ASPECTS OF THE PHONOLOGY OF BOGOŊ

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DEDICATION

To mom, Baba and Imam

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ABSTRACT

This thesis presents a discussion on the phonology of Bogoŋ, an endangered language spoken by the Cala people in Ghana, Togo, and Benin. Classified within the Eastern subgroup of Gurunsi languages under the Niger-Congo family, Bogoŋ is characterized by a unique phonemic inventory and a complex system of Advanced Tongue Root (ATR) harmony. The study utilizes data collected and stored on the Endangered Language Archive by Kleinewillinghöfer (2015) in the form of audio recordings, providing a descriptive framework that addresses the phonemic inventory, syllable structure, and various phonological processes observed in the language. This thesis observed ten vowels, nine of which are phonemic, while one ([ə]) is an allophone. Twenty consonant phonemes are also observed in Bogoŋ. In this thesis, it is also proposed that there are six main types of syllable structures in Bogoŋ. These structure types are CV/CVV, CVC, CCVC/CCV, VVC, V/VV and C. This thesis observed homorganic nasal assimilation, labialization/rounding, palatalization, aspiration, and ATR harmony as phonological processes in Bogoŋ. Central to the vowel system is the ATR feature, which is identified as both contrastive and phonologically conditioned. The thesis examines how vowel sounds are organized based on tongue root position, revealing a nine-vowel system that includes both [+ATR] and [-ATR] vowels. The research situates Bogoŋ within the broader typology of ATR harmony systems, drawing on existing literature to contextualize its findings. Significantly, I propose that the allomorphy involving [i]~[ɛ] in Bogoŋ suffixes is due to the strong relationship between the features [+ATR] and [+high]. [i] is the preferred [+ATR] vowel in this allomorphy instead of [e] because of the preference for [+ATR] vowels to be [+high].

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CHAPTER ONE
GENERAL INTRODUCTION

1.0 Introduction

Bogoŋ, an endangered language, is classified as a member of the Eastern subgroup of Gurunsi languages, under Gur, belonging to the major language family of Niger-Congo (Williamson, 1989), as cited in (Kleinewillinghöfer, 2000). This thesis will make use of data collected through interviews and conversations stored in the form of audio with orthographic transcriptions by Ulrich Kleinewillinghöfer on the Endangered Language Archives (Kleinewillinghöfer, 2015). In this thesis, I provide a descriptive analysis of the basic phonology of Bogoŋ using the basic descriptive and theoretical tools of phonology. The following four research questions are addressed: What is the phonemic inventory of Bogoŋ? What are the syllable structure types of Bogoŋ? What are some of the phonological processes that can be observed in Bogoŋ? Finally, how does [ATR] harmony pattern in Bogoŋ and how does it fit into typological patterns of [ATR] harmony?

This chapter presents a general overview of the thesis, including background on the language, previous literature on Bogoŋ, and the ethnolinguistics of the Cala (Cala is used to refer to the people while Bogoŋ is used to refer to the language). In addition, this chapter will outline the objectives of the study and its significance and scope as well as provide a description of the source of data for the thesis, the methodology, and the organization of the various chapters.

1.1 Background on Bogoŋ

Bogoŋ is spoken mainly in Ghana, east and west of the lower Oti River, with a small number of speakers found in Togo and Benin. The number of Cala who can speak Bogoŋ is just around 500 (Kleinewillinghöfer, 2010). Most Cala grow up with native proficiency in other languages like Tem, Chamba, Ife, and other Guang languages like Gicode and Nawuri depending on where they

grow up. This is the case of my situation. Although I identify as Cala due to my father being Cala, neither my father nor I myself speak Bogoŋ. Instead, I have native proficiency in Tem (Kotokoli) – a closely related language to Bogoŋ, and my mother's language. My paternal grandfather was the last speaker of Bogoŋ in my family. The most related languages to Bogoŋ are Tem (Kotokoli), Bago, Delo and Kusuntu (Glottolog). In Ghana, Bogoŋ is mainly spoken in the Nkwanta South District in present-day Oti Region, and around Kpandai in the Northern Region. By the 19th century, the Cala had Odomi as their capital, with other notable towns like Keri and Agou as their major settlements. Significantly, the populations in Keri and Odomi have become mixed with speakers of neighboring languages like Gicode and Adele due to intermarrying, contributing to the recent significant decline in the number of Bogoŋ speakers (Kleinewillinghöfer, 2010). The map below indicates where Bogoŋ is spoken in Ghana. Bogoŋ is indicated with the number 17 – "Chala (2)".

(1) Language map of Ghana

Source: https://facts.net/ghana-facts/
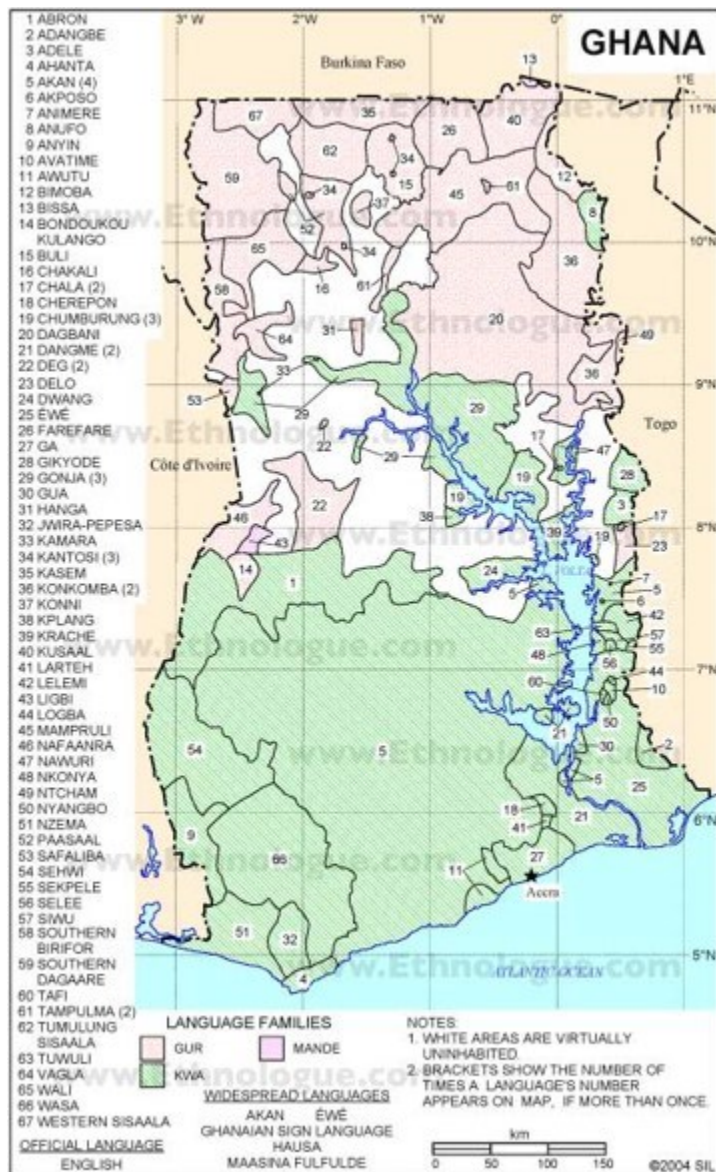
1.2 Previous Literature on Bogoŋ

Kleinewillinghöfer, (2000, 2010) form the greater part of the few works that have been done on

Bogoŋ. One significant work conducted by Kleinewillinghöfer is the collection of data on Bogoŋ

in the form of audio recordings with orthographic representations stored on the Endangered

Language Archive (ELAR) (Kleinewillinghöfer, 2015). This work is the primary data source for the current study.

Kleinewillinghöfer (2000) is a comparative study of noun-classification in Bogoŋ and its linguistic relatives, Bago and Kusuntu. It shows how Bogoŋ has modified its noun classification in the recent past, unlike its two other relatives which still possess "full-fledged" noun class systems where class markers are predominantly suffixed to the noun, and where concord is also marked by a set of specific (pronoun) morphemes. Bogoŋ, on the other hand, has generally dropped singular and/or plural forms and has also reduced the set of functioning concord morphemes (Kleinewillinghöfer, 2000). Kleinewillinghöfer (2000) notes that this change is attributed to contact with the surrounding Kwa language Adele, and the North Guang languages Nawuri and Gicode, which all have a noun class where class markers are extremely prefixed.

Kleinewillinghöfer (2010), as part of preserving the language and culture of Cala, conducted a study into the taboos of Bogoŋ. He found that the idea of a common (ethnic) identity is not particularly based on speaking Bogoŋ, nor living in a common territory. Rather, the common identity of the Cala is argued to be formed around their veneration of their deity, Juogoŋ, an earth deity. The majority of Cala belong to clans which are entitled to be initiated as priests, and therefore are obliged to 'meticulously' follow the taboos of Juogoŋ priests. This is significant in the way that it underlines the reason why there are many people who identify as Cala but many fewer who are fluent speakers of Bogoŋ.

More significant to this study is Kleinewillinghöfer (2022). This work is a phonological introduction to reading and writing Bogoŋ. In this study, Kleinewillinghöfer proposes an alphabet for Bogoŋ as well as a description of those aspects of the phonology of the language which he identifies as relevant for writing. In discussing tone, Kleinewillinghöfer (2022) notes that all

vowels and syllabic nasals are pronounced with a pitch tone which is either high, low, falling (moving from high to low) or rising (moving from low to high). Other issues touched on include nasal assimilation, consonant sequences, the behaviour of the short vowel [ə], and vowel sequencing of vowels with different qualities (diphthongs). Kleinewillinghöfer (2022) also discusses vowel harmony in the feature [ATR]. A description of vowel harmony is discussed in detail in Chapter 5.

In light of all these works, it is important to note that apart from Kleinewillinghöfer (2022) which is an introduction for the purpose of reading and writing Bogoŋ, there has not been any significant attempt at undertaking a phonological description of the language, hence the need for this study.

1.3 Theoretical Framework

This thesis is primarily descriptive rather than theoretical. However, terms from theories related to distinctive features will be used in the description of the sounds and phonemes of Bogoŋ. Consonants are described using place and manner of articulation. Voicing is also used in the description except in nasals and approximants. In the description of vowels, the features height, backness and [ATR] are used. In doing this, I use descriptive terminologies from Chomsky and Halle's (1968) Sound Patterns of English and other related development in distinctive theory in works like Katamba (1989).

In the description of syllable structure of Bogoŋ, theories driven by sonority principles are employed to describe how sounds are organized within syllables. Theories driven by sonority principles take their roots from theoretical proposals, such as the Sonority Sequencing Principle introduced by Sievers (1881) and later by Jespersen (1904). These theories have been used to describe the tendency for more sonorous segments to be closer to the syllable peak than less

sonorous segments. These theories also propose to explain the cross-linguistic phenomenon of segments ranking highest on the sonority scale in any syllable forming the peak of the syllable, and all other sounds being organized around the peak (nucleus).

The discussion of [ATR] harmony in Bogoŋ draws on work by Casali (2008) in order to contextualize Bogoŋ within the typology of [ATR] harmony systems. Casali (2008) provides a framework on how languages with different vowel systems function in terms of [ATR] harmony. Ten vowel systems provide the most symmetric system made up of five [+ATR] vowels and five [-ATR] vowels. However, the most common vowel systems lack an [ATR] contrast among low vowels, leading to a nine-vowel vowel phonemic system with five [-ATR] vowels but only four [+ATR] vowels (Casali, 2008:502). Bogoŋ also falls in this category of nine-vowel phonemic system, with Casali's (2008) discussion of the behaviour of /a/ in nine-vowel languages laying the foundation for the description of /a/ in Bogoŋ.

Developments in Grounded Phonology by Archangeli & Pulleyblank (1994) are also used in the description of [ATR] harmony in Bogoŋ. They posit that conditions used in natural language directly reflect physical correlation of features (or *F-elements*). Grounding theory provides an account of how the feature high is phonetically compatible with the feature [+ATR]. Grounding theory provides the framework to examine the interaction of the feature [ATR] with tongue height features in the [ATR] harmony patterning in Bogoŋ suffixes.

1.4 Methodology

Bogoŋ: a cultural, historical and linguistic documentation (2015) is the collection of all data collected by Ulrich Kleinewillinghöfer through an ethnolinguistic exercise. The data, collected and stored on the Endangered Language Archives (ELAR) is made up of a total number of 224 audio files ranging from one minute to one hour with an accompanying 174 orthographic transcriptions.

Recordings include discussions on topics such as the clans of the Cala, the environment, taboos, migration history, funeral processes, and settlement issues. A collection of interviews recorded at Kpandai in 2006 is also included.

The phonological description provided in following chapters is based on my transcriptions and analysis of this data. Given the voluminous nature of the data on ELAR, I selected a subset of audio files that contain long stretches of continuous monologues of language consultants with few interruptions from the researcher. One to two-minute chunks were transcribed at a time for the purpose of establishing the phonetic and phonemic inventory of Bogoŋ and subsequently investigating the syllable structure types and other phonological processes observed. Phonetic and phonological descriptions are based on impressionistic transcriptions.[1]

The resources on ELAR, although significant, are not without deficiencies. There are several instances of discrepancies between what is transcribed in the orthography and what is said in the audio. The orthographic transcriptions do not include morpheme-by-morpheme glossing in the translation. These discrepancies and omissions create difficulty in the glossing process, as it is sometimes unclear if the translation into English provided by the researcher is for what is written in the orthography or what is said in the audio by the language consultant. A full morphological analysis is beyond the scope of this project, but, where possible, morpheme boundaries are included in situations where relevant for phonological description.

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[1] Examples of the audio I listened to is a 14 minutes 44 second audio titled Tubale_Okuma_05-20_-_The_relation_with_the_Ntrubo_and_Adele, which took me not less than 10 hours to listen to and transcribe. Excerpts from audio files Agou_2_Discussion_in_the_reception_Hall_18-01-2006_at_the_f, Akolesa_1-1, Akolesa_1-2, Akolesa_1-3 and Tubale_Okuma_06-4_-_On_the_Chala_of_Togo_and_Asung were also listened to and transcribed.

Another limitation of the study arises from lack of direct engagement with language consultants. Because of working from collected data, I do not get the benefit of asking for different pronunciations of words that sound slightly different in different places. For example, the sounds /a/ and /ɪ/ sound like [ə] in some cases. As a speaker of Tem (Kotokoli), a closely related language to Bogoŋ, I used my native speaker knowledge to make hypotheses about the meaning of some words that sound similar to their closely related counterparts in Tem in the context they appear. For example, /kɔnɛ/ in Bogoŋ; /kɔnɪ/ in Tem (meaning 'come') and /lɪɪ/ in Bogoŋ; /lɪɪ/ in Tem (meaning ' [come] from'). A related limitation relates to the study of tone. Although Bogoŋ is a tone language, tone has not been considered in this research due to the type of data available and the fact that many tone processes may affect the realization of lexical items. Additional fieldwork including engagement with native speakers will be needed for future studies on tone in the language.

1.5 Previous Preliminary Phonological Study on Bogoŋ

Kleinewillinghöfer (2022) gives a foundational discussion of the phonology of Bogoŋ by providing a description of how to read and write the language. According to him, Bogoŋ has 34 letters in its alphabet. These are: / a b c d e ɛ (ə) f g gb (h) i ɪ j k kp l m n ny ŋ ŋm o ɔ p r s t u ʋ (v) w y (z)/. He uses /c/ and /j/ to represent the voiced and voiceless palatal affricate stops respectively. He also notes that there is a partial complementary distribution of /d/ and /r/, where /r/ does not occur in word initial position. The digraphs /gb/, kp/, /ny/ and /ŋm/ are used to represent the voiced and voiceless labial-velar stops, the palatal nasal, and the labial-velar nasal, respectively. He also included the short vowel /ə/ in his alphabet as the vowel that results from the rapid pronunciation of either /i/ /ɪ/ /e/, or /ɛ/.

1.5.1 Consonants

According to Kleinewillinghöfer (2022), Bogoŋ has 24 consonants, three of which are only found in loans (/h/ /v/ and /z/). The remaining consonants are: /b c d f g gb j k kp l m n ny ŋ ŋm p r s t w y/[2]. The table below is from Kleinewillinghöfer (2022) and represents the place and manner of articulation of these consonant sounds.

(2) Bogoŋ consonants

	Labial	Alveolar	Palatal	Velar	Velar-labial	Glottal
stops	p	t	c	k	kp	
	b	d	j	g	gb	
fricatives	f	s				
	(v)	(z)				
lateral		l				
trill		r				
glides			y		w	(h)
nasal	m	n	ny	ŋ	ŋm	

Kleinewillinghöfer (2022) also discusses the nature and behaviour of nasals, and consonant clustering in Bogoŋ. This will be discussed further in chapter 2.

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[2] Kleinewillinghöfer (2022) represents the voiceless and voiced palatal affricates with the symbols "c" and "j", respectively. These phonemes will be represented here as /tʃ/ and /dʒ/, respectively. Likewise, where Kleinewillinghöfer uses "ny" to represent the palatal nasal, /ɲ/ will be employed here.

1.5.2 Vowels

According to Kleinewillinghöfer (2022) Bogoŋ has nine vowel phonemes. These are: /a e ɛ i ɪ o ɔ u ʋ/. He also notes that [ʌ] and [ə] occur in Bogoŋ as conditioned variants of other vowels and therefore are not phonemes. These vowels are noted to belong to two harmony sets, sets that are defined by the position of the tongue root. The tongue root can either be non-advanced, [-ATR], or advanced [+ATR] (ATR stands for Advanced Tongue Root). The [+ATR] vowels are /(ʌ) e i o u/, and their respective [-ATR] counterparts are /a ɛ ɪ ɔ ʋ/. Kleinewillinghöfer (2022) also obverses that the low [-ATR] vowel has the [+ATR] [ʌ] as its counterpart. [ʌ] occurs mainly in bound morphemes as an allophone of /a/ when the adjacent syllable contains a vowel of the [+ATR] set. It is also noted that all short vowels have longer counterparts except [ʌ] and [ə]. Kleinewillinghöfer (2022) indicates long vowels by writing two of the short vowels. For example, the long form of /e/ is /ee/. He observes that /ee/ and /ɛɛ/ are often pronounced as [ie] and [ɪɛ] respectively. This, he states, is common among speakers west of River Oti. /oo/ and /ɔɔ/ are also pronounced as [uo] and [ʋɔ], respectively, when they occur in word final position. Below is a table showing the vowels summarized by Kleinewillinghöfer (2022).

(3) Bogoŋ vowels. From Kleinewillinghöfer (2022:7)

	[-ATR] [lax]			[+ATR] [tense]		
	front		back	front		back
raised	ɩ	(ə)	ʊ	i	(ə)	u
long	ɩɩ		ʊʊ	ii		uu
mid	ɛ		ɔ	e	o	
long	ɛɛ~ɩɛ	ɔɔ~ʊɔ		ee~ie	oo~uo	
low		a			(ʌ)	
long		aa				

Kleinewillinghöfer (2022) provides a foundational study on the phonology of Bogoŋ that is tailored towards the writing and reading of Bogoŋ. This work is unpublished and informally circulated. I was unaware of this work when I began this thesis project and was provided access to Kleinewillinghöfer (2022) only after I had started working with Bogoŋ data from the ELAR. Nonetheless, this resource contains relevant information and data that are useful for the present study.

1.6 Significance of Research

This study is necessitated because of the need to document a grammar of Bogoŋ. This study, after its completion, is to serve the following goals: To provide a detailed description of Bogoŋ phonology, detailing the phonemic inventory, syllable structure, and some phonological processes observed. This work may also help Bogoŋ speakers to better appreciate their linguistic heritage and identity. More significantly, this thesis will contribute to the general course of maintaining the language and culture of the Cala and serve as a reference point for further academic endeavours on Bogoŋ.

1.7 Outline

The study is structured as follows. The phonemic inventory of Bogoŋ is discussed in Chapter Two. Consonant and vowel inventories in the language and their distribution are dealt with in this chapter. Chapter Three deals with syllable structure types in Bogoŋ. This includes discussions on relevant literature on theoretical proposals like Sonority Sequencing Principle, Minimum Sonority Distance and Minimum Distance to Offset on syllable structure. Chapter Four deals with the various phonological processes observed in Bogoŋ. These include assimilatory processes such as homorganic nasal assimilation, vowel nasalization, labialization/rounding and palatalization. Other phonological processes discussed in this chapter include aspiration and vowel reduction. Chapter Five deals with [ATR] harmony in Bogoŋ. Discussions on relevant literature on [ATR] harmony is included in this chapter. Other topics discussed in this chapter include directionality in [ATR] spreading, symmetry and inventory shape and an approach to Bogoŋ [ATR] harmony in grounded phonology.

1.8 Summary of the Chapter

This chapter has provided background information on Bogoŋ as well as a brief discussion of the ethnolinguistic situation of Bogoŋ and its speakers, the Cala. I have also briefly discussed previous literature on Bogoŋ, all by Kleinewillinghöfer. I have also stated the research questions that are addressed in this study and, subsequently, the significance of the research. The source of the data consulted, theoretical tools and methodology used, as well as previous preliminary phonological studies of Bogoŋ have all been addressed in this chapter.

CHAPTER TWO

PHONEMIC INVENTORY OF BOGOŊ

2.0 Introduction

This chapter focuses on the phonemic inventory of Bogoŋ. This chapter will present the consonant and vowel sounds found in Bogoŋ, including descriptions and distribution of these sounds. In dealing with vowels, oral vowels have been identified in Bogoŋ, and likewise nasal vowels.[3] These vowels will be discussed with their specific descriptions and distribution. Consonants will also be dealt with by describing them and discussing their distribution.

This chapter is organized as follows. The first section discusses vowels in Bogoŋ; vowel length is also discussed in this section. Section 2 deals specifically with the description and distribution of Bogoŋ vowels. Consonants in Bogoŋ are discussed in Section 3. In the fourth section, descriptions and distribution of the consonants are discussed. The final section is the summary of the chapter.

To arrive at the sound inventory of Bogoŋ, transcriptions of the audio recordings from the Endangered Language Archives (ELAR), as described in Chapter 1, were analysed by identifying the sounds that occur in the various recordings. In the case of consonants, words having the same sound were grouped together and compared to other words with similar structures. For example, to come to the conclusion that /b/ is a part of the inventory, all words containing this sound were considered together and the environment in which /b/ occurs was considered. This was applied to all other sounds that were observed after the transcription. The inventory was strictly arrived at as a result of listening to the audio recordings from ELAR. For this reason, it is important to note that the sounds proposed as forming the inventory of Bogoŋ here is not identical to the inventory

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[3] I will return to a discussion of nasal vowels in Chapter Three.

established by Kleinewillinghöfer (2022) in his "A phonological introduction to reading and writing Bogoŋ language". Some sounds that are part of his inventory are not included in the one established here, because words containing such sounds were not encountered in the data transcribed for this study.[4] In dealing with vowels, the same approach of grouping words with same vowels and conducting an exercise to identify their distribution was used to determine the vowels that form part of the inventory. Both this work and Kleinewillinghöfer (2022) note the behaviour of /ə/ in the inventory.

In all, the inventory established in this work is close to what Kleinewillinghöfer (2022) establishes, except for the differences noted here.[5]

2.1 Vowels in Bogoŋ

Bogoŋ has ten surface vowels, nine of which are phonemic while one is an allophone. The ten vowels in Bogoŋ are /i, u, o, e, (ə), ɪ, a, ʊ, ɛ, ɔ/. Four of these vowels are [+ATR] (/i, u, o, e, (ə)/) and the remaining five are [-ATR] (/ɪ, a, ʊ, ɛ, ɔ/). Examples illustrating these vowels are:

(4) /i/   nt**i**r**i**bu   'Ntribo'   t**ii**b**i**   'land'
     /u/   akeb**u**   'Akebu'   ok**u**tu   'Okutu' (name)
     /o/   b**o**g**o**ŋ   'Bogoŋ'   atʃ**o**de   Akyode
     /e/   b**e**   'why'   l**e**   'where'
     /ɪ/   l**ɪɪ**   'from'   dɪŋ   'we'
     /a/   **a**m**a**   'but'   d**aa**~d**a**   'we/us/our'
     /ʊ/   w**ʊ**   'he'   s**ʊ**l**ʊ**   'plead/beg'
     /ɛ/   tal**ɛ**   'reached'   s**ɛ**   'said'
     /ɔ/   k**ɔ**nɛ   'came'   **ɔ**d**ɔ**mɪ   'Odomi'

The ten Bogoŋ vowels are represented in (5).

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[4] Sounds from Kleinewillinghöfer (2022) that are not observed in my data include /h/, /v/, /z/, and /ŋ͡m/.
[5] One immediate difference to note is in the representation of some of the sounds in the two inventories. In this study, the following sounds are represented in the way they appear here: /tʃ/, /dʒ/, /j/ and /ɲ/. On the other hand, Kleinewillinghöfer (2022) represents them as 'c', 'j', 'y', and 'ny', respectively.

(5) Bogoŋ Vowel Chart

	Front	Central	Back
High	i		u
	ɪ		ʊ
Mid-high	e		o
		ə	
Mid-low	ɛ		ɔ
Low		a	
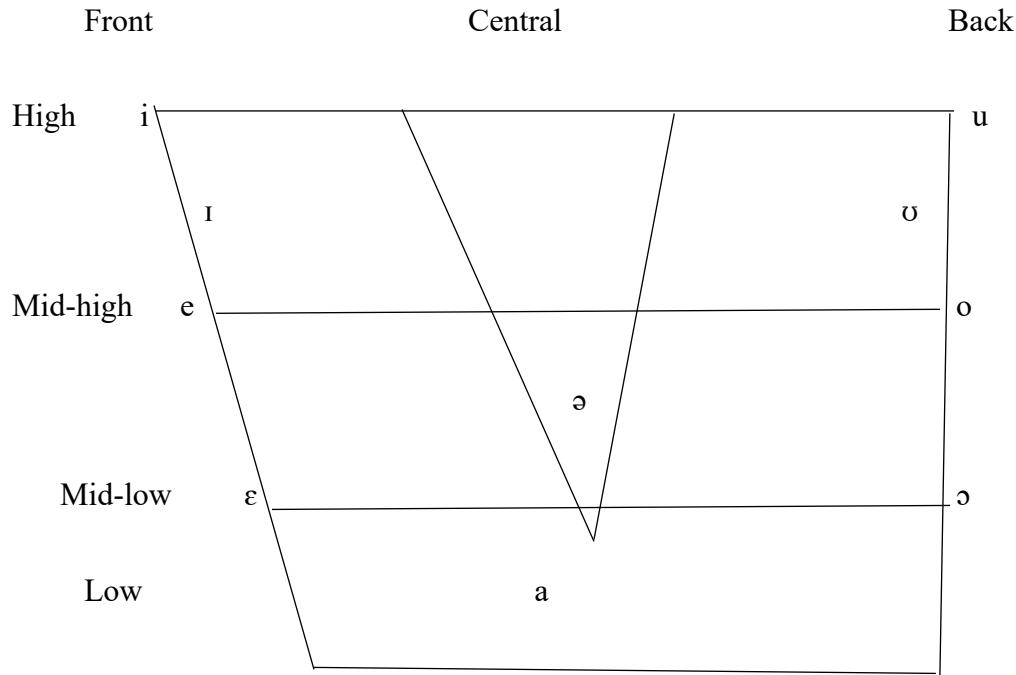
The figure above indicates where the high vowels, mid vowels and low vowels are produced with regards to the tongue position.[6] [ə] has not been described in detail in this study because it is not considered as a phoneme but as an allophone of other vowels (e.g., /i/, /ɪ/, /e/) when they occur between consonants. Examples are:

(6)   a. k͡pɪn [k͡pən]   'reason/what'
       b. jela   [jəla]   'whilst'
       c. ntiribo [ntərəbo]   'Ntribo'

The sound, /ɛ/, on the other hand is realised as [ə] when it occurs in word final position. For example:

(7)   a. jaagɛ [jaagə]   'called'
       b. panɛ [panə]   'gods'

_____

[6] Kleinewillinghöfer (2022) also notes [ʌ] as a conditioned variant of /a/. This was not observed in this study and therefore is not included in discussion of the vowel inventory. However, additional discussion of Kleinewillinghöfer's analysis of [ʌ] is provided in Chapter 5 in a discussion of [ATR] harmony in Bogoŋ.

These observations regarding the occurrence of [ə] were also made by Kleinewillinghöfer (2022). Additional description of the quality and distribution of all phonemic vowels is provided in section 2.2.

2.1.1 Vowel length in Bogoŋ

One important aspect of Bogoŋ vowels is vowel length. Vowel length does not appear to be phonemic. Examples where vowel length does not cause meaning change are:

(8)   /a:/ and /a/   d**aa**/d**a**   'we'
        /e:/ and /e/   k**ee**ri/k**e**ri   'Keri'
        /ʊ:/ and /ʊ/   l**ʊʊ**rʊ/l**ʊ**rʊ   'birth'

All of the vowels with the exception of /ə/ can be lengthened in Bogoŋ. The remaining vowels are observed in Kleinewillinghöfer (2022:7-8) to have long vowels counterparts. Examples from Kleinewillinghöfer (2022:7-8) include:

(9)   /o/   gó   'fold'   /oo/   dòòsì   'dream'
        /i/   tìbì   'descend'   /ii/   tììbí   'earth, ground'
        /ɛ/   sɛ́   'say that'   /ɛɛ/   nàmɛ́ɛ   'animals'
        /ɪ/   dìbʊ́lɔ́   'calabash'   /ɪɪ/   tìì   'abuse, insult'
        /u/   sú   'fill'   /uu/   lùù   'forge'

2.2 Description and Distribution of Bogoŋ Vowels

Bogoŋ vowels can be described based on their production and distribution. Cross-linguistically, vowels are generally categorized with reference to height, place, and rounding. As in many African languages, one important aspect of Bogoŋ vowels is the tongue root feature. In the production of advanced vowels, the root of the tongue moves forward whilst in the case of the unadvanced vowels, the root of the tongue remains in place and does not take an advanced position. Vowels that are produced with advanced tongue root are referred to as [+ATR], while those produced with unadvanced tongue root are referred to as [-ATR]. During the production of the vowel, a distinction is also made regarding the height of the tongue, i.e. high vowels, mid vowels, and low vowels. In

this section, the various vowels in Bogoŋ will be described, and their distribution elaborated using the tongue body feature. The distribution of these vowels in terms of their phonetic context will also be discussed.

2.2.1 High Vowels

High vowels are produced with the body of the tongue raised from a neutral position towards the hard palate. Below is an illustration of high vowels in Bogoŋ and the words in which they occur.

The high front unrounded advanced vowel, /i/, occurs in word medial and word final positions. This vowel does not occur in word initial position. The following examples demonstrate the positions of occurrence of this vowel.

(10)   a. tiibi   'land'
            b. tilesi   '??'
            c. ntiribu   'Ntribo'
            d. wuteri   '??'

The high front unrounded unadvanced vowel, /ɪ/, occurs only in word medial and word final positions. This vowel sound does not occur in word initial position. The following examples show the positions of occurrence of the vowel in Bogoŋ:

(11)   a. gɪtɛ   'common, boundary, barrier'
            b. lɪɪ   'from'
            c. dɪmaŋ   '??'
            d. dɪŋ   'we'

The high back rounded advanced vowel, /u/, also occurs only in word medial and word final positions in Bogoŋ. It does not occur in word initial position. The following examples show the positions that this vowel occurs in Bogoŋ:

(12)   a. ntiribu   'Ntribo'
            b. nawuri   'Nawuri'
            c. akebu   'Akebu'
            d. okutu   'Okutu'

/ʊ/, the high back rounded unadvanced vowel, occurs in word medial and word final positions only. The examples below indicate the positions they occur in Bogoŋ:

(13) a. lʊrʊ   'common, birth'
      b. wʊŋ   'who'
      c. sʊlʊ   'plead, beg'
      d. wʊ   'he'

2.2.2 Mid Vowels

Mid vowels are vowels that are produced between high and low vowels. Mid-high vowels are produced with the body of the tongue rising above the neutral level a little. In the case of mid-low vowels, they are produced with the body of the tongue falling a little below the neutral level in the oral cavity. Below are examples that illustrate the mid vowels and their distribution.

The mid-high front unrounded advanced vowel, /e/, occurs in only word medial and word final positions in Bogoŋ. The following examples illustrate the positions occupied by this vowel:

(14) a. be   'why'
      b. keri   'Keri'
      c. akebu   'Akebu'
      d. le   'where'

The mid-low front unrounded unadvanced vowel, /ɛ/, occurs also only in word medial and word final positions. The following examples illustrate their positions:

(15) a. gɪtɛ   'barrier, common, boundary'
      b. sɛ   'said'
      c. mɪɛna   'met'
      d. talɛ   'reached'

The mid-high back rounded advanced vowel, /o/, in terms of distribution, is one of only three vowels that occur in word initial position in Bogoŋ, in addition to occurring word medial and word final positions. Examples to illustrate the occurrence of /o/ in these positions are below:

(16) a. bogoŋ   'Bogoŋ'
      b. **o**kutu   'Okutu'
      c. atʃ**o**de   'Akyode'
      d. juo   'fight/war'

The mid-low back rounded unadvanced vowel, /ɔ/, occurs in word initial, word medial and word final positions. Below are examples to show this.

(17) a. kɔnɛ   'came'
      b. **ɔ**dɔmɪ   'Odomi'
      c. bʊjan**ɔ**   'evening'
      d. kɔŋ   'came'

2.2.3 Low Vowels

Low vowels are produced with the body of the tongue falling below the neutral level in the oral tract during production. Bogoŋ has only one low vowel. This vowel is the low central unrounded unadvanced vowel, /a/. It occurs at word initial, word medial and final positions. The following illustrate the distribution of /a/ in Bogoŋ:

(18) a. daa~da   'we'
      b. wɪɛna   'have'
      c. na   'and'
      d. ama   'but'

All vowels in Bogoŋ can appear in word medial and final positions, while /o/, /a/ and /ɔ/ may appear also in initial position. The table below is used to clearly summarize the positions of occurrence of Bogoŋ vowels.

(19)

VOWEL	WORD INITIAL POSITION	WORD MEDIAL POSITION	WORD FINAL POSITION
/i/	X	✓	✓
/ɪ/	X	✓	✓
/u/	X	✓	✓
/ʊ/	X	✓	✓
/e/	X	✓	✓
/ɛ/	X	✓	✓
/o/	✓	✓	✓
/ɔ/	✓	✓	✓
/a/	✓	✓	✓

In (19), (✓) indicates where a vowel occurs and (X) indicates the absence of the occurrence of the

vowels discussed.

Diphthongs are also observed in the data. The list of observed diphthongs are:

(20) a. /ej/   **sej**   'priest
      b. /ɛj/   ɔs**ɛj**   'Osei'
      c. /aj/   tʃa**aj**   'living'
      d. /aʊ/   ja**ʊ**   'Yaw'
      e. /ɪɛ/   wɪɛna   'have'
      f. /uo/   dʒ**uo**   'chief'
      g. /ʊɔ/   d**ʊɔ**   'also'
      h. /ie/   b**ie**   'children'

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2.3 Consonants in Bogoŋ

There are twenty consonant phonemes in Bogoŋ. The consonant phonemes are /p, b, t, d, k, g, k͡p, g͡b, m, n, ɲ, ŋ, r, f, s, tʃ, dʒ, j, w, l/. These consonants occur in the words below.

(21)
/p/	**p**ɔɪ	'before'	wʊ**p**anɛ	'his gods'
/b/	**b**a	'they/them'	ake**b**u	'Akebu'
/t/	**t**ɪɪna	'own'	gɪ**t**ɛ	'common/boundary/barrier'
/d/	**d**aa	'we'	ɔ**d**ɔmi	'Odomi'
/k/	**k**ɔnɛ	'came'	**k**ʊlʊ	'move'
/g/	jaa**g**ɛ	'called'	bo**g**oŋ	'Bogoŋ'
/k͡p/	ga**k͡p**aŋde	'Gakpande'	ba**k͡p**a	'people'
/g͡b/	wʊrʊ**g͡b**ɛ	'??'	dʒuodi**g͡b**e	'??'
/m/	**m**ɪɛna	'met'	tʊ**m**	'worship'
/n/	**n**tiribu	'Ntribo'	wɪɛ**n**a	'have'
/ɲ/	**ɲ**ɪna	'because'	asaa**ɲ**ɔ	'Asanyor'
/ŋ/	kɔ**ŋ**	'come/pass'	wʊ**ŋ**	'who'
/r/	lʊ**r**ʊ	'common'	faa**r**a	'started/began'
/f/	**f**aara	'started/began'	**f**a	'give'
/s/	**s**ɛ	'said'	taa**s**ɛ	'asked'
/tʃ/	**tʃ**aʊ	'settle/stay'	**tʃ**ala	'Cala'
/dʒ/	**dʒ**u	'going'	di**dʒ**im	'??'
/j/	**j**aagɛ	'called'	bʊ**j**anɔ	'evening'
/w/	**w**ɪɛna	'have'	ta**w**ɪ	'told'
/l/	**l**ʊrʊ	'birth/common'	sʊ**l**ʊ	'plead/beg'

Bogoŋ phonemic consonants can be illustrated in the following table:

(22) Bogoŋ Consonants

	Bilabial	Labio-dental	Alveolar	Post-alveolar	Palatal	Velar	Labio-velar
Plosives	p b		t d			k g	k͡p g͡b
Nasal	m		n		ɲ	ŋ	
Trill			r				
Fricatives		f	s				
Affricates				tʃ dʒ			
Approximants/Glides					j		w
Lateral			l				

Kleinewillinghöfer (2022:3) includes the sounds /h/, /v/, /z/, and /ŋ͡m/ in his inventory. These sounds were not observed in the data considered in this work. Kleinewillinghöfer (2022) notes that the sounds /h/, /v/ and /z/ occur only in loan words.

2.4 Description and Distribution of Bogoŋ Consonants

This section describes consonant sounds in terms of their production and distribution in Bogoŋ. The sounds will be grouped into plosives, fricatives, nasals, affricates, approximants, and laterals.

2.4.1 Plosives

Plosives are produced with the blockage of the airstream in the oral cavity and/or with some blockage of airstream in the nasal cavity briefly before a sudden release of the apparatus causing the blockade. The name of the sound is derived from the primary place(s) where the blockage occurs in the vocal tract. There are eight plosives in Bogoŋ. The following are descriptions of these plosives and their distribution.

The voiceless bilabial plosive, /p/, occurs in only word initial and word medial positions. For example:

(23)   a. **p**anɛ   'gods'
          b. **p**ɔɪ   'before'
          c. wʊ**p**anɛ   'his gods'

The voiced bilabial plosive, /b/, in Bogoŋ can also occur in word initial and word medial positions only. It does not occur in word final position, like many other consonants in Bogoŋ. For example:

(24)   a. **b**ɔntɪbɔ   'Bontibor'
          b. **b**ɪnɛ   'elder'
          c. **b**arɛ   'others'
          d. kaja**b**a   'Kayaba'

The voiceless alveolar plosive, /t/, in Bogoŋ occurs in word initial and word medial positions only. The /t/ sound does not occur in word final position in Bogoŋ. Examples include:

(25)   a. **t**aŋ   'not, have not'
          b. dɪ**t**awɪ   'language'
          c. **t**iibi   'land'
          d. ga**t**ʊŋgʊrʊ 'place, somewhere'

The voiced alveolar plosive /d/ occurs in word initial and word medial positions only in Bogoŋ. Therefore, /d/ does not occur in word final position. Examples include:

(26)   a. **d**iele   'where'
          b. gan**d**o   'Gando'
          c. a**d**ɪɛlɛ   'Adele'
          d. **d**ɪɛtɪɪna   'town owners'

The voiceless velar plosive, /k/, in Bogoŋ occurs in word initial and word medial positions. It does not occur in word final position. The following illustrate this fact.

(27) a. **k**ʊlʊ   'moving'
      b. a**k**ebu   'Akebu'
      c. **k**ɔnɛ   'came'
      d. a**k**ɔlɛsa   'like'

The voiced velar plosive, /g/, in Bogoŋ occurs only in word initial and word medial positions. /g/ does not occur in word final position. For example:

(28) a. **g**ʊʊ   'of'
      b. bo**g**oŋ   'Bogoŋ'
      c. sa**g**ɔdɛj   'Sokode'
      d. **g**ak͡paŋdɛ   'Gakpande'

The voiceless labial velar plosive /k͡p/ uses two places of articulation in its production. The sound combines bilabial and velar production. This sound occurs only in word initial and word medial positions in Bogoŋ. Examples include:

(29) a. **k͡p**ɪn   '??'
      b. ga**k͡p**aŋdɛ   'Gakpande'
      c. di**k͡p**oŋgʊʊ   'Dikpongu'
      d. wʊ**k͡p**a   'human/somebody'

The voiced labial-velar plosive /g͡b/, like its voiceless counterpart, occurs in word initial and word medial position. Examples are:

(30) a. wʊrʊ**g͡b**ɛ   '??'
      b. dʒuodi**g͡b**e   '??'
      c. **g͡b**aa   'also'

2.4.2 Fricatives

In the production of fricatives, a significant constriction is present in the vocal tract, but not a complete closure. Air moving through the constriction generates audible friction. Below is an illustration of fricatives and their distribution in Bogoŋ.

The voiceless alveolar fricative /s/ occurs only in word initial and word medial positions in Bogoŋ. Like most of the consonants discussed so far, /s/ does not occur in word final position. For example:

(31) a. **s**ɛ　　　　　　　'said''
　　　b. **s**ej　　　　　　　'priest'
　　　c. ɔ**s**ɛj　　　　　　'Osei'
　　　d. taa**s**ɛ　　　　　　'asked'

The voiceless labiodental fricative /f/ occurs only in word initial and word medial position in Bogoŋ. The sound /f/ does not occur in word final position. For example:

(32) a. **f**aara　　　　　　'started/began'
　　　b. gi**fi**　　　　　　'??'
　　　c. a**f**o　　　　　　　'Afo'
　　　d. **f**ʊlʊ　　　　　　'??'

2.4.3 Nasals

Nasals are sounds that are produced with a complete closure in the oral cavity and the airstream exiting through the nasal cavity. Cross-linguistically, nasal sounds are voiced. The nasals in Bogoŋ include:

The bilabial nasal, /m/, in Bogoŋ occurs in word initial, word medial and word final positions. Examples of /m/ occurring in words in Bogoŋ include:

(33) a. **m**ɪɛna　　　　　　'met'
　　　b. tʊ**m**　　　　　　'worship'
　　　c. ɔdɔ**m**ɪ　　　　　'Odomi'
　　　d. a**m**a　　　　　　'but'

The alveolar nasal, /n/, in Bogoŋ occurs in word initial, word medial, and word final positions. Examples include:

(34) a. **n**tiribu   'Ntribo'
      b. wıɛ**na**   'have'
      c. gadu**n**   'Gadun'
      d. **n**a   'and'

The velar nasal, /ŋ/, occurs in word initial, word medial, and word final positions in Bogoŋ.

Examples include:

(35) a. kɔ**ŋ**   'come/pass'
      b. wʊ**ŋ**   'who'
      c. dɔ**ŋa**   'ourselves/each other'
      d. **ŋ**ıdʊɔ   'so'

The palatal nasal, /ɲ/, unlike other nasals, occurs only in word initial and word medial positions. It does not occur in word final position. Examples are:

(36) a. **ɲ**ıına   'because'
      b. asaa**ɲ**ɔ   'Asanyor'
      c. **ɲ**a   'you'
      d. **ɲ**ıı   'know'

2.4.4 Affricates

The production of affricates involves two strictures. In their production, there is a closure in the vocal tract leading to an initial blockage of the airstream followed by a gradual release of the airstream with hissy noise after the blockage has been released. Below is an illustration of affricates in Bogoŋ and their distribution.

The voiceless post-alveolar affricate, /tʃ/, occurs only in word initial and word medial positions in Bogoŋ. For example:

(37) a. **tʃ**aʊ   'settle/stay'
      b. **tʃ**ala   'Cala'
      c. a**tʃ**ode   'Akyode'
      d. **tʃ**aa   'Cha-'

The voiced post-alveolar affricate, /dʒ/, also occurs only in word initial and word medial positions in Bogoŋ. For example:

(38) a. **dʒ**an   '??'
      b. **dʒ**u   'going'
      c. **dʒ**uo   'chief'
      d. di**dʒ**im   '??'

2.4.5 Trills

Trills are generally voiced. Only one trill occurs in Bogoŋ, the alveolar trill /r/. The sound /r/ occurs

only in word medial position in Bogoŋ. For example:

(39) a. lʊ**r**ʊ   'common'
      b. wʊ**r**ʊ   'man'
      c. faa**r**a   'started, began'
      d. amʊ**r**ʊsa   'Amu**r**usa'

2.4.6 Laterals

Laterals are sounds that are produced with the tip of the tongue rising against the upper part of the

oral tract making space for the airstream to exit along the sides of the tongue. The data on Bogoŋ

shows only the alveolar lateral /l/, which is described below.

The sound /l/ occurs in word initial and word medial positions in Bogoŋ. For example:

(40) a. **l**ʊrʊ   'common, birth'
      b. s**ʊl**ʊ   'plead, beg'
      c. tʃa**l**a   'Cala'
      d. **l**e   'where'

2.4.7 Glides

Glides are consonants which are produced with vowel-like features. In Bogoŋ, /w/ and /j/ are the

only glides identified. Generally, glides are voiced. Below is an illustration of Bogoŋ glides and

their distribution.

The labial-velar approximant glide, /w/, occurs in word initial and word medial positions

only in Bogoŋ. Examples are:

(41)   a. **w**ɪɛna   'have'
        b. **w**ʊ   'he'
        c. ta**w**ɪ   'told'
        d. na**w**ʊrɪ   'Nawuri'

The palatal approximant glide, /j/, occurs in only word initial and word medial positions in Bogoŋ. Examples include:

(42)   a. **j**aagɛ   'called'
        b. **j**uo   'fight, war'
        c. bʊ**j**anɔ   'evening'
        d. marɪ**j**ama   'Mariyama'

In terms of distribution, all Bogoŋ consonants, except the trill /r/, may occur in word initial position. All consonants can also occur in word medial positions. When it comes to word final position, the only consonant sounds that occur there are nasal sounds, with the exception of the palatal nasal /ɲ/.

2.4.8 Free Variation

One significant observation from Kleinewillinghöfer (2022:7-8) that was not made in this study is the phenomenon of free variation. Free variation is a phonological phenomenon where two different sounds can be used interchangeably, in the same environment, without any meaning change resulting in the words involved. According to Kleinewillinghöfer (2022), long vowels and certain diphthongs exhibit free variation. The long vowels that usually exhibit this free variation with diphthongs include /ee,/ /ɛɛ/, /oo/, /ɔɔ/. The following examples from Kleinewillinghöfer (2022:9) illustrate free variation in Bogoŋ involving the long vowels and diphthongs.

(43)   a. dʒòó ~ dʒùó   'chief'
        b. bɔ́ɔ́ ~ bʊ́ɔ́   'hole'
        c. cɔ́ɔ́ ~ cʊ́ɔ́   'fly'
        d. dèèsí ~ dìèsí   'sister'
        e. nàmɛ́ɛ̀ ~ nàmíɛ̀   'animals'

Interestingly, in a distinct pattern of free variation, the long vowels observed in my data are in free variation with their shorter counterparts, and thus causes no meaning change. For example:

(44)　　a. /a:/ and /a/　　　[daa ~ da]　　　'we'
　　　　b. /e:/ and /e/　　　[keer ~ keri]　　　'Keri'
　　　　c. /ʊ:/ and /ʊ/　　　[lʊʊrʊ ~ lʊrʊ]　　　'birth'

Kleinewillinghöfer (2022) appears to suggest that high and mid long vowels are in free variation with diphthongs, but these contrast with the corresponding short vowels. In the case of the low vowel, there is no relevant diphthong and Kleinewillinghöfer's (2022) presentation suggests that length is contrastive for the low vowel. For example,

(45)　　a. ná　　　　'see'　　　náà　　　　'cow
　　　　b. fàrà　　　'cultivate'　　fáárâ　　　'start'

In my observations, some variation between long and short vowels did not appear to be contrastive as shown in example (44) leading to the suggesting of free variation.

Considering that Kleinewillinghöfer (2022:9) had more pool of data and contact time with the language, his analysis showing long vowels being phonemic is plausible. My observations suggest at least some cases of free variation involving length, as indicated in example (43). The status and distribution of vowel length, as well its relation to diphthongization, is a subject for future research.

2.5 Summary of the Chapter

This chapter discusses the phonemic inventory of Bogoŋ, including vowels and consonants. It is observed that Bogoŋ has ten surface vowels, nine of them being phonemic. In terms of distribution, the following vowels do not occur in word initial position: /i, u, e, ɪ, ʊ, ɛ/. The vowels that occur in word initial positions are /o, a, ɔ/. It is also observed that [ə] may appear as an allophone of /i/, /ɪ/, or /e/ when occurring between consonants, and of /ɛ/ when it occurs in word final position. All vowels in Bogoŋ occur both in word medial and word final positions. In the case of Bogoŋ

consonants, it is observed that Bogoŋ has twenty consonants. In terms of their distribution, only nasals, i.e., /m/, /n/, /ŋ/, except /ɲ/, occur in word final position in Bogoŋ. All other consonants do not occur in word final position. On the other hand, all consonants in Bogoŋ occur in word initial and word medial position, except for /r/, which only occurs in word medial position.

CHAPTER THREE
SYLLABLE STRUCTURE OF BOGOŊ

3.0 Introduction

Although the syllable is a basic concept in linguistic description, it has been described in many different terms within the phonological literature. In many approaches, segments are organized within syllables according to principles driven by sonority. The sonority of a sound can be defined as "its loudness relative to that of other sounds with the same length, stress, and pitch" (Ladefoged, 1975:245). Within syllables, segments are typically organized such that more sonorous sounds such as vowels occupy the nucleus, while less sonorous sounds appear in peripheral positions, i.e. onsets and codas (Parker, 2011). Related theoretical proposals, such as the Sonority Sequencing Principle, introduced as early as the 19th century by Sievers (1881), and subsequently by Jespersen (1904), have been used to explain the tendency for more sonorous segments to stand closer to the syllable peak than less sonorous segments. Cross-linguistically, the segment ranking highest on the sonority scale in any syllable constitutes the peak of the syllable, and all the other segments are organized around the peak (nucleus) with more sonorous segments closer to the peak and less sonorous ones farther from the peak (Clements, 1990; Grammont, 1933; Hooper, 1976; Jespersen, 1904; Kiparsky, 1979, p. 19; Saussure, 1914; Selkirk, 1982; Sievers, 1881; Steriade, 1982).

(46)   Model sonority hierarchy (e.g., Clements, 1990; Kenstowicz, 1994; Smolensky, 1995)

       vowels   >   glides   >   liquids   >   nasals   >   obstruent

       ←——————————————————————————————————→

       higher in sonority   lower in sonority
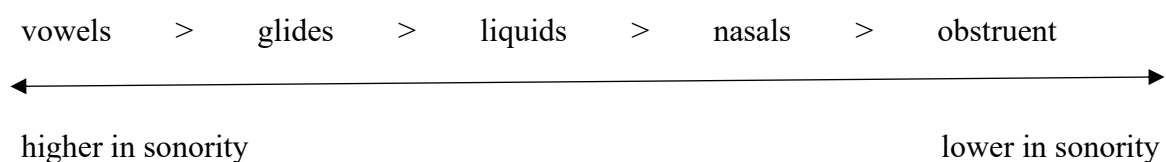
The five natural classes in (46), according to Parker (2011), are the easiest and most useful ones to employ in terms of sonority. However, there may be cross-linguistic differences in terms of what the most relevant sonority classes are, and there may be factors other than sonority that

affect how segments combine within syllables. In Bogoŋ, for example, we can attest syllabic nasals but not syllabic liquids or glides.

In this work, I shall describe the syllable as a phonological constituent composed of segments that serves as the domain for some phonological processes. In describing the structure of the syllable, Parker (2011) notes that "every syllable exhibits exactly one peak of sonority, contained in the nucleus". Sonority, as stated, is mostly discussed in relation to the syllable and how consonant clustering occurs in onset and coda positions. These are what are captured in the Sonority Sequencing Principle (SSP) (Blevins, 1995; Hooper, 1976; Selkirk, 1984). Discussions on syllable structure in this chapter is primarily based on my own documentation. Kleinewillinghöfer in his studies does not provide any description of syllable structure directly. However, reference to data and observations from Kleinewillinghöfer will be made, where relevant.

3.1 Syllable Structure in Bogoŋ

In this thesis, an onset-rhyme structure, which expresses the syllable as a hierarchical binary-branching structure with the nucleus and coda constituting components of the rhyme, will be used to describe the syllable structure of Bogoŋ. The onset-rhyme branching is the most common across languages (Kim, 2011). As required by a binary branching model, the root of the syllable is divided into the onset and the rhyme nodes. The rhyme is further divided into the Nucleus and the coda as shown in (47). The onset and the coda positions are occupied by consonants while the nucleus position is filled either by a vowel or a syllabic consonant. However, the nucleus is the only obligatory component of the syllable, with the onset and coda being optional. The implication is that a nucleus alone can constitute a syllable but neither an onset nor a coda can constitute a syllable alone.

(47) The internal structure of onset-rhyme (right-branching).

SYLLABLE
ONSET   RHYME
                NUCLEUS   CODA
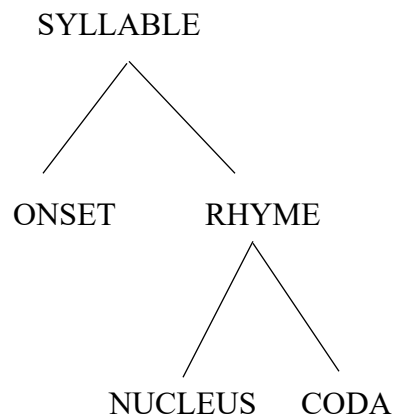
(Pike, 1975b, 1975a; Pike & Pike, 1947 - as adopted by Bosch, 2011)

The above structure is used in the description of Bogoŋ syllables in the sections below.

3.2 CV/CVV-Syllable Structure

The CV-syllable type is the most preferred cross-linguistically. This is a fact noted in the early days of linguistic inquiry. This is evident in Jakobson's (1962:526) observation that there "are languages lacking syllables with initial vowels and/or syllables with final consonants, but there are no languages where there are no syllables with initial consonants or syllables with final vowels". In Bogoŋ, the CV structure is the most prevalent syllable type in the language. Examples of CV-syllable structure in Bogoŋ are given below.

(48)　　a. **kɔ.na**[78]　　　　'brought'
　　　　b. ɔ.**dɔ.mɪ**　　　　'Odomi'
　　　　c. **na**　　　　　　'and'
　　　　d. **ba**.rɛ　　　　　'others'
　　　　e. **lʊ.rʊ**　　　　'birth/common'
　　　　f. **dɔ.ŋa**　　　　'each other'
　　　　g. **pa**.nɪŋ　　　　'gods'
　　　　h. a.**ma**　　　　　'but'

---

[7] Periods (.) are used to indicate syllable boundaries.
[8] Highlighted parts in the words are what constitute the CV structure.

i. **bo**.goŋ   'Bogoŋ'
j. **ba**   'them'
k. **wʊ**   'he'

The structure below illustrates how the onset-rhyme structure can be applied to the CV-syllable type in Bogoŋ.

(49) [na] 'and'
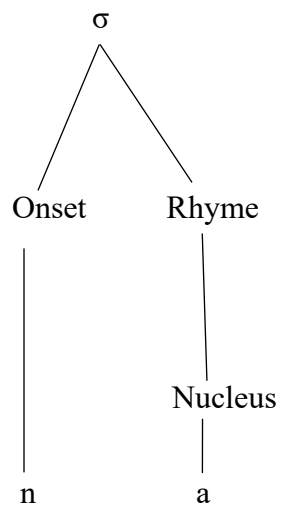
From the above (49), it is seen that the onset position is occupied by the /n/ sound with /a/ occupying the nucleus position, whilst there is no coda. This syllable structure gives a clear example of the CV-syllable type in Bogoŋ.

There is also the CVV-syllable type where the nucleus is made up of a diphthong or a long vowel. Examples of this structure is given below:

(50)   a. **wɪɛ**.na   'have'
             b. a.**dɪɛ**.lɛ   'Adele'

(51)

σ   σ

O   R   O   R

N

w   ɪ   ɛ   n   a
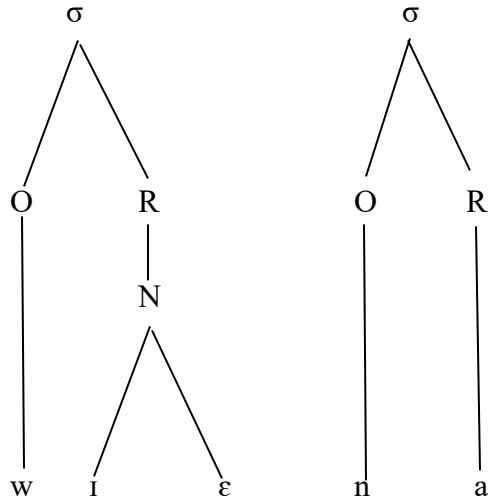
3.3 CVC-Syllable Structure

This syllable structure is made up of consonant-vowel-consonant. Such syllables have a consonant in onset position, a vowel in the nucleus position, and a consonant in the coda position. In Bogoŋ, only nasals occur in the coda position. This is also an observation made in Tem (Abdul-Latif, 2017), a Gur language closely related to Bogoŋ. The CVC-syllable type is illustrated in the examples below.

(52)   a. **taŋ**   'not'
          b. **k͡pɪn**   'reason/because'
          c. ga.**dun**   'Gadun'
          d. **wʊŋ**   'he/she/it'
          e. **naŋ**   'inside'
          f. di.**k͡poŋ**.gu   'Dikpongu'
          g. dɪ.**maŋ**   'there'
          h. **kɔŋ**   'come'
          i. **laŋ**   'pass'
          j. **dʒaŋ**   '??'
          k. **tum**   'worship'
          l. **mam**.**mam**   'Mohammed'

gadun 'Gadun', a two-syllable word with an initial CV syllable and a final CVC syllable, is used to illustrate the CVC structure type in Bogoŋ below.

(53) Illustration of the CVC-Syllable Structure [ga.**dun**]

```
        σ                           σ
       / \                         / \
      O   R                       O   R
      |   |                       |   / \
      |   N                       |  N   C
      |   |                       |  |   |
      g   a                       d  u   n
```
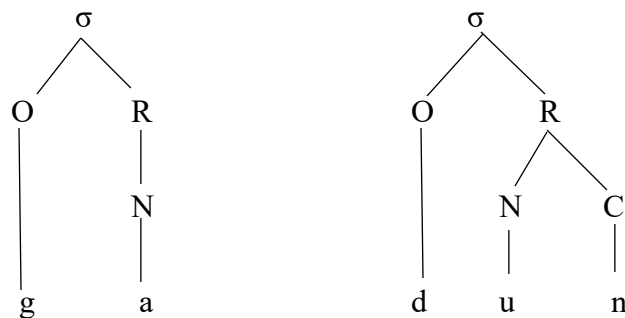
While I have not encountered the CVVC type of syllable in the data considered for this thesis, nor in the examples found in Kleinewillinghöfer (2022), I am unable to conclude that such syllable type does not exist in Bogoŋ. Further research and data are required for this.

3.4 Onset-Clusters in Bogoŋ

Onset clusters ($\sigma[C_1C_2V]$) refer to sequences such as [pl] and [pr], and consonant-glide clusters such as [kw] and [pj], that occur at the beginning of a syllable. The cluster that is used in a language is usually explained using phonological models that invoke sonority scale. Previous approaches to phonotactics of consonant clusters include Minimum Sonority Distance (Levin, 1985; Selkirk, 1984; Steriade, 1982), Sonority Dispersion (Clements, 1990), Sonority Rise (Flemming, 2008), and Sonority Angle (Fullwood, 2013).

Each of the above models calculate the gradient harmony of consonant cluster in terms of a different mathematical formula based on the distance between the sonority indices of C_1, C_2, and sometimes the following vowel. Other approaches include Duanmu (2002), which suggests that occurring clusters are in fact complex single sounds. This was demonstrated by surveying onset clusters in Chinese and English. Duanmu (2002) argues that what is referred to as clusters can be represented as a single complex sound.

However, Jay & Parker (2020) put forth a new model called Minimum Distance to Offset (MDO). This approach maintains a minimum threshold for sonority distance between C_2 and C_1 in each language like in MSD. However, MDO goes further, to arrange onset cluster types into several continua with a consonant C_2 in each scale. Jay & Parker (2020) exemplified this by demonstrating that glide offset continuum consists of a fixed ranking encoding the universal reference OG > NG > LG > GG.[9]

From the Bogoŋ data, the combinations that can be accounted for are obstruent-approximants and one instance of OG. Discussions of the various cluster examples are given below.

3.4.1 CCV/CCVC-Syllable Structure

Although Kleinewillinghöfer (2022) does not discuss syllable structure directly, he does talk about 'consonant sequences'. Consonant clusters are very rare in Bogoŋ, and most of them are loans from other languages. The few cases recorded by Kleinewillinghöfer (2022) mainly have a structure that combines a labial stop, /p/ or /b/ with either /l/ or /r/. Examples of words with this onset cluster include (from Kleinewillinghöfer, 2022:6):

(54)   a. gà**pl**ɛ́ kʊ́mâ   'anywhere'
        b. gà**pl**ɛ́**pl**íɛ̀   'fireflies'
        c. gàjì**br**ì   'leopard'
        d. t͡ʃ͡ìbrì   'antelope' (from Nawuri: t͡ʃ͡ìbə̀rì)
        e. dà**bl**á   'knife'
        f. **pr**ɔ̀ŋtʊ́wá   'bottle' (from Nawuri: pʰʊ̀ròntùwá)

Below are illustrations of syllabified examples from the above to demonstrate onset-cluster in Bogoŋ. The constraint in Bogoŋ grammar prefers the maximising of onsets in multisyllabic words

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[9] OG = obstruent and glide; NG = nasal and glide; LG = liquid and glide; GG = glide and glide

than codas (for works on maximal onset or onset first see for examples Cairns & Feinstein, 1982; Clements & Keyser, 1983; Hooper, 1976; Kahn, 1976; Selkirk, 1982; Steriade, 1982; Vennemann, 1987). In other words, in the middle of words, onsets are greedy, especially where the consonant cluster is obstruent-approximant and will take all possible consonants instead of sharing any of the consonants with the preceding syllable, i.e., not giving a coda to the preceding syllable. This explains the reasoning behind positing the structure of *gàplɛ́* as σ[gà]σ[plɛ́], as opposed to σ[gàp]σ[lɛ́].

(55)

```
        σ                      σ
      /   \                  /   \
     O     R                O     R
     |     |               / \    |
     |     N              /   \   N
     |     |             /     \  |
     g     à            p       l ɛ́
```

(56)

```
        σ                      σ
      /   \                  /   \
     O     R                O     R
     |     |               / \    |
     |     N              /   \   N
     |     |             /     \  |
     t͡ʃ    ì            b       r ì
```
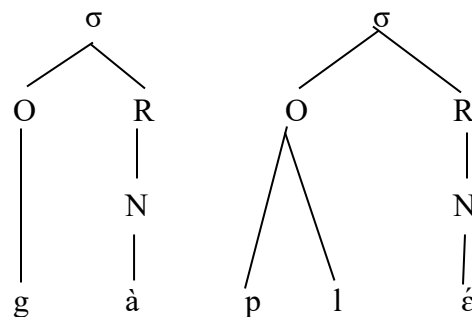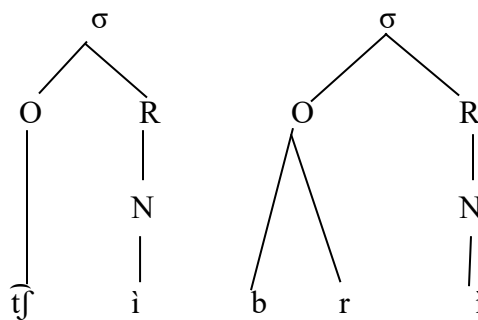
In my own examination of data from the ELAR, one word is identified to have the CCVC syllable structure: *ŋkwanta* 'Nkwanta'. Also, only one word is found in the data to have the CCV syllable structure type: *maŋkrado* 'Mankrado'[10]. These two words have been illustrated below:

---

[10] Nkwanta and Mankrado are borrowed words from Akan.

(57) Illustrations of the CCVC-syllable structure. [ŋ.**kwan**.ta]
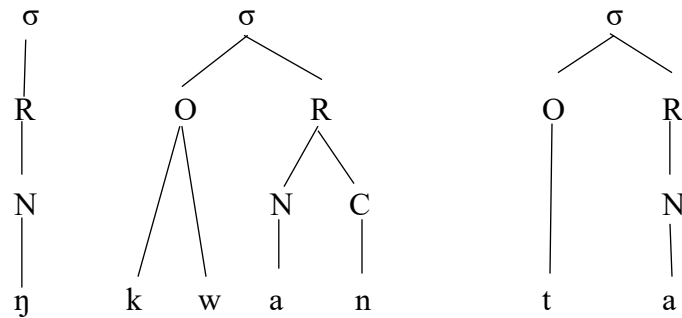
In this example, /kwa/ in the syllable /kwan/ is described as CCV and not as CVV because /w/ here is considered as a consonant and therefore forms part of the onset (making it a consonant cluster of /kw/). The initial part of this word, /ŋ/, is seen to form a syllable on its own. This will be discussed in Section 3.7. Note that this example also constitutes the only obstruent-glide cluster included here. The /kr/ cluster in *maŋkrado* and the loanword data provided by Kleinewillinghöfer (2022) include only obstruent-liquid onset clusters.

(58) Illustration of the CCV-Syllable Structure [maŋ.**kra**.do]
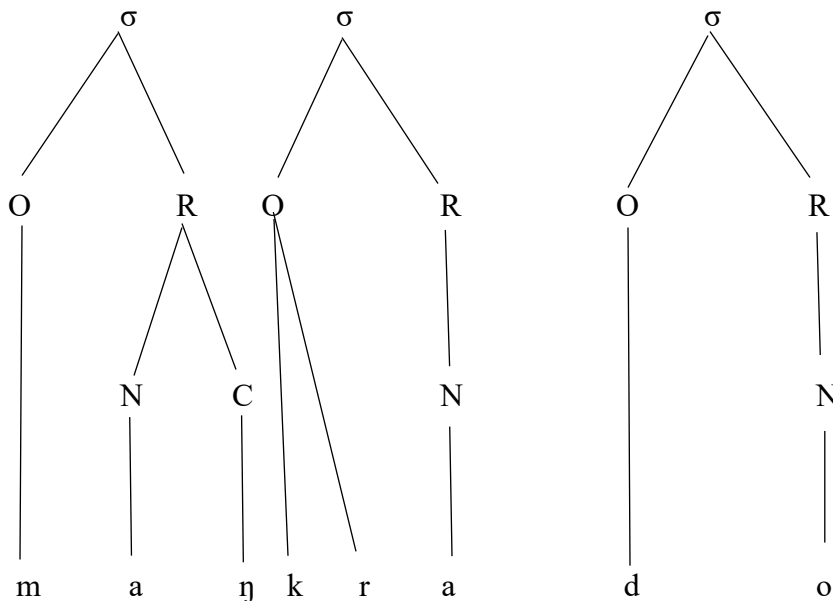
3.5 VVC-Syllable Structure

Bogoŋ exhibits the VVC syllable type. However, just like the CCVC and CCV syllable types, the VC syllable type is very rare in Bogoŋ. This syllable type was also only found in one word from the data considered in my analysis. i.e., *aaŋ* '??'. The VVC syllable type is exemplified below.

(59) Illustration of the VVC-Syllable Structure. [aaŋ] '??'
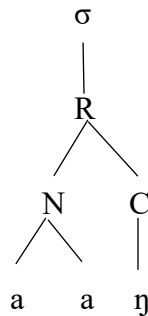
This example also illustrates the occurrence of a long vowel, represented here as a branching nucleus.

The data I examined contains no examples of VC syllable structure type, this may be an accidental gap, and more future studies may reveal examples of this syllable structure type.

3.6 V/VV-Syllable Structure

This is a syllable structure which is made up of only a vowel or two vowels. Examples include:

(60)   a. **a.**dɪɛ.lɛ   'Adele'
           b. **a.**ke.bu   'Akebu'
           c. **a.**mʊ.rʊ.sa   'Amurusa'
           d. **a**   '??'
           e. **o.**ku.tu   'Okutu'
           f. **a.**ma   'but'
           g. **ɪɪ**   'you'

The V-syllable type has been illustrated below using the word *ama* 'but':

(61) Illustration of the V-Syllable Structure. [a.ma]

```
        σ                    σ
        |                   / \
        |                  /   \
        R          O          R
        |          |          |
        |          |          |
        N                     N
        |          |          |
        |          |          |
        a          m          a
```
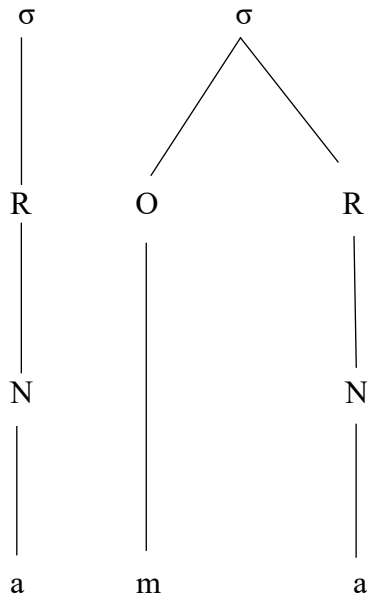
Example (61) illustrates that it is only the nucleus position that must be occupied. In the data only

one word is found that has the VV structure. This word is *ɪɪ* 'you'.

(62) Illustration of the VV-Syllable Structure. [ɪɪ]

```
        σ
        |
        |
        R
        |
        |
        N
       / \
      I   I
```

3.7 C-Syllable Structure
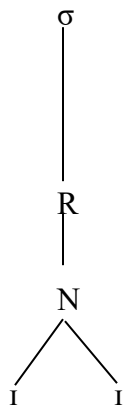
The C-syllable is a syllable in which a consonant occupies the nucleus position. These consonants that occur in this syllable type are referred to as syllabic consonants. Syllabic consonants which can form a C-syllable in Bogoŋ as observed in the data are nasals. This is illustrated in the examples below.

(63) a. **n**.te.ri   '??'
      b. **ŋ**.kwan.ta   'Nkwanta'
      c. **ŋ**.kɔ.na   'CL. come'
      d. **ŋ**.wɪɛ.na   'CL. have'
      e. **n**.ti.ri.bu   'Ntribo'
      f. **m**.bɔla   'NEG.be happy'
      g. **ɲ**.ɲĩna   'that is.because'
      h. **ɲ**.tʃaana   'that was.seating'

Below is an illustration of the C-syllable using the word *nteri*:

(64) Illustration of the C-Syllable Structure. [n.te.ri]

In the illustration above, the word *nteri* '??', which is a three-syllable word has the nasal /n/ occupying the nucleus position of the first syllable. The nasal does not occupy the onset position as it is a syllabic consonant in Bogoŋ. The other two syllables in the word follow the CV-syllable structure, with /t/ and /r/ occupying the onset positions and /e/ and /i/ occupying the nucleus positions in their respective syllable structures.

Although I am not able to provide a description of tone in Bogoŋ at this stage, it is important to note that, in his description of tone and tone marking in Bogoŋ, Kleinewillinghöfer (2022) notes that syllabic nasals, like vowels, bear tone. This supports the observation of syllabic nasals in this study as consonants that function as syllable nuclei.[11]

Nasal consonants in Bogoŋ are not always syllabic, and the distribution of syllabic nasals appears to be restricted. Syllabic nasals are not found in word medial or word final position. For example, in [ŋ.kwan.ta], the word-initial nasal is syllabic, but word-internal /n/ does not stand alone as a nucleus, but rather occupies the coda position of the syllable [kwan]. This is same in other examples, such as [bogoŋ] 'Bogoŋ', [gak͡paŋdɛ] 'Gakapande' and [aaŋ] '??'. This phenomenon can be explained with a syllabification process in Bogoŋ in which nasals are syllabified as codas when preceded by a vowel. In the sonority hierarchy, nasals are less sonorous than vowels. When occurring before or after vowels, which can qualify as a syllable nuclei, they are not syllabic but perform the function of either onsets or codas. For example, in the word [pa.nɪŋ] 'gods', the syllable [nɪŋ] contains nasals in both onset and coda. Neither nasal in this situation is qualified to stand alone as an individual syllable. This, in conjunction with the limited occurrence of consonant clusters, explains the fact that nasals only function as syllabic consonants when they precede other consonants in word initial position, for example, in words beginning with a nasal-consonant cluster, as in the example [n.ti.ri.bu] 'Ntribo'.

3.8 Summary of the Chapter

This chapter has looked at the syllable structures of Bogoŋ. Using the onset-rhyme (right-branching) structure in the description, it was shown that Bogoŋ has the following syllable

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[11] As stated by Kleinewillinghöfer (2022), I agree that there is a possibility of syllabic nasals at coda position, but I did not encounter them in the data I listened.

structures; CV/CVV, CVC, CCVC/CCV, VVC, V/VV and C. It was noted that the syllabic

consonants that occur in the C syllable type can only be nasals. Also, nasals are unique in the

language in being not just the only segments which can appear in coda position, but in being able

to appear in any position in the syllable. The most common syllable structure in Bogoŋ is CV.

The CCVC/CCV, and VVC syllable types are rare in Bogoŋ, and each of them were only found

in one word across the data.

CHAPTER FOUR
PHONOLOGICAL PROCESSES IN BOGOŊ

4.0 Introduction

This chapter discusses a number of phonological processes observed in Bogoŋ. These include assimilatory processes in the language, such as homorganic nasal assimilation, labialization, and palatalization, as well as other phonological processes including aspiration and vowel reduction governing the behaviour of the central vowel [ə]. In his work on reading and writing Bogoŋ, Kleinewillinghöfer (2022) provides some description of homorganic nasal assimilation and the distribution of [ə]. Reference to this work is provided where relevant. Descriptions of other phonological processes are based on my documentation of data from the ELAR.

4.1 Assimilatory Processes in Bogoŋ

Assimilatory processes are processes through which segments change some or all their features to resemble those of a neighbouring segment (Abercrombie, 1967; Bronstein, 1960; Jones, 1972; McCarthy & Smith, 2003). According to Katamba (1989:80) assimilation is "the modification of a sound in order to make it more similar to some other in its neighbourhood." For this reason, when a sound copies or takes the quality of a neighbouring sound, we say the phonological process called assimilation has taken place. This process has been argued to ease the pronunciation of the sounds involved, as in Katamba's (1989:80) statement that "the advantage of having assimilation is that it results in smoother more effortless, more economical transitions from one sound to another". The process of assimilation can be realised either progressively or regressively. During progressive assimilation, a sound copies the quality(-ies) of a sound that precedes it. On the other hand, regressive assimilation involves a process where a sound copies a quality of a sound that follows it. This section will show how some assimilatory processes take place in Bogoŋ. Vowel harmony

as an assimilatory process in Bogoŋ will be addressed separately and discussed in detail in chapter five.

4.1.1 Homorganic Nasal Assimilation

Homorganic nasal assimilation is an assimilatory process where a nasal consonant takes on the place of articulation feature of an adjacent consonant sound (Hock, 1986; Passy, 1890 mentioned in Ohala & Ohala, 1993). In Bogoŋ, homorganic nasal assimilation is regressive. This means, nasals assimilate to the place of the consonants that follow them. In examples (65a, b) the syllabic nasals prefixed to the words are realised with a velar place of articulation when followed by the velar sound /k/ and labial velar sound /w/, respectively. In (65c) the syllabic nasal prefixed to the word beginning with the alveolar is also realised with an alveolar place of articulation. In (65d, e) the syllabic nasals are palatalized, showing assimilation to the palatal sounds /tʃ/ and /ɲ/ that they precede. To identify the underlying forms of the nasal prefix shown here, examples where the nasal is attached to words beginning with vowel(s) need to be observed in the data. The data does not present any such examples for this prefix. For this reason, I tentatively propose an abstract nasal consonant as the underlying sound that changes according to the place of articulation of the following consonant in a particular word.

(65)   a. kɔna   'come'   **ŋ.**kɔna   'that has come'
       b. wɪɛna   'have'   **ŋ.**wɪɛna   'that have'
       c. lɪɪ   'come from'   **n.**lɪɪ   'that come from'
       d. tʃaana   'seating'   **ɲ.**tʃaana   'that was.seating'
       e. ɲĩna   'only/because'   **ɲ.**ɲĩna   'that is.because'

There is also an instance in the data I am working with where the nasal /n/, which indicates the possessive pronoun 'our', is prefixed to the word *fɪɛ.rɛ.mãŋ* 'minds'. I suspect that the /n/ undergoes assimilation to the nasal [ɱ]. However, this is difficult to hear and so I cannot be categorical about its assimilation in this case.

(66)   a. fɪɛ.rɛ.mãŋ   'minds'   **n.**fɪɛ.rɛ.mãŋ[12] 'our minds'

Homorganic nasal assimilation is also observed in negation in some words in Bogoŋ.

Examples of such words are shown in (67).

(67)   a. bɔla   'happy'   **m.**bɔla   'NEG.be happy'
        b. lɪɪ   'from'   **n.**lɪɪ   'NEG.be from'
        c. dagaa   'need'   **n.**dagaa   'NEG.be needed'

In example (67a), the syllabic nasal sound forming the negation marker assumes the place of

articulation features of the bilabial plosive /b/ that it precedes and is realised as [m]. On the other

hand, in examples (67b, c) the same negation marker is realised as an alveolar nasal [n] when

preceding the alveolar consonants /l/ and /d/, respectively.

In (65) and (67), syllabic nasals are shown to be homorganic with following consonants.

These examples also provide clear evidence of assimilation because the same morpheme is realised

with a different place of articulation, depending on the place of the following consonant. However,

my observations also include many instances where nasal codas are also realised as homorganic

to following consonants when they occur within words. Examples are provided in (68).

(68)   a. jẽ**n.**tu.mi   'Yentumi'
        b. dã**n.**da   'yesterday'
        c. bẽ**ɲ.**tʃi.aba   'benches'
        d. dɪ.tʃĩ**ŋ.**g͡bĭŋ   'assembly hall/sitting hall'
        e. ga.dõ**n.**dõ.lõŋ   'sickness'
        f. sã**m.**bɔd   'signboard'
        g. ɲã**n.**sɛ   '??'
        h. ga.nã**ŋ.**kʊ   'like/as/shall/will'
        i. je.lẽ**m.**bu   'any man'
        j. k͡pĩ**n.**d͡ʒĩm   '??'
        k. tã**ŋ.**gɪlɛ   'long time'
        l. tʃĩ**ŋ.**k͡pɪɛ   'first'

---

[12] Kleinewillinghöfer (2022:6) treated these nasals as non-bound in his discussion of the assimilation of the nasal [n]
as shown in example (69) and for that matter they appear in his discussions as separate words.

In a nutshell, the presence of homorganic nasal assimilation in Bogoŋ can be observed when nasals appear before other consonants. Although there is no evidence in the data, such as where these nasals are prefixed to words beginning with vowels to demonstrate their underlying forms, there is evidence in the data from alternations, as illustrated above, that shows that homorganic nasal assimilation is an active process in the language. The example in negation marking (35) shows an alternation between /m/ and /n/, depending on the consonant it precedes.

Kleinewillinghöfer (2022:6) discusses evidence for the underlying form of the nasal used as the 2nd person singular determiner 'your', which is /ǹ/ in its neutral or non-bound form. When this pronoun precedes a noun that begins with either a bilabial consonant or with a velar/labial-velar consonant, the determiner /ǹ/ 'your' is pronounced as [m̀] or [ŋ̀], respectively. Examples from Kleinewillinghöfer (2022:6) are provided in (69).

(69) a. ǹ tónsɛ̂   'your beard
      b. ǹ dìèsí   'your sister'
      c. ǹ bú ([m̀ bú])   'your child'
      d. ǹ páà ([m̀ páà])   'your dog'
      e. ǹ wáá ([ŋ̀ wáá])   'your house'
      f. ǹ kélî ([ŋ̀ kélî]) 'your tooth'

Similar evidence for the underlying forms of other morphemes that undergo homorganic nasal assimilation is not available in the data I am working with.

The examples in (68) also suggest that homorganic nasal assimilation does not only occur with syllabic nasals but also with nasals that occupy the coda position. However, in the word [gak͡paŋdɛ], the /ŋ/ sound does not assimilate to the following sound, /d/. This is the only exceptional case I found in the data where the nasal sound does not assimilate to the consonant it precedes. Additional examples of this apparent lack of assimilation are included in Kleinewillinghöfer (2022:6):

(70) a. dìlèŋ̀fú   'hip'
      b. ŋàŋsɛ̀   'squeeze'
      c. jìŋjìŋ   'mason wasp'
      d. lʊ̀ŋtɛ́   'relative'
      e. fʊ̀nfʊ́ŋ   'urine'

However, it is unclear how to interpret these examples. Because the phonological description provided in Kleinewillinghöfer (2022) is primarily intended as a guide to those interested in reading and writing Bogoŋ, not all phonological processes are represented in the written representations. With respect to homorganic nasal assimilation, Kleinewillinghöfer (2022:6) provides some examples of the process using transcriptions in square brackets but states that the process is regular and that there is "therefore, no need to write the assimilated forms". This suggests that examples which are provided and are not given in square brackets may in fact undergo assimilation that is not represented. For this reason, additional research is needed to see whether homorganic nasal assimilation applies differently to syllabic nasals as compared to nasals in coda position. In addition, the only example where the underlying representation of an alternating form is clear is the second person possessive marker /n-/. This also raises the possibility that nasal assimilation applies differently to different underlying nasals, another subject for future research.

4.1.2 Nasalized Vowels in Bogoŋ

Nasalized vowels (non-contrastive nasalization) occur in Bogoŋ as a result of nasality spreading from a nasal consonant to oral vowels when they appear in a nasal environment. Cross-linguistically, vowel nasalization in a nasal environment is a common assimilatory process (Bongiovanni, 2021; Clumeck, 1976; Cohn, 1993; Hajek, 1997; Solé, 1992). In the production of nasal vowels, the airstream escapes through both the oral and nasal cavity. In Bogoŋ, one

environment for nasalized vowels is when the vowels occur before a nasal consonant in the same

syllable.[13] Below are examples that illustrate nasalized vowels before nasal consonants in Bogoŋ:

(71) /u/   ga.dũn   'Gadun'
     /o/   bo.gõŋ   'Bogoŋ'
     /ɪ/   pa.nĩŋ   'gods'   dĩŋ   'we'
           d͡ʒĩŋ   'know'
     /a/   ŋ.kwãn.ta   'Nkwanta'   nãŋ   'inside'
           dãn.da   'yesterday tãŋ   'not'
           t͡ʃãm   'case'   mãŋ   'I did not/ I do not'
           mɪ.nãŋ   '??'   n.fɪɛ.rɛ.mãŋ 'our minds'
     /ʊ/   wõŋ   'who/that' tõm   'worship'
           ga.dõn.dʊ.lõŋ   'sickness'
     /ɔ/   bɔ̃n.tɪ.bɔ   'Bontibor' kɔ̃ŋ   'come/pass'
     /e/   jẽn.tu.mi   'Yentumi'

In addition, vowels are also nasalized when they appear after the nasals /ŋ/ and /ɲ/ in the

same syllable:

(72) /ĩ/   ŋĩĩ   'it'   ɲĩ.na   'only'
           ŋĩ.dʊɔ   'so'   dɔ.ŋã   'each other'
     /ã/   sa.ŋã   '??'   ɲã   'you'
     /ĩ/   ɲĩ.ŋẽŋ   '??'

The post-nasal nasalization does not occur following /n/ and /m/, as illustrated in the

following examples:

(73) na   'and'   a.ma   'but'
     mʊ   'take'   ma   'I am'
     na   'see'   jẽn.tu.mi   'Yentumi'
     wɪɪ.na   'this one'   d͡ʒɪ.na   'here'
     ti.ri.na 'close/near' dʊ.mʊ   'it'
     mʊ   'take'

---

[13] The vowels /ɛ/, /e/ and /i/ have not been encountered in the data in the relevant environment. However, all other sounds are nasalized in this environment observed across the data. A further exploration of the data may be needed to confirm that these vowels are also nasalized in the same environment, as expected.

4.1.3 Labialization/rounding

Labialization is a secondary articulation that causes some consonant sounds to be produced with lip rounding. This same gesture is made in the production of [+round] vowels and labialization is triggered by rounded vowel segments following consonants (Evans, 1995; Hudson, 1995). Abakah (2012) demonstrates how syllable-initial consonants in Akan (a Kwa language of the Niger-Congo language family spoken in Ghana) which immediately precede a [+round] vowel are labialized or at least subjected to some level of labialization. Like Akan, in Bogoŋ (a Gur language of the Niger-Congo language family), consonants that are also syllable-initial are labialized when they are followed by a [+round] vowel. When this assimilation occurs, consonants that are produced as unrounded segments with spread lips are now rounded due to the presence of a rounded vowel after such consonants (labialization is marked with the superscript /ʷ/). Examples of labialization of sounds in Bogoŋ words include the following. [14]

(74)   a. ga**dʷ**ũn   'Gadun'
       b. ŋɪ**dʷ**ʊɔ   '??'
       c. **lʷ**ʊ**rʷ**ʊ   'birth/common'
       d. **sʷ**ʊ**lʷ**ʊ   'plead'
       e. **gʷ**ʊʊ   'of'
       f. **kʷ**ʊ**lʷ**ʊ   'moving'
       g. b**ʷ**o**gʷ**oŋ   'Bogoŋ'
       h. **dʷ**ʊmʊ   'it'
       i. **kʷ**ob**ʷ**o **kʷ**ob**ʷ**o   'profit'
       j. jen**tʷ**umi   'Yentumi'
       k. **dʷ**oole   'by all means'
       l. di**k͡pʷ**oŋ**gʷ**u   'Dikpongu
       m. **pʷ**useŋ   'spread'
       n. a**t͡ʃʷ**ode   'Akyode'
       o. **kʷ**ɔnɛ   'come'

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[14] There seems to be extra labialization of labials, but data in video format will be needed to confirm this. This also applies to labial-velar /k͡p/. As a native speaker of Tem, a closely related language to Bogoŋ, I can report that labials in these environments undergo extra labialization.

4.1.4 Palatalization

Palatalization is the assimilatory process which causes sounds to be produced with palatal features in the environment of high or front vowels or glides. This assimilation process in Bogoŋ is not full palatalization, which involves a change in major place of articulation, but rather secondary palatalization: This causes a consonant which precedes a high or front vowel to maintain its identity regarding its underlying consonantal articulation while simultaneously realizing the palatal feature of the following vowel as a secondary articulation. In other words, the consonant does not lose its underlying place features but rather acquires the spreading palatal feature of the coronal vowel. Schachter & Fromkin (1968), Abakah (1978, 1993), an Dolphyne (1988), amongst others, demonstrate that palatalization is observed in Akan (a Kwa language, a sub family of Niger-Congo spoken in Ghana). Palatalization in Bogoŋ causes a consonant to acquire palatal features when it occurs before the front high vowels /i/ and /ɪ/. In Bogoŋ, non-palatal consonants take the palatal features of high vowels which are described to be produced with the body of the tongue raised towards the palatal region. In other words, when these consonants precede the high front unrounded vowels /i/ and /ɪ/, they are caused to become palatalized. Palatalization is marked with the superscript /ʲ/ after the palatalized consonant sound. Examples of these are shown in (75).

(75) a. **t**ʲiib**ʲ**i   'land'
      b. **d**ʲiele   'where'
      c. nt**ʲ**ir**ʲ**ibu   'Ntribo'
      d. bate**r**ʲi   'it's.theirs'
      e. **b**ʲie   'child'
      f. ke**r**ʲi   'Keri'
      g. **d**ʲi**k͡p**oŋgu   'Dikpongu'
      h. d**ʲ**ɪ   'we'
      i. **l**ʲɪɪ   'come from'
      j. di**k**ʲɪlet**ʲ**ie   'dikieletie'
      k. **w**ʲɪɛna   'to have'
      l. **k͡p**ʲɪn   'the reason (that)'
      m. **k͡p**ʲin**ʲ**iŋ   '??'

n. **wʲɪɪlʲɪŋ**	'difficult'
o. **baragʲɪɪ**	'separate'
p. **kʲilʲinsʲi**	'roam'

4.2 Aspiration

Aspiration is realised through the spread state of the glottis, which increases airflow and delays the onset of voicing in a following vowel. According to Bodomo (1997:12, cited in Agoswin, 2010:98), "voiceless plosives are usually aspirated when they occur in primary syllable initial position." Agoswin (2010:98) also notes that in Kusaal (a Gur language spoken in the northern part of Ghana), "the consonants [p, t and k] are the candidates which are produced with a greater degree of force when they occur at the beginning of a syllable." From the above view, it can be seen that aspiration mostly applies to voiceless stops that appear in the initial position of a syllable. (Aspiration in transcription is represented by the superscript /ʰ/). In Bogoŋ, aspiration occurs on /t/, /k/, /p/ and /k͡p/. The Bogoŋ data shows that when /t/, /k/, /p/ or /k͡p/ occur in the initial position of a syllable, they become aspirated. It is important to state that these consonants are always aspirated because they only occur in the onset position of the syllable in Bogoŋ. Examples are shown in (76).

(76)	a. **tʰaŋ**	'not'
	b. **kʰe.ri**	'Keri'
	c. **p͡ʰɔɪ**	'before'
	d. **k͡pʰãn.dʊ**	'Kpando'
	e. t͡ʃɪŋ.**k͡pʰɪɛ**	'??'
	f. wʊ.**k͡pʰa**	'a person/somebody'
	g. **k͡pʰɪɪ**	'??'
	h. ba.**k͡pʰa**	'people'
	i. **k͡pʰa.la.na**	'learn'
	j. jɛ̃n.**tʰu.mi**	'Yentumi'

In most African languages, aspiration is reported on all voiceless stops except (voiceless) labial velars which are specifically unaspirated (Cahill, 2008: 389-390). However, there are rare situations where aspiration on /k͡p/ is noted. Dagaare is one such example. Cahill (2008) noted that

through his personal communication with Adam Bodomo (a linguist and a native speaker of Dagaare), he was informed that /k͡p/ in Dagaare is however much less aspirated than /p/. This is the case of /k͡p/ in Bogoŋ, based on my impressionistic observations. Instrumental investigation of aspiration differences across places of articulation is a matter for future research.

In Bogoŋ, aspiration interacts with palatalization when high front vowels are preceded by plosives. These consonant sounds are both aspirated and palatalized simultaneously. Examples are:

(77)   a. **k͡pʰʲ**ɪɪ   'affects'
        b. **t͡ʃʰʲ**ĩŋ.**k͡pʰʲ**ɪɛ   '??'
        c. **tʰʲ**ii.bʲi   'land'
        d. n.**tʰʲ**i.rʲi.bʷu   'Ntribo'

Aspiration also interacts with labialization in Bogoŋ when voiceless consonants precede round vowels. Examples where this is observed are:

(78)   a. sʷu.**kʰʷ**uu.bʷu   'student/school child'
        b. jẽn.**tʰʷ**u.mʲi   'Yentumi'
        c. **kʰʷ**o.bʷo **kʰʷ**o.bʷo   'profit'

4.3 Vowel Reduction

As described in Kleinewillinghöfer (2022), the short vowel [ə] in Bogoŋ is not phonemic but is used as an allophone for the vowels /i/, /ɪ/, and /e/ when they occur between two consonants. [ə] is also an allophone of /ɛ/ when a verb with final /ɛ/ is followed by an object, or when a noun with final /ɛ/ is followed by a numeral or another number (Kleinewillinghöfer, 2022). The reduction to [ə] occurs when the words which follow the words ending in /ɛ/ also begin with a consonant (Kleinewillinghöfer, 2022:8).

(79). Distribution of [ə] (Examples from Kleinewillinghöfer, 2022:8)

vowel	Underlying form	Alternation with [ə]	Gloss
/i/	dìtúŋ	[də̀túŋ]	'clearing a site'
/ɪ/	líŋ	[lə́ŋ]	'water'
/e/	bèŋì	[bə̀ŋì]	'horse'
/ɛ/	Mà tíŋɛ dóm.	Mà [tíŋə] dóm.	'I cooked soup'
	wààsὲ sílà	[wààsə̀] sílà	'two houses'

From the above, it can be concluded that the mid-central vowel [ə] is used as an allophone for non-low front vowels, in the environments as explained above.

Kleinewillinghöfer (2022:9) also observes that there are words (mostly loanwords) that are realised with [ə] but do not show alternations with any other vowel. In this case, it is unclear what the underlying vowel should be. Also, Kleinewillinghöfer (2022:8) suggests that there is some phonetic difference between the [ə] that alternates with a [-ATR] vowel and the one that alternates with a [+ATR] vowel. This difference is not easily noticeable and will require further acoustic study to substantiate this claim. This is a topic to be considered in future studies.

From the data which I documented, I found examples, similar to those provided by Kleinewillinghöfer (2022), where /i/, /ɪ/ and /e/ sandwiched between two consonants are realised as the short central vowel [ə]. Examples of these are given in (80).

(80)

vowel	Underlying form	Alternation with [ə]	Gloss
/i/	ntiribu	[ntərəbo]	'Ntribo'
/ɪ/	dɪtawɪ	[dətawɪ]	'language'
/e/	puseŋ	[pusəŋ]	'spread'
/ɛ/	daa naana taasɛ ba	daa naana [taasə] ba	'our grandfather asked them'

4.4 Summary

This chapter deals with several phonological processes observed in Bogoŋ. These include assimilatory processes in the language, aspiration, and vowel reduction. Specific discussions are included on homorganic nasal assimilation, palatalization, labialization, and nasalization. I also discuss aspiration and how it interacts with other assimilatory processes like labialization and palatalization. The distribution of the mid vowel [ə] in Bogoŋ was also discussed, informed by description provided by Kleinewillinghöfer (2022). This chapter demonstrates how Bogoŋ sounds and features go through processes to modify their form(s) to conform to the structures accepted in the language.

CHAPTER FIVE
ATR HARMONY IN BOGOŊ

5.0 Introduction

This chapter addresses [ATR] harmony in Bogoŋ, first, by giving a brief literature review on issues in [ATR] harmony more generally, followed by a description of [ATR] phenomenon observed in the language in the context of this literature. Descriptions of the Bogoŋ phonemic inventory, syllable structure, and phonological processes provided in previous chapters are based on my own analysis of data in the ELAR. Where relevant, I have noted cases in which these descriptions are corroborated by, or differ in certain respects from, the description of Bogoŋ provided in Kleinewillinghöfer (2022). In the case of [ATR] harmony, however, Kleinewillinghöfer's (2022) description is informed by details about morphological structure that are unavailable based on the recordings and orthographic transcriptions in the ELAR. For this reason, although the basic description of the Bogoŋ vowel inventory and [ATR] harmony within words is based on my own observations, details regarding harmony in morphologically complex forms and the behaviour of specific affixes relies on data and descriptions provided by Kleinewillinghöfer (2022). Sections 5.1-5.3 include a literature review on theoretical and typological issues relating to [ATR] harmony, including discussion of directionality, and the role of symmetry and inventory shape in shaping harmony patterns. Remaining sections provide a description of [ATR] harmony in Bogoŋ. This includes how [ATR] harmony is observed in roots, prefixes, and suffixes. Although a formal phonological account is beyond the scope of this thesis, behaviour of the mid vowel /ɛ/ and the low vowel /a/ in suffixes is considered in light of the theory of Grounded Phonology (Archangeli & Pulleyblank, 1994). This section will show that patterning in the Bogoŋ harmony system has properties which are relevant to theoretical questions raised in the study of [ATR] harmony more generally.

5.1 ATR Harmony

ATR harmony refers to phonological processes and phonotactic constraints which require vowels within some domain to agree in the feature [ATR]. In its simplest form, ATR harmony is found in languages with a symmetric system of ten contrastive vowels made up of five [+ATR] vowels and five [-ATR] vowels, as occurs in some Sub Saharan African languages (Andersen, 1989; Anderson, 1999; Crouch & Herbert, 1997; Kaye, 1982; Kilpatrick, 1985; Rennison, 1984; Sapir, 1965). An example of such a vowel system is provided below (Casali, 2008:499).

(81)   Ten-vowel ATR harmony language
        a. [+ATR] vowels

	front	central	back
high	i		u
mid	e		o
low		ə	

        b. [−ATR] vowels

	front	central	back
high	ɪ		ʊ
mid	ɛ		ɔ
low		a	

In the vowel system illustrated in (81), there are five pairs of vowels with each pair sharing the same properties in terms of height, backness, and rounding. The vowels in each pair only differ in the [ATR] value. When the [ATR] value of one of the pair is changed, it will make it identical to the other member of the pair. In languages that display [ATR] harmony, the paired vowels alternate with one another, depending on other vowels within a form. These paired vowels are referred to as harmonic counterparts. In this case, /i/ is the harmonic counterpart of /ɪ/, /u/ is the harmonic counterpart of /ʊ/, and so on (Casali, 2008). Languages with such harmony systems normally do not allow opposite harmony sets to co-occur in the same root morpheme. Root vowels are harmonic in their value of [ATR].

[ATR] agreement typically goes beyond roots and includes affixes as well, making it extend throughout the word. In theses cases, the vowels in affixes alternate, changing their [ATR] value to match those of the root. As stated by Casali, although there are interesting cases of roots changing their [ATR] value to agree with affixes, in most cases, affixes change their [ATR] value to match that of the root. These affixes are referred to as 'harmonizing affixes'. Casali (2008:500) provides an example of harmonizing affixes in Kasem, a Gur language spoken in Ghana and Burkina Faso.

(82)   a. With [−ATR] root vowels

dʒɪn-a	hand
nag-a	leg
zʊn-a	calabash
kɔg-a	back

        b. With [+ATR] root vowels

dig-e	room
leŋ-e	song
bug-e	river
tʃoŋ-e	path

The harmonizing affix in the examples above is used to mark the singular form of certain nouns, that are referred to by Callow (1965) as Nominal Group C (Casali, 2008). In the examples, when the affix follows noun roots with [-ATR] vowels as in (82a), it is realised as the [-ATR] vowel [a]. On the other hand, when it follows roots with [+ATR] vowels, like in (82b), it is realised as the [+ATR] vowel [e].

[ATR] harmony languages also in some cases show exceptions to the general harmony pattern. Thus, in these languages, it is not abnormal to see some affixes idiosyncratically fail to undergo harmony. Also, some roots may fail to conform to the general harmony patterns of roots in the language. Languages with harmony may also limit the domain of [ATR] agreement to just 'an identifiable span of segments or morphemes that are smaller than the word' (Casali,

2008:501), while in other cases harmony agreement goes beyond the word level. The sections below will discuss issues involving directionality in [ATR] spreading, symmetry and inventory shape, and the patterning of [ATR] harmony in Bogoŋ.

5.1.1 Directionality in [ATR] Spreading

[ATR] harmony languages appear to show significant variation when it comes to direction of spreading. In languages like Yoruba, spreading appears to be leftward while in other languages it appears to be rightward (Casali, 2008). In some languages (e.g., Akan, Clements, 1985; Nkengo, Leitch, 1996) harmony is bi-directional. In this case, both prefixes and suffixes harmonize with the root vowels. Baković (2000, 2001, 2003) proposes that the direction of spreading in an [ATR] harmony language is predictable from the morphological structure of the language. In this account, the preferred direction of spreading is universally 'root-outward'. Thus, the direction of spreading should emanate from roots to affixes. In this respect, it is expected that [ATR] spreading be leftward in languages with only prefixes, rightward in languages with only suffixes, and bi-directional in languages with both prefixes and suffixes.

It is possible to have an [ATR] harmony language in which roots are the only domain for harmony, with no situation where the [ATR] values of affixes change to harmonize with that of the root. This case, if it exists, is rare (Casali, 2008). The most known feature of most [ATR] harmony languages is the existence of some assimilatory process involving affixes. As noted by Casali (2008), two different types of harmony patterns are observed in the literature. The first type is the one known as 'root-controlled (or "stem-controlled") harmony', as discussed above and illustrated in the Kasem examples given in (82). In these languages, the [ATR] values of affix vowels change and harmonize with those of the root. The second type is 'dominant harmony' (or "dominant-recessive harmony"). In these languages, there are what are called 'dominant affixes',

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which differ in two ways from harmonizing affixes. First, they do not alternate in their [ATR] value, but are invariantly [+ATR], whether they are attached to a [+ATR] or a [-ATR] root. The most interesting part is the second distinguishing factor, where [-ATR] root vowels become [+ATR] when these invariantly [+ATR] affix vowels are attached to the root. When the dominant [+ATR] affix is a suffix, any prefixes associated with the word will also typically become [+ATR] (Casali, 2008). It is also important to state that there are languages where [-ATR] can be dominant. The behaviour of dominant [+ATR] affixes is illustrated by (Casali, 2008:514) using the Maasai examples in (83).

(83) a. Root [sʊ́j]   'follow'
      b. ɛ́-sʊ́j   'he will follow'
         3s-follow
      c. e-suj-íé   'he will follow using it (e.g., a car)'
         3s-follow-INSTR
      d. Root [bɛ́l]   'break'
      e. ɛ́-bɛ́l   'he will break (it)'
         3s-break
      f. e-bel-íé   'he will break (it) using it'
         3s-break-INSTR

5.1.2 Symmetry and Inventory Shape

As noted by Casali (2008) and discussed above, in (82), Kasem presents an example of the most symmetric case of [ATR] harmony with ten vowels, each of which has a counterpart from which it minimally differs in [ATR]. However, the most common systems lack an [ATR] contrast among the low vowels, leading to a nine-vowel phonemic system with five [-ATR] but only four [+ATR] vowels (Casali, 2008:502).

(84)   Nine-vowel ATR harmony language (adapted from Casali, 2008:502)

a. [+ATR] vowels

	front	central	back
high	i		u
mid	e		o

b. [−ATR] vowels

	front	central	back
high	ɪ		ʊ
mid	ɛ		ɔ
low		a	

Nine-vowel [ATR] harmony languages are very common, most prominently within Niger-Congo and Nilo-Saharan, including well-known examples like Akan and Maasai. Bogoŋ also falls under this category. Nine-vowel languages also display both affix harmony and root-internal harmony, as seen in ten-vowel systems. The exception in this case is that, in most languages, the low [-ATR] vowel /a/ can occur with [+ATR] vowels in root morphemes (Casali, 2008). Alternatively, in some languages, the [-ATR] low vowel may alternate even though it lacks a harmonic partner in the inventory. Many nine-vowel [ATR] harmony systems have more vowel qualities in surface forms than in underlying forms, with one or more vowels in the inventory having both a [+ATR] and a [-ATR] allophone. Thus, most languages with nine contrastive vowels, as shown in (84), have a tenth vowel on the surface, predictably a [+ATR] variant of /a/ that occurs in contexts where a [+ATR] vowel can trigger harmony (Casali, 2008:502).

In dealing with the behaviour of /a/, Casali (2008) puts forth three questions about /a/ which distinguish the range of patterns in nine-vowel languages: First, can /a/ co-occur with [+ATR] vowels in roots? Second, where /a/ occurs in words with [+ATR] vowels (either as a root or affix vowel), how is it realised phonetically? Finally, if /a/ intervenes between an underlying [+ATR]

vowel and an underlying [-ATR] vowel (as in a hypothetical sequence /CiCaCɛ/ or /CɛCaCi/, does it prevent the latter from assimilating to the underlying [+ATR] vowel?

In a few nine-vowel languages like Konni (M. Cahill, 1992, 1999), the answer to the first question is no. There are no roots that combine /a/ with [+ATR] vowels (Casali, 2008). However, in most nine-vowel languages, /a/ can occur in roots with either [+ATR] or [-ATR] vowels. Even in these cases, however, there can be restrictions on how /a/ co-occurs with [+ATR] vowels. In Nawuri (Casali, 2008), for example, roots in which /a/ co-occurs with [+ATR] vowels are common, but roots combining /a/ with [+ATR] mid vowels /e/ or /o/ are very rare. Casali (2008) illustrates the co-occurrence of /a/ with [+ATR] and [-ATR] vowels in the Central Sudanic language Ngiti (adapted from Kutsch, 1994) below. All examples in (85) and (86) are from Casali (2008:528)

(85)   Co-occurrence of /a/ with [−ATR] vowels
        a. hìmbà   'sword'
        b. mʊ́là   'old man'
        c. lémà   'victory'
        d. kɔβà   'calabash'
        e. làlì   'yam'
        f. mànzɛ   'banana juice'
        g. kamà   'chief'
        h. kàzʊ   'fire'
        i. alálɔ   'bat'

(86)   Co-occurrence of /a/ with [+ATR] vowels
        a. lìgà   'big elephant'
        b. músà   'banana species'
        c. kpěkà   'bird species'
        d. màwozà   'thread'
        e. kàkì   'hoop net'
        f. màâé   'shrub species'
        g. làtú   'breastplate'
        h. màhò   'herd'

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Other attested patterns in African vowel systems include languages which have a seven-vowel inventory that lacks the mid [+ATR] vowels /e/ and /o/, as indicated in (87). In still another pattern, a seven-vowel inventory may lack the high [-ATR] vowels /ɪ/ and /ʊ/ as shown in (87). The former occurs in Kinande (Mutaka, 1995), while the latter occurs in Yoruba (Archangeli & Pulleyblank, 1989; Awobuluyi, 1967).

(87)   Seven-vowel language (type 1) (From Casali, 2008:502-503)
       a. [+ATR] vowels
               front   central   back
       high   i   u

       b. [−ATR] vowels
               front   central   back
       high   ɪ   ʊ
       mid   ɛ   ɔ
       low   a

(88)   Seven-vowel language (type 2) (From Casali, 2008:503)
       a. [+ATR] vowels
               front   central   back
       high   i   u
       mid   e   o

       b. [−ATR] vowels
               front   central   back
       mid   ɛ   ɔ
       low   a

In both systems, there are also eight-vowel variants in which a non-high central vowel /ə/ functions as the [+ATR] counterpart of /a/. Languages seen to have the second inventory are more common and widespread in West and Central than in East Africa. On the other hand, languages of the first type are much less common on the whole (Casali, 2008).

Although these cases illustrate ATR harmony primarily occurring in languages in which [ATR] is contrastive, there are also cases of purely allophonic ATR harmony in a number of

languages with underlying five-vowel inventories of the type in (89), in which [ATR] is not contrastive for either high or non-high vowels.

(89) Five-vowel language (From Casali, 2008:503)
      a. [+ATR] vowels
              front   central   back
      high   i   u

      b. [−ATR] vowels
              front   central   back
      mid   ε   ɔ
      low   a

In these languages, the mid vowels are phonetically realised as [-ATR] vowels [ε] and [ɔ], but in certain cases they undergo assimilation to neighbouring high [+ATR] vowels /i/, /u/ and surface as [+ATR] allophonic variants [e], [o] (Casali, 2008). Example of a well-known language of this type is Pulaar (Archangeli & Pulleyblank, 1994; Paradis, 1992), a West Atlantic language. Another reported case is found in Bantu languages Tsonga (Parkinson, 1996) and Zulu (Khumalo, 1987; Westermann & Ward, 1933, cited in Strazny, 2003).

Different languages exhibit different inventory shapes. The ten-vowel system provides an example of the most symmetric case of [ATR] harmony with each having a harmonic counterpart in the inventory. In other cases, there are systems with nine-phonemic vowels, seven-phonemic vowels and even five-phonemic vowels. The most common of the systems is the nine-phonemic vowel system in which there is a lack of [ATR] contrast among low vowels.

5.2 Vowel Harmony in Bogoŋ

The [ATR] feature as realised in Bogoŋ is both contrastive and phonologically conditioned; contrastive, in that each segment inherently has an [ATR] feature, and phonologically conditioned in cases where, due to other vowels in a domain, an [ATR] feature is determined by assimilation. The description of [ATR] properties of vowel segments in Bogoŋ will be provided primarily based

on data from the ELAR. As in many other African languages, Bogoŋ vowels can be grouped into two sets due to the position of the tongue root in their production. It is therefore expected that [ATR] harmony will result in a distribution in which only vowels that belong to one set will occur in a given word. Based on the tongue root position, the nine vowels in Bogoŋ have been grouped into advanced tongue root (indicated by a plus sign (+)) and the non-advanced tongue root (indicated with a negative sign (-)).

Set I: Advanced Tongue Root [+ATR]

(90)   [+ATR] vowels

	front	central	back
high	i		u
mid	e		o

Set II: Non-Advanced Tongue Root [-ATR]

(91)   [-ATR] vowels

	Front	central	back
high	ɪ		ʊ
mid	ɛ		ɔ
low		a	

Based on the inventory provided above, we can characterize Bogoŋ as a nine-vowel [ATR] harmony language in which the low vowel /a/ is not harmonically paired with a [+ATR] counterpart.

In examining vowel harmony across morphemes in Bogoŋ, data from Kleinewillinghöfer (2022) will be used, as it offers more detailed information on morphological structure than could be deduced from the data on ELAR. In the basic harmony assimilatory rule of Bogoŋ, prefix and suffix vowels must have the same [ATR] value as the stem vowels. Kleinewillinghöfer (2022) notes that, the vowel harmony rule can be observed with vowels of the noun prefixes and suffixes used for number and agentive marking in Bogoŋ. The vowels of these affixes are usually

assimilated to the same vowel set as the vowels of the stem of the word to which these affixes are attached. Vowel harmony does not occur in compounds which are composed of two stems and can contain vowels which belong to different sets, as illustrated in (92).

(92) a. bùrɔ̀ŋ.bíé 'hill (mountain.child)' ɲíí.tɛ́ 'lorry (head.owner)'

(Kleinewillinghöfer, 2022:11)

5.2.1 [ATR] Harmony in Roots

In Bogoŋ all vowels in a root must have the same [ATR] value. Thus, either all vowels in a root are [+ATR] or [-ATR]. This is observed in (93) and (94). Examples in (93) contain only [+ATR] vowels, while examples in (94) contain only [-ATR] vowels. In both examples, there is no situation where the root has a combination of vowels from both the [+ATR] and [-ATR] sets i.e., for example there is no situation where /i/ and /ɪ/ occur in the same root. It is important to also note that [ʌ], the [+ATR] counterpart of /a/ in prefixes, does not occur in roots. Below are examples to illustrate the points made above.

(93) a. t**ii**b**i** 'land'
      b. **o**k**u**t**u** 'Okutu'
      c. b**o**g**o**ŋ 'Bogoŋ'
      d. k**e**r**i** 'Keri'
      e. t**i**l**e**s**i** '?'

From the examples given above, it can be observed that all the vowels highlighted come from the first set (90). There is no instance where there is a word which mixes the vowels in set I with the vowels in set II (91) in the examples above.

(94) a. gɪtɛ 'common/boundary/ barrier'
      b. wɪɛna 'have'
      c. lʊrʊ 'common/birth'
      d. talɛ 'came.'
      e. bʊjanɔ 'evening'

In the examples above, it is seen that the vowels in the words are chosen only from set II (91).

Although Bogoŋ is has a 9-vowel inventory, without a [+ATR] counterpart of the low vowel, /a/ does not pattern as neutral. Bogoŋ does not have forms where /a/ co-occurs with [+ATR] vowels in a root or stem. In Bogoŋ roots, /a/ only co-occurs with other [-ATR] vowels. Examples are illustrated below.

(95)   /a/ occurrence with other [-ATR] vowels

        a. talɛ   'came'
        b. bʊjanɔ   'evening'
        c. wɪɛna   'have'
        d. ŋkɔna   'CL.come'
        e. ŋkwanta   'Nkwanta'

5.2.2 [ATR] Harmony in Prefixes

Harmony in prefixes is consistent in Bogoŋ. The harmony pattern is leftward, meaning it is root controlled. Vowels in prefixes must agree with the [ATR] feature value of the root vowel(s). Prefixes are therefore found with two variants, with one having [+ATR] vowel(s) while the other has [-ATR] vowel(s). Examples include the singular and plural markers: |dɪ- ~ di-|, |ga- ~ gʌ-| (Kleinewillinghöfer 2022:10).

(96)   [+ATR]   [-ATR]
        a. gʌ-bòtò/ʌ-bòtò   'yam(s)'   gà-bɔ̀là   'clay'
           SG.yam/PL.yam   SG.clay
        b. dì-kúúrí   'warthog'   dì-kòrɔ́   'drum'
           SG.warthog   SG.drum

                                                   (Kleinewillinghöfer, 2022:10)

Kleinewillinghöfer (2022) also notes that, in Bogoŋ, vowel harmony also governs the [ATR] value of vowels of a subject pronoun that precedes a verb, as well as of vowels of possessive pronouns that precede nouns. The vowels of the pronouns will be either [+ATR] or [-ATR], depending on vowels of the stem of the following verb or noun. Examples are from Kleinewillinghöfer (2022:10).

(97)   [+ATR]   [-ATR]

a. mʌ̀-dóò   'I slept'   mà-dʊ́ò   'I put inside.'
   I.slept   I.put inside

b. dì-dóò   'We slept.'   dì- dʊ́ò   'We put inside'
   We.slept   We.put inside

c. mʌ̀- ɲíì   'My head'   mà-líɳ̀   'My water'
   my.head   my.water

d. mʌ̀-gʌ̀fíè   'My calabash'   mà-gàtíjâ   'My hoe'
   my.calabash   my.hoe

One interesting aspect of vowel harmony affecting prefixes in Bogoŋ has to do with the behaviour of the low vowel /a/. In the Bogoŋ vowel inventory, the low vowel /a/ has no [+ATR] counterpart. As discussed in (95), /a/ occurs in roots only with other [-ATR] vowels. In prefixes, however, the [+ATR] vowel [ʌ] appears allophonically as the counterpart of /a/ when attached to roots with [+ATR] vowel(s). Underlying /a/ occurs in prefixes that are used to mark number in nouns. It also occurs in subject pronouns that precede verbs as well as possessive pronouns that precede nouns (Kleinewillinghöfer, 2022). Below are examples taken from Kleinewillinghöfer (2022) to illustrate the alternation between [a] and [ʌ].

(98)   Alternation of /a/ and /ʌ/
       [+ATR]   [-ATR]
    a.   gʌ̀- bòtò/ʌ̀-bòtò   'yam/yams   gà-bɔ̀là   'clay'
    b.   ʌ̀-kúúr-íè   'warthogs'   à- kʊ̀r-íɛ̀   'drums'
    c.   mʌ̀-dóò   'I slept'   mà-dʊ́ò   'I put inside.'
    d.   mʌ̀-gʌ̀fíè   'my calabash'   mà-gàtíjâ   'My hoe'

5.2.3 [ATR] Harmony in Suffixes

Kleinewillinghöfer (2022) notes that the rule of vowel harmony is not as strong with suffixes as it is with prefixes. Harmony in suffixes in this subsection will be discussed with respect to how high vowels, low vowels and mid vowels behave in the system. High vowels do not occur underlyingly

in suffixes in Bogoŋ. They only appear as allophones of mid vowels in a manner that is contrary to what would be expected of harmonic counterparts i.e., a [+ATR] mid vowel having a [-ATR] mid vowel counterpart. This phenomenon will be discussed in section (5.3) using grounded phonology.

Mid vowels in Bogoŋ suffixes participate in harmony in a variety of patterns which differ from what is observed for prefixes. First, there are cases in which suffixes with mid vowels which follow a harmony pattern in which both height and [ATR] are affected (Kleinewillinghöfer, 2022). These are the suffix morphemes **-sɛ̂** (used to form plural in nouns) and **-rɛ̂** (used to derive agentive nouns from verbs). Their [+ATR] counterparts are **-sî** and **-rî ~ -dî** respectively, and interestingly not **-sê** and **-rê ~ dê** (Kleinewillinghöfer, 2022). For these suffixes, the [+ATR] vowels which occur when the suffix is added to a [+ATR] stem must also be [+high].

(99) a. lʊ́ʊ́-rɛ̂[15]   'weaver'   lúú-rî   'blacksmith'
           weave.AG   bend.AG

       b. bʊ́ɔ́-sɛ̂   'holes'   búó-sî   'rivers'
           hole.PL   river.PL

Mid vowels in suffixes, generally, are poor participants in [ATR] harmony in Bogoŋ. At best they alternate with high vowels in [ATR] harmony like in (99). Kleinewillinghöfer (2022) also notes cases where no vowel harmony operates in suffixes with mid vowels. In these cases, the suffix vowels remain the same even when the vowels of the stem are [+ATR]. Examples are from Kleinewillinghöfer (2022:11).

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[15] Back vowels are not found in suffixes in the data available for this study. More data and further studies may be needed to concretely determine if this is systematic or if there are some situations where back vowels may occur in suffixes.

(100) a. Gbéŋí-rɛ̂   'slavery'   gékúó-sɛ̂   'doves
         slave.AG   dove.PL

       b. Kpírí-dɛ̂   'messenger'   sìèlí-sɛ̂   'worms'
          message.AG   worm.PL

Unlike in prefixes, the [+low] vowel /a/ in suffixes does not take part in [ATR] harmony. Examples of such suffixes are the plural suffixes **-â**, **-nâ** and **-ábâ**. Examples are from Kleinewillinghöfer (2022:10).

(101) a. lúúrî/lúúrâ   'blacksmiths'   gbéŋî/gbéŋâ   'slaves'
       b. dèèsínâ   'sisters'   dʒùó/dʒòábâ   'fathers'

Vowels that occur in suffixes appear to be more restricted than those occurring in roots and prefixes. In the data available, only /ɛ/ and /a/ appear to occur in suffixes underlyingly. [i] occurs as the [+ATR] counterpart of /ɛ/, and the vowels /o/, /ʊ/, /ɔ/ and /u/ are not observed in suffixes at all. Although the simple [+ATR] mid vowel /e/ does not occur in suffixes, this vowel quality does occur as part of a diphthong or long vowel. The diphthong [íɛ̀], which forms part of the plural marker in nouns, has the [+ATR] counterpart [íè] when attached to roots with [+ATR] vowels.

(102) a. ʎ-kúúr-íè[16]   'warthogs'   à- kòr-íè   'drums'
          PL.warthog.PL   PL.drum.PL

       b. dóm/dóm-**íè**   'soup(s)'   tɔ́n-**íɛ̀**   'skins'
          soup/soup.PL   skin.PL

According to Kleinewillinghöfer (2022:8), these diphthongs are allophones of the long vowels /ee/ and /ɛɛ/ respectively.

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[16]This example provides a situation where circumfixes also take part in harmony, with both the 'prefix' part and 'suffix' part harmonizing with the root vowels.

5.3 Bogoŋ ATR Harmony in Grounded Phonology

The behaviour of vowels in suffixes in [ATR] harmony in Bogoŋ presents an interesting pattern. The fact that non-high [+ATR] vowels are avoided in suffixes can be considered within the theory of Grounded Phonology (Archangeli & Pulleyblank, 1994). In this theory, Archangeli & Pulleyblank, (1994:167) make the point that conditions used in natural language directly reflect physical correlations of the features (or *F-elements*) involved. For example, Archangeli & Pulleyblank, (1994) note that the feature [+nasal] is characterized by velic opening which allows air freely through the nasal cavity, leading to modal voicing in the process. The phonetically based implication between nasality and voicing is realised i.e., if [+nasal] then [+voiced]. This type of physically grounded condition forms the core of Grounding theory. In the following paragraphs, Grounding theory will be used to examine the interaction of the feature [ATR] with tongue height features in the [ATR] harmony patterning in suffixes in Bogoŋ.

The tongue body and root are physically connected. A constriction of the tongue in one area requires expansion in the other, and vice versa. This leads to the situation where a gesture in one dimension correlates with a compensatory gesture in another dimension (Archangeli & Pulleyblank, 1994). This interaction of tongue root position ([±ATR]) and tongue body height ([±high] and [±low]) can shed light on why some vowels pattern in the manner they do.

Archangeli & Pulleyblank, (1994) provide a detailed analysis on how the feature high is phonetically compatible with the feature [+ATR]. The advancement of tongue root enhances the raising of the togue body, and vice versa. Therefore, [+ATR] implies [+high] not [-high], [+ATR] implies [-low] not [+low], [-ATR] implies [-high] not [+high] and [-ATR] implies [+low] not [-low] (Archangeli & Pulleyblank, 1994:175-176). With the implications of the relationship between tongue root position and tongue body height, the behaviour of the suffixes in (99) (plural markers and agentive markers) -sê [-sî] and -rê [-rî ~ -dî] can be best explained with the dependency

condition [+ATR] implies [+high] not [-high]. For a suffix containing [-ATR] /ɛ/, the harmonic counterpart is expected to be /e/. However, we see an interesting pattern where in Bogoŋ there is strong compatibility between the feature [+ATR] and the feature [+high]. The suffix vowel rather patterns with [i] as its [+ATR] counterpart, satisfying Archangeli and Pulleyblank's condition that [+ATR] implies [+high] not [-high]. This as described by Jakobson, (1980:185, as quoted in Archangeli & Pulleyblank, 1994:174): "…it is not an unusual expectation for higher vowels to have a tongue root which is more advanced [than] that for lower vowels…" The preference of [i] to [e] as the [+ATR] counterpart of /ɛ/ is because of the strong relationship between the features [+ATR] and [+high]. Though both [i] and [e] are [+ATR], [i] is [+high] while [e] is [-high, -low] making [i] favored between the two due to the relationship between [+high] and [+ATR]. In fact, this vowel can also be described as entirely unspecified for any features except [-low]. It gets [-back] by virtue of being a suffix, and [+ATR] or [-ATR] by context. This results in [+ATR, -back, -low] to which [+high] is added.

In the case of suffixes where harmony causes /ɛ/ to be realised as [i], the strong interdependency between tongue root and tongue body movement leads to the raising of the mid vowel into a [+high] vowel if there is a movement of the tongue in obedience of the [ATR] harmony rule. In other examples with suffixes with /ɛ/, this is avoided by having the suffix vowels not participate in [ATR] harmony. These suffix vowels maintain their [-ATR] value even when suffixed to roots with [+ATR] vowels like in (100).

Although the grounded conditions of Archangeli and Pulleyblank (1994) are physically motivated, they are not universally obeyed. The impact of these conditions is subject to variation depending on the phonological system of the language. In Bogoŋ, the [+ATR] mid vowel /e/, which violates the condition that [+ATR] implies [+high], occurs underlyingly in roots and as the

output of harmony in prefixes. When harmony applies to suffixes, however, this vowel is avoided. The phonological mechanisms driving harmony, such as ALIGN constraints in OT (e.g., Kirchner, 1993) or rules in a derivational model, must differ between leftward harmony, which can result in surface [e], and rightward harmony, which cannot. Alternatively, different ranking of faithfulness constraints referring to root specifications relative to faithfulness constraints referring to suffix specifications (e.g., Beckman, 1998) may play a role in the distinct patterning of suffix vowels. A formal analysis of the harmony pattern is beyond the scope of this work.

In discussing the interdependency between tongue root position and tongue body height, another relevant condition states that [+low] implies [-ATR] (Archangeli & Pulleyblank, 1994). This can be better explained by the *grounded path conditions* (Archangeli & Pulleyblank, 1994:176) on low vowels, which include the ATR/LO Condition (If [+ATR] then [-low], if [+ATR] then not [+high]), and the RTR/LO Condition (If [-ATR] then [+low], if [-ATR] then not [-low]). The claim here is that these conditions reflect the physiologically preferred configurations of tongue body height and tongue root position (D. B. Archangeli & Pulleyblank, 1994). In Bogoŋ [+high] vowels are preferred as [+ATR] counterparts while the [+low] vowel tends to be the most preferred to bear the [-ATR] feature. The [+low] [+ATR] vowel [ʌ] is not phonemic in Bogoŋ and does not occur in roots. It does, however, occur in prefixes, as the [+ATR] counterpart of /a/. This shows that harmony affecting prefixes can result in violation of the condition RTR/LO, particularly the condition that [+ATR] implies [-low]. When affecting suffixes, however, the Bogoŋ pattern, governed by ATR/LO, results in the situation where the suffix vowel /a/ remains the same, even when attached to a root with [+ATR] vowel(s).

(D. B. Archangeli & Pulleyblank, 1994) approach may also provide some explanation for the occurrence of diphthongs in suffixes. As described above, the diphthong [íὲ] has the [+ATR] counterpart [íè] when attached to roots with [+ATR] vowels as in example (103), repeated in (102).

(103) a. **ὰ-kúúr-íè**   'warthogs'   **à- kòr-íὲ**   'drums'
       PL.warthog.PL   PL.drum.PL

In the analysis provided for (99) it was noted that [+high] vowels are preferred to [-high] vowels as [+ATR] counterparts. In this situation, the long vowels surface as diphthongs so that a successful [ATR] harmony can take place with the [-ATR] [íὲ] becoming [íè] when the root vowels are [+ATR]. In these cases, the diphthongs have the crucial [+high] element in them in order to match, at least partially, the grounding condition [+ATR] implies [+high] not [-high].

5.4 Summary

This chapter explored [ATR] harmony in Bogoŋ by describing the vowels and their [ATR] features. Bogoŋ is a nine-vowel ATR harmony system that has the low [-ATR] vowel /a/ which has no [+ATR] counterpart in the phonemic inventory. The low [-ATR] vowel /a/ does, however, have [ʌ] as its [+ATR] counterpart in prefixes. [ʌ] does not occur in roots. Harmony in suffixes presents the most interesting harmony patterns, with some suffixes patterning with the mid vowel /ɛ/ having the high vowel [i] as its harmonic counterpart. In other cases, the mid vowel /ɛ/ in suffixes does not take part in [ATR] harmony altogether. The low [-ATR] vowel /a/ also does not undergo [ATR] harmony in suffixes. Grounded phonology was used to describe the harmony patterning that leads to having the high vowel [i] as the harmonic counterpart of the mid vowel /ɛ/ and not [e]. It also provides insight into why /a/ remains unchanged and does not undergo [ATR] harmony in suffixes.

CHAPTER SIX
SUMMARY, RECOMMENDATIONS, AND CONCLUSION

6.0 Introduction

This chapter presents a summary of the findings of the study, outlines its limitations, and provides some suggestions and recommendations for future research. This chapter has five sections. The first section deals with the summary of findings. Section 2 deals with the contribution of the study, and section 3 discusses the limitations of the thesis. Section 4 outlines some suggestions and recommendations, while the final section provides the conclusion.

6.1 Summary of Findings

Findings of this research relate to several key aspects of the phonology of Bogoŋ that form the thematic areas of the thesis. These thematic areas include the phonemic inventory, syllable structure, phonological processes, and [ATR] harmony.

Chapter Two of the thesis focuses on the description of the phonemic inventory of Bogoŋ. It is observed that Bogoŋ has ten surface vowels, nine of which are phonemic while one is an allophone. The ten vowels are /i, u, o, e, (ə), ɪ, a, ʊ, ɛ, ɔ/. Four of these vowels are [+ATR] (/i, u, o, e, (ə)/) and the remaining five are [-ATR] (/ɪ, a, ʊ, ɛ, ɔ/. All the vowels apart from [ə] can be lengthened in Bogoŋ. It is observed that long vowels and certain diphthongs exhibit free variation. The long vowels that usually exhibit this free variation with diphthongs include /ee/, /ɛɛ/, /oo/, and /ɔɔ/. In a distinct pattern of free variation, it is observed that long vowels in the data are in free variation with their shorter counterparts. With respect to distribution, all vowels in Bogoŋ can appear in word medial and final positions, while /o/, /a/, and /ɔ/ may appear also in initial position. The diphthongs observed in the data are /ej/, /ɛj/, /aj/, /aʊ/, /ɪɛ/ and /uo/.

In the case of consonants, twenty consonant phonemes are observed in Bogoŋ. The consonant phonemes are /p, b, t, d, k, g, k͡p, g͡b, m, n, ɲ, ŋ, r, f, s, tʃ, dʒ, j, w, l/. Regarding their distribution, all Bogoŋ consonants, except /r/, may occur in word initial position. All consonants can also occur in word medial positions. The only consonant sounds that may occur in word final position are nasal sounds, possibly excluding the palatal nasal /ɲ/, which is not observed in final position in the data.

In Chapter Three of this thesis, it is proposed that there are six main types of syllable structure in Bogoŋ. These structure types are CV/CVV, CVC, CCVC/CCV, VVC, V/VV and C. It is noted that the syllabic consonants that occur in the C syllable type can only be nasals. Also, nasals are the only consonants that may occur in any position in the syllable. The most common syllable structure in Bogoŋ is CV. The CCVC/CCV and VVC syllable types are rare in Bogoŋ.

With regards to phonological processes as discussed in Chapter Four, homorganic nasal assimilation occurs in a regressive manner. This means, nasals assimilate to the place of articulation of the consonants that follow them. In this chapter, nasalized vowels are also discussed. In Bogoŋ, vowels are nasalized due to nasality spreading from a consonant to oral vowels when they appear in a nasal environment. Labialization, or rounding, in Bogoŋ occurs when consonants that are syllable initial are followed by a [+round] vowel. Palatalization in Bogoŋ also occurs when a consonant acquires palatal features when it occurs before the front vowels /i/ and /ɪ/. Aspiration also takes place in Bogoŋ when /t/, /k/, /p/ or /k͡p/ occur in the initial position of a syllable. In fact, these consonants are always aspirated because they only occur in the onset position of the syllable in Bogoŋ. The final phonological process discussed in this chapter is vowel reduction. The vowels /i/, /ɪ/ and /e/ are reduced to [ə] when they occur between two consonants. /ɛ/ is also reduced to [ə] in the environment indicated in Chapter Four.

Chapter Five of this thesis concerns [ATR] harmony in Bogoŋ. This chapter considers the role of directionality, symmetry and inventory shape in [ATR] harmony systems, and employs an approach to understanding [ATR] harmony within the framework of Grounded Phonology. In this chapter, it was noted that [ATR] feature in Bogoŋ is both contrastive and phonologically conditioned. Bogoŋ vowels can be grouped into two sets based on the position of the tongue root in their production. Due to harmony, there is a distribution of the vowels where only vowels that belong to one set will occur in a given word. Bogoŋ is characterized as a nine-vowel [ATR] harmony language, in which the low vowel /a/ is not harmonically paired with a [+ATR] counterpart.

In Bogoŋ, all vowels in a root must have the same [ATR] value. Data provided in Kleinewillinghöfer (2022) shows that, in prefixes, vowels must agree with the [ATR] feature of the root vowel(s), whereas [ATR] harmony in suffixes is observed to be inconsistent. High vowels do not occur underlyingly in suffixes in Bogoŋ. Mid vowels are observed to participate in a variety of harmony patterns different from what is observed in prefixes. In the first case, mid vowels follow a harmony pattern in which both height and [ATR] are affected. The suffix morphemes in this case are -sê and -rê. Their [+ATR] counterparts are -sî and -rî ~ dî, respectively. In other cases, [ATR] harmony fails to apply to suffixes with mid vowels. The suffix vowels remain the same, even when the vowels of the stem are [+ATR]. It is observed that, generally mid vowels in suffixes are poor participants in [ATR] harmony in Bogoŋ.

Bogoŋ [ATR] harmony was considered in light of Grounded Phonology. Grounded Phonology provides insight into the harmony patterning that leads to having the high vowel /i/ as the harmonic counterpart of the mid vowel /ɛ/, rather than its expected [+ATR] counterpart, /e/. It also sheds light on why /a/ remains unchanged and does not undergo [ATR] harmony in suffixes.

6.2 Contribution of the Study

The contributions of this study to linguistic inquiry and to the speakers of Bogoŋ are multifaceted. The study provides a phonological description of Bogoŋ, crucial for documenting an endangered language. This contributes to the broader field of linguistics by adding to the understanding of Gurunsi languages and the Niger-Congo family. Also, by detailing the phonemic inventory, syllable structures, and phonological processes of the language, the research offers valuable insights into the phonological characteristics of Bogoŋ. This can serve not only as a reference for comparative studies with other languages but also enhance the understanding of phonological phenomena across different linguistic contexts.

The study employs and discusses various theoretical frameworks such as the Sonority Sequencing Principle and Grounded Phonology. Consequently, the work enriches theoretical discussions in phonology and may inspire further research in similar areas.

In addition, for the speakers of Bogoŋ, the study may help to foster a greater appreciation of their linguistic heritage and identity. Thus, through the documentation of their language, the research supports the community's efforts to maintain and revitalize Bogoŋ, which is vital for cultural preservation.

Finally, the findings can serve as an educational resource for both Bogoŋ speakers and linguists interested in the language. It may aid in the development of teaching materials and resources for learning Bogoŋ, thereby promoting its use among younger generations.

Overall, the study not only advances linguistic knowledge but also plays a crucial role in the preservation and appreciation of the Bogoŋ language and culture among its speakers.

6.3 Limitations of the Study

Although the thesis discusses many central issues in the phonology of Bogoŋ, due to some challenges, there are important issues that were not dealt with. Therefore, this section identifies some limitations that impact the results of the current study.

First, one significant limitation is the absence of direct interaction with native speakers or language consultants. This restricts the ability to gather nuanced pronunciations and variations of words that may differ across regions. Instead, I relied on previously collected data, which may not capture the full range of linguistic diversity within the language. The study primarily utilizes audio recordings and orthographic representations from the Endangered Language Archive (ELAR). While this data is valuable, it may not encompass all phonological aspects of Bogoŋ, particularly those that could be clarified through real-time consultation with speakers.

Second, although Bogoŋ is a tone language, the study does not consider tonal aspects due to the limitations of the available data. Tone plays a crucial role in the meaning and structure of words in tonal languages, and its exclusion may lead to an incomplete understanding of Bogoŋ phonology. The thesis suggests that additional fieldwork and engagement with native speakers are necessary for future studies on tone.

Third, the thesis is primarily descriptive, which may limit the exploration of more complex theoretical implications of the findings. While it employs some theoretical terms and concepts, a deeper theoretical analysis could enhance the understanding of the phonological features observed. This study, however, provides a foundation for such deeper theoretical analysis in the future.

Finally, the study focuses on specific phonological aspects, which may not provide a comprehensive overview of all linguistic features of Bogoŋ. Other areas, such as morphology or syntax, are not addressed, which could limit the overall understanding of the language.

These limitations highlight the need for further research and fieldwork to enrich the understanding of Bogoŋ and address the gaps identified in the current study.

6.4 Suggestions and Recommendations for Future Research

Based on the findings and limitations discussed in this chapter, the following suggestions and recommendations are advanced to help in future research on Bogoŋ.

First, it is recommended that future research includes direct engagement with native speakers of Bogoŋ. Conducting fieldwork would allow researchers to gather firsthand data on pronunciation variations, dialectal differences, and tonal aspects, which are crucial for a comprehensive understanding of the language. Given that Bogoŋ is a tone language, future studies should incorporate a detailed analysis of tone. This could involve examining how tone interacts with other phonological features and its role in meaning differentiation. Engaging with native speakers would be essential for accurately capturing tonal patterns.

While this thesis focuses on phonology, it is suggested that subsequent research explore other linguistic domains such as morphology, morphology, and semantics. A holistic approach would provide a more complete picture of the Bogoŋ language and its structure.

Also, the findings of this study could be used to create educational materials for teaching Bogoŋ. This would help promote the language among younger generations and support efforts for language revitalization within the Cala community. In addition, establishing partnerships between linguists and the Bogoŋ-speaking community could facilitate ongoing research and documentation

efforts. Collaborative projects could enhance the accuracy of linguistic data and ensure that the community's perspectives and needs are considered.

Finally, the study underscores the importance of documenting the grammar and phonology of Bogoŋ. It is recommended that initiatives be undertaken to create comprehensive language resources, including dictionaries, grammars, and audio recordings, to aid in the preservation of the language and its cultural heritage.

By implementing these suggestions, future research can build upon the foundation laid by this thesis, contributing to the understanding and preservation of the Bogoŋ language and supporting the Cala community in maintaining their linguistic identity.

6.5 Conclusion

This thesis provides a description of the phonological system of Bogoŋ, with a particular focus on the phonemic inventory, syllable structure, phonological processes, and [ATR] harmony. Significantly, this study proposes that allomorphy involving [i]~[ɛ] in Bogoŋ is due to the strong relationship between the features [+ATR] and [+high]. I propose that suffix vowels are entirely unspecified for any features except [-low]. However, [-back] is assigned as default to vowels by virtue of being (in) a suffix, and [+ATR] or [-ATR] is assigned by harmonic context. This results in [+ATR, -back, -low] to which [+high] is added, resulting in [i] and not [e]. In conclusion, this thesis not only enriches the academic discourse surrounding Bogoŋ, but also serves as a vital resource for future research and for the preservation of the language and culture of the Cala people. It underscores the importance of continued linguistic documentation and analysis to ensure the vitality of Bogoŋ and its speakers' heritage.

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