-WF short vowels and because no long vowels have been observed in WF position). The results show that the difference in means is statistically significant with p-values for the t-Test well below the typical threshold of 0.05. Furthermore, the actual 95% CI's for the difference in means shows that long vowels will typically be at least 55.5 ms longer than short vowels (the lowest value of all the 95% CI's for all the vowel pairs).

Table 21 Statistical analysis of vowel duration measurements

	Sample Size	Mean (ms)	Std Dev	Shapiro test for Normality (p-value)	95% CI for Difference in Means	Welch t-Test result (p-value)
/ii/	24	187	25.1	0.5926	55.5 – 85.4	<0.001
/i/	54	117	38.9	0.578		
/uu/	36	186	34.5	0.281	82.9 – 110.8	<0.001
/u/	58	89	24.8	0.1875		
/ee/	42	216	38.8	0.5743	83 – 110.8	<0.001
/e/	41	120	21.7	0.0434[12]		
/oo/	36	221	27.4	0.87	98.6 – 121	<0.001
/o/	51	111	22.3	0.0344[12]		
/aa/	24	227	27.8	0.3021	98.7 – 123.9	<0.001
/a/	140	116	24.4	0.3584		

4.4 Vowel Sequences

The corpus was examined for the presence of vowel sequences (VV) and the results (excluding long vowels) are summarized in Table 22. Domung exhibits an unusually large number of VV sequences (16 in total) including some typologically unexpected sequences. See Figure 14 for a graphical representation of these same VV sequences in a vowel space chart. In both Table 22 and Figure 14, vowel sequences conditioned by the environment are shown in yellow, marginal sequences in red, heterosyllabic sequences in blue, and tautosyllabic sequences in green.

Table 22 Vowel adjacency frequency chart[13]

		i H	u H	e/[ɛ] M	o M	ə M	a L
i	H				11	49	22
u	H			5			35
e/[ɛ]	M	10				121	
o	M	2	3				
ə	M	2		9			4
a	L	21		12	29	4	

[12] The p-values are less than 0.05 for these data sets, indicating that they fail the test for normality. However, they fail normality due to outliers on the high-end of the distribution; these outliers skew the mean higher and it would be a worst-case assumption to treat the data sets as normal when running the t-Tests.

[13] Note that this chart includes vowel sequences ultimately analyzed as heterosyllabic with an intervening glide [w] or [j] present (when adjacent to the corresponding vowels [u] and [i]). This approach is consistent with Sands (2004) who treats glides as vowels for analysis purposes.

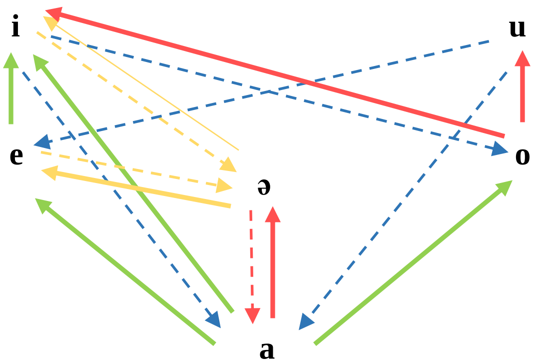

Figure 14 Vowel sequences in Domung

Sands (2004) conducted a genetically balanced, cross-linguistic study of vowel sequence patterning in 42 different languages, and determined that there is a strong cross-linguistic tendency for VV sequences to contain at least one high (H) vowel and also a corresponding tendency to disprefer Mid-Mid (MM) and Low-Mid (LM) sequences. Sands' database of languages had no Mid-Low (ML) sequences reported.

Vowel sequences in which the first vowel is more prominent/sonorous (such as [ai]) are considered falling sequences (Sands 2004: 7). I have analyzed all the falling VV sequences in Domung as tautosyllabic. The falling VV sequences in Domung which include a high vowel, and are thus typologically expected, are shown in (42); these sequences include /ei/ and /ai/ as well as the marginal sequence /ou/ (with only three instances in the corpus).

(42) Typologically expected falling VV sequences (with a high vowel)

/ai/	[aino]	/aino/	'mother's brother'	0349.1
(LH)	[daindain]	/daindain/	'morning'	1378
	[nait]	/n-ait/	'eat-2/3PL.FPST'	0140.7
	[qʰəɴai]	/qəɴai/	'galip nut'	1811
/ei/	[eit]	/Ø-eit/	'make-2/3PL.FPST'	1458.7
(MH)	[neitʰo]	/neito/	'therefore'	2093
	[deinə]	/dein-nə/	'friends-3SG.POSS'	0380.1
	[tʰei]	/tei/	'yes'	1699
/ou/	[qʰup mout]	/qup mout/	'red ground'	1261.2
(MH)	[qouɴəqouɴə]	/qouɴəqouɴə/	'different kinds'	1158
	[qwouq]	/qʷouq/	'owl'	---

Domung also exhibits two typologically unexpected falling sequences, /ae/ and /ao/ as shown by (43), which do not include a high vowel. Sands indicates that LM sequences are generally dispreferred, but they are present in a small minority of languages in her database.

(43) Typologically unexpected falling VV sequences (with no high vowel)

/ae/	[daen]	/daen/	‘group’	2140
(LM)	[tʰaɴ qʰəjae]	/tʰaɴ qəjae/	‘stem’	1185
	[məɴaewo]	/məɴaewo/	‘female child’	0336
	[məɴae]	/məɴae/	‘woman’	0329 (See Figure 15)
/ao/	[saot]	/saot/	‘bamboo (sp)’	1174.5 (See Figure 18)
(LM)	[jaot̚]	/jaot/	‘mushroom’	1226
	[saom]	/saom/	‘thorn’	1193
	[ɢao]	/ɢao/	‘knife’	0786

The vowel sequence /ae/ is also interesting because it contrasts in analogous environments with the very similar (and more typologically expected) LH vowel sequence /ai/ as evidenced by (44).

(44)	a.	/d**ai**ndain/	‘morning’	1378
		/d**ae**n/	‘group/line’	2140
	b.	/qəɴ**ai**/	‘galip nut’	1811
		/məɴ**ae**/	‘woman’	0329
	c.	/j-**ai**t/	‘say-2/3PL.FPST’	0435.7
		/qəj**ae**/	‘bones.POSS’	1185/0076

The contrastive nature of the similar VV sequences /ai/ and /ae/ is confirmed by native-speaker intuition because native speakers consistently insist on writing words like /məɴae/ ‘woman’ or /daen/ ‘group’ as <míngae> or <daen> despite initial attempts to convince them to use the similar <ai> sequence. Additionally, when I incorrectly transcribe /ae/ sequences as [ai], I am consistently corrected by native speakers. Furthermore, acoustic analysis reveals a difference between /ai/ and /ae/ sequences as can be seen by comparing the formant values from the /ai/ sequence in Figure 16 to the formant values for the /ae/ sequence in Figure 15. The F1/F2 values for the second half of the /ai/ sequence are 332 Hz/2409 Hz, consistent with an /i/; but the F1/F2 values for the second half of the /ae/ sequence are 553 Hz/1699 Hz, consistent with an /e/.

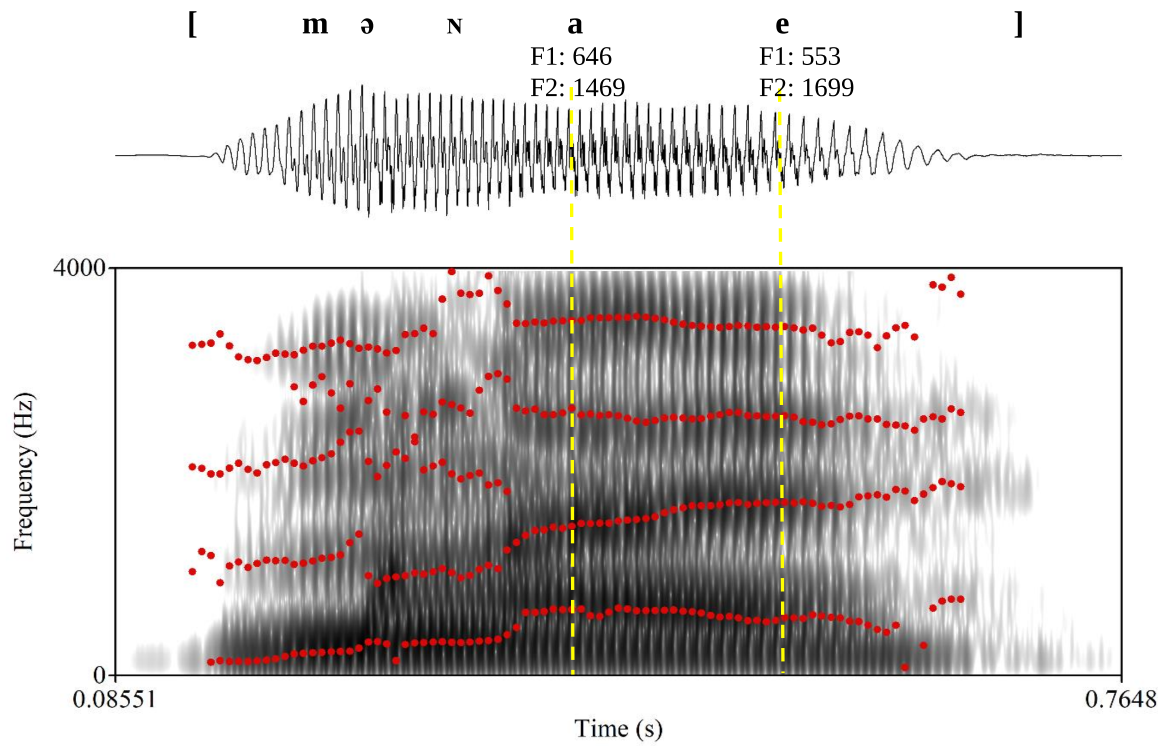

Figure 15 VV sequence [ae] from [məɴae] 'woman' 0329 spoken by M01

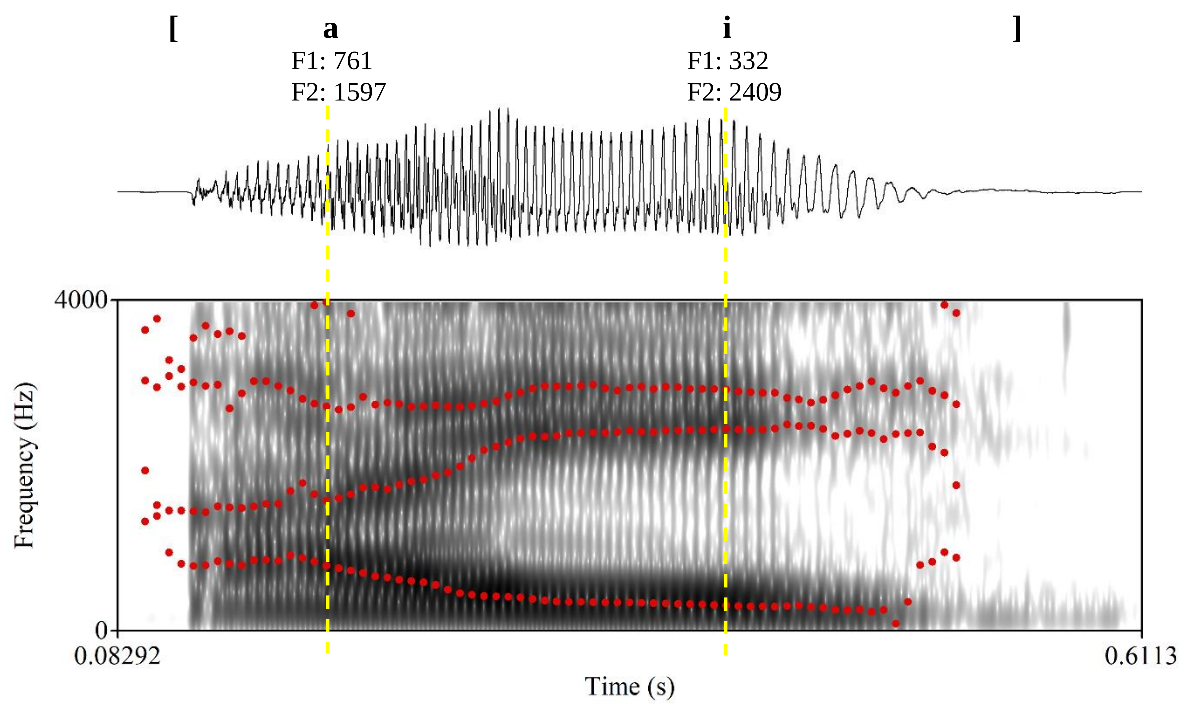

Figure 16 VV sequence [ai] in [ai] 'mother's brother' 0349 spoken by M03

The falling sequences /ei/, /ou/, /ai/, and /ao/ are analyzed as tautosyllabic, while the corresponding rising sequences /io/, /ue/, /ia/ and /ua/ are analyzed as heterosyllabic. Furthermore, as shown by (45), these heterosyllabic rising sequences are analyzed and transcribed with a glide between the vowels: /ijo/, /uwe/, /ija/, and /uwa/. This analysis is somewhat subjective and is based primarily on native speaker intuition as determined by their orthographic preferences. Native speakers prefer to spell falling LH sequences [ao] and [ai] as <ao> and <ai> respectively, but to spell corresponding rising HL sequences as <uwa> and <iya>.

(45) Typologically expected rising VV sequences (with high vowel)

/ijo/	[qʷijon]	/qʷijon/	‘place.LOC’	2086
(HM)	[qʰumijo]	/qumijo/	‘for a plate’	0620.1
	[ɢaonijo]	/ɢaonijo/	‘for a knife’	0786.1
/uwe/	[uweəq̚uweəq̚]	/uweəquweəq/	‘quickly’	1419.1
(HM)	[ɢuwɛt]	/ɢuwet/	‘millipede’	1139
	[suwat qʰuwe]	/suwat quwe/	‘dry coconut’	1739.2 (see Figure 17)
/ija/	[ijat̚]	/ijat/	‘louse’	1119
(HL)	[bijam]	/bijam/	‘bee’	1143
	[pʰapʰija]	/papija/	‘book’	1851
/uwa/	[uwa]	/uwa/	‘sore’	0220
(HL)	[suwat qʰuwe]	/suwat quwe/	‘dry coconut’	1739.2 (see Figure 17)
	[soɢuwa]	/soɢuwa/	‘choko plant’	1728

There is however some additional evidence to support both the heterosyllabic analysis of rising sequences and also (though to a lesser degree) the inclusion of a glide when transcribing these sequences. First, as discussed in §6.3, various morphological processes are utilized to resolve vowel hiatus in the case of rising vowel clusters. Second, there is some acoustic evidence indicating a more prolonged ‘glide’ for rising sequences compared to their falling counterparts. Note the formants for the sequence [uwa] in Figure 17 exhibit a steady state portion at the beginning and end of the sequence with a transition period for the glide, while the sequence [ao] in Figure 18 does not do so.

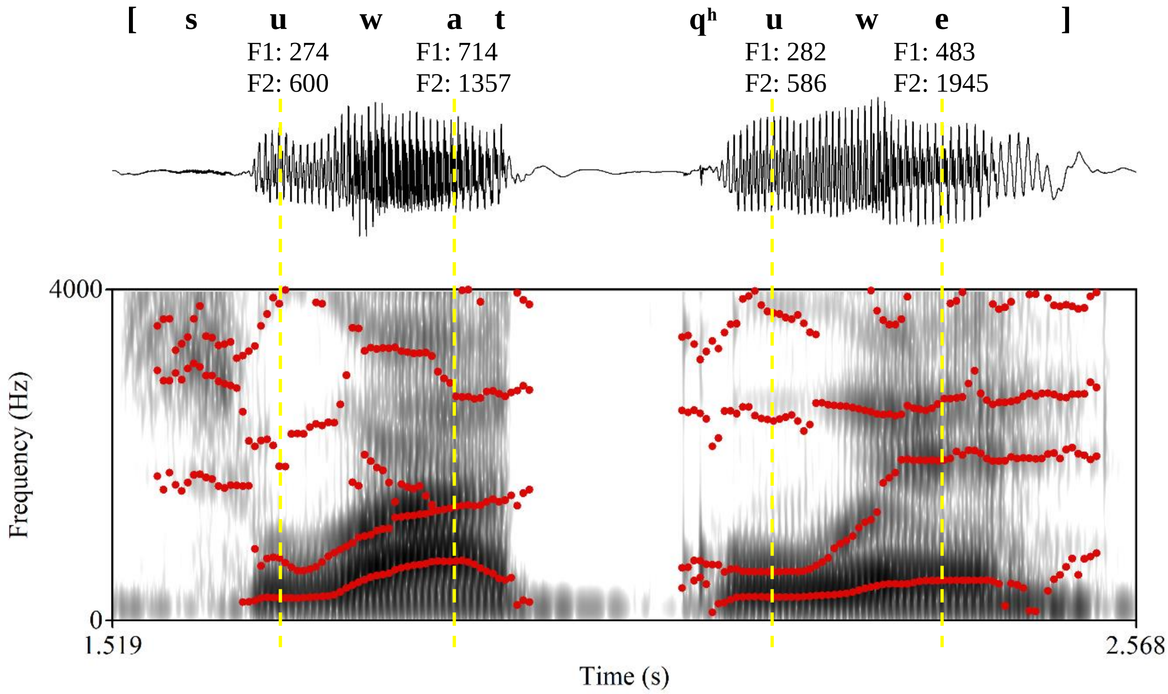

Figure 17 VV sequences [uwa] and [uwe] in [suwat qʰuwe] ‘dry coconut’ 1739.2

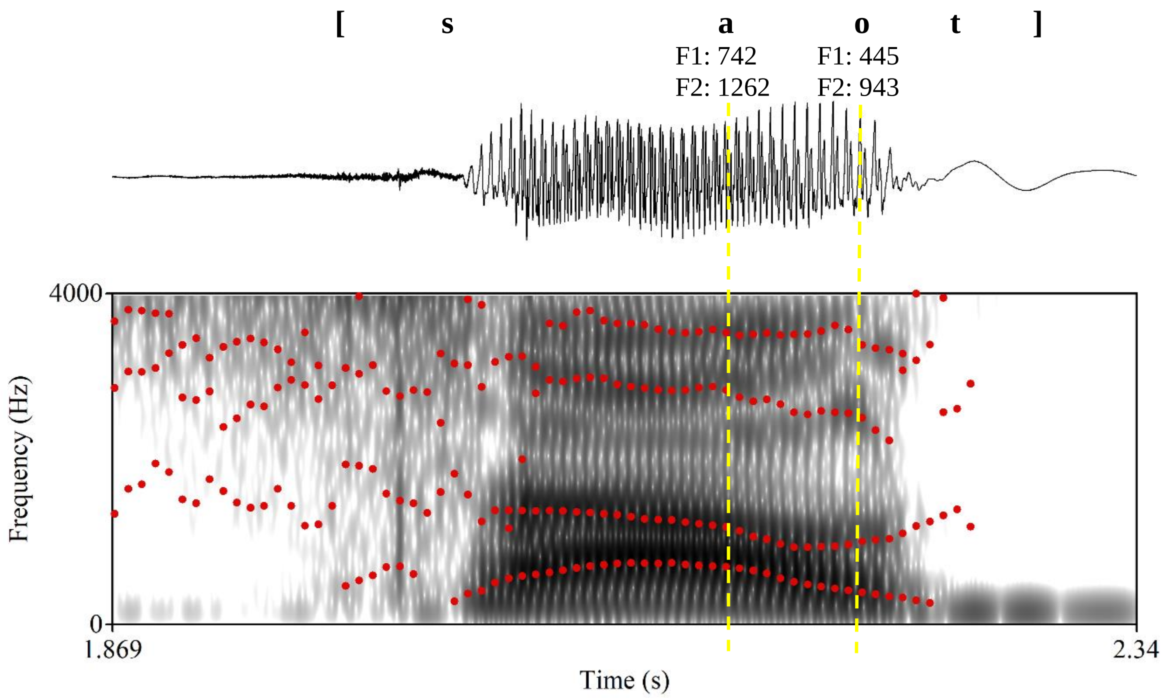

Figure 18 VV Sequence [ao] from [saot] ‘bamboo(sp)’ 1174.5

Continuing with the analysis of vowel sequences, there is a surprisingly large number of /eə/ and /iə/ sequences in Domung as shown by the counts in Table 22. Distribution analysis reveals that, in every case, these VV sequences are followed by a uvular consonant. Thus, the distribution of /eə/ and /iə/ sequences is predictable and results from articulatory constraints. As the tongue transitions from a front vowel to a very back (uvular) consonant, a schwa is produced. A similar phenomena is noted for the closely related language of Nankina (Spaulding 1994: 15) and also for other unrelated languages (Wilson 2007). Figure 19 shows the acoustic data for the word [tʰeəq̚] /teq/ 'neck'; note the gradual rise in F1 and a significant lowering of F2 which correspond to the tongue being slightly lowered and backed as it transitions from a starting mid-high and front position for the /e/ through a more mid and central position (for the /ə/) to the final low back position for the uvular /q/.

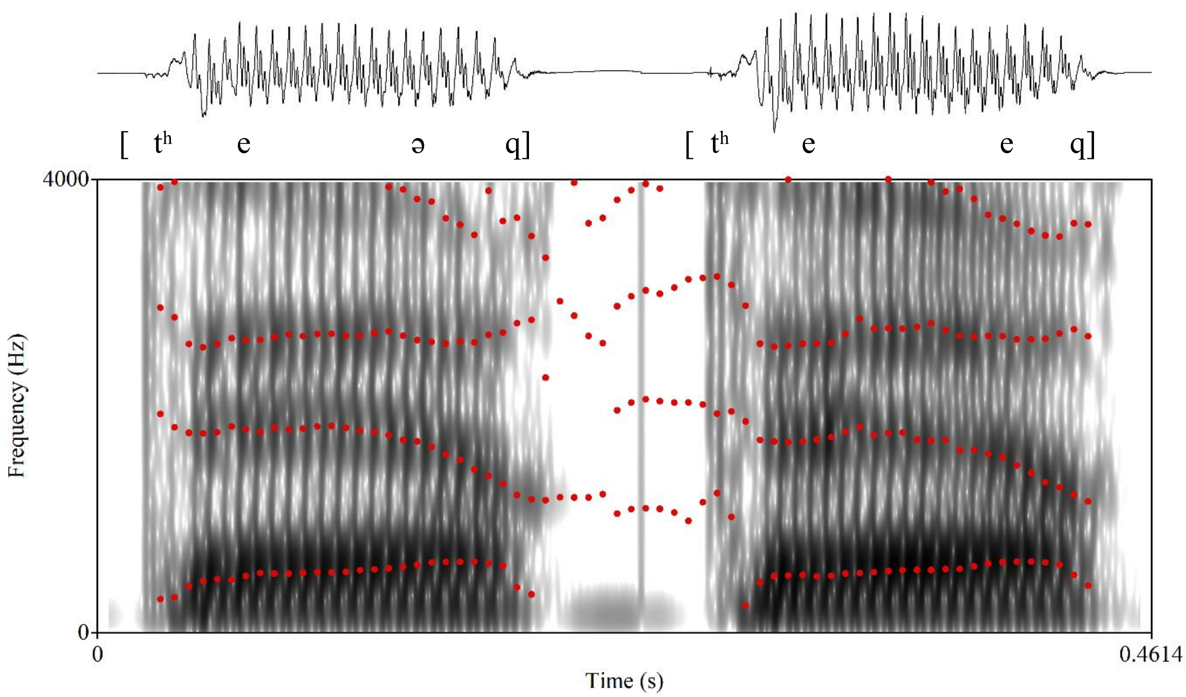

Figure 19 Two tokens of [tʰeəq] 'neck' 0023

The MM vowel sequences /əe/ and /əi/ exhibit similar behavior in the opposite direction as these sequences may only occur after a uvular consonant. While these VV sequences are less common, they are also clearly a result of the same articulatory constraints working in the opposite direction.

The remaining vowel sequences highlighted in red in Table 22 are marginal because there are fewer than five instances of each of them. While the MH sequence /oi/ is common cross-linguistically, there are only two instances of the sequence in the corpus. The LM sequence /aə/ as well as the ML sequence /əa/ are uncommon cross-linguistically and also have fewer than five instances each. Each of these sequences are analyzed as tautosyllabic at this time and although further analysis of these sequences is warranted, such analysis is outside the scope of this thesis.

5. Syllable and Word Structure

The syllable and word structure of Domung is not particularly complex with only four basic syllable types. Syllable structure is described in §5.1 including a more detailed discussion of the analysis of /Cəɾ/ sequences. How the syllables combine to form words is described in §5.2.

5.1 Syllable Structure

The syllable structure template for Domung is (C)V(C) which results in four basic syllable types: CVC, CV, VC, and V. This syllable structure derives from two underlying analyses. The first is to analyze the sequences [qw] and [ɢw] as monophonemes /qʷ/ and /ɢʷ/ as previously discussed in §3.7. The second is to analyze [Cəɾ] sequences as CVC sequences as discussed in §5.1.1 below.

Refer to Table 23 for a summary of syllable types occurring as monosyllabic words, and also in word-initial (WI), word-medial (WM), and word-final (WF) positions in polysyllabic words. The most common syllable type is CVC which is closely followed by CV; the VC and V syllables are much less common. See (46) –

(49) for examples of each of the four possible syllable types as whole words and also in WI, WM, and WF positions.

Table 23 Syllable type versus word-position[14]

	Whole word	WI	WM	WF	Total
CVC	139	389	156	1029	1852
CV	16	709	517	280	1506
VC	25	92	0	0	92
V	2	120	0	0	120

[14] Generated via Dekereke using the following parameters: Tautosyllabify all vowel sequences (in accordance with analysis described in §4.4); Exclude multi-words and compounds; Treat /qʷ/ and /ɢʷ/ sequences as monomorphemic.

(46) Examples of the CVC syllable type

Whole word	[bət̚]	/bət/	‘pig’	0987
	[pʰup̚]	/pup/	‘chicken’	0974
	[tʰam]	/tam/	‘leaf’	1177
WI	[dim.dim]	/dim.dim/	‘vine (sp)’	1191.9
	[muɴ.ɢup̚]	/muɴ.ɢup/	‘cucumber’	1732
	[muq̚.pʰot̚]	/muq.pot/	‘blanket’	2019
WM	[qʰa.βit.na]	/qa.bit.na/	‘banana (sp)’	1208.2
	[qʰə.mun.daɴ]	/qə.mun.daɴ/	‘toilet’	0681
	[jə.saɴ.də]	/jə.saɴ.də/	‘somehow’	2156
WF	[wɛ.ɾuq̚]	/we.ɾuq/	‘armpit’	0051
	[tʰa.səɴ]	/ta.səɴ/	‘post’	1760
	[ɢɛn.duq̚]	/ɢen.duq/	‘snore’	0108

(47) Examples of the CV syllable type

Whole word	[du]	/du/	‘dream’	0129
	[qʰo]	/qo/	‘go.2SG.IMP’	1400.36
	[me]	/me/	‘speech/talk’	0430
WI	[wu.səm]	/wu.səm/	‘yar tree’	1158.3
	[ma.ɾun]	/ma.ɾun/	‘honor’	0283
	[sə.nə]	/sə.nə/	‘very/really’	1695
WM	[qʰa.ɾə.ɾəɴ]	/qa.ɾə.ɾəɴ/	‘thunder’	1333
	[mu.ɢa.βaq̚]	/mu.ɢa.baq/	‘orchid (sp)’	1900.1
	[a.sa.da]	/a.sa.da/	‘left’	1667
WF	[ɢap.ma]	/ɢap.ma/	‘hole’	1268
	[a.sə.nə]	/a.sə.nə/	‘true’	1579
	[qʰa.si]	/qa.si/	‘wind’	1330

(48) Examples of the VC syllable type

Whole word	[ap̚]	/ap/	‘signal/alarm’	2111
	[am]	/am/	‘bird (sp)’	1041.5
	[ɛt̚]	/Ø-e-t/	‘make-PRES-1SG’	1458.15
WI	[əm.jom]	/əm.jom/	‘tree (sp)’	1158.1
	[op.ma]	/op.ma/	‘yesterday’	1371
	[un.soq̚]	/un.soq/	‘walking stick’	0560
WM	---	---	---	---
WF	---	---	---	---

(49) Examples of the V syllable type

Whole word	[ai]	/ai/	‘mother’s brother’	0349
	[a]	/Ø-a/	‘make/do-2/3PL.DS.SQ’	1458.36
WI	[a.dat̚]	/a.dat/	‘custom’	0932
	[ə.səp̚]	/ə.səp/	‘pitpit plant (sp)’	1730.2
	[a.ɾon]	/a.ɾon/	‘visit’	2041
WM	---	---	---	---
WF	---	---	---	---

5.1.1 Discussion of /Cəɾ/ Sequences

When plosives are followed by an alveolar flap, there is a brief schwa release. This schwa release could be analyzed as a phonetic artifact resulting from articulatory constraints due to its short duration. However, I have chosen to analyze these sequences as a true CVC sequence for several reasons.

First, as shown by Table 24 below, every other vowel may also be present between plosives and /ɾ/ consonants. Thus, the distibution of vowels in the C_ɾ context is not predictable and contrast exists between each vowel in this context. Since /ə/ is clearly phonemic as discussed in §4, it is reasonable to assume that it is also phonemic in this context and is merely reduced in duration.

Table 24 Comparison of CVɾ sequences

	iɾ	**eɾ**	**oɾ**	**uɾ**	**əɾ**	**aɾ**
p	--	1	--	4	5	7
b	1	--	2	1	13	1
t	--	--	--	2	10	9
d	--	1	--	4	7	--
q	1	--	11	4	10	11
ɢ	2	--	1	2	7	6

Second, as shown by (50) below, when native Domung speakers write these /Cəɾ/ sequences using the current trial orthography, they prefer to include a schwa (which is represented by < í >).

(50) Examples of orthographic representations of /Cəɾ/ sequences

[qʰəɾap̚]	/qəɾap/	<kírap>	‘water’	1284
[qʰəɾaq̚]	/qəɾaq/	<kírak>	‘firepit’	1309
[tʰəmbəɾət̚]	/təmbəɾət/	<tímbírít>	‘weed’	1176
[tʰəɾəm]	/təɾəm/	<tírím>	‘decoration’	1822

Third, if these /Cəɾ/ sequences are analyzed as CVC, then a simple syllable structure of (C)V(C) results; if they are not, then a more complex (C(ɾ))V(C) structure results.

Fourth, while the duration of the schwa in /Cəɾ/ sequences is usually quite brief (36 ms as shown in Table 25), it is still noticeable both by non-native speakers such as myself and by native speakers (as evidenced by the orthographic preferences previously mentioned).

Lastly, while the duration of the schwa phoneme in Cəɾ sequences is shortened compared to other word-medial environments, the duration of other vowels in CVɾ sequences is also shortened. Duration measurements were completed following the manual selection methodology outlined in Appendix C on the sequences /qoɾ/, /qəɾ/, and /qaɾ/ from the corpus. The results of these measurements are detailed in Appendix D and summarized in Table 25 below. These sequences were selected because of their identical environments and similar sample sizes. As shown by Table 25, all three vowels show a similar percentage of length reduction when the vowels occur in the /q_ɾ/ environment.

Table 25 Comparision of vowel duration measurements in /qVɾ/ environments

/qVɾ/ Sequence	Sample Size	Mean Vowel Duration in /qVɾ/ (ms)	Mean Duration of /V/ word-medially (ms)[15]	% Reduction in Vowel Length
/qoɾ/	9 words, 18 tokens	73	112	65%
/qəɾ/	9 words, 18 tokens	36	54	68%
/qaɾ/	10 words, 20 tokens	90	118	76%

5.2 Word Structure

The word structure for Domung is theoretically determined by the maximum number of syllables allowed in a word combined with the four different syllable types. If multi-words and compound words in the corpus are excluded, the longest nouns are four syllables long and the longest verbs are six syllables long. Refer to Figure 20 for a summary of syllable counts by word type.

Most words are bisyllabic, but there are a large number of monosyllabic and trisyllabic words as well. Noun roots must contain at least one full syllable, but as shown by Appendix B, some bound verb roots consist of a single phoneme (such as /q/ or /n/). Shorter

[15] Values taken from Table 19 which details mean lengths of short vowels in word-medial position.

words tend to be nouns and longer words tend to be verbs (due to their highly agglutinative nature of verb morphology).

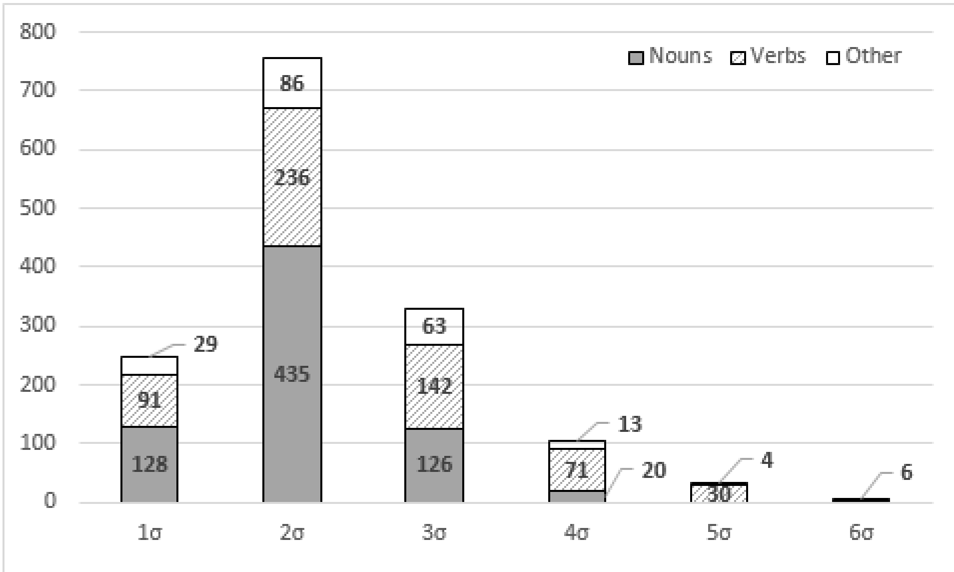

Figure 20 Syllable count by word type

Further analysis of bisyllabic and trisyllabic syllable combinations is detailed in Table 26 below which reveals a strong preference for word-final syllables to be closed. Note that in Table 26, combinations that result in a V.V sequence were excluded (because all VV sequences are analyzed as tautosyllabic as described in §4.4) and the principle of maximal onset also excluded some logically possible combinations. The table shows the different bisyllabic and tri-syllabic syllable type combinations that are present in the corpus. For example, as shown in the first row, there are eight bisyllabic words of structure V.CV, four tri-syllabic words of structure V.CV.CV and 16 tri-syllabic words of structure V.CV.CVC.

Table 26 Word structure analysis by syllable type

		tri-syllabic	
	bisyllabic	CV /	CVC
V.CV	8	4	16
V.CVC	50	0	9
VC.CV	4	1	22
VC.CVC	23	1	4
CV.CV	76	60	74
CV.CVC	268	8	23
CVC.CV	31	10	41
CVC.CVC	126	2	9

6. Phonological Processes at Morpheme Boundaries

While the Domung language utilizes a relatively simple phonological system, a number of phonological processes do affect monomorphemic forms (as discussed in §3 and §4) and there are also several interesting morphophonemic processes in the language which are detailed in §6.1 to §6.4 below.

There are no phonological processes related to vowel harmony. There are also no nasal place assimilation processes as any nasal may co-occur adjacent to any other nasal or consonant.

6.1 Enclitic Alternations

Domung utilizes several different enclitics all of which have a vowel-initial and a consonant-initial form which alternate in order to agree with the final phoneme of the previous word. [16]

As shown by (51), the consonant-initial form of the possessive enclitic, /dasən/, is used when the enclitic follows words ending with a consonant while the vowel-initial form, /asən/, is used when it follows words ending in vowels.

(51) Alternation of possessive enclitic /dasən/ ~ /asən/

a.	/məndʒit **d**asən daen/	<mínyit dasín daen>	'[the] male's group'	NS06 1.2
	/Saimon **d**asən jon /	<Simon dasín yon>	'in Simon's house'	NS07 1.1
	/Buwap **d**asən meqanə/	<Buwap dasín mekaní>	'story of Buwap'	NS17 1.7
b.	/nunə **a**sən man/	<nuní asín man>	'name of mother-3SG.POSS'	NS06 1.2
	/waɢo **a**sən wurop/	<wago asín wurop>	'picture of work'	NS05 3.1
	/qʷoɾi **a**sən man/	<kwori asín man>	'name of younger.sibling'	NS17 1.2

Similarly, as shown by (52), the consonant-initial form of the subject/source enclitic, /da/, is used when the enclitic follows words ending with a consonant while the vowel-initial form /a/ is used when the preceeding word ends in a vowel.

(52) Alternation of subject/source enclitic /da/ ~ /a/

a.	/Aisaq=**d**a/	<Aisak da>	'Aisak=SM'	GE22 6.2
	/mənam=**d**a/	<mínam da>	'bird=SM'	NS05 3.1
	/qʷang=**d**a/	<kwang da>	'earthquake=SM'	NS15 2.9
b.	/dein-nə=**a**/	<deiní a>	'friends-3SG.POSS=SM'	NS06 1.2
	/mondʒi=**a**/	<monyi a>	'man/boy=SM'	NS07 1.4
	/misinaɾi=**a**/	<misinari a>	'misinari=SM'	NS17 1.6

[16] The precise semantic and grammatical function of the enclitics discussed within this section are not yet fully understood and these enclitics remain a subject of ongoing research.

A similar phenomena is observed for the direction/purpose enclitic but it alternates between the consonant intial form /to/ and a glide-initial form /jo/. As shown by (53), the consonant-initial form is used when the preceeding word ends with a consonant and the glide-initial form is used when the preceeding words ends with a vowel.

(53) Alternation of direction/purpose enclitic /to/ ~ /jo/

a.	/doməɴ=**t**o/	<domíng to>	‘language(sp)=DIR/PUR’	NS19 1.5
	/qap=**t**o/	<kap to>	‘song/dance(sp)=DIR/PUR’	NS21 1.12
	/Saimon=**t**o/	<Simon to>	‘Simon=DIR/PUR’	NS1 1.4
b.	/tei=**j**o/	<tei yo>	‘good=DIR/PUR’	NS06 1.2
	/qabə-nə=**j**o/	<kavíní yo>	‘group-3SG.POSS=DIR/PUR’	NS15 2.8
	/waɢo=**j**o/	<wago yo>	‘garden=DIR/PUR’	NS17 1.3

Interestingly, further analysis of these enclitic alternations reveals that the phonological feature driving them is [±CONTINUANT] rather than [±CONS] or [±SYL], as might be expected. This is especially evident when analyzed with borrowed words containing WF consonants which are not allowed word-finally within Domung. As shown by Table 27 below, the first phoneme of the enclitics must match the last phoneme of the preceeding word for the feature of [CONT].

Table 27 Enclitic agreement with preceding words

		Possessive		Subject/Source		Direction/Purpose	
		/dasən/	/asən/	/da/	/a/	/to/	/jo/
Final phoneme of Preceding Word		[-CONT]	[+CONT]	[-CONT]	[+CONT]	[-CONT]	[+CONT]
Nasals /m n ɴ/	[-CONT]	x		x		x	
Plosives /p t q/	[-CONT]	x		x		x	
/s/ (as in Moses/Tomas)	[+CONT]		x		x		x
/l/ (as in Israel/Ismael)	[+CONT]		x		x		x
Vowels	[+CONT]		x		x		x

6.2 Alveolar Flap Substitution

In Domung, the alveolar nasal phoneme may occur intervocalically word-internally as previously shown by (27). However, when the alveolar nasal occurs word-finally and a vowel-initial morpheme is attached, the alveolar nasal is replaced by an alveolar flap as shown by (54). The flap and the surrounding vowels do not seem to retain any nasalization. This substitution process also applies to bound morphemes as illustrated by the verb root

/qaman-/ ‘become/appear’ which, when inflected with vowel-initial morpheme suffixes, is realized as [qamaɾ-]. Refer to the full verb paradigm in Appendix B.

(54)	/qəɾan/ ‘branch’	+ /-ə/ ‘3.POSS.INAL’	→ /qəɾa**ɾ-**ə/ ‘branch-3.POSS’
	/ɢaman/ ‘beauty’	+ /-ə/ ‘ADJ’	→ /ɢama**ɾ-**ə/ ‘beautiful’
	/maan/ ‘cloth.skirt’	+ /-on/ ‘LOC’	→ /maa**ɾ-**on/ ‘cloth.skirt-LOC’
	/ɢin/ ‘woven.bamboo.wall’	+ /-on/ ‘LOC’	→ /ɢi**ɾ-**on/ ‘woven.bamboo-LOC’

Interestingly, this process only applies to word-final alveolar nasals. If a word-initial alveolar nasal morpheme is suffixed to a vowel-final morpheme, then the alveolar nasal is retained as shown by (55).

(55)	/əgwi/ ‘bad/ugly’	+ /-nə/ ‘3.POSS.ALN’	→ /əgwi-**n**ə/ ‘bad/ugly-3.POSS’
	/mondʒi/ ‘boy/son’	+ /-nə/ ‘3.POSS.ALN’	→ /mondʒi-**n**ə/ ‘boy/son-3.POSS’
	/qəɾa/ ‘rule/care’	+ /-nə/ ‘3.POSS.ALN’	→ /qəɾa-**n**ə/ ‘rule/care-3.POSS’
	/qabə/ ‘group’	+ /-nə/ ‘3.POSS.ALN’	→ /qabə-**n**ə/ ‘group-3.POSS’
	/tao/ ‘bearer’	+ /-nə/ ‘3.POSS.ALN’	→ /tao-**n**ə/ ‘bearer-3.POSS’

6.3 Vowel Hiatus Resolution

As discussed in §4.4, Domung allows many different monomorphemic vowel clusters, but certain vowel clusters, such as most rising vowel clusters, result in a heterosyllabic vowel sequence (which I have analyzed as a vowel+glide+vowel sequence per §4.4) instead of a tautosyllabic VV sequence. When vowel hiatus occurs at morpheme boundaries, Domung utilizes several different phonological processes to prevent the formation of disallowed vowel clusters.

The first process is the least common and seems to be isolated to cases where a noun with a high vowel as the final phoneme is suffixed by a schwa-initial morpheme. In this case, an alveolar flap is inserted to resolve the vowel hiatus as shown by (56).

(56)	/wao/ ‘namesake’	+ /-ə/ ‘3.POSS.INAL’	→ /wao**ɾ-**ə/ ‘namesake-3.POSS’
	/ai/ ‘mother’s brother’	+ /-ə/ ‘3.POSS.INAL’	→ /ai**ɾ-**ə/ ‘mother’s brother-3.POSS’
	/babu/ ‘father’s father’	+ /-ə/ ‘3.POSS.INAL’	→ /babu**ɾ-**ə/ ‘father’s father-3.POSS’

The second process is far more common and it involves glide insertion. This glide insertion occurs in at least two different situations. The first is when a morpheme-final higher vowel is affixed by a morpheme-initial lower vowel leading to a rising vowel sequence occurring across a morpheme boundary. In these cases, as shown by (57), a glide is inserted to resolve the hiatus – usually matching the place of articulation of the high vowel, or if not, then a /j/ is typically used. The second is when a morpheme-final vowel is affixed by a morpheme with the same vowel occurring in morpheme-initial position. Rather than deleting one of the vowels or creating a phonemically long vowel, a glide is most often inserted as shown by (58).

(57)	/pu/ 'sleep.RPST'	+ /-a/ 'RPST' + /-t/ '1SG'	→ /pu**w**-a-t/ 'sleep-RPST-1SG'
	/i/ 'sit'	+ /-e/ 'PRES' + /-man/ '1PL'	→ /i**j**-e-man/ 'sit-PRES-1PL'
	/i/ 'sit'	+ /-oja/ 'NFUT' + /-n/ '2SG'	→ /i**j**-oja-n/ 'sit-RPST-2/3PL'

(58)	/aa/ 'stand.RPST'	+ /-a/ 'RPST' +/-n/ '2SG'	→ /a**j**-a-n/ 'stand-RPST-2SG'
	/i/ 'sit'	+ /-ɪɴja/ 'FFUT' + /-n/ '2SG'	→ /i**j**-ɪɴja-n/ 'sit-FFUT-2SG'

6.4 Asymmetric Voicing and Spirantization

As previously mentioned in §3.2, bilabial and uvular plosives are subjected to the phonological processes of voicing and spirantization, but the alveolar plosives are not. As shown by Table 28, when a word-final voiceless bilabial plosive /p/ has a vowel-initial suffix attached, it always becomes voiced and often (though not always) becomes continuant and is thus realized as either [b] or, more often, [β]. When a word-final voiceless uvular plosive /q/ has a vowel-initial suffix attached, it may optionally become voiced or continuant and may thus be realized as any of the following surface forms [q], [ɢ], [χ], or [ʁ]. Interestingly, the voicing of uvular plosives intervocalically is not as productive as the voicing of bilabial plosives intervocalically (see §3.2 for discussion).

The voiceless alveolar plosive /t/ is never realized as anything but /t/, thus introducing an unusual asymmetry in these phonological processes of voicing and spirantization. Another asymmetric aspect of these processes is that although a voiceless uvular plosive /q/ may be realized as the voiceless fricative [χ], the voiceless bilabial plosive /p/ is never realized as the voiceless fricative [ɸ].

Table 28 Examples of plosive voicing and spirantization at morpheme boundaries

	Underlying Root	+ Suffix	Final Surface Form	[+CONT]	[+VOI]
/p/	/qəɾap/ 'water'	/-on/ 'LOC'	[qəɾa**β-**on] 'water-LOC'	Yes	Yes
	/qəep/ 'fire/wood'	/-ijon/ 'for'	[qəɛ**β-**ijon] 'for the fire'	Yes	Yes
	/sep/ 'seed/fruit'	/-ə/ '3.POSS.INAL'	[se**β-**ə] 'seed-3.POSS.INAL'	Yes	Yes
	/muɴɢap/ 'roof'	/-on/ 'LOC'	[muɴɢa**β-**on] 'roof-LOC'	Yes	Yes
	/wap-/ 'come'	/-aɴ/ '2SG.IMP'	[wa**β-**aɴ] 'come-2SG.IMP'	Yes	Yes
/t/	/ɢəndat/ 'sun'	/-on/ 'LOC'	[ɢənda**tʰ-**on] 'sun-LOC'	No	No
	/muqpot/ 'blanket'	/-on/ 'LOC'	[muqpo**tʰ-**on] blanket-LOC'	No	No
	/amat/ 'hunting blind'	/-on/ 'LOC'	[ama**tʰ-**on] 'hunting blind-LOC'	No	No
	/qoɢot/ 'flat sticks'	/-on/ 'INST'	[qoɢo**tʰ-**on] 'flat sticks-INST'	No	No
/q/	/biq/ 'head'	/-ə/ '3.POSS.INAL'	[bi**qʰ-**ə] 'head-3.POSS'	No	No
	/pijəq/ 'ripe'	/-ə/ '3.ADJ'	[pijə**ʁ-**ə] 'ripe-ADJ'	Yes	Yes
	/ɢeruq/ 'knee'	/-ə/ '3.POSS.INAL'	[ɢɛɾu**ʁ-**ə] 'knee-3.POSS'	Yes	Yes
	/wabamoq/ 'streambed'	/-on/ 'LOC'	[wabamo**qʰ-**on] 'streambed-LOC'	No	No
	/watuq/ 'thin'	/-ə/ 'ADJ'	[watu**χ**ə] 'thin-ADJ'	Yes	No
	/naq/ '1SG.PRO'	/=asən/ 'POSS'	[na**ɢ=**asən] '1SG.POSS.PRO'	No	Yes

Furthermore, the spirantization process only seems apply to word or morpheme-final plosives. If a morpheme ending in a vowel is suffixed by a plosive-initial morpheme, the spirantization processes do not apply as shown by (59).

(59)	[iɢəm]	/i-**ɢ**ə-m/	'sit-FPST-1SG'
	[iɢət]	/i-**ɢ**ə-t/	'sit-FPST-3SG'
	[qʷaaɢo]	/qʷaa-**ɢ**o/	'wife's.family-2SG.POSS.ALN
	[mondʒiɢo]	/mondʒi-**ɢ**o/	'son/boy-2SG.POSS.INAL'

7. Tone and Accent

Domung does not exhibit lexical or grammatical tone, which is not surprising since no other Finisterre languages exhibit tone. A typological review of tone, and especially accent in Finisterre languages, is discussed in §7.1. The accent system of Domung is summarized in §7.2 along with a preliminary acoustic analysis of acoustic cues for accent in §7.3.

7.1 Typological Review of Tone and Accent in Finisterre Languages

Foley (1986: 63) argued that although tonal systems have been reported for some Papuan languages, they are likely better analyzed as pitch-accent systems rather than genuine tonal systems. However, subsequent work by Donohue (1997) and Cahill (2011) indicate that tone is in fact more widespread within TNG languages and occurs along a spectrum from simple pitch-accent systems to complex syllable-tone systems. Pawley and Hammerström (2018: 88) summarize the investigation of tonal types within PNG and observe that the distribution of these tonal systems is better understood in terms of areal diffusion versus genealogical relationships. They also note that tone and pitch accent systems are "largely absent" in languages of the Madang and Finisterre-Huon groups (2018: 89). As would therefore be expected, a review of 16 analyzed Finisterre family languages reveals that tone systems are absent as shown in Table 29.

Although no tone systems are present in Finisterre languages, the accentual systems for these languages are typically quite complex – both in terms of word accent placements and also in terms of the various acoustic cues used to indicate accent. Himmelmann (2023) has recently described some of the difficulties of comparing word accent (he uses the term 'stress') cross-linguistically. He argues that while such comparisons are difficult given the "highly complex cluster concept" of word-accent (2023: 356), they are not impossible when done carefully and correctly. I have utilized the data available for 16 Finisterre languages to provide a preliminary cross-linguistic comparison of word accent in Finisterre languages (see discussion below), but it must be recognized that further work is needed to provide a truly robust cross-linguistic analysis of accent in Finisterre languages.

An extensive typology of accent by Hulst (2011) discusses various accent systems in the world's languages. He helpfully differentiates accent systems into *fixed accent* and *variable accent* systems. In the former, a "primary accent is always placed on a particular syllable in a word" while in the latter, "the location of accent is not the same for every word but depends on one or more word-internal factors (2011: 33)." Additionally, a third type of accent system exists for languages where accent placement is entirely unpredictable and thus marked lexically; Hulst refers to these languages as *lexical accent* systems. In these languages, accent serves a contrastive function and a change in accent may change meaning. I have used these same three terms to summarize the different accent systems reported for Finisterre languages.

Out of the 16 analyzed Finisterre languages summarized in Table 29, some sort of accent system is described for 13 of them. The most common system, utilized by seven languages, is some form of a first syllable variable accent system (see Ma Manda, Nek, Uri, Nukna, Gwahatike, Nankina, and Yopno). Three languages exhibit different fixed or variable accentual systems which include: a fixed accent second syllable system (Yau), a penultimate variable accent system (Iyo), and even a complex third/first syllable fixed accent system (Awara)[17] which is considered by Hulst (2011: 35) to be an exceedingly rare system. Four languages are reported to have some degree of lexical accent systems (see Numanggang, Ngaing, Wantoat, Yopno). The precise accent systems for the remaining three languages are currently unclear.

[17] Three separate accent systems are reported for Awara (Quigley 2003). In the primary system, primary accent falls on the third syllable with secondary accent falling on the first syllable. The second accent system is a lexical accent system for a smaller subset of words where accent falls on the second syllable. The third reported accent system is a neutral or 'no accent' system for some bisyllabic words.

Table 29 Summary of tone and accent systems for Finisterre languages

	Name [ISO]	Tonal	Accent
Erap	Finongan [fag] (Rice & Rice 2010)	No	Accent placement is analyzed as “unpredictable but non-contrastive” indicating a complex accent system. Heavy syllables (with codas or long vowels) attract accent.
	Ma Manda [skc] (Pennington 2013)	No	*Variable accent* system: Accent is not contrastive but nor is it entirely predictable. The first syllable typically carries accent, but it is influenced by syllable weight.
	Nek [niv] (Linnasalo 2003a,b)	No	*Variable accent* system: For nouns, accent typically falls on the first syllable without a /ə/ as its nucleus. If all vowels are /ə/, then it falls on the first syllable.
	Numanggang [nop] (Hynum 1988, 2001)	No	*Lexical accent* system: Accent is contrastive; however because it is not written orthographically it is assumed to have a low functional load. Long vowels tend to attract accent.
	Uri [uvh] (Webb 1995)	No	*Variable accent* system: Accent typically occurs on the first syllable, but the first syllable with /e/, /o/, or a long vowel will attract stress.
Gusap-Mot	Iyo / Nahu [nca] (Minter 1998, 2008)	No	*Variable accent* system: Primary accent placed on penultimate syllable, but word-final CVN syllables often attract stress.
	Nekgini [nkg] (Lillie 2011)	No	Accent is not contrastive; no further information available.
	Ngaing [nnf] (Hodgkinson 1998)	No	*Lexical accent* system: Accent is contrastive and shifts based on affixation.
Uruwa	Nukna [klt] (Taylor 2015)	No	*Variable accent* system: Accent typically falls on first syllable of multisyllabic words but shifts to the second syllable if the first syllable nucleus is [ʌ] and the second syllable is CVC.
	Yau [yuw] (Wegmann 1994)	No	*Fixed accent* system: Accent falls on second syllable (except in cases where second syllable of disyllabic words is open).
Wantoat	Awara [awx] (Quigley 2003)	No	*Variable accent* system: Accent typically falls on the first and third (alternating) syllables with primary accent on the last accented syllable (2003: 50).
	Tamu-Irumu [iou] (Webb 1997)	---	No information available regarding tone or stress.
	Wantoat [wnc] (Davis 1994)	No	*Lexical accent* system: Accent is contrastive but has low functional load and no minimal pairs reported.
Warup	Gwahatike [dah] (An and An 1990, Price n.d.)	No	*Variable accent* system: Accent typically falls on the first syllable; if the word is trisyllabic, it moves to the second syllable if it is a long vowel.
Yupna	Nankina [nnk] (Spaulding 1994)	No	*Variable accent* system: Accent typically falls on the first syllable of bisyllabic words; the system is complex and varies by syllable weight, vowel quality, and reduplication status. Some syllables receive equal degrees of accent but the final syllable is rarely accented.
	Yopno [yut] (Reed 1993, 2000a)	No	*Lexical accent* system: Accent is reported to be contrastive, but occurring on first or second syllable

Table 30 Summary of acoustic cues for accent in Finisterre languages

	Name [ISO]	Acoustic Cues for Accent
Erap	Finongan [fag] (Rice and Rice 2010)	Heavy syllables (with codas or long vowels) attract accent indicating that duration may be the primary acoustic cue.
Erap	Ma Manda [skc] (Pennington 2013)	Accent is indicated by: vowel length/quality, intensity, elevated pitch, aspiration or onset lengthening.
Erap	Nek [niv] (Linnasalo 2003a,b)	Primary acoustic cue is often syllable duration.
Erap	Numanggang [nop] (Hynum 1988, 2001)	Long vowels attract stress indicating that vowel and/or syllable duration may be an acoustic cue.
Erap	Uri [uvh] (Webb 1995)	Long vowels attract stress indicating that vowel and/or syllable duration may be an acoustic cue.
Gusap-	Iyo / Nahu [nca] (Minter 1998, 2008)	Syllables with nasal codas often attract stress and thus duration or nasalisation may be acoustic cues.
Gusap-	Nekgini [nkg] (Lillie 2011)	No information available regarding accent cues.
Gusap-	Ngaing [nnf] (Hodgkinson 1998)	Accent indicated by (or heavily correlated with) vowel duration.
Uruwa	Nukna [klt] (Taylor 2015)	Syllables with codas attract accent if the first syllable nucleus is [ʌ]; acoustic cues may include duration and vowel quality
Uruwa	Yau [yuw] (Wegmann 1994)	Primary acoustic cue is rising pitch.
Wantoa	Awara [awx] (Quigley 2003)	Accent indicated by falling pitch and higher intensity.
Wantoa	Tamu-Irumu [iou] (Webb 1997)	No information available regarding accent cues.
Wantoa	Wantoat [wnc] (Davis 1994)	Davis notes “Tone follows the stress” (1994: 3), likely indicating pitch as primary acoustic cue.
Warup	Gwahatike [dah] (An and An 1990, Price n.d.)	Primary acoustic cue appears to be vowel duration.
Yupna	Nankina [nnk] (Spaulding 1994)	The accent pattern is complex and varies based on syllable weight and vowel quality indicating these may be acoustic cues.
Yupna	Yopno [yut] (Reed 1993, 2000a)	Second syllables with codas tend to attract accent, particularly if the first syllable contains /ɨ/ or /ə/; acoustic cues may include duration and vowel quality.

I contend, based on a review of the data currently available, that most Finisterre languages exhibit some form of a variable accent system, but there is clearly an amazing degree of variety in the types of accent systems reported for these languages. Furthermore, as shown by Table 30 above, the acoustic cues for accent in Finisterre languages also vary greatly and may include but are not limited to: increased syllable length, increased vowel length, vowel quality cues, higher intensity, elevated or rising pitch, falling pitch, and aspiration or lengthening of onset consonants. The most common acoustic cue appears to be duration (of either the vowels or the syllables or the syllable moras) as 10 out of 16 Finisterre languages either directly mention or indirectly indicate that duration affects the accent system. The second most common acoustic cue appears to be pitch with four languages mentioning pitch as an acoustic correlate for accent.

7.2 Accent System in Domung

It is difficult to identify the primary accent of a word in Domung due to three main factors. First, the abbreviated duration of the schwa vowel (see §4.3) makes the presence of potential acoustic cues in syllables with a schwa difficult to detect audibly and measure acoustically. Second, the presence of phonemically lengthened vowels makes the prototypical acoustic accent cue of a lengthened syllable/nucleus difficult to isolate. And third, prototypical acoustic cues for accent, such as higher pitch and higher intensity, do not always align within accented syllables. This lack of alignment has been noted for other Finisterre languages (see Pennington 2013 on Ma Manda for example). A native speaker intuition study was therefore conducted to determine where and how consistently native speakers identify word-level accent via a participatory methods exercise conducted with nine different native speakers.

The native speaker intuition study is detailed in Appendix E and was based on a participatory methods approach proposed and modeled by Dr. René van den Berg (via personal communication). After explanation of the principle of accent and the different ways that accent can be indicated in different languages, examples were provided from English and Tok Pisin to illustrate the accent systems of these languages. Fourteen different representative Domung words were then assessed by nine native speakers to determine where native speakers intuit accent is placed. One native speaker did not believe the language included any accent and that every syllable receives the same degree of prominence. The assessments of the eight remaining native speakers are summarized in Table 31 below and agree well with the proposed accent system.

Table 31 Speaker intuition agreement with accent system

Phonemic Word	Gloss	Ref ID	Predicted Accent Location	Speaker Intuition Agreement
ˈɢaɴ.ɢa.boq	vine (sp)	1191.1	σ1	6/8 = 75%
qə.ˈɾa.ɾə	branch	1178	σ2	8/8 = 100%
ˈqa.bə.bot	butterfly	1146	σ1	8/8 = 100%
a.ˈsa.da	left	1667	σ2	6/8 = 75%
mə.ˈɴai.wo	daughter	0336	σ2	7/8 = 88%
ˈmeəɴ.qə.ɾop	lightning	1334	σ1	8/8 = 100%
ˈma.ɢə.ɾeəɴ	tree (sp)	1158.17	σ1	8/8 = 100%
ˈnaɴ.ɢam.pe.ɾuɴ	rainbow	1316	σ1	8/8 = 100%
ˈpa.pi.ja	book	1851	σ1	6/8 = 75%
ˈsə.ɢan	fork.in.tree	2022	σ1	6/8 = 75%
ˈbo.ɾam	grub	1788	σ1	8/8 = 100%
ˈsa.so	chinese taro	1228	σ1	7/8 = 88%
ˈqə.mun	feces	0102	σ1	7/8 = 88%
də.ˈmu.na	pitpit (sp)	1730.3	σ2	7/8 = 88%
				88 % Agreement

The results of the native speaker intuition study combined with acoustic analysis (see §7.3) provide sufficient evidence, despite the challenges mentioned above, to propose a bounded, quantity-sensitive, variable accent system for Domung. Specifically, accent falls within a bisyllabic window on the left edge of words with the first syllable as the preferred accent location as shown by (60).

(60) Examples of accent falling on the first syllable within the bisyllabic accent window

[ˈɢaɴ.ɢa.boq̚]	‘vine (sp)’	1191.1 (see Figure 25)
[ˈbo.ram]	‘grub’	1788
[ˈuu.mə.ɾaq̚]	‘make-RPST-2/3DU’	1458.12
[ˈa.sə.nə]	‘true’	1579
[ˈən.əɴ.səq]	‘teacher’	0263
[ˈwan.də.dət̚]	‘vomit’	0233
[ˈɢoɴ.ɢə.tʰat̚]	‘snail’	1094
[ˈsa.ɾi.riəɴ]	‘strong cry’	0437.2
[ˈnaɴ.ɢam.pʰe.ɾuɴ]	‘rainbow’	1316
[ˈqʰən.dʒi.nə]	‘color’	1554

If the first (target) syllable within the accent window is lighter than the second syllable, then accent shifts to the second syllable as shown by (61) in accordance with the syllable weight scale detailed below in (62).

(61) Examples of accent shifting to the second syllable within the bisyllabic accent window

[a.ˈsa.da]	‘left’	1667 (see Figure 26)
[a.ˈsi.βaq̚]	‘sneeze’	0115
[bə.ˈtʰu.wat]	‘vine (sp)’	1191.14
[də.ˈmu.na]	‘pitpit (sp)’	1730.3
[mə.ˈɢu.ɾə]	‘banana (sp)’	1208.8

Most typically, in quantity-sensitive variable accent systems, accent shifts to heavy syllables with heavy syllables simply being syllables with long vowels and/or with codas. This is also true in Domung with closed syllables being heavier than open syllables. However, this is not the full picture for Domung (nor in fact for several other Finisterre languages). In Domung, the relative prominence of the two syllables within the bisyllabic accent window must be considered. Hulst (2011: 47) states that in prominence based systems, “certain properties of the segments in the syllable count towards weight, not their mere presence” and mentions several such properties including tone, vowel aperture or vowel quality, consonant sonority, and even consonant type. In such systems, syllable weight is better conceptualized as a scale with multiple levels rather than a simple, binary heavy/light distinction. I propose using this concept of a syllable weight scale for Domung with the scale shown in (62). The scale is tentative in nature, particularly with respect to the claim that syllable onset affects syllable weight as this is typologically unexpected and warrants further investigation.[18]

(62)	Heaviest weight	Closed syllable / contains long V or VV sequence: (C)VC / (C)VV(C)
		Open syllable with onset: CV
		Open syllable with no onset: V
	Lightest weight	Open syllables with schwa nucleus: (C)ə

Lastly, the final syllable of a word may not be accented; therefore, in bisyllabic words, accent is placed on the first syllable even if the first syllable is lighter than the second syllable as shown by (63).

[18] Kager (2007) and Hulst (2011) do not mention syllable onset as potentially affecting weight, but Gordon and Roettger (2017) do mention a few languages in which onset durations are increased for accented syllables.

(63) Examples of accent failing to shift to word-final syllables

[ˈə.meəɴ]	'swollen belly sickness'	0206.1
[ˈmə.nam]	'bird'	1041
[ˈqʰə.mun]	'feces'	0102 (see Figure 27)
[ˈsə.ʁan]	'fork in tree'	2022
[ˈu.wa]	'sore'	0220

Further research of Domung and related Finisterre languages is warranted – particularly in light of the amazing variety of accent systems currently reported for Finisterre languages, which could, in fact, be an indication that at least some of these languages do not utilize accent at all (see Goedemans & van Zanten 2014). In addition, it should be noted that while this analysis accounts for the vast majority of the words within the corpus, exceptions do exist and more in-depth research of the accent system is needed in order to understand these exceptions. Further research may reveal that some of these apparent exceptions simply result from the difficulties in accent identification previously mentioned. Alternatively, further research may also reveal additional complexities of the accent system. Another area for additional research is the relationship between word-level and phrase-level stress which is beyond the scope of this thesis.

7.3 Preliminary Acoustic Analysis of Accent

While an in-depth quantitative acoustic analysis of accent cues in Domung is, unfortunately, beyond the scope of this thesis, a preliminary and more qualitative description of acoustic cues is not. Gordon and Roettger (2017) conducted a cross-linguistic typological analysis of word-level accent (which they termed word-stress) in 75 different languages[19] and determined that the most common acoustic cues for accent were, in order: 1) duration (of either the vowel, the rime, the entire syllable, or the onset), 2) intensity, and 3) pitch (the mean F0 of the vowel, the peak F0, the F0 at vowel midpoint or at intensity peak, or the variability of F0). Other acoustic cues were also examined and discussed but these three cues are the most common and easiest to measure acoustically.

Therefore, these three probable acoustic cues for accent (duration, pitch, and intensity) were examined in more detail for the same 14 representative nouns used in the

[19] No Trans New Guinea languages were included in the typological analysis although several Austronesian languages were included.

native speaker intuition study (listed in Table 31). These 14 nouns were spoken in isolation by three different native speakers (M01, M02, and M03; all of whom were also included in the native speaker intuition study). Each word was spoken two times by each speaker yielding a total of 84 word tokens (14*2*3) with a total of 234 syllables for investigation.

The relative duration of syllables (including any onsets and codas) were assessed and the syllable with the longest duration was marked with an “x”; if more than one syllable exhibited similar and longest duration, both were marked and counted. Word-final syllables, were excluded from the assessment of max syllable duration since they tend to be lengthened and are also never accented. The mean pitch (F0) was measured near the right edge of each syllable (to attempt to capture the ‘target pitch’ of the speaker) and the resulting values for each syllable were compared. Syllables with the highest or maximum pitch value were marked with an “x”; if more than one syllable exhibited similar (within 10%) and highest pitch values, both syllables were marked and counted. The relative intensity (loudness) of syllables was assessed and the syllable with the highest intensity was marked with an “x”; if more than one syllable exhibited similar and maximal intensity, both were marked and counted. Refer to Appendix F for details regarding the methodology as well as acoustic plots of representative words.

Figure 21 details the count of all the syllables for which a potential acoustic cue is present, sub-divided into accented versus unaccented syllables. In cases where an acoustic cue is present in multiple syllables within a word, each syllable with the cue is included in the counts. For example, if a tri-syllabic word has similar and maximal pitch on the first two syllables, both syllables would be counted (one as an accented syllable and the other as an unaccented syllable, both with maximum pitch). Details for each of the three acoustic cues are discussed below.

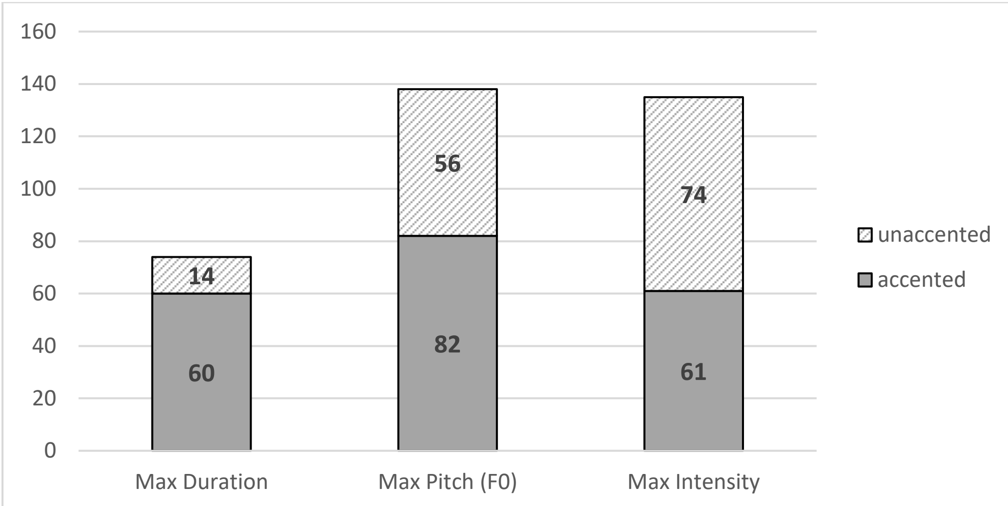

Figure 21 Count of acoustic cues in accented vs unaccented syllables

First, as shown by Figure 21, the most relevant acoustic correlate for accent is syllable duration with 60 accented syllables exhibiting the maximum syllable duration within the word and only 14 unaccented syllables exhibiting the maximum syllable duration. The ratio of accented syllables containing the acoustic cue of maximum duration divided by the total number of syllables with the cue is 81% (60/(60+14)).[20] In other words, if a given syllable in Domung is the longest syllable within the bisyllabic accent window, it is very likely (much more than 50%) to be an accented syllable. This conclusion also fits with the proposed weight scale in (62) because the heaviest syllables are ones with codas and/or long vowels or vowel sequences and thus should be longer than other, lighter syllables. As Gordon and Roettger (2017) note, in most acoustic studies of accent, the acoustic cue of 'duration' is assessed for the syllable nucleus alone, however, there are studies which have assessed other duration measurements including overall syllable duration (Lehiste et al. 2005 on Meadow Mari, Sadeghi 2011 on Persian). Thus, using overall syllable duration as the relevant acoustic correlate for 'duration' in Domung is not without precedent.

Furthermore, the database used to describe and analyze vowel quality and duration acoustically (see §4) can be queried to determine if vowel duration (rather than, or in addition

[20] Theoretically, every word should have only one accented syllable and with 84 word tokens, the denominator might logically be assumed to be 84. However, the 4 bisyllabic words were not assessed for max syllable duration since final syllables are excluded due to known final-syllable lengthening effects and thus including the first syllables for these 4 words would artificially 'inflate' the analysis. Therefore, only 10*2*3=60 word tokens were analyzed for syllable duration. The extra 14 instances of syllables with 'max duration' are due to the fact that in some word tokens, more than a single syllable exhibited the 'maximum duration'.

to, syllable duration) is a relevant acoustic cue. The results of this query are detailed in Table 32 below and reveal that vowel duration is not at all correlated with accent. This is because vowels in unaccented syllables within the vowel quality and duration database actually exhibit a slightly longer mean duration than vowels in accented syllables (107 ms vs 100 ms). It is therefore apparent that overall syllable duration is a superior duration correlate than vowel duration alone.

Table 32 Analysis of vowel duration of accented vs unaccented (non-WF) syllables[21]

	Accented Syllables		Unaccented Syllables (non-WF)	
	Mean Duration (ms)	Sample Size	Mean Duration (ms)	Sample Size
i	114	36	122	18
u	91	40	83	12
e	113	18	121	17
o	109	44	124	12
ə	62	30	58	24
a	105	72	124	44
Totals	100	240	107	127

Second, Figure 21 also shows that maximum pitch (measured via fundamental frequency, F0) is not well correlated with accent. The ratio of accented syllables containing the acoustic cue of maximum pitch, divided by the total number of syllables with the cue, is 59% (82/(82+56)). In other words, because this approaches 50%, if a given syllable in Domung has the maximum pitch, it may be an accented syllable but it is almost nearly as likely to be an unaccented syllable. Therefore, I conclude that the acoustic cue of maximum pitch is not well-correlated with accent. This is also consistent with subjective auditory impressions and acoustic data of pitch which both indicate that pitch is often rather steady in non-word-final syllables as shown in Figure 22.

[21] This analysis only includes short vowels. In addition, word-final (WF) syllables are excluded from the analysis since they tend to be lengthened compared to other syllables but are also never accented. Including them would skew the analysis toward unaccented vowels being longer than accented vowels.

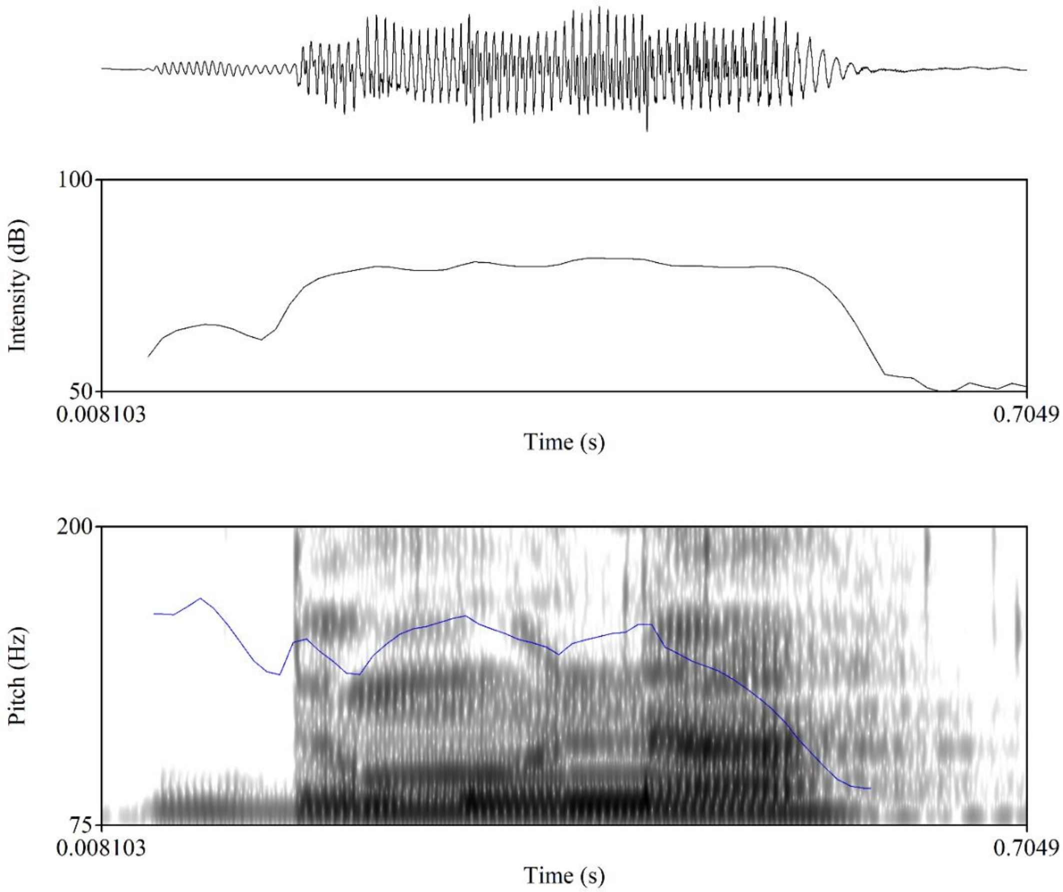

Figure 22 Steady intensity and falling pitch on final syllable in [de.mu.na] 1730.3

However, while maximum pitch itself is not well-correlated with accent, there is almost always a significant lowering of pitch word-finally (see the final syllable in Figure 22). Thus, a decrease in pitch over the course of a syllable is a very strong indication that the syllable is an unaccented, word-final syllable. If viewed from this perspective, a decrease in pitch is strongly, but inversely, correlated with accent because accented syllables will almost never exhibit a significant decrease in pitch.

Third, Figure 21 shows that maximum intensity is not correlated with accent at all. In fact, there are more unaccented syllables that exhibit the maximum intensity than accented syllables (74 vs 61). In fact, the maximum intensity for many words is relatively similar for all the syllables in the word as shown by Figure 22.

Summarizing the results of this preliminary acoustic analysis of accent in Domung, it is clear that syllable duration is the acoustic cue most closely correlated with accent. This finding aligns with previous typological work regarding word-level accent. However, intensity is not at all correlated with accent which is a more surprising result. And lastly, while maximum pitch is not well-correlated with accent, a significant drop in pitch appears to be inversely correlated with accent because word-final (or at least utterance-final) syllables are always unaccented and also always exhibit a significant lowering of pitch.

8. Conclusion

This thesis has provided a phonological description of the underdescribed langage of Domung [dev], a Trans New Guinea language spoken in the Finisterre mountains of Papua New Guinea. The Domung people and their language are described at a high level and a review of relevant literature from the level of the Trans New Guinea language family all the way down the language family tree to the level of the Domung language itself is provided. A brief introduction to some basics of Domung grammar is also provided.

The Domung language has 16 consonant phonemes occurring at three main places of articulation: bilabial, alveolar/palatal, and uvular. A full set of voiceless and voiced plosives as wells as nasals occur at each place of articulation. Additional consonant phonemes include the voiceless alveolar fricative /s/, the affricate /dʒ/, the alveolar flap /ɾ/, and the glides /w/ and /j/. Labialized uvular plosives /qʷ/ and /ɢʷ/ are analyzed as monophonemic. Neutralization of contrast may occur between voiced and voiceless plosives at the bilabial and uvular places of articulation due to processes of voicing and spirantization.

The six vowel phonemes in Domung include the prototypical five vowels: /i e a o u/ which all exhibit phonemically long versions as well as a phonemic schwa /ə/ vowel which is never lengthened. Extensive acoustic analysis of both vowel quality and vowel duration confirms these results and provides important acoustic evidence unusual within the Finisterre family of languages. A review of previous phonological analysis of other related Finisterre languages reveals that vowel length is actually more common among Finisterre languages than previously thought. An extensive analysis of the many vowel sequences in Domung, including acoustic evidence, reveals many typologically expected sequences as well as several unexpected sequences. The unusual sequences involving front vowels and schwa are analyzed as phonetically conditioned due to the presence of neighboring uvular consonants while the typologically rare /ae/ sequence is analyzed as a tautosyllabic sequence which interestingly contrasts with the more common /ai/ sequence.

The syllable structure of Domung is a simple (C)V(C) structure resulting in four basic syllable types with the most common syllable types being CVC and CV. Several phonological processes that occur at morpheme boundaries are detailed including: [CONT] agreement of enclitic forms, alveolar flap substitution, vowel hiatus resolution, and asymmetric voicing and spirantization.

Lastly, the suprasegmental features of tone and accent are analyzed. While tone is not present in Domung nor in any other Finisterre languages, various and complex accent systems abound among these languages. Native speaker intuition data combined with a preliminary acoustic analysis of accent shows that Domung exhibits a bounded, quantity-sensitive variable accent system. Specifically, accent falls within a bisyllabic accent window on the left edge of words with the first syllable being accented unless the second syllable is heavier than the first in which case accent shifts to the second syllable. Acoustic analysis of accent reveals that the acoustic cues of pitch and intensity are not well correlated with accent, but the cue of syllable duration (as opposed to vowel duration) is well correlated with accent in Domung.

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Appendix A – Noun Paradigms

Table 33 Examples of inalienable possessive suffixes

	Suffix	*qʷem* ‘ear’	*mameəɴ* ‘maternal grandmother’	*biəq* ‘head’	*ɢeɾuq* ‘knee’	*nanan* ‘gums’	*duun* ‘mouth’
1SG	*-no*	*qʷemno*	*mameəɴno*	*biəqno*	*ɢeɾuqno*	*nanano*	*duuno*
2SG	*-ɢo*	*qʷemɢo*	*mameəɴɢo*	*biəɢo*	*ɢeɾuɢo*	*nananɢo*	*duunɢo*
1DU	*-nit*	*qʷemnit*	*mameəɴnit*	*biəqnit*	*ɢeɾuqnit*	*nananit*	*duunit*
2DU	*-din*	*qʷemdin*	*mameəɴdin*	*biəqdin*	*ɢeɾuqdin*	*nanandin*	*duundin*
1PL	*-nin*	*qʷemnin*	*mameəɴnin*	*biəqnin*	*ɢeɾuqnin*	*nananin*	*duunin*
2PL	*-də*	*qʷemdə*	*mameəɴdə*	*biəqdə*	*ɢeɾuqdə*	*nanandə*	*duundə*
3SG/DU/PL	*-ə*	*qʷemə*	*mameəɴə*	*biəqə*	*ɢeɾuqə*	*nanaɾə*	*duuɾə*

Table 34 Exampes of alienable possessive suffixes

	Suffix	*pup* ‘chicken’	*woɴ* ‘fence’	*jut* ‘house’	*jəq* ‘bilum’	*dein* ‘friend.PL’
1SG	*-no*	*pupno*	*woɴno*	*jutno*	*jəqno*	*deino*
2SG	*-ɢo*	*pupɢo*	*woɴɢo*	*jutɢo*	*jəɢo*	*deinɢo*
1DU	*-nit*	*pupnit*	*woɴnit*	*jutnit*	*jəqnit*	*deinit*
2DU	*-din*	*pupdin*	*woɴdin*	*jutdin*	*jəqdin*	*deindin*
1PL	*-nin*	*pupnin*	*woɴnin*	*jutnin*	*jəqnin*	*deinin*
2PL	*-də*	*pupdə*	*woɴdə*	*jutdə*	*jəqdə*	*deində*
3SG/DU/PL	*-nə*	*pupnə*	*woɴnə*	*jutnə*	*jəqnə*	*deinə*

Table 35 Examples of locative suffixes

Root			**Root-LOC**		
Phonetic	Phonemic	Gloss	Phonetic	Phonemic	Gloss
waχo	*waqo*	‘garden’	waχɛn	*waqen*	‘garden-LOC’
qʰəɾap˺	*qəɾap*	‘water’	qʰəɾaβon	*qəɾapon*	‘water-LOC’
jut˺	*jut*	‘house’	jon	*jon*	‘house-LOC’
tʰap˺	*tap*	‘ocean’	tʰaβon	*tapon*	‘ocean-LOC’
tʰamo	*tamo*	‘field’	tʰamɛn	*tamen*	‘field-LOC’
tʰam	*tam*	‘leaf’	tʰamon	*tamon*	‘forest-LOC’
mara	*mara*	‘valley’	marajon	*marajon*	‘valley-LOC’
ɢin	*ɢin*	‘wall’	ɢiɾon	*ɢiɾon*	‘wall-LOC’
muɴɢap˺	*muɴɢap*	‘roof’	muɴɢaβon	*muɴɢapon*	‘roof-LOC’
qʰut˺	*qut*	‘village’	qʰujon	*qujon*	‘village-LOC’
muqpot˺	*muqpot*	‘blanket’	muqpotʰon	*muqpoton*	‘blanket-LOC’
maan	*maan*	‘cloth skirt’	maaɾon	*maaɾon*	‘cloth.skirt-LOC’
waɴɢa	*waɴɢa*	‘ship’	waɴɢajon	*waɴɢajon*	‘ship-LOC’

Appendix B – Final Verb Paradigms

Table 36 Final intransitive verb paradigms

	Gloss	**‘go’**	**‘stay/live(anim)’**	**‘look’**	**‘say’**	**‘eat’**
	Class	**o-class**	**o-class**	**ao-class**	**ao-class**	**ao-class**
FAR PAST	**1SG**	*qom*	*jaqom*	*qaom*	*jaom*	*naom*
	2SG	*qoraq*	*jaqon*	*qaon*	*jaon*	*naon*
	3SG	*qot*	*jaqot*	*qaot*	*jaot*	*naot*
	1DU	*qomat*	*jaqomat*	*qaomat*	*jaomat*	*naomat*
	2/3DU	*qoməɾaq*	*jaqoməɾaq*	*qaoməɾaq*	*jaoməɾaq*	*naoməɾaq*
	1PL	*qoman*	*jaqoman*	*qaoman*	*jaoman*	*naoman*
	2/3PL	*qit*	*jaqit*	*qait*	*jait*	*nait*
NEAR PAST	**1SG**	*qət*	*jaqət*	*qat*	*jat*	*nat*
	2SG	*qən*	*jaqən*	*qan*	*jan*	*nan*
	3SG	*qəq*	*jaqəq*	*qaq*	*jaq*	*naq*
	1DU	*qəmat*	*jaqəmat*	*qamat*	*jamat*	*namat*
	2/3DU	*qəməɾaq*	*jaqəməɾaq*	*qaməɾaq*	*jaməɾaq*	*naməɾaq*
	1PL	*qəman*	*jaqəman*	*qaman*	*jaman*	*naman*
	2/3PL	*qiɴ*	*jaqeɴ*	*qaɴ*	*jaɴ*	*naɴ*
PRESENT/CONT	**1SG**	*qʷet*	*jaqʷet*	*qet*	*jet*	*net*
	2SG	*qʷen*	*jaqʷen*	*qen*	*jen*	*naɴ*
	3SG	*qʷeq*	*jaqʷeq*	*qeq*	*jeq*	*neq*
	1DU	*qʷemat*	*jaqʷemat*	*qemat*	*jemat*	*nemat*
	2/3DU	*qʷeməɾaq*	*jaqʷeməɾaq*	*qeməɾaq*	*jeməɾaq*	*neməɾaq*
	1PL	*qʷeman*	*jaqʷeman*	*qeman*	*jeman*	*neman*
	2/3PL	*qʷeɴ*	*jaqʷeɴ*	*qeɴ*	*jeɴ*	*neɴ*
NEAR FUTURE	**1SG**	*qʷojat*	*jaqʷojat*	*qojat*	*jojat*	*nojat*
	2SG	*qʷojan*	*jaqʷojan*	*qojan*	*jojan*	*nojan*
	3SG	*qʷojaq*	*jaqʷojaq*	*qojaq*	*jojaq*	*nojaq*
	1DU	*qəndojamat*	*jaqəndojamat*	*qondojamat*	*jondojamat*	*nondojamat*
	2/3DU	*qəndojaməɾaq*	*jaqəndojaməɾaq*	*qondojaməɾaq*	*jondojaməɾaq*	*nondojaməɾaq*
	1PL	*qənojaman*	*jaqənojaman*	*qonojaman*	*jonojaman*	*nonojaman*
	2/3PL	*qənojaɴ*	*jaqənojaɴ*	*qonojaɴ*	*jonojaɴ*	*nonojaɴ*
FAR FUTURE	**1SG**	*qʷiɴjat*	*jaqʷiɴjat*	*qiɴjat*	*jiɴjat*	*niɴjat*
	2SG	*qʷiɴjan*	*jaqʷiɴjan*	*qiɴjan*	*jiɴjan*	*niɴjan*
	3SG	*qʷiɴjaq*	*jaqʷiɴjaq*	*qiɴjaq*	*jiɴjaq*	*niɴjaq*
	1DU	*qəndiɴjamat*	*jaqəndiɴjamat*	*qondiɴjamat*	*jondiɴjamat*	*nondiɴjamat*
	2/3DU	*qəndiɴjaməɾaq*	*jaqəndiɴjaməɾaq*	*qondiɴjaməɾaq*	*jondiɴjaməɾaq*	*nondiɴjaməɾaq*
	1PL	*qəniɴjaman*	*jaqəniɴjaman*	*qoniɴjaman*	*joniɴjaman*	*noniɴjaman*
	2/3PL	*qəniɴjaɴ*	*jaqəniɴjaɴ*	*qoniɴjaɴ*	*joniɴjaɴ*	*noniɴjaɴ*

Table 37 Final intranstive verb paradigms (continued)*

	Gloss	**‘put/leave’**	**‘come’**	**‘become/appear’**	**‘sit down’**
	Class	**gə-class**	**gə-class**	**gə-class**	**gə-class**
FAR PAST	**1SG**	*əpɢəm*	*wapɢəm*	*qamanɢəm*	*iɢəm*
	2SG	*əpɢən*	*wapɢən*	*qamanɢən*	*iɢən*
	3SG	*əpɢət*	*wapɢət*	*qamanɢət*	*iɢət*
	1DU	*əpɢəmat*	*wapɢəmat*	*qamanɢəmat*	*iɢəmat*
	2/3DU	*əpɢəməɾaq*	*wapɢəməɾaq*	*qamanɢəməɾaq*	*iɢəməɾaq*
	1PL	*əpɢəman*	*wapɢəman*	*qamanɢəman*	*iɢəman*
	2/3PL	*əpɢit*	*wapɢit*	*qamanɢit*	*iɢit*
NEAR PAST	**1SG**	*əβat*	*waβat*	*qamaɾat*	*ijat*
	2SG	*əβan*	*waβan*	*qamaɾan*	*ijan*
	3SG	*əβaq*	*waβaq*	*qamaɾaq*	*ijaq*
	1DU	*əβamat*	*waβamat*	*qamaɾamat*	*ijamat*
	2/3DU	*əβaməɾaq*	*waβaməɾaq*	*qamaɾaməɾaq*	*ijaməɾaq*
	1PL	*əβaman*	*waβaman*	*qamaɾaman*	*ijaman*
	2/3PL	*əβaɴ*	*waβaɴ*	*qamaɾaɴ*	*ijaɴ*
PRESENT/CONT	**1SG**	*əβet*	*waβet*	*qamaɾet*	*ijet*
	2SG	*əβen*	*waβen*	*qamaɾen*	*ijen*
	3SG	*əβeq*	*waβeq*	*qamaɾeq*	*ijeq*
	1DU	*əβemat*	*waβemat*	*qamaɾemat*	*ijemat*
	2/3DU	*əβeməɾaq*	*waβeməɾaq*	*qamaɾeməɾaq*	*ijeməɾaq*
	1PL	*əβeman*	*waβeman*	*qamandeman*	*ijeman*
	2/3PL	*əβeɴ*	*waβeɴ*	*qamandeɴ*	*ijeəɴ*
NEAR FUTURE	**1SG**	*əβojat*	*waβojat*	*qamaɾojat*	*ijojat*
	2SG	*əβojan*	*waβojan*	*qamaɾojan*	*ijojan*
	3SG	*əβojaq*	*waβojaq*	*qamaɾojaq*	*ijojaq*
	1DU	*əpdojamat*	*wapdojamat*	*qamandojamat*	*idojamat*
	2/3DU	*əpdojaməɾaq*	*wapdojaməɾaq*	*qamandojaməɾaq*	*idojaməɾaq*
	1PL	*əpnojaman*	*wapnojaman*	*qamannojaman*	*itnojaman*
	2/3PL	*əpnojaɴ*	*wapnojaɴ*	*qamannojaɴ*	*itnojaɴ*
FAR FUTURE	**1SG**	*əβiɴjat*	*waβiɴjat*	*qamaɾiɴjat*	*ijiɴjat*
	2SG	*əβiɴjan*	*waβiɴjan*	*qamaɾiɴjan*	*ijiɴjan*
	3SG	*əβiɴjaq*	*waβiɴjaq*	*qamaɾiɴjaq*	*ijiɴjaq*
	1DU	*əpdiɴjamat*	*wapdiɴjamat*	*qamandiɴjamat*	*idiɴjamat*
	2/3DU	*əpdiɴjaməɾaq*	*wapdiɴjaməɾaq*	*qamandiɴjaməɾaq*	*idiɴjaməɾaq*
	1PL	*əpniɴjaman*	*wapniɴjaman*	*qamanniɴjaman*	*itniɴjaman*
	2/3PL	*əpniɴjaɴ*	*wapniɴjaɴ*	*qamanniɴjaɴ*	*itniɴjaɴ*

* These transcriptions are phonemic with the exception of the surface form [β].

Table 38 Final transitive verb paradigm (with object prefixes)

	'TELL'		**OBJECT** PERSON/NUMBER				
			1SG	**2SG**	**3SG/DU/PL**	**1DU/PL**	**2DU/PL**
SUBJECT PERSON/NUMBER	**FPST**	**1SG**	--	ɢanom	ənom	--	danom
		2SG	nanon	--	ənon	nənon	--
		3SG	nanot	ɢanot	ənot	nənot	danot
		1DU	--	ɢanomat	ənomat	nənomat	danomat
		2/3DU	nanoməɾaq	ɢanoməɾaq	ənoməɾaq	nənomaɾaq	danoməɾaq
		1PL	--	ɢanoman	ənoman	nənoman	danoman
		2/3PL	nanit	ɢanit	ənit	nənit	danit
	RPST	**1SG**	--	ɢanət	ənət	--	danət
		2SG	nanən	--	ənən	nənən	--
		3SG	nanəq	ɢanəq	ənəq	nənəq	danəq
		1DU	nanəmat	ɢanəmat	ənəmat	nənəmat	danəmat
		2/3DU	nanəməɾaq	ɢanəməɾaq	ənəməɾaq	nənəməɾaq	danəməɾaq
		1PL	nanəman	ɢanəman	ənəman	nənəman	danəman
		2/3PL	naniəɴ	ɢaniəɴ	əniəɴ	nəniəɴ	daniəɴ
	PRES	**1SG**	--	ɢanɛt	ənɛt	--	dant
		2SG	nanɛn	--	ənɛn	nənɛn	--
		3SG	naneəq	ɢaneəq	əneəq	nəneəq	daneəq
		1DU	--	ɢanemat	ənemat	nanemat	danemat
		2/3DU	naneməɾaq	ɢaneməɾaq	əneməɾaq	naneməɾaq	daneməɾaq
		1PL	--	ɢaneman	əneman	naneman	daneman
		2/3PL	naneəɴ	ɢaneəɴ	əneəɴ	naneəɴ	daneəɴ
	NFUT	**1SG**	--	ɢanojat	ənojat	--	danojat
		2SG	nanojan	--	ənojan	nənojan	danojan
		3SG	nanojaq	ɢanojaq	ənojaq	nənojaq	danojaq
		1DU	--	ɢanəndojamat	ənəndojamat	nənəndojamat	danəndojamat
		2/3DU	nanəndojaməɾaq	ɢanəndojaməɾaq	ənəndojaməɾaq	nənəndojaməɾaq	danəndojaməɾaq
		1PL	--	ɢanənojaman	ənənojaman	nənənojaman	danənojaman
		2/3PL	nanənojaɴ	ɢanənojaɴ	ənənojaɴ	nənənojaɴ	danənojaɴ
	FFUT	**1SG**	--	ɢaniɴjat	əniɴjat	--	daniɴjat
		2SG	naniɴjan	--	əniɴjan	nəniɴjan	daniɴjan
		3SG	naniɴjaq	ɢaniɴjaq	əniɴjaq	nəniɴjaq	daniɴjaq
		1DU	--	ɢanəndiɴjamat	ənəndiɴjamat	nənəndiɴjamat	danəndiɴjamat
		2/3DU	nanəndiɴjaməɾaq	ɢanəndiɴjaməɾaq	ənəndiɴjaməɾaq	nənəndiɴjaməɾaq	danəndiɴjaməɾaq
		1PL	--	ɢanəniɴjaman	ənəniɴjaman	nənəniɴjaman	danəniɴjaman
		2/3PL	nanəniɴjaɴ	ɢanəniɴjaɴ	ənəniɴjaɴ	nənəniɴjaɴ	danəniɴjaɴ

Appendix C – Acoustic Measurement and Analysis Methodology

The measurement methods described below were developed with input from my thesis advisor, Dr. Roderic Casali, and after review of Baart (2010) and Ladefoged (2003).

The following methodology was utilized for acoustic analysis of vowel quality and duration:

1. Identify target words for acoustic analysis study from existing corpus using the guidelines below. The list of words selected is shown in Table 39 at the end of this Appendix.
    a. Avoid adjacent nasal consonants (for vowel quality analysis only)
    b. Include several (target 3-5) instances of each vowel in word-initial, word-medial, and word-final positions
    c. For bisyllabic words, include several (target 2-4) instances of each vowel in the first syllable and in the second syllable position (to facilitate comparison of accented vs unaccented vowels if desired)
2. Create wordlist datasheets for elicitation sessions
    a. Create two separate wordlists:
        i. Speaker Wordlist: for the speaker to use with reference numbers and glosses only, no Domung orthographic representations or IPA transcriptions. This is to ensure that the researcher's bias regarding orthographic representation (particularly long vs short vowels) does not influence the native speakers' natural pronunciation.
        ii. Researcher Wordlist: for the researcher to use with reference numbers, glosses, and IPA transcriptions
    b. Duplicate the Speaker Wordlist twice for a total of three copies (referred to as "sets") and randomize the order of the words in each of the three copies. This results in three different sets of the same words which will be recorded in a randomized run order to eliminate run order effects.
    c. Update the Researcher wordlist (all three copies) to match the run order of the three sets of the Speaker wordlist
3. Record the words with each of three different male speakers (M01, M02, M03)
    a. Record in the same location using the same equipment (in my case a Zoom H4N Pro digital recorder with a headset microphone)
    b. Record Wordlist Set 1 first, followed by a short break, then Wordlist Set 2, followed by a short break, then Wordlist Set 3
    c. When recording, have the speaker repeat each word twice

   d. Three recordings are thus be obtained for each speaker, one for each set of the wordlist; since each word is spoken twice, a total of 6 tokens will be collected for each word for each speaker or a total of 18 tokens of each word across all three speakers.

4. Using the Audacity software (https://www.audacityteam.org/, version 2.1.3), split each recording into individual sound files (one per token of each word)
   a. Label each clip with speaker ID, set number, word number, and token number. Example: "M01 set1 44 T1"
   b. Use the 'Export Multiple Audio Files' function to export each sound file separately.
   c. Note that although each token for each word is exported, generally only the second token is used for analysis unless there is background noise or a clear speaker error in the second token which is then replaced with the first token for analysis purposes.
5. Use PRAAT (Boersma & Weekink 2018, version 6.0.37) to analyze the sound files per the following process
   a. Open a group of sound files using 'Open' → 'Read from file'
   b. Open a sound file for analysis using the 'View and Edit' button which will show the waveform and spectrogram for the sound file.
   c. One time only: Create a log script which will be used to measure both mean vowel formant information (F1, F2, F3, bandwidth1 to the nearest whole number) and vowel duration information (start time, end time, duration to six decimal places) and store results in two separate .csv text file logs (one for vowel formant analysis and one for vowel duration analysis)
      i. Log Script Used: 'editor$',MeanF1:'f1:0',MeanF2:'f2:0',MeanF3:'f3:0',Time1:'t1:6',Time2:'t2:6',Dur:'dur:6',Band1:'b1:0'
   d. For each vowel in a word (moving in order from the first vowel to the final vowel for multi-syllabic words):
      i. Manually select the full vowel duration window using the following criteria:
         1. Zoom in to a level where the waveform and spectrogram plots are clear
         2. At the starting point of the vowel, visually examine the waveform to identify where the waveform crosses the zero axis (moving upward). This will be the first selection point.
         3. Study the waveform shape to identify the shape of an entire period of the waveform.

a. For word-initial vowels, the exact shape of the waveform is not critical when selecting the starting point, just select the earliest point where any sort of periodic waveform starts.

4. At the ending point of the vowel, visually examine the waveform to identify where it cross the zero axis (moving upward)

   a. For word-final vowels, the exact shape of the waveform is not critical when selecting the ending point, just select the latest point where any sort of periodic waveform finishes.

5. The selection window should capture full periods of the waveform with no partial periods (with the previously noted exceptions for the initial portion of word-initial vowels and the final portion of word-final vowels)

6. Verify the selection window by listening to the selected portion vs the visible portion to ensure no transitional effects are present (such as fricatives or approximants or other consonant effects)

7. Examine the spectrogram to verify that the selection window is logical (i.e. ensure transition effects from adjacent consonants are minimized, etc.)

ii. Export the vowel duration (which will also include all the other log script information) to the Duration log script text file.

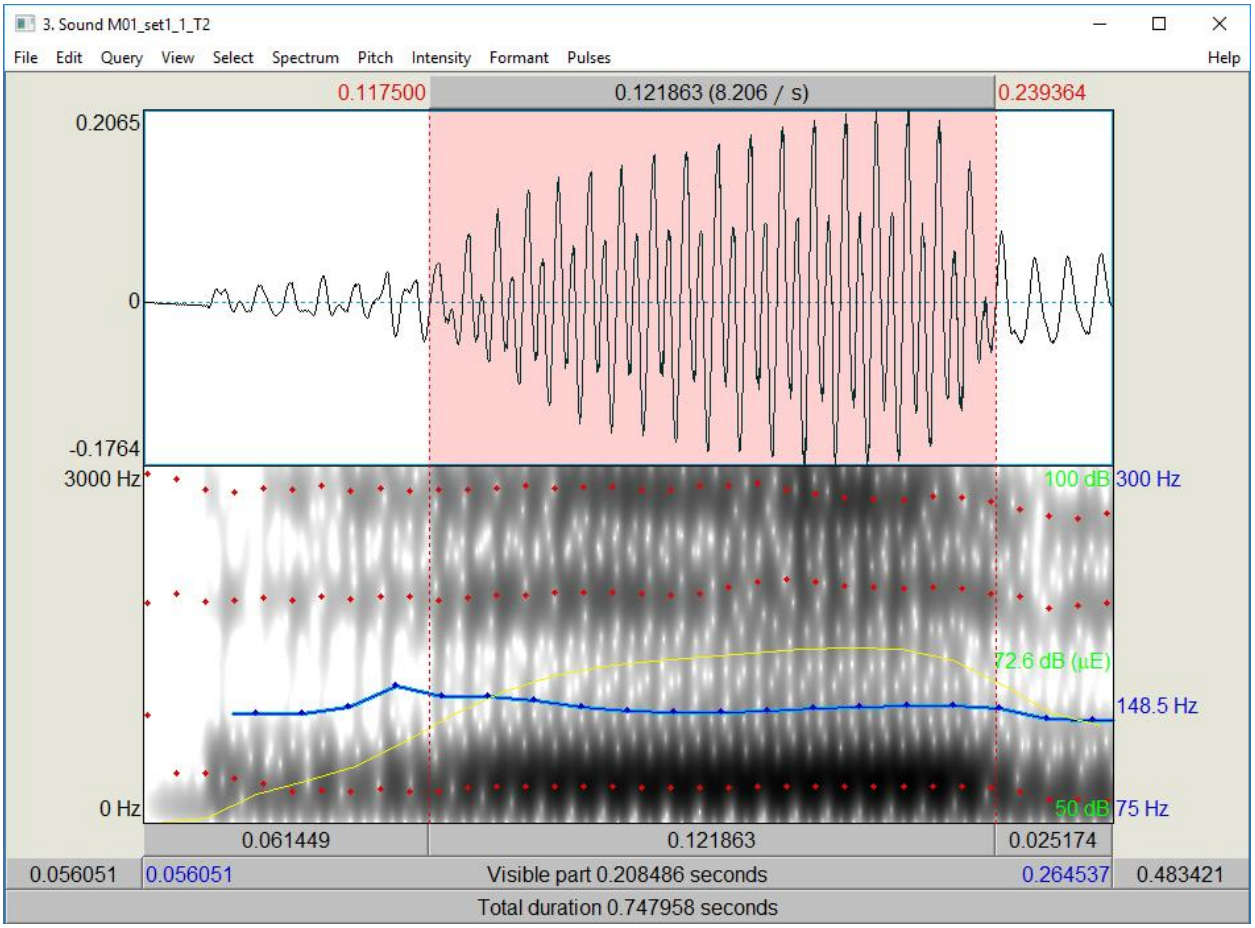

Figure 23 Example of vowel duration selection for first [i] in [idit] 'sit down' (M01)

iii. Zoom in to the vowel duration selection window (Cntrl+n) and manually select the window to be used for vowel formant analysis using the following criteria:

1. Select a window from about 40% to 60% of the overall vowel length to capture the 'central' portion of the vowel. Visually, this should be slightly less than the middle third of the vowel selection window.

2. Select full periods only by looking at the waveform and selecting the start and ending points where the waveform intersects the zero axis (moving in an upward direction). The window should not include any partial periods.

3. The window should capture the steady-state portion of the vowel formants and should not include significant spurious formants or obvious transition effects.

4. Shift the measurement window earlier or later within the vowel if needed in order to capture a steady-state portion of the vowel without significant transition effects.
5. The measurement window may also be shortened if needed but should include at least 2-3 full periods (typically the measurement window will include many more periods for all vowels except for the rather short /ə/ vowel)

iv. Export the vowel formant information (which will also include all the other log script information) to the Vowel Formant log script text file.

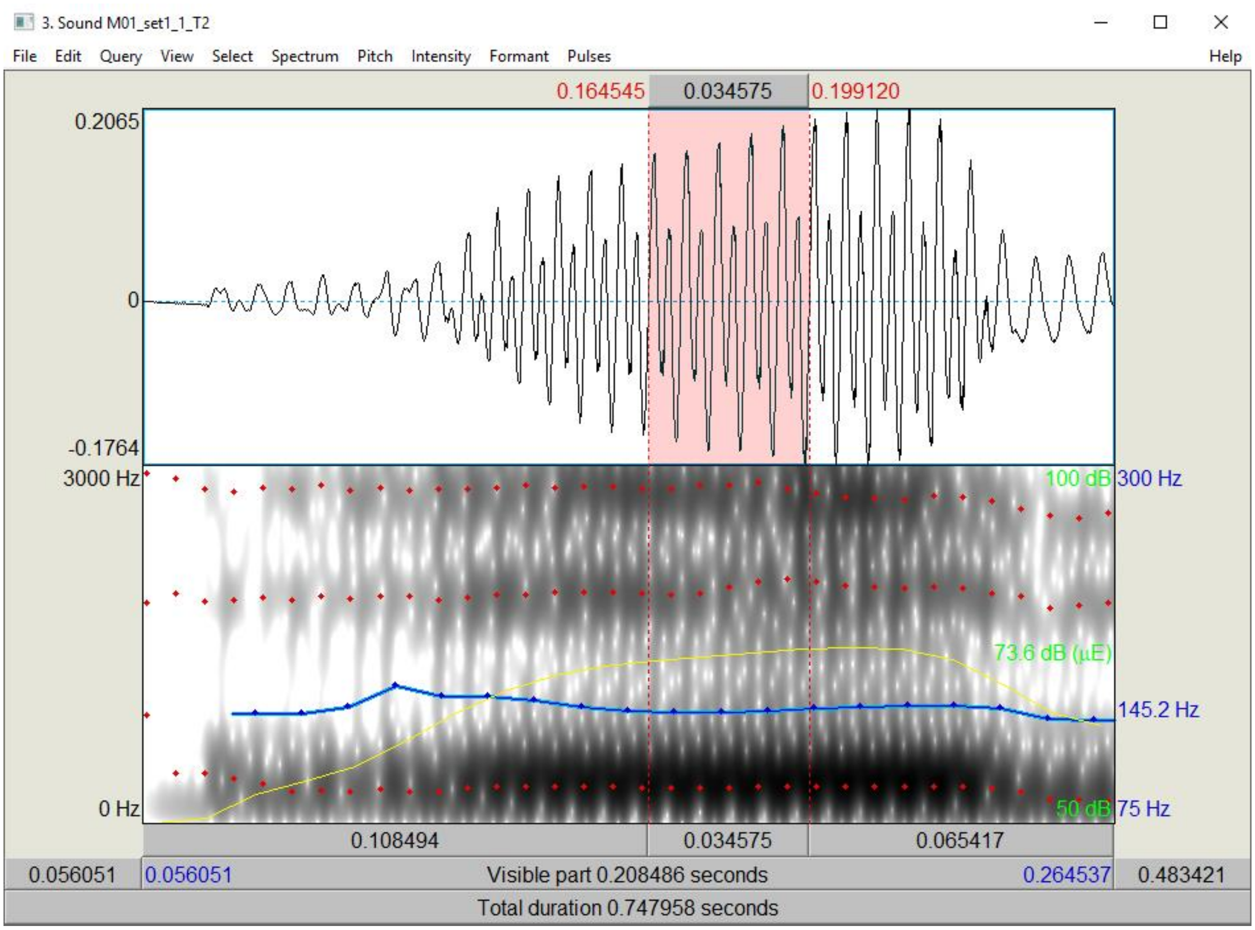

Figure 24 Example of vowel formant selection for first [i] in [idit] 'sit down' (M01)

6. Copy and paste the duration log script text file into an Excel spreadsheet and use the convert 'text to columns' function to create a database of vowel duration information.
   a. Add syllable position information to the database (any words with multiple syllables will have multiple log script 'rows' with one row for each vowel in

the word and, since they were measured in order from first to last, the first row will be the first syllable, the second row, the second syllable, etc.)

7. Copy and paste the vowel formant log script text file into an Excel spreadsheet and use the convert ‘text to columns’ function to create a database of vowel formant information.
    a. Add syllable position information to the database (any words with multiple syllables will have multiple log script ‘rows’ with one row for each vowel in the word and, since they were measured in order from first to last, the first row will be the first syllable, the second row, the second syllable, etc.)
8. Merge the two Excel spreadsheets from Step 6 and Step 7 into a single spreadsheet
9. Manually annotate each vowel in the spreadsheet with other relevant information such as the phonetic realization of the vowel, the predicted accent status (accented vs not), syllable structure, vowel length, presence/absence of adjacent nasal, etc.
10. Analyze vowel formant data:
    a. Exclude all vowels with an adjacent nasal (add data column ‘AdjNasal’)
    b. Use Pivot table to automatically calculate data for statistical summary (see ‘FormantPlot’ tab of spreadsheet)
11. Import the Excel spreadsheets into R for statistical and graphical analysis.
    a. The R code detailed in Appendix G was used to perform statistical analysis of vowel duration measurements.

Table 39 Words used for acoustic analysis of vowel quality and vowel duration

ID #	Phonetic Form	English Gloss	ID #	Phonetic Form	English Gloss
1	idit	sit.down	41	babu	father's father
2	iɾun	lips	42	bubu	sorry
3	taam	all	43	dudu	hunting blind
4	iibə	spleen	44	tam	leaf
5	təm	part	45	qo	go.2SG.PRES
6	ɛɛt	make.1SG.PRES	46	saso	chinese.taro
7	ɛraɴə	dry	47	siit	cook.2-3PL.FPST
8	eəq	make.3SG.PRES	48	pita	scissors
9	eeman	make.1PL.PRES	49	ɢisan	bettlenut.cluster
10	əsəp	kind.of.pitpit	50	teβət	type.of.fern
11	əɢwa	maybe	51	ɢuɢɛm	cloud
12	oʁo	climb.2SG.PRES	52	tɛt	string

Table 39 (continued)

ID #	Phonetic Form	English Gloss	ID #	Phonetic Form	English Gloss
13	əβa	lose.3PL.FUT	53	seeβə	seed/egg
14	aaq	stand.2SG.PRES	54	bət	pig
15	adat	custom	55	qəp	black.feathers
16	asada	left	56	qətat	rest
17	aptɛt	get(it).1SG.PRES	57	pətaq	rat.trap
18	asuq	yam	58	qoɢot	flat.sticks.for.cleaning
19	uuɾaq	make.2SG.NPST	59	patot	bed
20	uut	make.1SG.NPST	60	soot	cook.3SG.FPST
21	uuq	make.3SG.NPST	61	pup	chicken
22	oot	make.3SG.FPST	62	tap	ocean
23	oχo	up	63	piit	urine
24	oɢeəɴ	praying.mantis	64	suut	drizzle
25	opma	yesterday	65	iβip	type.of.vine
26	qwoɾi	younger sibling	66	suunə	old
27	sɛɢiɢi	kind.of.limbum	67	ɛɛm	sugarcane
28	ɾaɢi	green onion	68	gɛɛɾə	root.3SG.POSS
29	qasi	wind	69	sɛɛt	cook.1SG.PRES
30	tape	blackboard	70	gɛɛn	root
31	pure pure	forever	71	ooq	cargo/clothes
32	patəte	potato	72	oop	buzz.from.buai
33	paɾe paɾe	humble	73	qoot	floor
34	sooɢə	seashells	74	baat	tree.beetle
35	teβə	yellow daka leaf	75	qat	stinging.plant
36	də	2PL.PRO	76	taap	type.of.ant
37	ɢuʁə	wet	77	qaq	type.of.pitpit
38	ɢuta	type.of.banana	78	isəq	type.of.trap
39	qoɾa	green.daka.leaf	79	guun	type.of.tree
40	du	dream	80	mumsiin	nipple

Appendix D – Vowel Duration Measurements for qVɾ Sequences

Vowel durations in /qVɾ/ frames were manually measured for two tokens of each word using the manual selection methods outlined in Appendix C for vowel duration measurements.

/qVɾ/	Phonetic Word	Gloss	Ref ID	T1 Dur (ms)	T2 Dur (ms)	Mean V Dur in /qVɾ/ frame (ms)
	əɴqoɾəpəɴ	SG.OBJ-hide-2SG	1472	76	80	
	qʰoɾəqʰə	stem/shoot-3.POSS	1185.1	89	89	
	qʰoriβə	tail feather	1058.6	49	45	
	qʰorəptaɴ	hide-PRES-2SG	1472.1	76	77	
/qoɾ/	qʰoɾup	bird (sp)	1041.1	40	42	73
	qʰoɾa	green daka leaf	1899.1	131	134	
	qʰoriəq	intercourse	0487	69	44	
	qʰoɾɪt	orchid (sp)	1900.5	64	67	
	qʰoɾəp	quiet	0442.2	71	70	
	qʰəɾoɴ	hook on plant	1193.1	39	27	
	meəɴqʰəɾop	lightning	1334	33	37	
	qʰəɾe	okay	2005	32	22	
	qʰəɾap daɢat	stream	1292	36	36	
/qəɾ/	qʰəɛp qʰəɾaqʰ	firepit	1309	29	35	36
	qʰəɾo	limbum (sp)	1708.2	44	45	
	qʰəɾamən	boss	2051	45	38	
	qʰəɾaɾə	branches	1178	42	49	
	qʰəɾeəɴ	sign with stick	2104	26	40	
	qʰaɾəɾəɴ	thunder	1333	80	83	
	qʰaɾap̚	meat/animal	0570, 0957	92	90	
	qʰaɾəɾap̚	vine (sp)	1191.21	62	84	
	qʰaɾət̚	tree (sp)	1158.1	87	89	
/qaɾ/	qʰaɾap mup	tree for posts	1158.15	106	94	90
	qʰaɾəɾaɴ	tracks on tree	778	76	72	
	qʰaɾiəɴ	shout.2SG.PRES	444	107	104	
	qʰaɾeəɴnut	recognize.PL	2101	88	70	
	qʰaɾot̚	cabbage	1736	93	97	
	qʰaɾiəɴ	loud announcement	2108	116	113	

Appendix E – Native Speaker Intuition of Syllables and Accent

A study of syllable count and accent placement was conducted with 9 different native speakers in November 2022 in Bobongat village in the Domung language area. The study was based on a participatory methods approach modeled by Dr. René van den Berg (personal communication). The study was conducted with 9 different individuals using the following method:

1. Explain the principle of accent and how it can change the meaning of words in English.[22] Explain the different ways that accent can be indicated in non-technical terms (i.e. loudness, length, voice pitch or 'singing'). Provide some examples in English and carefully pronounce each example to illustrate where accent is located.
2. Have a native speaker of English (the researcher) speak a word slowly and carefully three times.
3. Speak the word several more times and clap hands with each syllable to identify the number of syllables.
4. Speak the word several more times with clapping to identify where the accent/stress is being placed.
5. Discuss with the participant where the accent/stress is located.
6. Repeat steps 2-5 with several Tok Pisin words. Explain that accent/stress is not as important in Tok Pisin as in English and that every language is different.
7. Repeat steps 2-5 with multiple Domung words. Record the following data:
    a. How many syllables the native speaker believes to be present in the word
    b. Which syllable in the word is accented; record both the primary opinion ('Prim') along with any secondary/alternate opinion ('Alt').
8. Obtain audio recordings of each of the words used in the study spoken twice each by three native speakers (M01, M02, M03) for subsequent acoustic analysis.

See raw data results for syllable counts in Table 40 and for accent placement in Table 41. A summary of the accent assessment data is also provided in Table 42. Note that speaker M01 is not included in Table 41 or Table 42 as he did not believe that Domung exhibits any accent at all and he thought that every syllable receives exactly the same amount of accent/prominence. His opinion is interesting, but is not included in the counts of the opinion

[22] Most Domung speakers have some limited knowledge of English if they attended primary school. However, there are very few Domung speakers who know English well enough to speak or read it fluently.

on where accent is placed (since he did not want to identify any single syllable as receiving more accent or prominence than any other).

Table 40 Raw data of native speaker intuition assessment of syllable count

		Opinion of syllable count								
Word	Ref ID	M04	M05	M03	M06	M07	M02	M08	M09	M01
ɢaɴ.ɢa.boq	1191.1	3	3	3	3	3	3	3	3	3
qə.ɾa.ɾə	1178	3	3	3	3	3	2 or 3	3	2	3
qa.bə.bot	1146	3	3	3	3	3	3	3	3	3
a.sa.da	1667	3	3	3	3	3	3	3	3	3
mə.ɴai.wo	0336	3	3	3	3	3	3	3	3	3
meɴ.qə.ɾop	1334	3	3	3	3	3	2	2 or 3	2	3
ma.ɢə.reɴ	1158.17	3 or 2	3	3	3	3	2	3	3	3
naɴ.ɢan.pe.ɾuɴ	1316	4	4	4	4	4	4	4	4	4
pa.pi.ja	1851	3	3	3	3	3	3	3	3	3
sə.ɢan	2022	2	2	2	2	2	2	2	2	2
bo.ɾam	1788	2	2	2	2	2	2	2	2	2
sa.so	1228	2	2	2	2	2	2	2	2	2
qə.mun	0102	2	2	2	2	2	2	2	2	2
də.mu.na	1730.3	3	3	3	3	3	3	3	3	3

Table 41 Raw data of native speaker intuition assessment of accent

			M04	M05	M03	M06	M07	M02	M08	M09
ɢaɴ.ɢa.boq	1191.1	Prim	σ1	σ1	σ2	σ2	σ1	σ1	σ1	σ1
		Alt				σ1				
qə.ɾa.ɾə	1178	Prim	σ2	σ2	σ2	σ2	σ2	σ2	σ2	σ2
		Alt	σ1							
qa.bə.bot	1146	Prim	σ1	σ1	σ1	σ1	σ1	σ1	σ3	σ1
		Alt								
a.sa.da	1667	Prim	σ2	σ2	σ2	σ2	σ1	σ1	σ2	σ2
		Alt	σ1	σ1	σ1	σ1			σ1	σ1
mə.ɴai.wo	0336	Prim	σ2	σ2	σ2	σ2	σ2	σ3	σ2	σ2
		Alt						σ2		
meɴ.qə.ɾop	1334	Prim	σ1	σ1	σ1	σ1	σ1	σ1	σ1	σ1
		Alt								
ma.ɢə.reɴ	1158.17	Prim	σ1	σ1	σ1	σ1	σ1	σ1	σ1	σ1
		Alt								
naɴ.ɢan.pe.ɾuɴ	1316	Prim	σ1	σ1	σ1	σ1	σ1	σ1	σ1	σ1
		Alt		σ3	σ3				σ3	σ3
pa.pi.ja	1851	Prim	σ1	σ1	σ1	σ1	σ1	σ1	σ2	σ2
		Alt								
sə.ɢan	2022	Prim	σ1	σ1	σ1	σ1	σ2	σ1	σ2	σ1
		Alt					σ1			
bo.ɾam	1788	Prim	σ1	σ1	σ1	σ1	σ1	σ1	σ1	σ1
		Alt								
sa.so	1228	Prim	σ1	σ1	σ1	σ2	σ1	σ1	σ1	σ1
		Alt				σ1				
qə.mun	0102	Prim	σ1	σ1	σ1	σ1	σ2	σ1	σ1	σ1
		Alt					σ1		σ2	
də.mu.na	1730.3	Prim	σ1	σ2	σ2	σ2	σ2	σ2	σ2	σ2
		Alt		σ1	σ1		σ3	σ1		

Table 42 Summary of native speaker intuition assessment of accent

Phonemic Word	**Ref ID**	**Count of Primary Accent Location Judgements (from 8 Native Speakers)** σ1	σ2	σ3	σ4	**Predicted Location**	**% Agreement**
ɢaɴ.ɢa.boq	1191.1	6	2		--	σ1	75%
qə.ɾa.ɾə	1178		8		--	σ2	100%
qa.bə.bot	1146	7		1	--	σ1	88%
a.sa.da	1667	2	6		--	σ2	75%
mə.ɴai.wo	336		7	1	--	σ2	88%
meɴ.qə.ɾop	1334	8			--	σ1	100%
ma.ɢə.reɴ	1158.17	8			--	σ1	100%
naɴ.ɢan.pe.ɾuɴ	1316	8				σ1	100%
pa.pi.ja	1851	6	2		--	σ1	75%
sə.ɢan	2022	6	2	--	--	σ1	75%
bo.ɾam	1788	8		--	--	σ1	100%
sa.so	1228	7	1	--	--	σ1	88%
qə.mun	102	7	1	--	--	σ1	88%
də.mu.na	1730.3	1	7		--	σ2	88%
						Average Agreement:	**88%**

Appendix F – Acoustic Analysis of Accent Cues

The following methodology was used to obtain acoustic data regarding accent cues:

1. With three different speakers (M01, M02, and M03), record two tokens of each of the 14 words used in the native speaker intuition test (see Appendix E).
2. Use Audacity to:
    a. Trim excess time between tokens of the same word (to facilitate ease of viewing two tokens simultaneously).
    b. Convert from stereo to mono track as needed.
    c. Label each word (two tokens together) by speaker and the reference ID of the word, according to the format: "M0X_refID"
    d. Export multiple audio files from Audacity.
3. Open the sound files in PRAAT by selecting 'View and Edit'.
    a. Trim excess time before/between/after tokens of the same word (to facilitate ease of viewing two tokens simultaneously).
4. For each token of each word spoken by each speaker, rate each of three different acoustic cues as follows (see below for several examples of how this procedure was applied):
    a. For *Max Intensity*: compare the peak intensity of each syllable and mark the syllable(s) with the highest peak intensity with an "x" (leaving other syllables with a clearly lower intensity blank). If more than one syllable appears to have similar (and highest) intensity, rate each of these syllables with an "x".
    b. For *Max Duration*: mark the syllable(s) with the longest duration with an "x". If visual inspection alone is insufficient to determine max syllable duration, select the syllable start and end using the cursor and measure the duration of each syllable. Include syllable onsets and codas in the duration measurement. Exclude final syllables from analysis as final syllables are always lengthened.
    c. Assess the *Max Pitch (F0)* using the following guidelines[23]:
        i. Ignore edge effects of adjacent consonants on the pitch[24]
            1. In particular, recognize and ignore the normal elevating of pitch (F0) near voiceless consonants.
        ii. Select a brief window (2-4 periods) near the right edge of the syllable for measurement of F0 (a window from about 80% - 90% of the syllable duration) where the F0 remains relatively stable and the

[23] These guidelines were developed based on lecture notes from Dr. Roderic Casali's Acoustic Phonetics course (2020)

[24] The presence of these edge effects often make it impossible to assess the pitch profile of short schwa syllables and, in these cases, the pitch profile is marked as "na" to indicate it is not assessable.

spectrogram/waveform are both clear. For word-final syllables, the window may often need to be moved leftward to closer to 50%-70% of the syllable duration to avoid utterance-final signal attenuation and degradation. The window may include codas consisting of sonorant consonants if formants are clear, but for non-sonorant consonants, use the latest part of the vowel where formants/pitch are clear and do not exhibit obvious edge effects.

1. Note: this approach focuses the analysis on the speaker's likely 'pitch target' for the syllable. It often, though not always, aligns closely with the peak intensity of a syllable (another common point at which pitch is measured).

iii. Use the 'Get Pitch' function in PRAAT to obtain the mean pitch (F0) within this small window. Record this value.

iv. Compare these Pitch values and enter an "x" under the Max Pitch column of the datasheet for the syllable with the highest pitch value. If two or more syllables have similar pitch values (less than 10% difference) and do not seem audibly different, enter an "x" for each of the syllables with this 'highest' pitch. Leave other syllables blank

5. Enter all observations into Excel spreadsheet (using the "1" instead of "x" to facilitate use of mathematical formulas) and use the formula below to count how many acoustic cues are present for each syllable: =COUNTIF(D16:AG16,"1")
6. Use an Excel pivot table and pivot chart to analyze results and compare accented vs unaccented syllables.

The detailed results of the acoustic analysis procedure are provided in Table 43 (with predicted accented syllables in bold face font) and several examples including descriptions of the corresponding analysis are provided in Figure 25 to Figure 27 below.

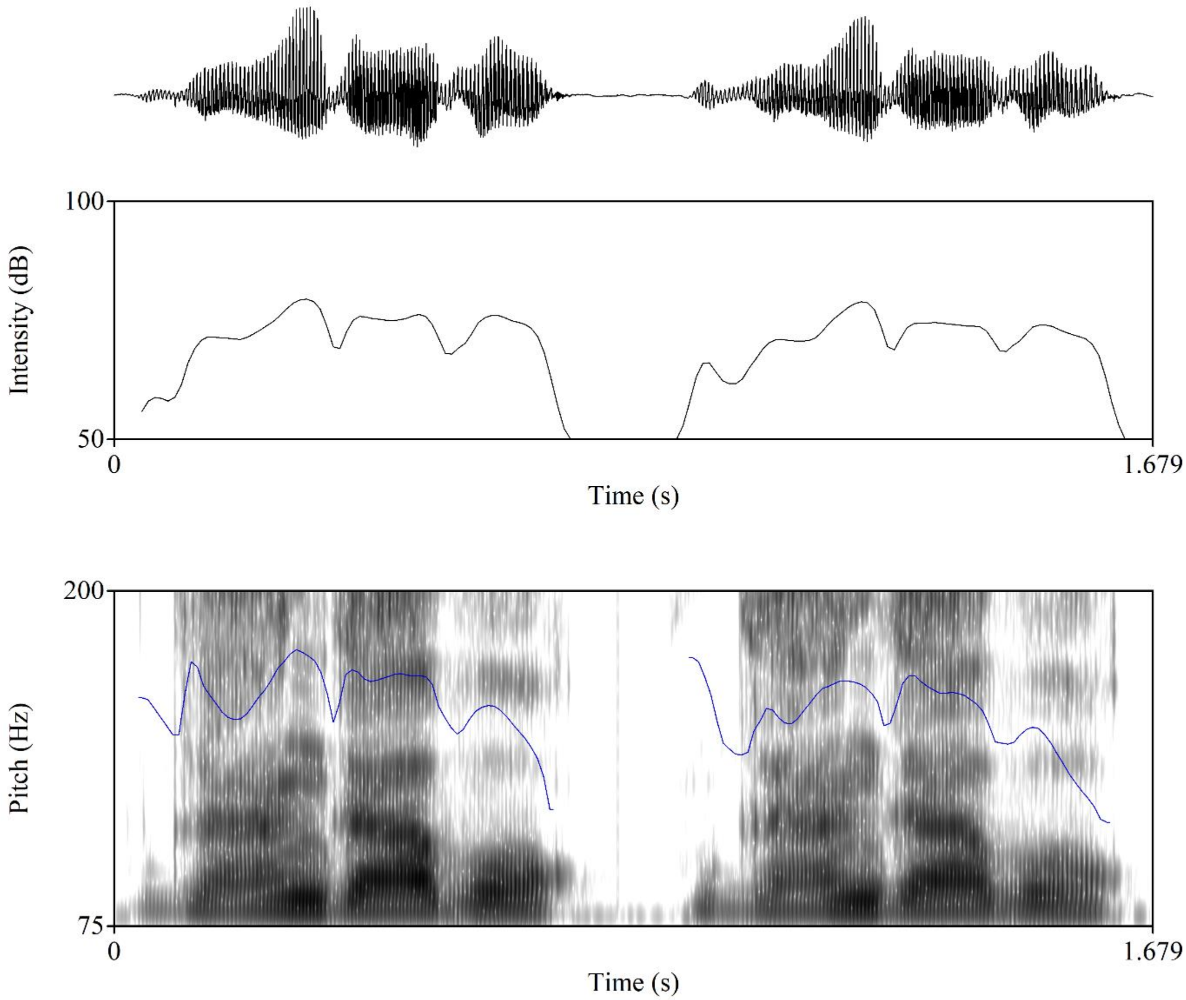

Figure 25 Acoustic data for 2 tokens of [ɢaɴ.ɢa.βoq̚] ‘vine (sp)’ 1191.1 spoken by M03

The analysis procedure, when applied to the acoustic data shown in Figure 25 is as follows:

- For maximum intensity: the first syllables of both tokens exhibit maximum intensity and are each marked with "x" while the other syllables with lower intensity are left blank.
- For maximum pitch (blue line) at the right edge of the syllables: only the first syllable of token 1 exhibits max F0 and is therefore marked with "x" while both syllables 1 and syllable 2 of token 2 exhibit similar and maximal pitch (within 10%) and therefore both of them are marked with "x". All other syllables for both tokens are left blank.
- For duration: the first syllables of both tokens are marked with an "x" as both appear clearly longer than the second syllables. The third syllable is not evaluated since it is the final syllable and subject to some lengthening effects (although in this case they both appear shorter than the first syllables).

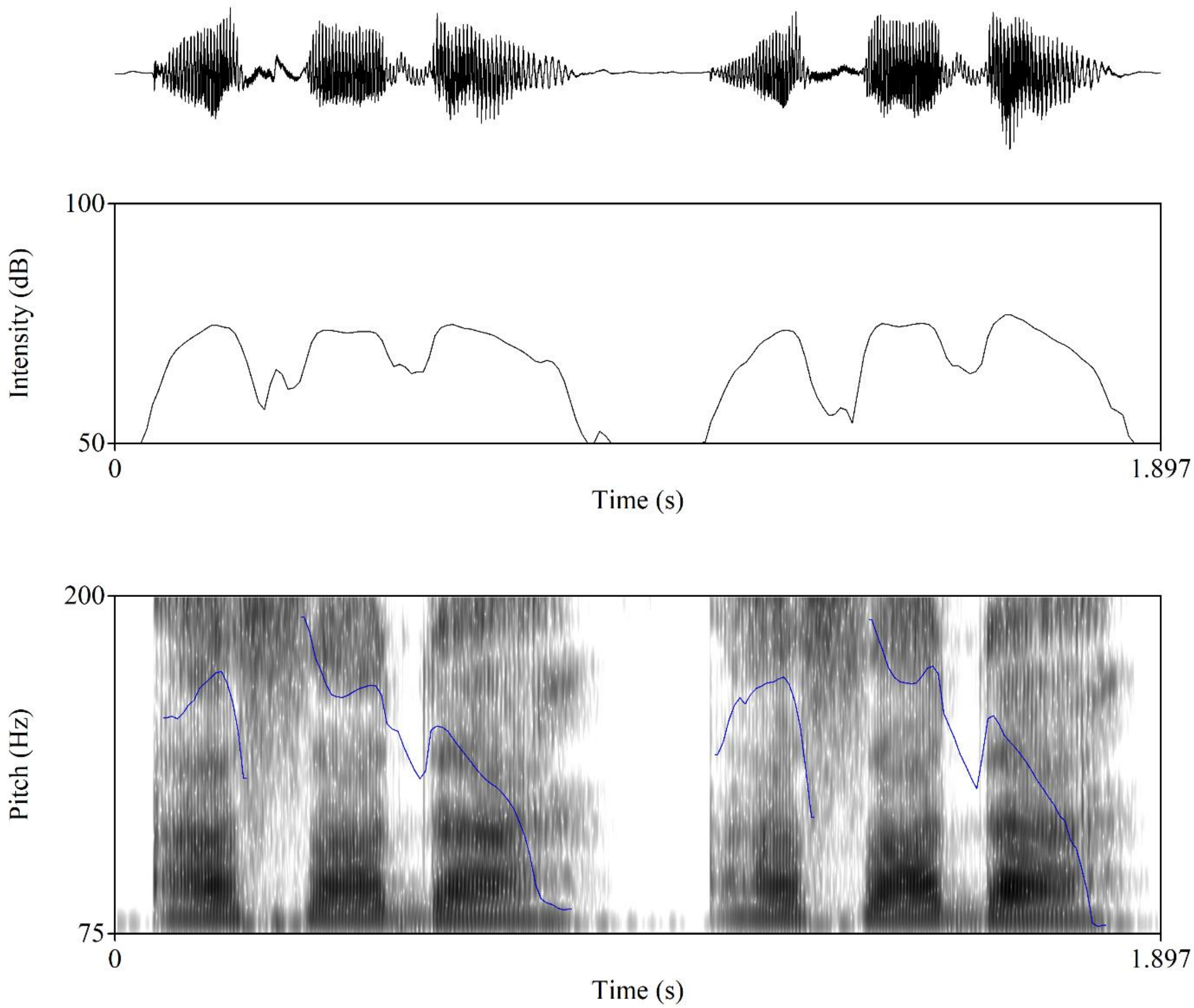

Figure 26 Acoustic data for 2 tokens of [a.sa.da] 'right' 1667 spoken by M03

The analysis procedure, when applied to the acoustic data shown in Figure 26 is as follows:

- For maximum intensity: all the syllables within token 1 exhibit similar intensity levels and are all marked with "x"; the third syllable in token 2 exhibits an intensity which is apparently higher than the first two syllables and thus only the third syllable of token 2 is marked with "x".
- For maximum pitch (blue line) at the right edge of the syllables: the first and second syllables of both tokens exhibit similar F0 values (verified via pitch measurement to be within 10%) and so the first two syllables for both tokens are marked with "x".
- For duration: the second syllables of both tokens are marked with "x" as they both appear clearly longer than the first syllables (because onset consonants are included). The third syllable is not evaluated since it is the final syllable and subject to some lengthening effects.

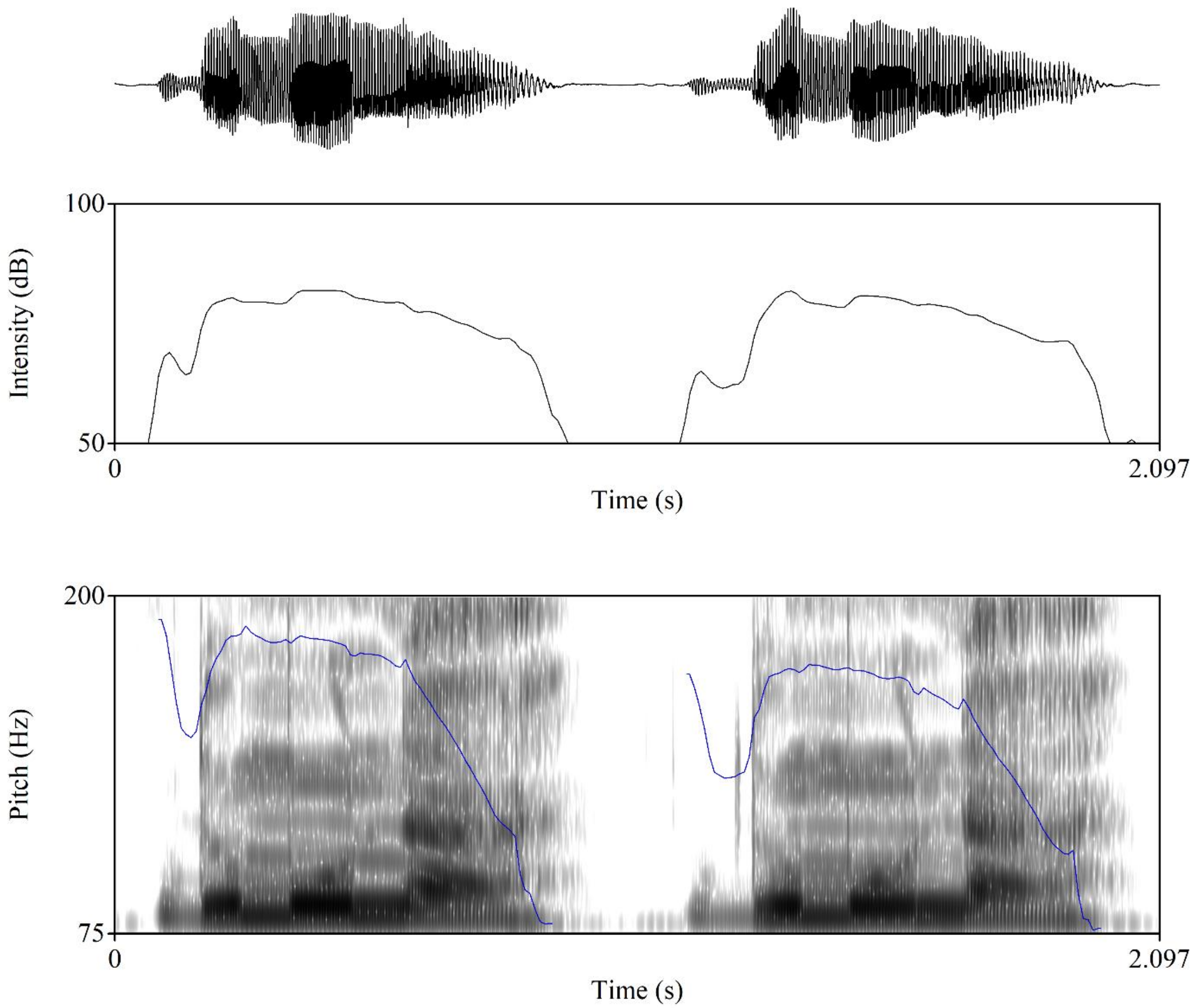

Figure 27 Acoustic data for 2 tokens of [qə.mun] 'pitpit (sp)' 1730.3 spoken by M03

The analysis procedure, when applied to the acoustic data shown in Figure 27 is as follows:

- For maximum intensity: the second syllable of token 1 exhibits highest intensity level and is marked with "x", but the first and second syllables of token 2 exhibit similar and highest intensities and are thus both marked with marked with "x".
- For maximum pitch (blue line) at the right edge of the syllables: the first syllables of both tokens exhibit the highest F0 values (verified via pitch measurement) and so the first syllables of both tokens are marked with "x".
- For duration: because this word is only two syllables, duration was not evaluated. This is because word-final syllables are typically lengthened and thus comparing any syllables with the word-final syllable is likely to generate spurious results and skew the analysis inappropriately.

Table 43 Results of acoustic analysis of accent cues

	Cue	Max Intensity						Max F0						Max Syl Duration					
	Speaker	M01		M02		M03		M01		M02		M03		M01		M02		M03	
	Token	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2
ɢaɴ.ɢa.boq 1191.1	**σ1**		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	σ2	x	x	x				x	x		x	x	x						
	σ3	x	x											-	-	-	-	-	-
qə.**ɾa**.ɾə 1178	σ1			x				x	x	x	x	x	x						
	σ2		x	x	x	x	x	x	x			x	x	x	x	x	x	x	x
	σ3	x	x			x								-	-	-	-	-	-
qa.bə.bot 1146	**σ1**	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x
	σ2	x	x	x	x	x	x	x	x		x	x	x		x				
	σ3	x	x			x	x							-	-	-	-	-	-
a.**sa**.da 1667	σ1	x	x			x		x	x	x	x	x	x						
	σ2	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x
	σ3	x	x			x	x							-	-	-	-	-	-
mə.**ɴai**.wo 0336	σ1	x	x	x		x	x	x	x	x	x		x						
	σ2	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	σ3	x	x											-	-	-	-	-	-
meɴ.qə.ɾop 1334	**σ1**	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	σ2	x	x					x	x	x	x	x	x						
	σ3	x	x			x	x				x			-	-	-	-	-	-
ma.ɢə.reɴ 1158.17	**σ1**		x			x	x	x	x	x	x	x	x	x	x	x	x	x	x
	σ2	x	x	x	x			x	x	x	x	x	x						
	σ3			x										-	-	-	-	-	-
naɴ.ɢan.pe.ɾuɴ 1316	**σ1**			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	σ2			x	x	x		x	x			x				x	x	x	x
	σ3	x	x					x	x			x							
	σ4													-	-	-	-	-	-

Table 43 Continued

	Cue	Max Intensity						Max F0						Max Syl Duration					
	Speaker	M01		M02		M03		M01		M02		M03		M01		M02		M03	
	Token	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2
pa.pi.ja 1851	**σ1**			x	x		x	x	x	x	x	x	x	x	x	x	x	x	x
	σ2	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x
	σ3													-	-	-	-	-	-
sə.ɢan 2022	**σ1**	x	x	x	x		x	x	x	x	x	x	x	-	-	-	-	-	-
	σ2					x	x							-	-	-	-	-	-
bo.ɾam 1788	**σ1**	x		x	x	x	x	x	x	x	x	x	x	-	-	-	-	-	-
	σ2	x	x			x								-	-	-	-	-	-
sa.so 1228	**σ1**		x			x		x	x	x	x	x	x	-	-	-	-	-	-
	σ2	x	x	x	x	x	x							-	-	-	-	-	-
qə.mun 0102	**σ1**			x	x		x	x	x	x	x	x	x	-	-	-	-	-	-
	σ2	x	x	x	x	x	x							-	-	-	-	-	-
də.**mu**.na 1730.3	σ1			x			x	x		x	x	x	x	x	x				x
	σ2	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	σ3	x	x											-	-	-	-	-	-

Appendix G – R Scripts/Code for Analysis

```
# Install and load Tidyverse
install.packages('tidyverse')
library(tidyverse)

# Read Domung Vowel Acoustic Data and Assign the CSV file to DataFrame
# NOTE: need to manually set working directory via 'Session -> Set Working Directory'
# NOTE: this csv file has missing values, use getOption("na.action") to verify they are
omitted via "na.omit"
DevData<-read.csv('Vowel Data VerE for R.csv',header=TRUE)

# Display the first 6 rows of data to the user
head(DevData)

# Filter data frame to remove vowels in WF position AND
# Assign resulting Duration data to separate vectors for analysis
i<-filter(DevData, V_Phone == 'i_short',V_Pos != 'WF')$Dur_ms
ii<-filter(DevData, V_Phone == 'i_long',V_Pos != 'WF')$Dur_ms
u<-filter(DevData, V_Phone == 'u_short',V_Pos != 'WF')$Dur_ms
uu<-filter(DevData, V_Phone == 'u_long',V_Pos != 'WF')$Dur_ms
e<-filter(DevData, V_Phone == 'e_short',V_Pos != 'WF')$Dur_ms
ee<-filter(DevData, V_Phone == 'e_long',V_Pos != 'WF')$Dur_ms
o<-filter(DevData, V_Phone == 'o_short',V_Pos != 'WF')$Dur_ms
oo<-filter(DevData, V_Phone == 'o_long',V_Pos != 'WF')$Dur_ms
a<-filter(DevData, V_Phone == 'a_short',V_Pos != 'WF')$Dur_ms
aa<-filter(DevData, V_Phone == 'a_long',V_Pos != 'WF')$Dur_ms
schwa<-filter(DevData, V_Phone == 'ax',V_Pos != 'WF')$Dur_ms

# Test normality of each duration data vector (note that missing values are allowed)
shapiro.test(i)
shapiro.test(ii)
shapiro.test(u)
shapiro.test(uu)
shapiro.test(e)
shapiro.test(ee)
shapiro.test(o)
shapiro.test(oo)
shapiro.test(a)
shapiro.test(aa)

# Run two-sided, two-sample t-tests on pairs of long and short vowels at 95% CI
t.test(ii,i,conf.level=0.95)
t.test(uu,u,conf.level=0.95)
```

```
t.test(ee,e,conf.level=0.95)
t.test(oo,o,conf.level=0.95)
t.test(aa,a,conf.level=0.95)

# Display Boxplot of long and short vowels in non-word-final position
bxplabels<-c('i','ii','u','uu','e','ee','o','oo','a','aa','schwa')
boxplot(i,ii,u,uu,e,ee,o,oo,a,aa,schwa,names=bxplabels)
```