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A phonological sketch of Ilocano

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Abstract: In this paper I describe and analyze the phonology of the northern dialect of Ilocano (Western Malayo-Polynesian, Northern Luzon). The description includes segmental phonology, syllable structure and weight, stress placement, and phonological processes. I also argue the following. First, the phonemic status of the glottal stop depends on the environment. It is partly phonemic, but epenthetic in particular environments. Second, syllables that contain a long vowel are heavy but open syllables with a short vowel and closed syllables should be considered as light. Third, Ilocano has no diphthongs and those which have been considered to be diphthongs are in fact a sequence of a consonant and vowel. Fourth, the assignment of stress is almost entirely predictable and is assumed to be essentially postlexical. Fifth, in Ilocano three distinct prosodic word domains, the lowest prosodic constituent which is related to morphosyntactic constituency, should be posited to describe phonological processes. I also show that most of these processes repair ill-formed syllable structures.*

Keywords: Ilocano, Austronesian, segmental phonology, prosodic phonology

1 The Ilocano language

The Ilocano language is a Western Malayo-Polynesian language of the Austronesian Family (Blust 2013) and is spoken by about 9 million people in the northwest of Luzon Island in the Philippines (Rubino 2005), serving as the lingua franca of the region. Ilocano is assumed to be a member of the Cordilleran subgroup and occupy a direct daughter position on its own within the family (Reid 1989: represented as 'ILK' in Figure 1). Ilocano shares some

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lexical similarities with its neighboring languages due to borrowing rather than genetic relationship.

Ilocano is spoken not just by Ilocano people, but also by those not ethnically Ilocano, such as Itneg and Pangasinan. There are also large communities of Ilocano speakers in California and Hawai'i in the United States (Nagasaka 2009).

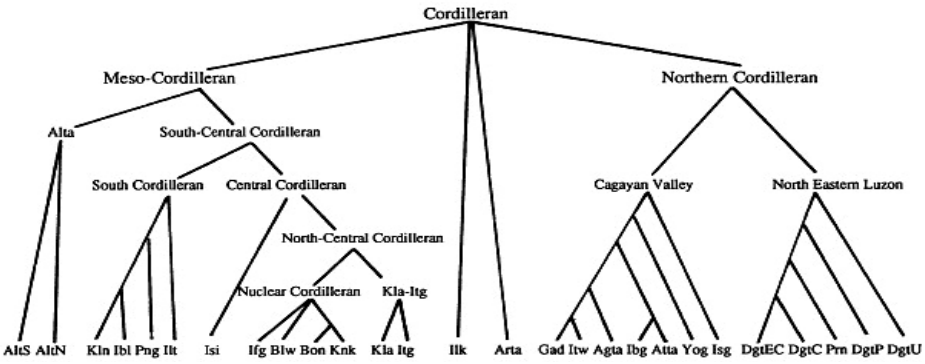


Figure 1 Subgrouping of the Cordilleran languages.

From a socio-linguistic perspective, it is worth noting that almost all, if not all, Ilocano speakers can speak more than one language. They learn Tagalog as the official language of the Philippines at school. Most of them also speak English. Ilocano has some alternative names such as Iloko and Samtoy (derived from *Sao mi toy* 'our language') to refer to their ethnicity and their language (Jocano 1982).

Two major dialects of Ilocano are commonly recognized among speakers and researchers. A difference between the dialects is the phonetic realization of /e/: it is pronounced as [e] in the northern dialects and as [ɯ] in the southern dialects in Ilocos Sur, La Union and Pangasinan. In this paper I focus on the northern dialect.

The purpose of this paper is to provide a description and analysis of the phonology of the northern dialect of Ilocano. Issues that I address include segmental phonology, syllable structures and weight, stress assignment, (morpho-)phonological processes and prosodic domains that the processes reference. The analysis presented here is primarily based on data collected through my fieldwork in Laoag City in Ilocos Norte.

The organization of the paper is as follows: Section 2 presents the inventory of consonant and vowel phonemes. It also discusses the phonemic status of the glottal stop. Section 3 describes syllable structure and weight. The problem of whether there are diphthongs in the language is also addressed here. Section 4 provides an analysis of stress assignment. In Section 5, (morpho-)phonological processes such as assimilation and prosodic word domains are described. Section 6 concludes the study.

2 Segmental phonology

Ilocano has four native vowel phonemes. They are listed in Table 1. In addition, there is the loan phoneme /o/, which is found only in loan words. The high back /u/ is lowered to [o] in word-final syllables and is distinguished in the orthography, e.g. *agsao* /agsau/ 'to speak', *tayo* /taju/ '1PL.ABS'.

Table 1 Vowel phonemes[2]

	FRONT UNROUNDED	CENTRAL	BACK ROUNDED
HIGH	i		u
MID	e		
LOW		a	

Previous descriptions of Ilocano differ in the number of consonantal phonemes, ranging from 14 to 17 (Bloomfield 1942; Vanoverbergh 1955; Constantino 1971; Hayes and Abad 1989; Rubino 1997, 2000, 2005). This is primarily due to whether they recognize the glottal stop as a phoneme. Considering it phonemic, I distinguish 15 native consonantal phonemes. A glottal fricative that only appears in loan words and one native word *ha?an* 'no', the variant of *sa?an,* is excluded from the inventory. The phonemic status of the glottal stop will be discussed below.

The consonant inventory of Ilocano is shown in Table 2. The language has a relatively small set of consonants compared with that of other Austronesian

[2] I assume that vowel length is not included in the segmental phonology but is represented on a distinct tier.

languages (Himmelmann 2005) and the mean number of consonants in 317 languages (Maddieson 1984; see also Gordon 2016). Maddieson concludes that "the typical size of an inventory lies between 20 and 37 segments" (1984: 7) The inventory of Ilocano does not include any cross-linguistically uncommon consonants. It only shows a two-way contrast, voiced and voiceless, between stops.

Table 2 Consonantal phonemes

	BILABIAL	APICO-DENTAL	APICO-ALVEOLAR	LAMINO-PALATAL	DORSO-VELAR	GLOTTAL
VOICELESS STOP	p	t			k	ʔ
VOICED STOP	b		d		g	
VOICELESS FRICATIVE			s			
NASAL	m		n		ŋ	
TAP			ɾ			
LATERAL			l			
SEMI-VOWEL				j	w	

Note that /t/ is realized as an apico-dental stop [t̪] and its voiced counterpart /d/ is as an apico-alveolar stop. Consonant gemination occurs word-medially and as a result of derivation. Every consonant except for the glottal stop can appear geminate.

/p/	/uppat/	'four'	/b/	/kubbu/	'humpbacked'
/t/	/latta/	'only'	/d/	/adda/	'to exist'
/k/	/dakkel/	'big'	/g/	/iggem/	'to grasp'
/s/	/bassit/	'little'	/m/	/ammu/	'to know'
/n/	/punnu/	'to fill'	/ŋ/	/teŋŋa/	'center

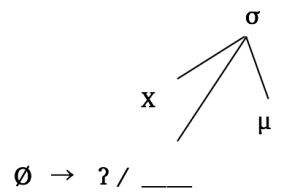
/ɾ/	/guɾɾuud[3]/	‘thunder’	/l/	/allukuj/	‘to lean’
/j/	/gajjem/	‘friend’	/w/	/lawwa/	‘spider’

As mentioned above, the previous studies differ in recognizing the glottal stop [ʔ] as phonemic. In what follows, I describe the distribution of [ʔ] and argue that a compromise position provides a straightforward account, namely, its phonemic status depends on the environment where it occurs.

Unlike other consonantal phonemes, [ʔ] occurs only in onset positions. Glottal stops occurring intervocalically, as in *babaʔi* ‘woman’, *saʔo* ‘word’ and *baʔet* ‘interval’, make no contrast with zero because hiatus is not allowed on the surface in Ilocano (i.e. **babai*, **sao*, **baet*). There is also no contrast between [ʔ] and zero in morpheme-initial positions. There is no syllable that begins with a vowel in Ilocano. I assume that all syllables in the language must have at least one onset consonant on the surface.

Glottal stops which occur intervocalically and root-initially are almost entirely predictable. To capture the distribution, I adopt Hayes and Abad’s (1989) view claiming that the glottal stop is not phonemic and is derived by a phonological rule that inserts [ʔ] into an empty onset position if the syllable lacks its onset consonant:

(1) Glottal epenthesis (formulated by Hayes and Abad 1989):



Examples in (2) illustrate the derivations of underlying forms that lack [ʔ].

[3] The geminate of /ɾ/ is phonetically realized as the apico-alveolar trill and is represented by ‘rr’ in the orthography.

(2)	/aɾaːmid/ ‘work’	/babaːi/ ‘woman’	UNDERLYING FORM
	a.ɾaː.mid	ba.baː.i	SYLLABIFICATION
	ʔa.ɾaː.mid	ba.baː.ʔi	GLOTTAL EPENTHESIS

Hayes and Abad argue that this rule applies cyclically, as (3) illustrates. They assume that glottal deletion also concerns the following process (1989: 347–350). In §5.5, I argue that the glottal deletion rule is unnecessary.

(3) Derivation of *ʔagaraːdo* (cf. Hayes and Abad 1989: 347–350)

/aɾaːdu/	UNDERLYING FORM
	First cycle:
a.ɾaː.du	SYLLABIFICATION
ʔa.ɾaː.du	GLOTTAL EPENTHESIS
	Second cycle:
ag-ʔa.ɾaː.du	AFFIXATION
aga.ɾaː.du	GLOTTAL DELETION
a.ga.ɾaː.du	SYLLABIFICATION
ʔa.ga.ɾaː.du	GLOTTAL EPENTHESIS
[ʔagaɾaːdo]	OUTPUT
AV:plow ‘to plow’	

Conversely, root-internal [ʔ] contrasts with zero in C_V, as illustrated below:

(4)	/ʔ/ vs Ø	[labʔaj]	‘lukewarm’
		[labaj]	‘rice porridge’
		[saŋʔat]	‘land’
		[saŋat]	‘to inspect’
		[saŋʔi]	‘to sob’
		[saːŋi]	‘molar tooth’

On the basis of these (near-)minimal pairs, I conclude that the glottal stop occurring in the C_V environment is phonemic, whereas word-initial and intervocalic glottal stops are epenthetic. If the glottal stop occurring in the C_V environment was epenthetic, then the contrast would have to be made with syllabification which is lexically represented, as in (5) and (6):

(5)	/lab.aj/	'lukewarm'	/la.baj/	'rice porridge'	UNDERLYING FORM
	lab.ʔaj		la.baj		GLOTTAL EPENTHESIS
(6)	/saŋ.i/	'to sob'	/sa:.ŋi/	'molar tooth'	UNDERLYING FORM
	saŋ.ʔi		sa:.ŋi		GLOTTAL EPENTHESIS

This analysis seems less straightforward than considering the glottal stop as phonemic in the C__V environment, and there is no evidence in the language to support such contrastive syllabification in the lexicon. Furthermore, the analysis I have suggested may be consistent with speakers' knowledge. Orthographically, glottal stops in C__V are represented with a hyphen, while those that occur elsewhere are not written.

3 Syllable structure, syllable weight and diphthongs

3.1 Syllable structure

Syllable structures found in Ilocano are CV, C_1C_2V, CVC and C_1C_2VC[4]. Syllables consist of at least one onset, which is either simple or complex, and one nucleus. Although all consonants except for the glottal stop appear in C_1 of a complex onset, only /j/ and /w/ appear in C_2[5], e.g. *dwa* 'two', *ɾwaɾ* 'outside', *dwiɾ* 'to totter', *ta.ljaw* 'to look back', *gje.ra* 'war', *ŋjaw* 'to meow' *pjek* 'chick'.

[4] Complex codas are allowed only in loan words, e.g. [ko.miks] 'comics', [naɾs] 'nurse', [kju:.teks] 'nail polish remover'.

[5] This is not the case for loan words in which complex onsets are preserved, e.g. *kl* in [klawsula] 'clause', *pɾ* in [pɾak.ti.ka] 'practice' and *bɾ* in [bɾon.se] 'bronze'.

Similar to other Austronesian languages (Blust 2013: 234), indigenous word roots in Ilocano are predominantly disyllabic. There are a small number of monosyllabic words, most of which are words of closed classes such as pronouns and case markers. Many roots that consist of more than two syllables include ideophones and loan words (Yamamoto 2016).

(7) monosyllabic words:	[ka]	'2SG.ABS'
	[kan]	'to eat'
	[lwa]	'tear'
	[nwaŋ]	'water buffalo'
disyllabic words:	[naː.ma]	'hope'
	[daː.mag]	'news'
	[lam.ʔek]	'chill'
	[ka.njak]	'1SG.OBL'
three-syllable words:	[led.da.ʔaŋ]	'sorrow'
	[sa.gaː.na]	'preparation'
	[bal.la.siw]	'cross'
	[ma.ɾuŋ.gaj]	'horseradish tree'
four-syllable words:	[be.lja.doː.na]	'belladonna'(from Spanish)
	[da.na.ruː.doɾ]	'sound of an engine'
	[gwa.joŋ.gwa.joŋ][6]	'to sway one's hands'
	[kal.ka.lek.ket]	'crispy'
five-syllable words:	[ʔa.ɾi.mu.kaː.mok]	'slight drizzle'

[6] [gwa.joŋ.gwa.joŋ], an ideophone, is monomorphimic and does not involve reduplication because **gwa.joŋ* does not exist. This is termed "inherent repetition" (Dingemanse 2011), which is often found in ideophones crosslinguistically. I have not examined whether the mid back vowels in the ideophone are derived or underlying. I leave the issue open for future research.

[ʔa.ɾi.ma.saː.mas] ‘noise of approaching feet’

[he.ne.ɾo.si.dad] ‘generosity’ (from Spanish)

3.2 Syllable weight

To describe syllable weight in Ilocano, I adopt a moraic theory (Hayes 1989; see also Gordon 2016). In what follows, I argue that heavy syllables are strongly restricted in the language, and along with open light syllables, closed syllables are considered as monomoraic in terms of the distributional pattern and stress assignment.

First, long vowels, which make the syllable heavy, only occur in penultimate syllables, e.g. *buː.ja* ‘to watch’, *ʔa.saː.wa* ‘spouse’, and *saː.kup* ‘territory’. In contrast, closed syllables, in addition to light open syllables, do not have any distributional restriction (witness 7).

Second, as for stress assignment, while syllables with a long vowel always have stress, the other syllable structures (i.e. C(C)V and C(C)VC) are not necessarily assigned stress, as shown in (8) – (9).

(8) words with an open heavy penult

[ˈpuː.tot]	‘child’
[ˈgaː.kat]	‘plan’
[ˈduː.mog]	‘to incline’
[ˈtuː.loj]	‘help’
[ˈwaː.li]	‘to wobble’

(9) words with a closed penult

a. ultimate stress		b. penultimate stress	
[paw.ˈʔit]	‘to send’	[ˈlaŋ.ka]	‘jackfruit’
[pak.ˈbet]	‘Ilocano vegetable dish’	[bi.ˈbiŋ.ka]	‘rice cake’
[puŋ.ˈtot]	‘anger’	[ɾu.ˈbiŋ.ki]	‘rope’
[sak.ˈnib]	‘overlapping’		

[tab.ˈbi] ‘to fall down together’

[duŋ.ˈŋo] ‘sweetheart’

Previous works (Vanoverbergh 1955: 28–29; Rubino 1997: 18) state that stress falls on the final syllable of native words with closed penults[7] (i.e. CVC. ˈCV(C)). This fact means that closed syllables themselves do not attract stress as heavy open syllables do. To capture the differences between closed and heavy open syllables, and the similarities between closed and light open syllables, I conclude that heavy syllables are only permitted in the penultimate syllable of a word, and closed syllables are not bimoraic but monomoraic.

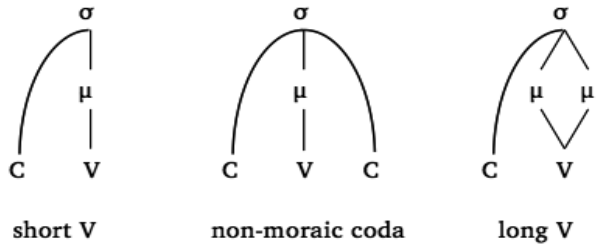


Figure 2 Syllable structure and weight in Ilocano

3.3 Diphthongs

This section addresses the problem of whether there are diphthongs in Ilocano. Previous studies (Constantino 1971; Rubino 1997) recognize diphthongs in Ilocano with a difference in number. Constantino (1971: 5–6) recognizes 13 diphthongs, *aj*, *aw*, *uj*, *ej*, *iw*, *ja*, *wa*, *ji*, *wi*, *je*, *we*, *ju* and *jo*, and Rubino (1997: 17–18) recognizes 5 diphthongs, *aw, iw*, *aj*, *ej* and *uj*. Their analyses, however, lack discussion and evidence, so other possibilities should be considered. There

[7] This is true but is not enough to predict stress placement since final syllables that are not preceded by closed penults may bear stress, e.g. [ga.ˈlut] ‘frame’, [ba.na.ˈba] ‘a kind of tree’, [pa.ˈteg] ‘price’, [ku.ˈko] ‘nail’.

are at least three options to analyze such sequences as (a) diphthongs, (b) a sequence of a consonant and vowel, or (c) a sequence of two separate syllable nuclei. In what follows, I argue that there are no diphthongs in Ilocano, that is, the sequences listed in the literature are a sequence of a consonant and vowel.

To begin with, as discussed in Section 3.1, syllables necessarily have at least one onset consonant on the surface. This fact excludes option (c) because V.V is not allowed and it would be the target of the glottal epenthesis. Similarly, the following examples show that *w* and *j* preceding a vowel function as the onset consonant.

(10) (i) *j*-V:

[jan]	'place'	[jegjeg]	'to shake'
[jo]	'2PL.GEN'	[jujek]	'earwax'
[ja:ja]	'nursemaid'		

(ii) *w*-V:

[walo]	'eight'	[wenno]	'or'
[wida:wid]	'to swing one's arms'	[waɾis]	'to sprinkle'

w and *j* after vowels are also consonants. This is based on two pieces of evidence. First, whereas heavy open syllables are restricted in the penultimate position, V-*j* and V-*w* sequences have no such restriction, that is, their distribution shows the same pattern as that of closed syllables.

Second, they behave as consonants morphophonologically. In Ilocano, personal pronoun enclitics =*ko* '1SG.GEN' and =*mo* '2SG.GEN' realize as allomorphs =*k* and =*m*, respectively, after vowels.

(11) a. Consonant-final

[ʔajan=ko]	'my place'
[baja:bas=ko]	'my guava'

[baɾu:koŋ = mo]	‘your chest’
[piŋpiŋ = ko]	‘my cheeks’
[ʔanak = mo]	‘your child’
[bjag = mo]	‘your life’

b. Vowel-final

[pusa = m]	‘your cat’
[ʔaso = k]	‘my dog’
[kaaruba = m]	‘your neighbor’
[ima = k]	‘my hand’
[ʔili = k]	‘my town’

After V-*j* and V-*w* sequences, *=ko* and *=mo* appear instead of *=k* and *=m*, as demonstrated in (12).

(12)

[balaj = ko]	‘my house’
[kasaŋaj = mo]	‘your birthday’
[ʔaldaw = ko]	‘my day’
[panagpali:ʔiw = mo]	‘your observation’
[ʔituloj = mo]	‘you will continue’
[duŋʔaw = ko]	‘my lament’

These data show that those that have been analyzed as diphthongs are in fact a sequence of a consonant and vowel. A better analysis is that there are no diphthongs in Ilocano.

4 Stress

Stress is a property of a syllable and has to do with metrical prominence which is obligatory and culminative, meaning that each word has one and only one

syllable marked by the greatest prominence (Hyman 2006: 231; McCarthy 2003: 110). Stress in Ilocano falls on the penultimate syllable or final syllable of a word. A vowel with stress seems to have higher pitch and greater intensity, although this characteristic has not been examined acoustically. Examples in (13) illustrate (near-)minimal pairs that are differentiated by the placement of stress and by vowel length.

(13)				
	[ˈsiː.ka]	‘dysentery’	[si.ˈka]	‘2SG.ABS’
	[ˈlaː.baj]	‘skein’	[la.ˈbaj]	‘rice porridge’
	[ˈgaː.mal]	‘handful’	[ga.ˈmal]	‘to gather’
	[ˈgaː.lut]	‘tendon’	[ga.ˈlut]	‘frame’
	[ˈdaː.ja]	‘east’	[da.ˈja]	‘party’
	[ˈʔaː.sok]	‘my dog’	[ʔa.ˈsok]	‘smoke’
	[ˈʔiː.ma]	‘hand’	[ʔi.ˈma]	‘to be foiled’

I assume that long vowels are underlying. If the penultimate syllable contains a long vowel, it is always assigned stress. In cases where the penultimate syllable is not heavy but open light or closed, the final syllable is stressed.

(14) Ilocano stress placement[8] [9]:

[8] Exceptions to this rule include native roots, in which the coda of the penultimate syllable is /ŋ/, shown in (9b).

[9] It is possible to hypothesize that Ilocano stress placement is based on a quantity-sensitive iambic foot at the right word edge, although there is no independent evidence for it. Possible evidence for assuming feet in the language comes from a reduplication pattern analyzed by Hayes and Abad (1989). They argue that in Ilocano the targets of reduplication rules are specified prosodically rather than segmentally and one metrical foot (i.e. an open heavy or closed syllable) is the target of a reduplication rule. Their analysis leads to coda consonants being dominated by a mora. In a moraic theory they adopt, however, the difference between vowels and glides depends on whether they are dominated by a mora. If

The position of stress is on the penult if it is heavy, but otherwise is on the final syllable.

Rubino (1997) suggests that in Ilocano the position of stress of all words except for those with closed penultimate syllables, in which stress falls on the final syllable, is included in lexical representations. However, stress is almost entirely predictable by the above rule and exceptions to the rule are only those shown in (9b) and loan words[10].

The opposite view seems possible, that is, stress is lexical and stressed vowels in penultimate open syllables are lengthened. However, this view cannot account for why there is only a handful of closed penultimate syllables that are stressed (i.e. ˈC(C)VC.C(C)V(C)) and why penultimate syllables are almost always open when they are stressed. The stress assignment rule proposed in (14) can account for such an asymmetry.

Morpheme types in Ilocano include roots, affixes (prefixes, infixes and suffixes), and clitics. Possible domains for one stress are an enclitic or a structure that contains a stem, its affixes and/or proclitics (see also Section 5). Because the addition of suffixes such as *-en* and *-an* is a derivational and lexical morphological process (Himmelman 2005; cf. Luraghi 2014), stress assignment, a postlexical process, follows such processes.

codas are moraic, glides never occur in the coda position. But this contradicts the distributional fact of glides. As I discussed in Section 3, syllable-final [j] and [w] behave as consonants, and codas should be considered as non-moraic.

More research is called for to determine whether Ilocano has a foot structure or is a language such as Amele, an unbounded quantity-sensitive language with no foot structure (Roberts 1987).

[10] I assume that the stress placement of the words in (9b) is represented lexically. The stress of loanwords may be assigned lexically or postlexically. I leave this issue open for future research.

(15) [ʔitˈd-en = nakaˈmi ti = baˈsaːʔ-en]
give-PV = 3SG.ERG + 1EX.PL.ABS C = read-PV
'S/he will give us something to read.'

(16) [ʔaˈnja ŋaˈta ti = ka-ʔimbaˈg-an ˈŋa ʔaɾaˈmiːd-e = m]
what maybe C = SUP-good-SUP LIG something.to.do-PV = 2SG.ERG
'What is the best thing you will do?'

5 Phonological processes and phonological word

Section 5 describes phonological processes that reference word-level domains—i.e. domains larger than syllables (or feet) and smaller than phrases —in Ilocano.

5.1 Phonological word

This section introduces the phonological word (ω). I assume that phonological word domains are sound pattern domains that are required in the analysis of phonological phenomena of an individual language. In this study, such domains are considered to be delimited by a morphological structure that includes a single lexical stem (Bickel et al. 2009). This working definition excludes syllable and foot structures, which are not a morphological structure, and structures such as phrases, which may contain more than one lexical stem. Thus, a phonological word may comprise a single stem with affixes or/and clitics/particles. Importantly, phonological word domains identified under the definition are language-particular and highly specific properties of individual phonological rules (Bickel and Hildebrandt 2010; see also Dryer 1986, 1997; Croft 2001).

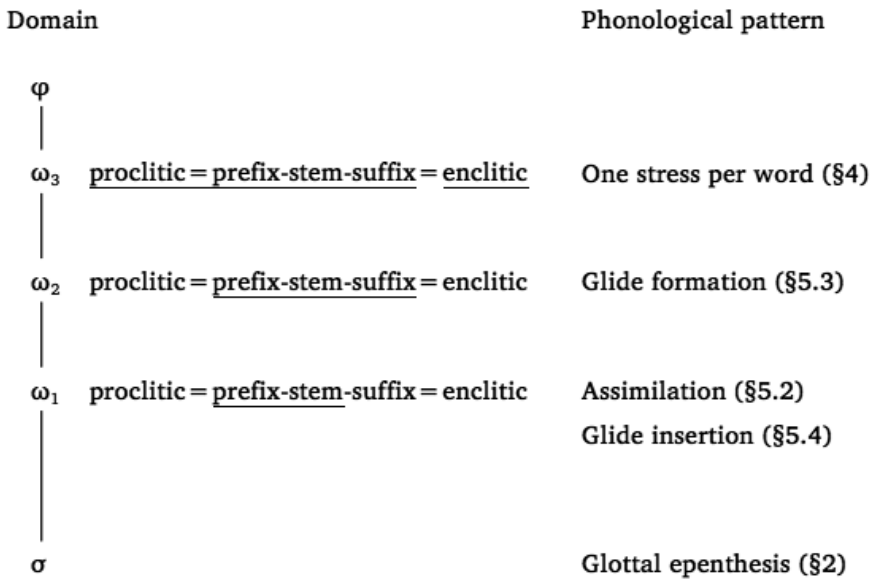


Figure 3 Prosodic domains in Ilocano

Phonological rules in Ilocano reference at least three different domains between the syllable (σ) and the phrase (φ). Of those, the stress-defined domain is larger than the other domains, consistent with a cross-linguistic tendency observed by Bickel et al. (2009).

Note that Figure 3 appears to violate a prediction of the Strict Layer Hypothesis (Nespor and Vogel 1986): the higher two phonological words dominate another level of the same rank, namely, it does not dominate a unit of the immediately lower category[11].

[11] As discussed above, there are no phenomena that reference a foot structure. This, however, may lead to the violation of another principle requiring that no level of prosodic hierarchy is skipped (Strict Succession).

5.2 Assimilation

In Ilocano, as in other Philippine languages[12], the prefix ending /ŋ/ undergoes a phonological process assimilating the place features of [ŋ] to the following obstruent. The place assimilation turns [ŋ] into [m] before [b] or [p] and it assimilates [ŋ] to [n] before [s], [t] or [d]. The following examples illustrate the process. After the assimilation rule is applied, the initial consonant of the stem, to which [ŋ] is assimilated, is deleted.

(17) [ŋ] → [m]

Underlying	*Surface*	
maŋ-baka	mamaka	'to buy cows'
maŋ-badaŋ	mamadaŋ	'to assist'
maŋ-pagaj	mamagaj	'to buy rice'
paŋ-pakada	pammakada[13]	'farewell gesture'
paŋ-bullad-en	pammulladen	'large rounded eye'
paŋ-balakad	pammalakad	'advice'
maŋ-barɾtek	mammarɾtek	'drunkard'

(18) [ŋ] → [n]

Underlying	*Surface*	
maŋ-suŋɾud	manuŋɾod	'to gather fuel'
maŋ-salapi	manalapi	'to worth 50 centavos'
maŋ-dait	mana?it	'to sew'
paŋ-turaj	pannuraj	'dependence'

[12] More accurately, nasal assimilation is common in Austronesian languages that have the symmetrical voice system defined as a system involving at least two voice alternations marked on the verb, neither of which is clearly the basic form (Himmelmann 2005: 112).

[13] Words with the prefix *paŋ-* also undergo the reduplication of the nasal, usually expressing an instrument or a theme.

paŋ-tajag-en	panajagen	‘somewhat tall’
maŋ-daniw	mannaniw	‘poet’
maŋ-sugal	mannugal	‘gambler’

The place assimilation rule is given in Figure 4. The place node of the right-hand obstruent spreads to a nasal on the left while the original place node of the nasal is delinked. The domain of the rule is limited to prefix-stem boundaries.

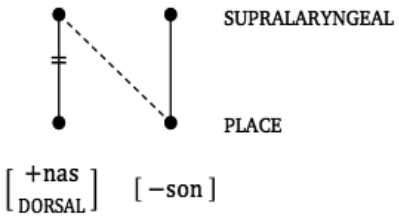


Figure 4 Place assimilation

5.3 Glide formation

The glide formation rule applies to prefix-stem or stem-suffix boundaries. A stem-initial or stem-final vowel specified with [+high] becomes a glide, when it is adjacent to a [−high] vowel of an affix added to the stem. If the glide formation rule did not apply, the output would violate the well-formed syllable structure since Ilocano does not permit diphthongs nor syllables lacking the onset.

(19) prefix-stem boundary

Underlying	*Surface*	
i-pa-uneg (TV-CAUS-inside)	ʔipa**w**neg	(*ʔi.pau.neg; *ʔi.pa.u.neg)
	‘to put something inside’	

i-pa-igid (TV-CAUS-edge)	ʔipa**j**gid	(*ʔi.pai.gid; *ʔi.pa.i.gid)
	‘to put aside’	
ma-ulud (POT-drag)	ma**w**lud	(*mau.lud; *ma.u.lud)
	‘to be pulled’	
na-ilet (ST-tightness)	na**j**let	(*nai.let; *na.i.let)
	‘tight’	
na-ilem (ST-jealousy)	na**j**lem	(*nai.lem; *na.i.lem)
	‘jealous’	

(20) stem-suffix boundary

Underlying	*Surface*	
baba:wi-en (regret-PV)	babaw**j**en	(*ba.ba.wien; *ba.ba.wi.en)
	‘to regret’	
adaju-an (far-LV)	ʔadaj**w**an	(*ʔa.da.joan; *ʔa.da.ju.an)
	‘to go far away from’	
pa-sa:ŋu-an (caus-front-LV)	pasaŋ**w**an	(*pa.sa.ŋoan; *pa.sa.ŋu.an)
	‘to put something in front of someone’	
sa:ŋu-en (front-PV)	saŋ**w**en	(*sa.ŋoen; *sa.ŋu.en)
	‘to confront’	

On the basis of the assumption that vowels and glides share an identical feature (Backley 2011 inter alia), the glide formation is analyzed as a process in which such a feature dominated by a mora on the underlying level becomes non-moraic through syllabification. In the glide formation in /babawi-en/, for example, the suffix *-en* cannot be syllabified in its own right due to the lack of its onset, so by deleting the mora, the feature |I|[14] of the stem-final segment is incorporated into the suffix as the onset to form the legitimate syllable.

[14] Element Theory assumes that /i/ and /j/ share the feature |I|, while /u/ and /w/ share |U| on the basis of their acoustic nature (Backley 2011; Backley and Nasukawa 2010).

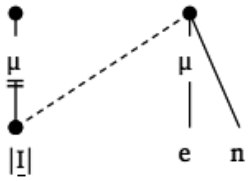


Figure 5 Glide formation

The application of the glide formation precedes the glottal epenthesis if the two rules compete.

5.4 Glide insertion

When a prefix ending in /i/ is added to a stem beginning with a different vowel, hiatus is avoided by the insertion of a glide. Examples in (21) illustrate the occurrence of a glide while in (22) no glide occurs between the boundaries.

(21)	*Underlying*	*Surface*	
	i-a:wid	ʔija:wid	'to go home'
	i-asideg	ʔijasideg	'to approach'
	i-uneg	ʔijuneg	'to put inside'
	i-u:ged	ʔiju:ged	'to sketch'
	agi-a:but	ʔagija:but	'to reach'
	agi-a:wat	ʔagija:wat	'to hand something to'
(22)	*Underlying*	*Surface*	
	i-lutu	ʔilutu	'to cook'
	i-baba	ʔibaba	'to put down'
	i-serek	ʔiserek	'to put inside'
	i-ilokano	ʔiʔilokano	'to translate into Ilocano'

The [ij] sequence has a phonetically brief realization, and is therefore occasionally confused with glides resulting from the glide formation discussed above (cf. Rubino 1997). The two processes, however, are distinct from each other, as glides assumed to be inserted remain when the word undergoes an inflection in which the prefix alternates with a prefix, *in-*, expressing the perfective aspect. Compare (23) with (24).

(23)	*Neutral*		*Perfective*
	ʔi-ja:wid	'to go home'	ʔin-ja:wid
	ʔi-jasideg	'to approach'	ʔin-jasideg
	ʔi-juneg	'to put inside'	ʔin-juneg
	ʔi-ju:ged	'to sketch'	ʔin-ju:ged
	ʔi-ja:but	'to reach'	ʔin-ja:but
	ʔi-ja:wat	'to hand something to'	ʔin-ja:wat

(24)	*Neutral*		*Perfective*
	ʔi-lutu	'to cook'	ʔin-lutu
	ʔi-baba	'to put down'	ʔin-baba
	ʔi-serek	'to put inside'	ʔin-serek
	ʔi-ʔilokano	'to translate into Ilocano'	ʔin-ʔilokano

This process is described as follows: when the stem to which a prefix ending in /i/ is added has an empty onset slot word-initially, the feature composing the final segment of the prefix, namely |I̲|, spreads to the slot. The slot is not the syllable nucleus, so the feature is realized as the consonant counterpart [j]. This process is blocked when the first syllable of the stem has an identical vowel, in which case the glottal epenthesis rule applies (e.g. *ʔiʔilokano*), because the sequence [ji] does not exist in the language. The spreading analysis also accounts for why what is inserted is [j] rather than other segments.

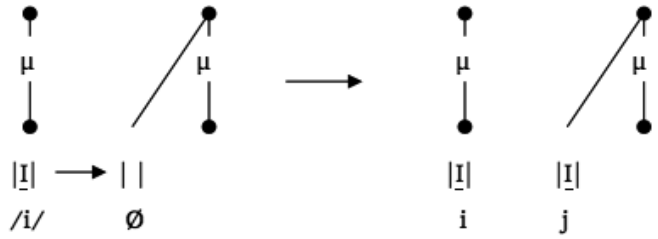


Figure 6 Glide insertion

5.5 Unnecessary rule: glottal deletion

Section 2 introduced the glottal epenthesis. Hayes and Abad also suggested that an additional rule deleting a glottal stop has to be posited to obtain outputs such as *ʔagaraːdo* (1989: 347–350). Here I repeat (3) as (25).

(25) Derivation of *ʔagaraːdo*

/aɾaːdu/	UNDERLYING FORM
	First cycle:
a.ɾaː.du	SYLLABIFICATION
ʔa.ɾaː.du	GLOTTAL EPENTHESIS
	Second cycle:
ag-ʔa.ɾaː.du	AFFIXATION
aga.ɾaː.du	GLOTTAL DELETION
a.ga.ɾaː.du	SYLLABIFICATION
ʔa.ga.ɾaː.du	GLOTTAL EPENTHESIS
[ʔagaɾaːdo]	OUTPUT

AV:plow ‘to plow’

This analysis, however, has at least two problems. First, the process is complicated and it seems unnatural that an inserted glottal stop is deleted at the following stage. Second, the application of the rule cannot be predicted by the environment surrounding the target, but a default rule such as the following

has to be assumed: Unless the output satisfies the legitimate syllable structure, the glottal deletion does not apply. Consider examples in (26) and (27). In (27), the other output candidate is unacceptable as the syllabification cannot be executed.

(26)	ag-ʔaːdal	→	ʔag.aːdal	‘to study’	
	ag-ʔidda	→	ʔa.gid.da	‘to lie down’	
	ipa-ʔigid	→	ʔi.paj.gid	‘to put aside’	
	na-ʔimas	→	naj.mas	‘tasty’	
	pa-ʔuneg-en	→	paw.ne.gen	‘to invite a guest to come in’	
(27)	na-ʔuːdi	→	na.ʔuː.di	‘last’	(*nauːdi)
	ka-ʔadu-an	→	ka.ʔad.wan	‘most’	(*kaadwan)
	i-ʔiloka:no	→	ʔi.ʔi.lo.kaː.no	‘to translate into Ilocano’	(*ʔiiloka:no)
	ipa-ʔidda	→	ʔi.pa.ʔid.da	‘to lay’	(*ipajdda)

To resolve these problems, I propose the following process.

(28) Derivation of *ʔagaraːdo* (revised)

/aɾaːdu/	UNDERLYING FORM
a.ɾaː.du	SYLLABIFICATION
ag-a.ɾaː.du	AFFIXATION
a.ga.ɾaː.du	SYLLABIFICATION
ʔa.ga.ɾaː.du	GLOTTAL EPENTHESIS
[ʔagaɾaːdo]	OUTPUT

AV:plow ‘to plow’

The process shown in (28) is different from that in (25) in that the glottal epenthesis apples only once at the last stage and the glottal deletion is not involved at all. Moreover, I assume the syllabification at the beginning stage to

be maintained through the whole process except that the stem-initial syllable incorporates the final segment of the prefix as its onset. A further example is given in (29a). Compare it with an example in (29b), which involves the glottal deletion and multiple applications of the glottal epenthesis as the previous study assumes. The simplicity of my proposal is obvious.

(29) Derivation of *ʔagadʔaːdal*

a.	/aːdal/	UNDERLYING FORM
	aː.dal	SYLLABIFICATION
	ad.aː.dal	REDUPLICATION
	ag-ad.aː.dal	AFFIXATION
	a.gad.aː.dal	SYLLABIFICATION
	ʔa.gad.ʔaː.dal	GLOTTAL EPENTHESIS
	[ʔagadʔaːdal]	OUTPUT
b.	/aːdal/	UNDERLYING FORM
		First cycle:
	aː.dal	SYLLABIFICATION
	ʔaː.dal	GLOTTAL EPENTHESIS
	ʔad.ʔaː.dal	REDUPLICATION
	ag-ʔad.ʔaː.dal	AFFIXATION
	agadʔaːdal	GLOTTAL DELETION
		Second cycle:
	a.gad.ʔaː.dal	SYLLABIFICATION
	ʔa.gad.ʔaː.dal	GLOTTAL EPENTHESIS
	[ʔagadʔaːdal]	OUTPUT

AV:IMPF:study ‘be studying’

6 Concluding remarks

In this paper, I described and analyzed the phonology of the northern dialect of Ilocano, including segmental phonology, syllable structures and weight, stress placement, and phonological processes.

The phonemic status of the glottal stop depends on the environment in which it occurs. It is phonemic in the C_V environment while it is epenthetic elsewhere.

Syllable structures found in Ilocano are CV, CCV, CVC, CCVC. Long vowels, which make the syllable heavy, occur only in the penultimate syllable. On the basis of the distribution of each syllable type and the stress assignment sensitive to syllable weight, closed syllables are considered as light along with open syllables containing a short vowel. In addition, I argued that there are no diphthongs in Ilocano.

Unlike previous studies, this study claimed that Ilocano stress placement is postlexical. If the penultimate syllable contains a long vowel, it is always assigned stress. In cases where the penultimate syllable is monomoraic, the final syllable is stressed.

I also addressed phonological processes applying to prosodic word domains, which relate to the lowest morphosyntactic structure. I argued that in Ilocano, three distinct phonological word layers are necessary to describe such processes. Importantly, most of the processes have to do with making syllable structures well-formed.

Abbreviations and symbols

The following abbreviations and symbols are used in the paper: ABS-absolutive, AV-actor voice, C-core argument marker, ERG-ergative, EX-exclusive, IMPF-imperfective aspect, LIG-ligature, PL-plural, PV-patient voice, SG-singular, SUP-

superlative, 1-first person, 2-second person, 3-third person, ω-phonological word, σ-syllable, μ-mora, φ-phonological phrase

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イロカノ語の音韻論

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要旨

本研究では、イロカノ語北部方言の音韻論の記述と分析を行う。本記述は、分節音韻論、音節構造と重さ、強勢の付与、音韻過程を含む。加えて、これらに関して以下のことを論じる。まず、声門閉鎖音が音素であるか否かはそれが生起する環境に依存する。特定の環境において声門閉鎖音は音素であるが、それ以外の環境では挿入子音であるとみなす。次に、イロカノ語は二重母音を持たない。これまでの先行研究において二重母音と記述されてきたものは子音と母音の連続である。また、重音節は長母音を含む音節のみで、閉音節と短母音を持つ開音節は軽音節である。加えて、強勢の付与はほとんど全てが予測可能であり、語彙的ではない。さらに、音韻過程を記述するためには、イロカノ語が三つの異なる音韻語を持つと仮定する必要がある。またこれらの音韻過程の多くは、非適格な音節構造を修復する役割を果たしていることを示す。

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