Sound Patterns in the Batak Language of Palawan

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ABSTRACT

This study examines the phonological features of the endangered Batak language spoken in Maoyon, Puerto Princesa, Palawan, with particular focus on vowel quality variations, consonant quality variations, and stress pattern variations. Grounded in phonological theory, the research aims to document and analyze the sound system of Batak, which remains underdescribed despite its critical endangerment. A qualitative research design was employed, involving fifteen native Batak speakers selected through purposive stratified sampling. Data were collected through interviews, audio recordings, elicitation tasks, and field observations, and were analyzed using phonetic transcription and thematic analysis. Findings reveal that Batak exhibits a wide range of vowel quality variations, including raising, lowering, fronting, backing, centralization, lengthening, reduction, and diphthong variation, occurring in systematic phonological environments. Consonant quality variations were also observed, particularly in processes such as lenition and palatalization, reflecting both internal phonological rules and external linguistic influences. Additionally, stress pattern variation in Batak includes penultimate, final, monosyllabic, root–based, and variable stress, demonstrating both regularity and flexibility in prosodic structure. The results indicate that Batak phonology reflects both conservative Austronesian features and adaptive changes due to language contact with Tagalog, Cuyonon, and other regional languages. These findings contribute to Batak language documentation and preservation by providing a detailed account of its sound patterns. Furthermore, the study offers valuable implications for language education, orthography development, and revitalization efforts, supporting the sustainability of this endangered linguistic heritage.

Keywords: phonetic transcription; thematic analysis; language revitalization; Austronesian linguistics; prosodic structure

INTRODUCTION

The Batak language of Palawan is widely documented as a critically endangered indigenous language undergoing rapid language shift, characterized by declining intergenerational transmission and increasing influence from dominant regional languages (Tajolosa 2015a, 2015b, 2022). This situation places Batak at risk of further structural erosion, including the potential loss of phonological distinctions embedded in everyday speech. In response to such endangerment, language documentation becomes essential, as it involves the systematic recording of spoken language data to ensure that linguistic features, including sound systems, grammar, and discourse patterns, are preserved for analysis, revitalization, and long–term archiving (Himmelmann 2006; UNESCO 2003; Woodbury 2003).

Language endangerment may lead to the loss of oral traditions, cultural and ecological knowledge, and ethnic and cultural identity, underscoring the importance of language documentation and preservation efforts (UNESCO 2003). Linguistic documentation is particularly crucial for underdescribed languages, as it creates a lasting record of speech forms, sound patterns, and communicative practices that may no longer be transmitted to younger generations (Himmelmann 1998). Centuries of tradition, oral narratives, and cultural knowledge are now at risk of disappearing within a single generation. According to the latest survey of Puerto Princesa City Planning Office as of 2010, only 416 individuals identified as Batak, including those of mixed heritage, were recorded (Tajolosa 2015a). Several sociolinguistic factors, including migration, intermarriage, and the increasing influence of dominant languages, continue to accelerate the decline of Batak, particularly among younger generations (Tajolosa 2015b, 2022). Despite these challenges, Batak identity remains strong, and the language continues to hold a special place in homes, workplaces, and neighborhoods (Tajolosa 2022).

However, the core phonological features of Batak, its sounds, rhythms, and patterns, remain underdocumented. Existing research provides only limited descriptions, focusing primarily on basic vowel and consonant inventories, but missing a richer picture of how the language actually sounds in daily life (Tajolosa 2015b; Zorc 1984). While Proto–Palawan reconstructions outline consonant inventories (Zorc 1984), surface phonological variations, including vowel quality shifts, consonant alternations, and stress patterns, remain largely undescribed, necessitating empirical analysis amid multilingual contact (Tajolosa 2015b; The Katig Collective 2024). Studies on related Batak languages in Indonesia have documented complex phonological processes, uncovering processes such as ablaut reduplication and special rules for combining sounds (Ambarita and Sembiring 2025; Barus et al. 2021). Contemporary studies have yet to comprehensively document the vowel qualities, consonant variations, and stress patterns of Palawan Batak, representing a critical gap given lexical replacement from neighboring languages (Blust 2013; Lobel 2021; Tajolosa 2015b).

Current sociolinguistic conditions further intensify the urgency of documentation. Language shift often occurs when minority language speakers increasingly use dominant regional or national languages in education, public communication, and everyday interaction (Fishman 1991). In this context, documenting Batak phonology is not only a linguistic task but also a contribution to cultural preservation and language revitalization. Tagalog, Cuyonon, and Tagbanua dominate communication in education, governance, and public domains; most Batak adults have not reached Grade 1 in school (Saavedra 2025; Tajolosa 2015b). Younger generations are increasingly multilingual, and Batak is gradually being restricted to private and familial domains. Although the language remains central to Batak identity, its use is shrinking and is now mostly limited to family spaces (Tajolosa 2015b, 2022). Many Batak families face educational challenges, as formal schooling rarely incorporates indigenous linguistic and cultural knowledge, with little traditional knowledge appearing in school lessons, further distancing Batak youth from their heritage (Saavedra 2025).

These conditions highlight the urgent need for systematic linguistic documentation. This study aims to address these gaps by systematically analyzing vowel quality variation, consonant quality variation, and stress pattern variation in Batak speech. By documenting these phonological features, the study aims to support education, contribute to language revitalization efforts, and preserve the Batak language for future generations (Saavedra 2025; Tajolosa 2015b). Through the analysis of vowel quality variations, consonant quality variations, and stress pattern variations in Palawan Batak, the research preserves authentic phonological data for linguistic study, strengthens community revitalization initiatives, and helps safeguard the language's endangered sound system from further erosion. Ultimately, the study seeks to document, analyze, and preserve these phonological features to support language revitalization and future linguistic research.

METHODS

Research Design

This study employed a qualitative–descriptive phonological approach, incorporating elements of phonetic analysis to examine sound patterns in the Batak language. This design is appropriate because phonological fieldwork requires close description of actual speech forms, sound variation, and language–specific patterns that may not be captured through purely numerical analysis (Bowern 2008; Crowley 2007). The study utilized qualitative methods, including interviews and speech elicitation, to collect linguistic data, which were then analyzed through phonetic transcription and phonological analysis (Creswell 2018). Qualitative methods were used to conduct interviews with native speakers to gather speech samples and understand the cultural context of language use. The cultural significance of language practices and their influence on phonology were examined through thematic analysis, narratives, and social contexts, consistent with qualitative approaches in phonological research (Qasim et al. 2025).

Population of the Study

The study involved members of the Batak community in Barangay Maoyon, Puerto Princesa. The total number of respondents in the study was 15 members of the Batak community at Barangay Maoyon, Puerto Princesa City.

Table 1 shows the respondents' gender profile, consisting of 5 males (33.33%) and 10 females (66.67%).

Table 1. Respondents' gender profile

Gender	Respondents
Male	5 (33.33%)
Female	10 (66.67%)

Table 2 shows the respondents' age profile, consisting 6 (40%) of participants ranging 0–17 that belongs to child/adolescent, 7 (47%) 18–59 adults, and 2 (13%) identified as Senior.

Table 2. Respondents' age profile

Age	Respondents
Child/Adolescent (0–17)	6 (40%)
Adult (18–59)	7 (47%)
Senior (60+)	2 (13%)

Table 3 shows that all 15 participants speak Batak as their primary language, with 46.67% speaking only Batak and Tagalog, 20.00% also speaking Cuyonon, 13.33% speaking Batak, Tagalog, Cuyonon, and Tagbanua, another 13.33% speaking Batak, Tagalog, and Tagbanua, and 6.67% speaking Batak, Tagalog, and Bisaya.

Table 3. Language spoken

Language Spoken	Frequency (Percentage)
Batak, Tagalog	7 (46.67%)
Batak, Tagalog, Cuyonon	3 (20.00%)
Batak, Tagalog, Cuyonon, Tagbanua	2 (13.33%)
Batak, Tagalog, Tagbanua	2 (13.33%)
Batak, Tagalog, Bisaya	1 (6.67%)

Table 4 shows that among the fifteen participants, 46.67% completed elementary education, 33.33% reached junior high, and 20.00% reported no formal schooling. Overall, most respondents have some level of formal education, though a minority remain without schooling.

Table 4. Educational attainment

Educational Attainment	Frequency
Elementary (Grades 1–6/Elementary Level)	7 (46.67%)
Junior High (Grades 7–10)	5 (33.33%)
No formal education	3 (20.00%)

Sampling Method

The study employed purposive stratified sampling, with participants selected according to age, gender, and language exposure to ensure representation of linguistic variation within the Batak community. This method helps achieve balanced subgroup representation, reduce selection bias, and strengthen the accuracy of phonological analysis across social groups (Fleetwood 2023).

Instrumentation

The study used multiple instruments for comprehensive data collection, including audio recordings of speech, questionnaires for participant profiles, and elicitation tools like word lists and minimal pairs to gather phonological data. Audio recordings are important in language documentation because they preserve actual speech data for repeated listening, verification, and future analysis (Crowley 2007; Himmelmann 1998). Elicitation tasks such as word lists and minimal pairs also help researchers identify phonemic contrasts and observe how sounds behave in different phonological environments. Field notes, observations, and surveys further provided ethnographic insights and information on language use, attitudes, and the status of Batak.

Data Gathering Procedure

For data gathering, participants were clearly informed about the study's objectives, and consent was secured from both the NCIP and local barangay officials. Researchers conducted interviews to collect demographic details and explore linguistic backgrounds, use patterns, and attitudes related to Batak. All recording activities were performed in quiet environments to ensure data clarity. The administration of questionnaires and elicitation tools allowed systematic collection of relevant information. Observational methods enabled the researchers to document Batak in everyday life and cultural contexts. Collected data was then organized and categorized according to phonological phenomena identified during analysis.

Data Analysis

Data analysis involved phonetic transcription using the International Phonetic Alphabet (IPA) with diacritics to accurately represent speech sounds. The International Phonetic Alphabet was used because it provides a standardized system for representing speech sounds across languages, including fine phonetic details that ordinary spelling systems cannot capture (Vajda 2000; Zimman 2020). This allows researchers to compare sound patterns, identify variation, and describe language–specific features more systematically. Patterns of variation in vowels, consonants, and stress were identified through systematic comparison of recorded tokens and analyzed using phonological principles, including segmental and suprasegmental analysis, to determine recurring sound processes and their environments. Diacritics were used to capture fine phonetic details such as vowel raising, lowering, fronting, backing, centralization, reduction, lenition, fricativization, and palatalization that are not fully represented by basic IPA symbols as shown in Figure 1, Figure 2, and Figure 3. This ensured precise, consistent transcription and aligns with established phonetic conventions for marking secondary articulatory features.

DIACRITICS

◌̥	Voiceless	n̥ d̥	◌̤	Breathy voiced	b̤ a̤
◌̬	Voiced	s̬ t̬	◌̰	Creaky voiced	b̰ a̰
◌ʰ	Aspirated	tʰ dʰ	◌̪	Linguolabial	t̪ d̪
◌̹	More rounded	ɔ̹	◌ʷ	Labialized	tʷ dʷ
◌̜	Less rounded	ɔ̜	◌ʲ	Palatalized	tʲ dʲ
◌̟	Advanced	u̟	◌ˠ	Velarized	tˠ dˠ
◌̠	Retracted	e̠	◌ˤ	Pharyngealized	tˤ dˤ
◌̈	Centralized	ë	◌̴	Velarized or pharyngealized	ɫ
◌̽	Mid-centralized	e̽	◌̝	Raised	e̝ (ɹ̝ = voiced alveolar fricative)
◌̩	Syllabic	n̩	◌̞	Lowered	e̞ (β̞ = voiced bilabial approximant)
◌̯	Non-syllabic	e̯	◌̺	Advanced Tongue Root	e̺
◌˞	Rhoticity	ɚ a˞	◌̻	Retracted Tongue Root	e̻
			◌̃	Nasalized	ẽ
			◌ⁿ	Nasal release	dⁿ
			◌ˡ	Lateral release	dˡ
			◌̚	No audible release	d̚

Figure 1. IPA diacritics symbols.

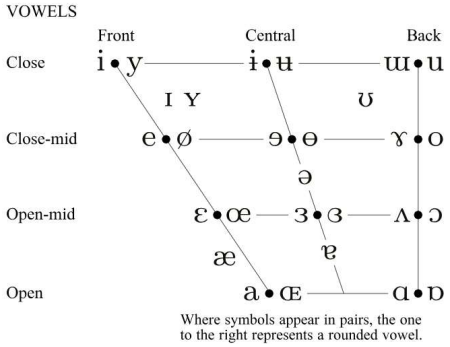

Figure 2. IPA vowels symbols.

CONSONANTS (PULMONIC) © 2015 IPA

	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal
Plosive	p b			t d		ʈ ɖ	c ɟ	k g	q ɢ		ʔ
Nasal	m	ɱ		n		ɳ	ɲ	ŋ	ɴ		
Trill	ʙ			r					ʀ		
Tap or Flap		ⱱ		ɾ		ɽ					
Fricative	ɸ β	f v	θ ð	s z	ʃ ʒ	ʂ ʐ	ç ʝ	x ɣ	χ ʁ	ħ ʕ	h ɦ
Lateral fricative				ɬ ɮ							
Approximant		ʋ		ɹ		ɻ	j	ɰ			
Lateral approximant				l		ɭ	ʎ	ʟ			

Symbols to the right in a cell are voiced, to the left are voiceless. Shaded areas denote articulations judged impossible.

CONSONANTS (NON-PULMONIC)

Clicks	Voiced implosives	Ejectives
ʘ Bilabial	ɓ Bilabial	’ Examples:
ǀ Dental	ɗ Dental/alveolar	pʼ Bilabial
ǃ (Post)alveolar	ʄ Palatal	tʼ Dental/alveolar
ǂ Palatoalveolar	ɠ Velar	kʼ Velar
ǁ Alveolar lateral	ʛ Uvular	sʼ Alveolar fricative

OTHER SYMBOLS

ʍ Voiceless labial-velar fricative
ɕ ʑ Alveolo-palatal fricatives
w Voiced labial-velar approximant
ɺ Voiced alveolar lateral flap
ɥ Voiced labial-palatal approximant
ʡ Simultaneous ʃ and x
ʜ Voiceless epiglottal fricative
ʢ Voiced epiglottal fricative
ʡ Epiglottal plosive

Affricates and double articulations

t͡s k͡p

Figure 3. IPA consonants symbols.

RESULTS

Vowel Quality Variations

Vowel quality refers to the articulatory and acoustic properties that distinguish vowel sounds in spoken language. The data reveal that vowel variation is prevalent in Batak speech, particularly through processes such as raising, fronting, lowering, backing, centralization, reduction, lengthening, and diphthong variation. These variations indicate a dynamic phonetic system in Batak, influenced by speaker variation and phonological environment as shown in Table 5. Batak speakers are also exposed to other Philippine languages, which may contribute to language contact effects (Tajolosa 2015a, 2022).

Vowel raising is observed in words such as ina (/ˈɪna/ → [ˈi̯na]) and pito (/piˈtu/ → [piːˈtu]), where vowels are produced with a higher tongue position in stressed syllables. Fronting occurs in items such as kayo (/kaˈju/ → [kæ̯ˈju]) and magsageb (/magˈsageb/ → [magˈsæ̯gəb]), particularly before /j/ or in medial positions. Lowering is evident in tubu (/tuˈbu/ → [tǫˈbu]), where the vowel is articulated with a lower tongue position in medial syllables.

Backing is observed in baba (/baˈba/ → [bɑ̟ˈbɑ̟]) and trabaho (/trabaˈho/ → [trɑ̟bɑ̟ˈho]), especially in stressed syllables, where vowels are produced with a retracted tongue position. Centralization appears in dələm (/ˈdeləm/ → [ˈdə̈ləm]), while vowel reduction is found in magkasulagı (/magˈkasulagı/ → [magˈkəsulagı]), both occurring in unstressed syllables. Lengthening is evident in dose (/doˈsı/ → [doːˈsıː]), where vowel duration is extended in stressed positions. Diphthong variation is observed in pagbalaygo (/pagbaˈlaıgo/), which is realized as [pagbaˈlaɪ̯go] and [pagbaˈlaə̯go] in different speech contexts.

Table 5. Vowel quality variations

Vowel Quality Variation	Example Words	Underlying Forms	Surface Forms	Phonological Environment
Raising	ina, pito	/ˈɪna/, /piˈtu/	[ˈi̯na], [piːˈtu]	Stressed syllables
Fronting	kayo, magsageb	/kaˈju/, /magˈsageb/	[kæ̯ˈju], [magˈsæ̯gəb]	Before /j/, medial position
Lowering	tubu	/tuˈbu/	[tǫˈbu]	Medial syllable
Backing	baba, trabaho	/baˈba/, /trabaˈho/	[bɑ̟ˈbɑ̟], [trɑ̟bɑ̟ˈho]	Stressed syllables
Centralization	dələm	/ˈdeləm/	[ˈdə̈ləm]	Unstressed syllable
Reduction	magkasulagı	/magˈkasulagı/	[magˈkəsulagı]	Unstressed syllable
Lengthening	dose	/doˈsı/	[doːˈsıː]	Stressed syllables
Diphthong Variation	pagbalaygo	/pagbaˈlaıgo/	[pagbaˈlaɪ̯go], [pagbaˈlaə̯go]	Stressed and casual speech

Overall, the analysis identified eight types of vowel quality variation in Batak, each occurring in specific phonological environments. These results show that vowel variation occurs across both stressed and unstressed syllables, as well as in medial, final, and coarticulatory contexts, reflecting a highly dynamic and context–sensitive vowel system.

Consonant Quality Variations

Through the examination of the Batak corpus, specific consonant quality variations were identified and organized into three primary categories: stop lenition, stop secondary palatalization, and glide secondary palatalization. Rather than imposing a rigid structure, this classification highlights language–specific adaptations that reflect Batak's phonotactic constraints and phonological processes as shown in Table 6.

Stop lenition is observed in words such as tubu (/ˈtu.bo/ → [tʊ.ˈt̄bo]), tug (/ˈtug/ → [ˈtʊg̈]), taro (/ˈta.ro/ → [ˈt̄a.rʊ]), pito (/ˈpi.tu/ → [pɪ.ˈt̄ʊ]), binit (/bɪˈnit/ → [bɪˈnɪt̄]), and batu (/ˈba.tu/ → [baˈt̄ʊ]), where stops are realized as unreleased consonants [C̄] across initial, medial, final, and coda positions

Stop secondary palatalization is observed in kayo (/ˈka.ju/ → [ˈkʲa.jʊ]), pabukid (/paˈbu.kid/ → [pabʊˈkʲɪd]), kideng (/ˈki.dɛŋ/ → [ˈkʲiːdɛŋ]), and tubay (/tuˈbaı/ → [tʊˈbʲaı]), where stops acquire palatal secondary articulation in the presence of front vowels and glides.

Glide secondary palatalization is found in uway (/ʊˈwaı/ → [ʊˈwʲaı]), where the glide /w/ is realized with palatal secondary articulation in a fronted vocalic environment.

Table 6. Consonantal Quality Variations.

Consonant Quality Variation	Example Words	Underlying Forms	Surface Forms	Phonological Environment
Stop Lenition	tubu, tug, taro, pito, binit, batu	/ˈtu.bo/, /ˈtug/, /ˈta.ro/, /ˈpi.tu/, /bɪˈnit/, /ˈba.tu/	[tʊ.ˈt̄bo], [ˈtʊg̈], [ˈt̄a.rʊ], [pɪ.ˈt̄ʊ], [bɪˈnɪt̄], [baˈt̄ʊ]	Initial, medial, final, and coda positions
Stop Secondary Palatalization	kayo, pabukid, kideng, tubay	/ˈka.ju/, /paˈbu.kid/, /ˈki.dɛŋ/, /tuˈbaı/	[ˈkʲa.jʊ], [pabʊˈkʲɪd], [ˈkʲiːdɛŋ], [tʊˈbʲaı]	Before front vowels and glides

Consonant Quality Variation	Example Words	Underlying Forms	Surface Forms	Phonological Environment
Glide Secondary Palatalization	uway	/ʊˈwaɪ/	[ʊˈwʲaɪ]	Fronted vocalic environment

Overall, these results show that consonant quality variation in Batak occurs systematically across different positions and phonological environments, including coda, and coarticulatory contexts.

Stress Pattern Variations

Stress is a key suprasegmental feature in Batak, shaping the language's rhythm, clarity, and lexical identity. The data show that stress occurs in penultimate, final, monosyllabic, and root–based patterns, distributed across different word types and morphological structures as shown in Table 7.

Final stress is observed in words such as daun (/daˈun/), bulan (/buˈlan/), saging (/saˈgiŋ/), balay (/baˈlay/), apun (/aˈpun/), and sapa (/saˈpa/), where stress falls on the final syllable. It is also present in affixed forms such as naglabag (/naglaˈbag/), nagdena (/nagdɪˈna/), magkaubra (/magkauˈbrɐ/), and pabukid (/pabʊˈkɪd/), where stress is realized on the final syllable of the root.

Penultimate stress occurs in words such as aldaw (/alˈdaw/), degwa (/dəˈgwa/), gata (/gaˈta/), sampulok (/samˈpulok/), and tubay (/tuˈbaɪ/), where prominence falls on the second–to–last syllable.

Monosyllabic stress is found in forms such as tug (/tug/), bay (/baj/), lang (/laŋ/), and gaw (/gaw/), where the single syllable carries stress. Additional forms such as a (/ˈa/), ay (/ˈaɪ/), and na (/ˈna/) show stress when produced in isolation or in emphatic contexts.

Root–based stress is observed in morphologically complex forms such as magluto (/magˈluto/), magbatu (/magbaˈtu/), magkuha (/magkuˈha/), magbantay (/magbanˈtaɪ/), magpaapuy (/magpaˈapoy/), magkayo (/magkaˈjo/), manilig (/manɪˈlɪg/), and magpabukid (/magpabuˈkid/), where stress is realized on the root syllable.

Table 7. Stress pattern variations

Stress Pattern	Example Words	IPA Forms	Stressed Syllable	Morphological Context
Penultimate Stress	aldaw, degwa, gata, sampulok, tubay	/alˈdaw/, /dəˈgwa/, /gaˈta/, /samˈpulok/, /tuˈbaɪ/	Second–to–last syllable	Simple and polysyllabic words
Final Stress	daun, bulan, saging, balay, apun, sapa	/daˈun/, /buˈlan/, /saˈgiŋ/, /baˈlay/, /aˈpun/, /saˈpa/	Final syllable	Simple words
Final Stress (Affixed)	naglabag, nagdena, magkaubra, pabukid	/naglaˈbag/, /nagdɪˈna/, /magkauˈbrɐ/, /pabʊˈkɪd/	Final syllable	Affixed forms
Monosyllabic Stress	tug, bay, lang, gaw, a, ay, na	/tug/, /baj/, /laŋ/, /gaw/, /ˈa/, /ˈaɪ/, /ˈna/	Single syllable	Monosyllabic forms
Root–Based Stress	magluto, magbatu, magkuha, magbantay, magpaapuy, magkayo, manilig, magpabukid	/magˈluto/, /magbaˈtu/, /magkuˈha/, /magbanˈtaɪ/, /magpaˈapoy/, /magkaˈjo/, /manɪˈlɪg/, /magpabuˈkid/	Root syllable	Affixed and complex forms

Overall, the results show that stress placement in Batak is systematic and predictable, occurring in consistent positions across both simple and morphologically complex words, particularly in final, penultimate, monosyllabic, and root–based environments.

DISCUSSION

Vowel Quality Variations

Vowel processes in Batak operate within a unified phonological system shaped by articulatory, prosodic, and sociolinguistic factors. This section addresses the research question on vowel quality variations and highlights their relevance for phonological description, orthography development, and language revitalization.

Vowel variation in Batak reflects the interaction of articulatory constraints, prosodic structure, and language contact (Bybee 2001; Lindblom 1990). The analysis is grounded in Lindblom's adaptive model, which situates vowel realization along a hypoarticulation–hyperarticulation continuum, and usage–based perspectives that emphasize frequency and communicative function (Bybee 2001). Prosodic frameworks further explain the role of stress and prominence (Beckman and Edwards 1994; Hayes 1986; Johnson 2004). Areal studies also situate these processes within Philippine languages (Keenan and Chung 2017; Lobel 2013). Together, these perspectives position Batak as a system that balances structural stability with adaptive variation.

The analysis identifies eight vowel quality variations: raising, fronting, lowering, backing, centralization, lengthening, reduction, and diphthong variation. Vowel variation is commonly influenced by articulatory effort, stress, and surrounding sounds. Cross–linguistic studies show that vowels may shift in height, backness, duration, or quality depending on prosodic prominence and phonetic environment (Jacewicz et al. 2006). These processes are systematic and context–dependent, supporting intelligibility and prosodic organization (Keenan and Chung 2017; Lindblom 1990; Lobel 2013).

Vowel raising involves higher tongue position in stressed syllables, enhancing clarity and prominence. This aligns with Lindblom's (1990) claim that speakers increase articulatory effort in contexts requiring precision, and with findings that raised vowels improve perceptual distinctiveness (Beckman and Edwards 1994; Johnson 2004). Similar patterns in Philippine languages suggest both universal tendencies and contact influence (Lobel 2021).

Vowel fronting reflects advancement of vowels influenced by coarticulation and phonological environment. It enhances contrast and precision, particularly in prominent or frequent forms. This supports the view of hyperarticulation proposed by De Jong et al. (1993) and Johnson's (2004) account of articulatory variation shaped by communicative demands. Areal evidence indicates reinforcement through contact with neighboring languages (Keenan and Chung 2017; Lobel 2013).

Vowel lowering and backing adjust tongue height and position to enhance perceptual prominence. Lowering increases acoustic weight, while backing contributes to resonance and salience. These processes are associated with stressed or emphatic speech and may reflect sociolinguistic variation across registers (Lobel 2021; Novellino 2018).

In contrast, centralization and reduction occur in unstressed syllables, where vowels shift toward mid–central positions due to reduced articulatory effort (Lindblom 1963; Manuel 1990). This supports the observation that Batak vowel quality is affected by stress and syllable position. Since unstressed syllables usually receive less articulatory energy, vowel reduction and centralization may appear as natural outcomes of prosodic weakening (Kapatsinski et al. 2022; Lindblom 1963). These processes are prosodically conditioned, with stressed syllables maintaining full quality. Acoustic and areal studies confirm that such reductions are systematic and widespread in Philippine languages (Kapatsinski et al. 2022; Keenan and Chung 2017; Lobel 2013, 2021).

Vowel lengthening functions as a prosodic feature marking stress and prominence through increased duration (Hayes 1986). It often co–occurs with spectral changes, reinforcing perceptual contrast (Johnson 2004; Kangatharan 2015; Kangatharan et al. 2022; Pierrehumbert 2002). This pattern aligns with Austronesian systems where length supports rhythm and emphasis (Keenan and Chung 2017; Lobel 2021).

Diphthong variation reflects adjustments in vowel–glide sequences influenced by stress, timing, and coarticulation (Hayes 1995; Lindblom 1963). While structurally stable, diphthongs vary in realization across contexts, supporting flexibility and perceptual contrast. Similar patterns are observed in Austronesian languages and may reflect adaptive strategies in endangered language contexts (Fitzgerald 2021; Keenan and Chung 2017; Lobel 2021).

Taken together, Batak vowel variation reflects a coordinated system shaped by articulatory mechanics, prosodic structure, and sociolinguistic factors. These processes are systematic, prosodically conditioned, and socially meaningful, aligning with theories of adaptive articulation (Lindblom 1963, 1990), prosodic organization (Beckman and Edwards 1994; Hayes 1986), and usage–based change (Bybee 2001). Comparative evidence situates Batak within broader Philippine phonological patterns (Keenan and Chung 2017; Lobel 2021).

Consonant Quality Variations

These findings show that Batak has a dynamic yet structured consonant system that supports intelligibility and phonological contrast. Documenting these patterns is important for orthography development, literacy, and broader language revitalization efforts, aligning with the objectives of the study (Grenoble and Whaley 2005). This study examines consonant quality variations in Batak Palawan, focusing on their phonological behavior and relevance for documentation and revitalization. Three core processes are identified: stop lenition, stop secondary palatalization, and glide secondary palatalization. These processes demonstrate that consonant variation in Batak is systematic and context–dependent rather than random.

From a theoretical perspective, consonant variation reflects articulatory economy and phonological conditioning. Processes such as lenition, palatalization, and secondary articulation are widely attested cross–linguistically, where consonants shift depending on phonological environment and ease of articulation (Katz and Pitzanti 2019). Lenition, in particular, is a common weakening process in which stops become unreleased or fricative in specific positions while preserving phonemic identity (Lai 2023; Wayland et al. 2024). Similar patterns in Batak Angkola, where assimilation and place changes occur in nasal–consonant sequences, further support the rule–governed nature of Batak phonology (Nadra et al. 2024).

Articulatory, prosodic, and coarticulatory factors also influence consonant variation in Batak. The analysis draws on lenition hierarchies and areal linguistics (Keenan and Chung 2017; Lobel 2021), which explain systematic weakening and strengthening across environments. Cross–linguistic studies show that secondary palatalization and labialization are typically conditioned by adjacent front vowels or glides, as observed in Romance, Bantu, and Malay dialects (Recasens 2020; Usman et al. 2021). These patterns closely parallel Batak realizations.

Stop lenition is a dominant process, where forms such as *tubu, tug, taro,* and *batu* show stops realized as unreleased [C̚] in various positions (Kochetov 2016; Melguy 2018). This reflects reduced articulatory effort while maintaining phonemic contrast. Secondary palatalization occurs in *kayo, pabukid,* and *kideng*, where stops are realized as [Cʲ] due to front–vowel or glide environments, reflecting coarticulatory anticipation (Lobel 2021). Glide palatalization is also observed in *uway*, where /w/ becomes [wʲ] in fronted contexts, which indicates a broader coarticulatory sensitivity (Himmelmann and Kaufman 2020).

The findings indicate that Batak exhibits systematic consonant variation that balances articulatory economy and phonological enhancement. Lenition occurs in weaker prosodic positions, while palatalization is conditioned by front–vowel environments. These findings align with established phonological frameworks (Keenan and Chung 2017; Lobel 2021), showing that Batak consonant variation is structured and predictable.

From an applied perspective, these results support orthography development and literacy planning. Studies on related languages show that phonological patterning informs effective teaching materials and writing systems (Ambarita and Sembiring 2025; Lai 2023; Siahaan et al. 2021). Ethnolinguistic vitality studies further indicate that Batak Palawan retains stable structural features despite language contact, making documentation timely and important. Overall, these consonant processes are systematic and meaningful, contributing directly to language maintenance and revitalization by guiding which phonetic variations should be represented in writing.

Stress Pattern Variations

Batak exhibits systematic stress patterns that align with broader Austronesian languages, where stress is generally predictable and based on word edges rather than random assignment (Hayes 1995; Irawan et al. 2024; Kaland 2019; Smith 2023). This regularity shows that Batak has an organized phonological system, which is important for both linguistic analysis and language revitalization.

The analysis identifies four major stress patterns: penultimate, final, monosyllabic, and root–based stress. Stress plays a key role in organizing rhythm and highlighting important syllables in words. Metrical stress theory explains that stress is often assigned to fixed positions, such as the final or penultimate syllable (Hayes 1995). This is consistent with Proto–Austronesian reconstructions, where penultimate stress is considered the default, with shifts to final stress occurring under certain phonological conditions, such as vowel reduction (Smith 2023). Many Austronesian languages today reflect this system, often described in terms of edge–based prominence and metrical structure.

Penultimate stress functions as the default pattern in Batak, appearing consistently in words such as aldaw (/alˈdaw/), degwa (/dəˈgwa/), gata (/gaˈta/), sampulok (/samˈpulok/), and tubay (/tuˈbaɪ/). This supports previous findings that penultimate stress is the unmarked pattern in many Austronesian languages (Hayes 1995; Smith 2023). In contrast, final stress, as seen in daun, bulan, and balay, represents a marked pattern that occurs under specific phonological or morphological conditions. Similar patterns are observed in Papuan Malay, where final stress is less common but more strongly pronounced when it occurs (Kaland 2019; Voica 2020).

Final stress occurs when prominence falls on the last syllable, as in daun (/daˈun/), bulan (/buˈlan/), saging (/saˈgiŋ/), balay (/baˈlay/), apun (/aˈpun/), and sapa (/saˈpa/). This pattern is systematic and aligns with Austronesian tendencies for edge–based prominence (Keenan and Chung 2017). In affixed forms such as naglabag (/naglaˈbag/), nagdena (/nagdɪˈna/), magkaubra (/magkauˈbrɐ/), and pabukid (/pabʊˈkɪd/), stress remains on the final syllable of the root, while prefixes are prosodically weaker. Minor variation in rapid speech reflects performance effects rather than changes in the stress system (Keenan and Chung 2017).

Monosyllabic stress applies to words with only one syllable, such as (/tug/), bay (/baj/), lang (/laŋ/), and gaw (/gaw/), where stress is inherently assigned due to the absence of other syllables (Hayes 1995). Additional forms such as a (/ˈa/), ay (/ˈaɪ/), and na (/ˈna/) also exhibit stress when emphasized. This reflects a general feature of languages with fixed or predictable stress systems, where lexical items generally carry stress (Davis 1988; Kaland 2019; Smith 2023). Additionally, this pattern reinforces clarity, particularly in minimal lexical items (Keenan and Chung 2017).

Root–based stress is observed in more complex forms, such as (/magˈluto/), magbatu (/magbaˈtu/), magkuha (/magkuˈha/), magbantay (/magbanˈtaɪ/), magpaapuy (/magpaˈapoy/), magkayo (/magkaˈjo/), manilig (/manɪˈlɪg/), and magpabukid (/magpabuˈkid/), where stress remains on the lexical root while affixes are less prominent. This pattern highlights the role of stress in marking meaning–bearing units and is consistent with other

Austronesian languages where stress is anchored to the root (Fitzgerald 2021; Irawan et al. 2024; Shryock 1993). Studies on languages like Embaloh and Cebuano show similar behavior, where stress remains stable despite the addition of affixes.

The analysis demonstrates that Batak has a structured phonological system in which stress interacts with vowel and consonant variation in predictable ways. Research in Austronesian phonology also shows that stress is closely linked to features such as vowel quality and mora structure, further supporting the idea that prosody and segmental patterns are systematically related (Irawan et al. 2024; Kaland 2019).

These results support the classification of Batak as a penultimate–based stress system with systematic variation in final, monosyllabic, and root–based patterns. Such patterns reflect reconstructed Proto–Austronesian features and demonstrate that stress in Batak is stable, predictable, and closely tied to word structure. Documenting these prosodic features is essential for orthography development, teaching materials, and language revitalization efforts. Accurate representation of stress and rhythm helps preserve not only vocabulary but also actual language use in the community (Grenoble and Whaley 2005; Hinton and Hale 2002; Leonard and Haynes 2010).

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GENERATIVE AI STATEMENT

The study used generative AI tools, specifically Perplexity AI and ChatGPT (OpenAI, GPT–based model), to assist in language refinement, summarization, and clarification of linguistic concepts through prompts related to paraphrasing, summarization, and language refinement. However, all analyses, interpretations, and final outputs were independently developed by the researchers, with AI–generated content used only as supplementary support after critical evaluation.

ETHICAL CONSIDERATIONS

Throughout the research process, ethical considerations were upheld. All participants and officials were fully briefed about the study's purpose and procedures, with informed consent obtained prior to participation. Confidentiality was maintained, ensuring that participant identities and responses remained anonymous. The principle of voluntary participation was respected, permitting withdrawal at any point without repercussion. Finally, all collected data was securely stored and used exclusively for academic purposes, adhering to required standards for data protection.

DECLARATION OF COMPETING INTEREST

The authors declare that they have no competing interests.

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ROLE OF AUTHORS: *BLANG – design, analysis of data, revising, investigation; GSMT – concept, analysis of data, drafting, revising, investigation, timeline and task management; KSMM – design, analysis of data, revising, supervision, validation; JMVM – design, analysis of data, revising, investigation.*

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