

Above Us, Only Sky¹: A Reconstruction of Some Astronomical and Meteorological Terms in Pre-Ibaloi

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Abstract

Twenty-four (24) lexical items belonging to the astronomical and meteorological domains were collected from four Ibaloi varieties—namely Atok, Bokod, Daklan, and Kabayan—with the aim of reconstructing a hypothetical Pre-Ibaloi. Through phonological analyses and internal reconstruction, the cognates yielded twenty-five (25) reconstructed proto-forms. Moreover, nineteen (19) pre-phonemes constitute the PIBL phonemic inventory. Kabayan was also deemed phonetically to be the “closest” to PIBL, concurring with Himes’s (1998) and Ruffolo’s (2004) conclusions that Kabayan was the Ibaloi communities’ “dispersal point.” This study provided a glimpse into the rich cross-cultural commonalities that go beyond geographical boundaries for these cultural communities. Furthermore, the semantic domains were chosen for the reason that astronomical and meteorological phenomena have a significant influence on the largely agricultural communities of the Cordilleran mountains. The lexical repository for these domains was bound to be remarkable when what is over and above, and the most consequential to their way of life, is the sky.

Keywords: Ibaloi, Pre-Ibaloi, internal reconstruction, ethnolinguistics

1 Introduction

1.1 Cordillera Central

Orogenic, ecological, and anthropological histories run the expanse that is the Cordillera Central. The mountain system trends 300 km north-south separating the coasts of Ilocos from the Cagayan basin; with its highest point being Mt. Pulag’s summit at 3,000 km. The Cordillera Central also hosts 13 major river basins, notably Chico and Magat Rivers, that enable the region’s irrigation system among other things.

¹“Above Us, Only Sky” also happens to be a title of a Beatles biopic that coincidentally sounded poetically appropriate to be the title of this study, as this paper focuses on one of the Cordilleran “mountain” peoples and their relations to certain weather and astronomical phenomena, their “sky.”

Needless to say, the crests and troughs of the mountain range affect the weather patterns not only of the Cordillera Administrative Region (CAR) but the entirety of Luzon, as the Cordilleras constitute 1/5th of the entire island.

The high elevation brings the region's cold climate. CAR received an average of 5,546 mm of rainwater annually from 2008 to 2018 (PSA CAR, 2020). Moreover, PAG-ASA (n.d., as cited in PSA CAR, 2020) identified that most of the region has a short dry season and then wet for the rest of the year, with the maximum rainfall between November and December (PSA CAR, 2020). Because agriculture is central to the Cordilleras, it follows that its people have a great and profound understanding of the region's weather patterns that goes beyond marked seasons. For instance, Conklin (1980, as cited in Murphy, 2017) remarked that the rice farming cycle in the Cordillera region is based on centuries-old cultivation patterns. Beginning with the repair and formation of the terrace, the field preparation, and the rice planting in the wet season; and come the dry season, rice cultivation, weeding, then finally the harvest. Furthermore, Launio et al.'s (2020) study with smallholder farmers in Benguet found that they utilize their own local indicators and adaptation strategies against meteorological hazards, such as typhoons and irregular monsoons, that could otherwise be disastrous to their agricultural production.

1.2 Indigenous People and Land

The Cordillera Central is home to many cultural communities in Northern Luzon—the Kankanaey, Ifugao, Isneg, Ibaloi, Kalanguya, and Gaddang, among others. Although these names are widely used in publications, it is imperative to note that there is a wide breadth of languages, cultural identities, and heritage among the different groups of the people of the mountain that go beyond linguistic and geopolitical markedness.

No matter the autonym, every person in the Cordilleras has respect and regard for their ancestral land. It is for this reason that they remained undaunted by the advent of colonizers that were able to take the low-lying regions surrounding the mountains. Land in the Cordillera is life itself. The “symbiotic relationship” between the land and the people of the land is highly developed and maintained (Carling, 2001). The mountain peoples have a shared understanding of ancestral land and collective management of the land, building socio-political systems around it. The agricultural cycle from seed to harvest is collectively performed by the community, as well as the conservation of environmental resources such as rivers and forests, as certain beliefs and rituals need to be practiced during these periods of time (Carling, 2001). It is this community and sense of communal work that makes their reverence for their ancestral land even more daunting against land opportunists—then against Spanish colonizers, and today against capitalists on the advent of neoliberalism.

In an article in the *Cultural Survival Quarterly* (2001), the Philippine government's own Mining Act of 1995 made the mountains more accessible to transnational mining corporations as it approves of 100% foreign ownership. For capitalists and seemingly the Philippine government, this is a golden opportunity; for the indigenous mountain peoples, it is a death sentence to the land they have cultivated and preserved

since the time of their ancestors. Expectedly, opposition to mining and exploitation in the Cordillera has been militant and extensive. The San Roque Dam, owned by a Japanese trading company, in the lower Agno River of Pangasinan province, has displaced more than 2,000 Ibaloi families in Itogon, Benguet (World Rainforest Movement, 2001). Despite fierce opposition from many indigenous peoples all over Cordillera, the dam has been fully operational since 2003 (Environmental Justice Atlas, 2017).

Although this paper will try to focus on certain linguistic processes of Ibaloi lexicon, it is crucial to be informed of these narratives. It is imperative to attach the words from the mouths where they came from and disconnecting the people from these narratives will never make for a lauded and grounded study.

1.3 Ethnoastronomy

It can be said that with only the sky and nothing else above, the cultural communities of the Cordilleras have a wealth of indigenous knowledge about the sky and the various phenomena that orbit past. Ambrosio's *Balatik: Etnoastronomiya, Kalangitan sa Kabihasnang Pilipino* (2010) has reflected on various astronomical and meteorological phenomena and their profound and established influences on various Philippine cultural communities. They have integrated meaning-making into their way of perceiving their environment in the hopes of understanding it better, which in the present day is constituted into their very belief system. Astronomical and meteorological phenomena instructed the rhythm of their movements, the directions they take, the when and which crops to sow and harvest. When one is confronted with a predicament, one can look up and find himself answered by the heavens. Their belief systems surrounding the celestial bodies and other meteorological phenomena have been passed down to today's culture bearers as songs, prayers, rituals, enchantments, and such practiced customs.

For Ambrosio (2010), it is common for indigenous groups all over the Philippines to look to the sun and moon as the first deities to revere, and for various myths of their peoples' origin to have manifested from their celestial presence. According to Moss (1920), these heavenly bodies are objects of worship for the Ibaloi. The fact that the Ibaloi regarded the sun as the most powerful of deities and was, therefore, always appealed to the most seems to point to the fact that he was a god of justice (p. 281). Ambrosio (2010) remarked that some Ibaloi elders use *akou* and *Kabunian* interchangeably when regarding the sun (p. 86).

Ambrosio (2010) furthermore observed that the Ibaloi hold their rituals during the first appearance of the first quarter moon, the *balal*. They believe a family's fortune will be more prosperous if the moon is waxing (growing) into a full moon. The deities and the diwatas that they would offer their prayers to are the most "reachable" at this period of time, and their luck and prayers would dissipate had they tried to contact them when the moon is in darkness (p. 118). For this reason, the Ibaloi also only begin to plant or move their seedlings, or harvest during this period of time. According to their beliefs, it is not productive nor prosperous at a time when the moon is waning (p. 122).

The Ibaloi also mapped multiple constellations across their sky. Prayers are offered

to *San apon* (Pleiades), *Salabobo* (Hyades), *Bodays* (Orion's belt), to name a few, and even to *Mamawas*, the planets Venus or Jupiter visible in the daylight. Even though these same constellations appeared in the same periods of time and orientation as the people of the mountains, they nevertheless have distinct names for them even within the same cultural communities. As Ambrosio explained, even though these names are discovered by scholars through passed-down oral history, the exact reason for their prayer to the stars is unknown (p. 181).

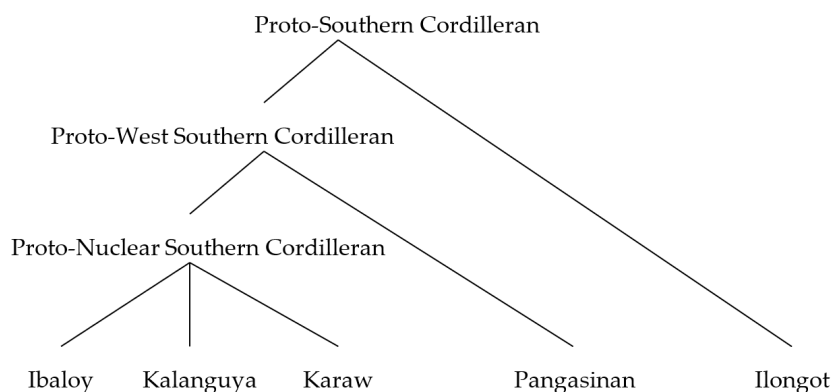
These accounts from Ambrosio (2010) and Moss (1920) offer glimpses into the Ibaloi worldview. The usage of distinct terminologies reflects an essential indigenous knowledge utilized in various spheres of their lives. The knowledge of celestial bodies, meteorological phenomena, and how they held a significant maneuver in the daily operation of the Ibaloi people and of their land is a ground well with nothing but more depth to discover. This study can certainly be reflected on and expanded on to be a full cultural reconstruction of Ibaloi meteorological and astronomical phenomena but that is at the discretion of future researchers.

1.4 Subgrouping and Language Status

Ibaloi, with ISO 639-3 code *ibl*, is primarily spoken in the province of Benguet, where Eberhard et al. (2021) posit a user population of 116,000. Its native speakers call the language "Inibaloi." *Ibl* is also tagged as 5* or Developing in the Expanded Graded Intergenerational Disruption (EGIDS) scale. This means that *Ibl* is vigorously used by its speakers, but standardized literature is not yet sustainable throughout the community.

Figure 1

Internal Relationships of Southern Cordilleran Languages (Himes, 1998, p. 121)



Moreover, *Ibl* is classified under the Northern Luzon branch of the Malayo-Polynesian subgroup of the Austronesian language family. Himes (1998) further identified *Ibl* as belonging to the Southern Cordilleran branch, along with Kalanguya,

Karaw, Pangasinan, and Ilongot. Furthermore, Glottolog (n.d.) only recognizes three of its varieties: Bokod, Daklan, and Kabayan. However, Himes (1998) identified other varieties such as Atok, Natubleng, I-wak, Sablan, La Trinidad, Tuba, Tublay, and Itogon.

2 Objective, Scope, and Limitations of the Study

This study aims to reconstruct 24 PIBL lexical items under the semantic domains of astronomy and meteorology from four attested Ibl dialects. Three of these, Bokod, Kabayan, and Daklan, have been listed in Ethnologue, and Atok has been identified in an acoustic phonetics study by Cruz et al. (2018a). The semantic domains were chosen on the basis that astronomical and meteorological phenomena have a significant influence on the largely agricultural communities of the Cordilleran mountains and so would naturally reflect on the Ibaloi lexical repository. Aside from the lexical items that have been indicated from Lyman and Wolfenden's (2018) and Cruz et al.'s (2018b) datasets, other lexical items from the Summer Institute of Linguistics International (SIL) Swadesh lists have also been consulted to make sure no phonemes have been left unidentified. Otto Scheerer's *The Nabaloi Dialect* (1905) was supposed to be included in the data pool; however, it was deemed unreliable due to the possibility of transcription errors from using optical character recognition on the document.

It is also important to note that out of all the references used in this study, only the one done by Cruz et al. (2018a) used a phonetic transcription with the aid of computer programs, while every transcription from other studies was done by ear. Moreover, Himes (1998) and Ruffolo (2004) identified other varieties of Ibl which will not be included in this study. Furthermore, despite their best efforts to consult with various data sets and studies, the researchers cannot guarantee the full accuracy of these reconstructions.

3 Review of Related Literature

3.1 Ibaloi Phonology

The study will mainly draw its references on Ibl phonology from Himes's (1998) "The Southern Cordilleran Group of Philippine Languages," Ruffolo's (2004) *Topics in the Morpho-syntax of Ibaloy, Northern Philippines*, Ameda et al.'s (2011) *Ibaloy Dictionary, Phonology, Grammar, Morphophonemics*, and Cruz et al.'s (2018a) *An Acoustic Analysis of Ibaloi Sounds*. Aside from providing a sound inventory, these studies have also discussed some phonological processes observed in Ibl and the distribution of its allophones. These would significantly help in determining possible pre-phonemes from the gathered data.

Table 1*Distribution of Consonant Variation in Ibaloi (Himes, 1998, p. 127–128)*

*	#_V	VC._V	CV._V	V_.CV	V_#
PSC *l	[d]	[d]	[d]	[j]	[j]
PNuSC *j	[dʒ]	[dʒ]	[dʒ]	[l]	[l]
PNuSC *d	[tʃ] ^{a,b} , [ʃ] ^c	[tʃ] ^{a,b} , [ʃ] ^c	[tʃ] ^{a,b} , [ʃ] ^c , [ɾ] ^d	[d]	[d]
PNuSC *g	[k]	[k]	[g]	[g]	[g]
PNuSC *b	[b]	[b]	[v] ^a	[b]	[b]
PNuSC *w	[g ^w] ^c , [y ^w] ^a , [b ^w] ^b	[g ^w] ^c , [y ^w] ^a , [b ^w] ^b	[g ^w] ^c , [y ^w] ^a , [b ^w] ^b	<i>no data</i>	[w]

^a Reflex observed in the Atk variety.^b Reflex observed in the Kby variety.^c Reflex observed in the Bkd variety.^d Appears when preceded by a stressed vowel.**Table 2***Consonants' Allophonic Variation and Distribution (Ruffolo, 2004, p. 17)*

Phoneme	#_V, VC._V, CV.'_V	'CV._V	V_.CV	V_#
/p/	[p] ^a , [pp] ^b	[β]	[pʰ]	[pʰ]
/t/	[t] ^a , [tt] ^b	[ɸ]	[tʰ]	[tʰ]
/k/	[k] ^a , [kk] ^b	[x]	[kʰ]	[kʰ]
/ʔ/	[ʔ]	[ʔ]	[ʔ]	—
/b/	[ɸ], [ɸ ^w] ^c , [ɸɸ] ^b , [ɸɸ ^w] ^c	[b]	[bʰ]	[bʰ]
/d/	[tʃ], [tʃtʃ] ^b	[ɸ]	[dʰ]	[dʰ]
/g/	[k], [kk] ^b	[g]	[gʰ]	[gʰ]
/l/	[d], [dd] ^b	[l]	[l]	[l]
/w/	[b], [b ^w] ^c , [bb] ^b , [bb ^w] ^{b,c}	[w]	[w]	[w]
/j/	[dʒ], [dʒdʒ] ^b	[j]	[j]	[j]
/s/	[s], [ss] ^b	[s]	[l]	[s]
/m/	[m], [mm] ^b	[m]	[m]	[m]
/n/	[n], [nn] ^b	[n]	[n]	[n]
/ŋ/	[ŋ], [ŋŋ] ^b	[ŋ]	[ŋ]	[ŋ]

^a Also optionally intervocalically before /ə/ regardless of stress.^b Only after /ə/.^c Only after /a/.

First, Himes identified 18 phonemes in Ibl, 15 of which are consonants and four of which are vowels, in their journal article “The Southern Cordilleran Group of Philippine Languages” (1998). Certain phonological changes from PSC and PNuSC to Ibl that are relevant to this study is summarized in Table 1. The table also features variety-specific reflexes.

Ruffolo’s 2004 thesis titled *Topics in the Morpho-syntax of Ibaloy, Northern Philippines* identified the municipality of Kabayan in Benguet as the area where Ibl is spoken, where varieties exist throughout the different barangays within the town, and the data elicited from this study only comes from the Poblacion (Central) variety. It is also noted that Ibl, Kyj, and Kak speakers also live in Kabayan. Through multiple fieldworks conducted from 1998 to 2000, Ruffolo was able to provide a grammar sketch of Ibl, included here is a list of 18 phonemes which would be indicated in Table 5 below. Ruffolo has also presented the allophonic distribution in Ibl, as seen in Table 2.

According to the *Ibaloy Dictionary, Phonology, Grammar, Morphophonemics* by Ameda et al. (2011), there are 23 contrastive phonemes in Ibl, 19 of which are consonants and four of which are vowels. Some consonants, labeled as restricted by Ameda et al., appear in complementary distribution as seen in Table 3. Unrestricted consonants, on the other hand, retain their original features regardless of the environment. Interestingly, Ameda et al.’s proposed distribution of allophones corroborates Himes’ and Ruffolo’s distribution.

Table 3
Distribution of All Consonants (Ameda et al., 2011, p. 773)

Syllable-initial	Restricted Consonants			Unrestricted Consonants
	Intervocalic (ə)	Intervocalic (a-i-ə)	Syllable-final	
/d/	/d/	/l/	/l/	/b/
/l/	/k/	/g/	/g/	/q/
/β/	/β/	/w/	/w/	/m/
/ʃ/	/ʃ/	/ɛ/	/d/	/n/
/dʒ/	/dʒ/	/j/	/j/	/ŋ/
				/p/
				/s/
				/t/
				/ʔ/

The vowels also exhibit allophones in certain environments. Central and back vowels /ə/, /ɔ/, and /a/ exhibit vowel raising and become [i], [u], and [ə] when they succeed /b/, /d/, /g/, /k/, and /dʒ/. On the other hand, /i/ exhibits vowel lowering and becomes [e] when it succeeds /q/, or becomes /ɛ/ or /i^ɛ/ if it precedes /q/. There are also variety-specific allophones such as /q/ to [x] and [h], and /b/ to [p^w] in Kabayan.

Compared to previous studies, Cruz et al. provided a contrastive analysis and

Table 4*Consonants' Allophonic Variations and Distributions (Cruz et al., 2018a, p. 6)*

Phoneme	#_V, VC_V	CV_V	V_CV	V_#
/p/	[p]	[p], [pp] ^a	[p̣]	[p̣]
/t/	[t]	[t], [tt] ^a	[ṭ]	[ṭ]
/k/	[k]	[k], [kk] ^a	[ḳ]	[ḳ]
/q/	[q]	[x], [qq] ^a	[q̣]	[q̣]
/ʔ/	[ʔ]	[ʔ]	[ʔ]	—
/b/	[b], [β]	[β], [bb] ^a	[ḅ]	[ḅ]
/d/	[d]	[d], [dd] ^a	[ḍ]	[ḍ]
/g/	[g]	[g], [gg] ^a	[g̣]	[g̣]
/l/	[l]	[l]	[l]	[l]
/ɾ/	[ɾ]	[ɾ]	[ɾ]	—
/w/	[w], [β], [g ^w], [ϕ]	[w], [β], [g ^w], [ϕ]	[w]	[w]
/j/	[j]	[j]	[j]	[j]
/s/	[s]	[s]	[s]	[s]
/ʃ/ = /tʃ/	/ʃ/ = /tʃ/	/ʃ/ = /tʃ/	/ʃ/ = /tʃ/	—
/dʒ/	[dʒ]	[dʒ]	[dʒ]	—
/m/	[m]	[m], [mm] ^a	[m]	[m]
/n/	[n]	[n], [nn] ^a	[n]	[n]
/ŋ/	[ŋ]	[ŋ], [ŋŋ] ^a	[ŋ]	[ŋ]

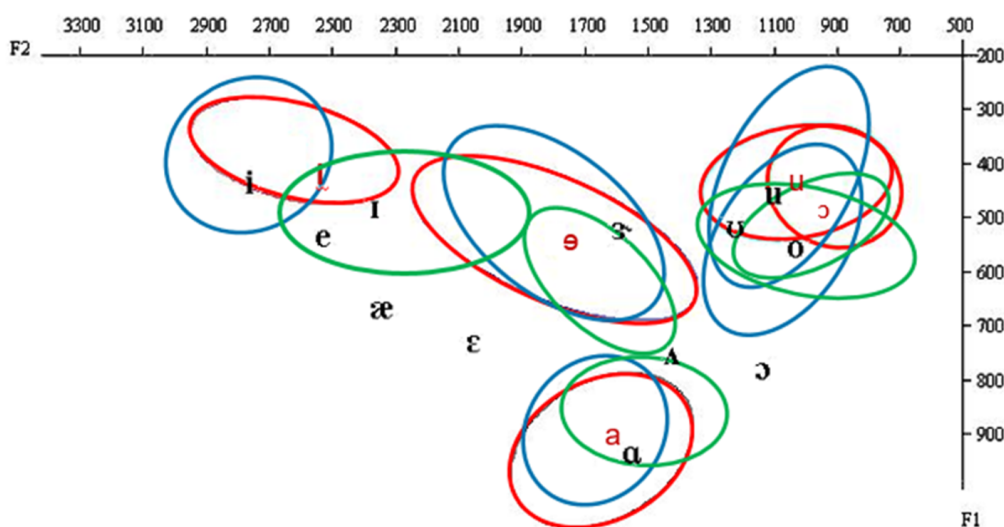
^a Allophone only occurs after [ə].

demonstrated the complementary distribution of the segments by conducting an acoustic analysis using three varieties of Ibl: Atk, Bok, and Kby. They identified a total of 22 phonemes, 18 of which are consonants and four of which are vowels, as listed in Table 4. Aside from this, they have also listed the observed allophonic distributions. It is interesting to note that Cruz et al. did not identify the allophones that were previously mentioned by Himes, Ruffolo, and Ameda et al. such as [k], [d], [r], and [dʒ] of /g/, /l/, /d/, and /j/, respectively. Instead, they treated these as contrastive segments.

The acoustic analysis identified a four-vowel system in Ibl with /i/, /ə/, /u/, and /a/. Two of these vowel phonemes, /i/ and /a/, have been consistently identified by previous studies. As for /u/, it can be seen in Figure 2 that [ɔ] and [u] overlap over the /u/ vowel space, proving that [ɔ] is an allophone of /u/. Moreover, they claimed that it is more accurate to depict the fourth vowel as the close mid-rounded central vowel /ə/ as opposed to earlier studies which identified it as /ə/ or /i/. As such, this study would be following the usage of /ə/ to depict Ibl's central vowel.

Figure 2

Comparison of the Three Vowel Spaces with the English Vowel Space (Cruz et al., 2018a, p. 30)



English vowels are colored black while Ibaloi vowels are colored red. The distribution of the plot formants are color-coded as follows: red for Atk, green for Kby, and blue for Bkd.

To summarize, a comparison of the Ibl sound inventories proposed by the studies can be seen in Table 5. These segments, along with the phonological processes, will be used as references for reconstructing the phonemes of PIBL.

3.2 Internal Reconstruction

Internal reconstruction is a method used by historical linguists to reconstruct an earlier stage of a current language by comparing and analyzing the features derived from within it or its varieties (Crowley & Bovern, 2013, p. 121). The resulting reconstruction is called a *prelanguage*. In this study, four varieties of Ibl will be analyzed to reconstruct some select terms from a hypothetical prelanguage “Pre-Ibaloi.” One of the criteria considered in reconstructing pre-phonemes is the *majority rules principle*, as mentioned by Crowley and Bovern (2013, p. 86), where the reflex with the widest distribution is considered to be the original form. However, the researchers may also refer to diachronic studies to identify these pre-phonemes.

According to Peneyra in their graduate thesis *Isang Rekonstrusyong Internal ng Tagalog Batay sa mga Piling Dayalek* (2003, p. 48), the current alternant forms existing are due to phonological changes that happened to the original forms over time. This means that before these changes, there were no alternative forms present. In other words, the form that is less used and that is from an older variety may be closer to the original form of the prelanguage. This goes against the majority rules principle; however, due to the

Table 5*A Comparison of Ibaloi Sound Systems from Various Studies*

Himes (1998) (18)	Ruffolo (2004) (18)	Ameda et al. (2011) (23)	Cruz et al. (2018a) (22)
/b/	/b/	/b/	/b/
/p/	/p/	/p/	/p/
/d/	/d/	/d/	/d/
/t/	/t/	/t/	/t/
/g/	/g/	/g/	/g/
	/k/	/k/	/k/
/q/		/q/	/q/
/ʔ/	/ʔ/	/ʔ/	/ʔ/
/m/	/m/	/m/	/m/
/n/	/n/	/n/	/n/
/ŋ/	/ŋ/	/ŋ/	/ŋ/
		/r/	/r/
		/β/	
	/s/	/s/	/s/
/tʃ/			
		/ʃ/	/ʃ/
		/dʒ/	/dʒ/
/l/	/l/	/l/	/l/
/w/	/w/	/w/	/w/
/j/	/j/	/j/	/j/
/i/	/i/	/i/	/i/
/ī/			
			/u/
			/ə/
	/ə/	/ə/	
/ɔ/	/ɔ/	/ɔ/	
/a/	/a/	/a/	/a/

regularity of sound laws, it is possible to deduce and lay out the phonological changes that happened over time.

Earlier, it was also mentioned that Ruffolo (2004) observed multiple Ibl varieties flourishing throughout the different barangays within Kabayan, Benguet. Furthermore, Himes (1998), citing oral tradition, posited that the ancestors of Ibl speakers “migrated northward along the Agno River from Pangasinan to present-day Kabayan” (p. 174).

Kabayan then became the “cultural homeland”, the point of dispersal from where the Ibaloi migrated to other parts of Benguet. These pieces of information coincide with Dyen’s conclusion in their article “Language Distribution and Migration Theory” (1956, p. 625). Here, they claimed that a region with great language diversification can be inferred as the point of dispersal because positive migrations usually happen from a more complex area to a more uniform one.

Assessing the findings, it can be conjectured that the Kby variety may have been the earlier form of Ibl. Pursuing this, the researchers will also be considering the weight of Kby’s reflexes in determining the pre-phonemes since it can be hypothesized that it is one of the older varieties of Ibl. However, careful analysis must be done since additional evidence such as historical records and anthropological studies to support this conjecture are yet to be discovered.

A previous study on PSC, PWSC, and PNuSC can also be consulted for this study. In “The Southern Cordilleran Group of Philippine Languages” (1998), Himes attempted to reconstruct lexical items from the Southern Cordilleran group, including Ibl, collected from 1962 to 1995 from previous studies on this group of languages. Moreover, they attempted to reconstruct PIBL from its varieties. However, the semantic domains of the PIBL reconstructions do not overlap with this study’s domains, but some of the reconstructions from PNuSC fall under the meteorological and astronomical domains. Some of these are listed below (pp. 155–159).

PNuSC			
*kulpút	Ibl, Kyj Kak	kolpot kulput	‘cloud’
*buɲlúl	Ibl Kak Cf. PC	boɲdól buɲlúl buɲlún	‘rainbow’
*sigít	Ibl Kak Ifa Cf. KnkS	sikít həgít, hagít hugít sigít, sogít	‘sun’
*tigʔín	Ibl Kyj Cf. KnkS	tigʔín tʌgʔín togʔín	‘cold’

In reconstructing some of the stative verbs in PWSC, the inclusion of a possible stative morpheme *ʔə(N)- was applied inconsistently as seen below (pp. 153–154). For this study, the researchers will reconstruct the lexical items with the morpheme included, following Himes’s reconstruction. In other words, a morpheme boundary symbol, denoted by a hyphen, will be included to separate the morpheme from the root of the lexical item, e.g., PWSC *ʔan-tíkij.

PWSC

*ʔan-tíkij	Ibl, Pag	ʔantíkij	‘short (object)’
	Kak	ʔantíkkóʃj, ʔantíkkéj	‘short (person)’
*balaja	Ibl	ʔambaliṇá, ʔimbaliṇá	‘red, yellow’
	Pag	ambalaṇá	
	Kak	ʔambalaṇá	
*bilujít	Ibl	ʔambiloṇít, ʔimbiṇoṇít	‘dark’
	Pag	ambiluṇít	

4 Methodology

Lexical items related to meteorology and astronomy were gathered from existing datasets on Ibl varieties: Cruz et al.’s “An Acoustic Analysis of Ibaloi Sounds” (2018a) and Lyman and Wolfenden’s “Inibaloi, Benguet Sub-province Yale Linguistic Questionnaire” (2018). Additional Ibl wordlists without any specified variety were also used for cross-referencing data and for eliciting some terms that were not available from the two previous data sets: Elkins’s “Inibaloi 1962 Wordlist” (1962), Ballard’s “Inibaloi 1966 Wordlist” (1966–1970), Wimbish’s “Ibaloi - Baguio, Benguet Wordlist” (1984), and Ambrosio’s *Balatik: Etnoastronomiya, Kalangitan sa Kabihasnang Pilipino* (2010). The phonetic transcriptions from the SIL International datasets were converted from the Americanist notation system into the International Phonetic Alphabet (IPA) for uniformity and consistency of data. From the six datasets, 24 lexical items were chosen for the study, and cognates for each lexical item were noted. Moreover, the researchers consulted with an Ibl speaker from Benguet to discern the semantic nuances of lexical items with different meanings and similar forms.

Applying internal reconstruction, the researchers tabulated the corresponding phonemes from the discovered cognates and noted both contrastive and complementary distributions from the correspondences. Phonemes with consistent occurrences across all varieties despite the conditioning environment were deemed as uncontested pre-phonemes via the Majority Principle. For those with complementary distributions, Himes’s (1998) and Ameda et al.’s (2011) discussions on Ibl phonological processes were consulted. The researchers also hypothesize that Kby, being an older variety of Ibl, has retained some of the original features of PIBL; therefore, this may also be considered when extrapolating the original pre-phonemes. Additionally, phonetic transcriptions from Cruz et al.’s acoustic analysis were prioritized over Lyman and Wolfenden’s written transcriptions in determining the exact place of articulation of the segments. The resulting phonemic inventory from this process was then used as a reference to internally reconstruct the 26 lexical items in PIBL.

5 Results and Discussion

5.1 Phonemic Inventory of Pre-Ibaloi

The reconstructed pre-phonemes PIBL gathered from comparing the four varieties of Ibl—Atok (Atk), Bokod (Bok), Kabayan (Kby), and Daklan (Dak)—and datasets with unidentified varieties were 19 in total, 15 of which are consonants and four of which are vowels. Their places and manners of articulation are illustrated in Tables 6 and 7. The distribution of the allophones’ correspondences from which the pre-phonemes were derived can be seen in Sections 9.1 and 9.2.

Table 6
Consonant Phonemes of Pre-Ibaloi

	Bilabial		Dental-Alveolar		Post-Alveolar	Palatal	Labio-velar	Velar	Uvular	Glottal	
Plosive	*b	*p	*d	*t				*g	*k	*q	*ʔ
Nasal	*m		*n					*ŋ			
Fricative				*s							
Tap/Flap											
Affricate											
Approximant						*j	*w				
Lateral Approximant			*l								

Table 7
Vowel Phonemes of Pre-Ibaloi

	Front	Central	Back
Close	*i		*u
Close-Mid		*ɔ	
Open-Mid			
Open		*a	

5.1.1 Consonants

As can be seen in Section 9.1, the distribution of the following consonants is consistent in almost all environments: *ʔ, *g, *k, *q, *t, *p, *m, *n, *ŋ, and *w. Hence, the majority rules principle was applied. Moreover, the previously mentioned phonological sketches were consulted for pre-phonemes that had clear complementary distribution

such as in *b, *d, *j, and *l. As for segments that did not fit these cases, the Kby reflexes were taken into account, as well as the reflexes manifested in proto-forms of higher subgroupings.

The reflexes of PIBL consonants will be shown below to further show how the pre-phonemes were derived. Due to the limited data available, some of the positions were not represented. However, this does not necessarily mean that the pre-phonemes do not occur in the unrepresented positions.

Stops There are eight stops in PIBL, three of which are voiced and five of which are voiceless and appear in almost all positions. All these stops were derived using the majority rules principle except for *b and *d, which demanded a closer look into previous phonological studies to extrapolate these pre-phonemes.

PIBL *b had four reflexes appearing in different environments. Atk, Bok [β], and Kby [v] appeared in the intervocalic position. Meanwhile, [ɸ] appeared in the word-initial and VC_V position. However, all four varieties of Ibl also exhibited [b] in all these positions. Therefore, it was concluded that the pre-phoneme will be reconstructed as the voiced bilabial stop *b.

As for the reconstruction of *d, reflexes [tʃ] and [ʃ] appeared in environments that suggest that these are also allophones of *d, rather than existing as contrastive units of their own. As Himes (1998, pp. 197–198) pointed out, Kby, Atk [tʃ] and Bok [ʃ] are area-specific reflexes of PNuSC *d. Moreover, previous Ibl studies considered the reflex [r] to be an intervocalic allophone of /d/, instead of being a contrastive unit. Therefore, it is excluded from the reconstructed phonemic inventory.

/b/: voiced bilabial stop

#_V	Atk, Bok, Dak	/bulan/	‘moon’
	Kby	/ɸulan/	
	Dak	/bagidat/	‘lightning’
	Kby	/bugidat/	
VC._V	Atk	/nalbəŋ/	‘wet’, as in surface
	Kby	/nalɸəŋ/	
	Bok	/ʔəmbasa/	‘wet’, as in soaked
	Kby	/ʔʌmbaʃa/	
	Dak	/ʔumbafa/	
CV._V	Bok, Dak	/tabʌn/	‘sky’
	Kby	/tavin/	

/p/: voiceless bilabial stop

#_V	Bok, Kby, Dak	/pitʌk/	‘mud’
VC._V	Atk, Bok, Kby	/qɔlpɔt/	‘cloud’
	Dak	/kilput/	

CV_#	Atk, Kby	/tapɔq/	'dust'
	Bok	/fabuk/	
	Dak	/dapok/	

/d/: voiced dental stop

#_V	Atk, Bok, Dak	/ʃanum/	'water'
	Kby	/tʃanom/	
	Atk	/tʃagəm/	'wind'
	Bok, Dak	/ʃagum/	
	Kby	/ʃagub/	
VC_#	Kby	/maʔʃem/	'evening'
CV_#	Bok, Dak	/maʃem/	'evening'

/t/: voiceless dental stop

#_V	Atk, Bok, Kby	/təgʔin/	'cold', as in weather
	Dak	/tʌgin/	
CV_#	Atk, Bok	/ʔəmpətəŋ/	'warm'
	Kby	/pətəŋ/	
	Dak	/patəŋ/	
V_#	Atk	/səkkit/	'sun'
	Bok	/səkit/	
	Kby	/səkk ^h it/	
	Dak	/ʃakit/	

/g/: voiced velar stop

CV_#	Dak	/bagidat/	'lightning'
	Kby	/bugidat/	
V_#	Atk	/ʔəmagʔan/	'dry'
	Bok	/ʔəməgʔan/	

/k/: voiceless velar stop

#_V	Bok, Dak	/kejrol/	'thunder'
	Kby	/kerol/	
CV_#	Atk	/ʔaqqɔw/	'day'
	Bok	/ʔak ^h u/	
	Kby, Dak	/ʔaku/	
V_#	Bok, Kby, Dak	/pitʌk/	'mud'

/q/: voiceless uvular stop

#_V	Atk, Bok, Kby	/qɔlpɔt/	'cloud'
	Dak	/kilput/	
V_#	Atk, Kby	/tapɔq/	'dust'
	Bok	/fabuk/	
	Dak	/dapok/	

/ʔ/: glottal stop

#_V	Bok, Dak	/ʔamol/	'dew'
	Kby	/ʔamul/	
VC._V	Atk	/ʔəmagʔan/	'dry'
	Bok	/ʔəməgʔan/	
V_.CV	Kby	/maʔfem/	'evening'

Nasals There are three voiced nasals in PIBL. Since the reflexes of these nasals have little to no diversity, the majority rules principle was applied to derive the pre-phonemes.

/m/: voiced bilabial nasal

#_V	Kby	/maʔfem/	'evening'
	Bok, Dak	/mafem/	
CV._V	Bok, Dak	/ʔamol/	'dew'
	Kby	/ʔamul/	
V_.CV	Bok	/ʔəmbasa/	'wet', as in soaked
	Kby	/ʔʌmbaʃa/	
	Dak	/ʔumbaʃa/	
V_#	Atk	/tʃagəɱ/	'wind'
	Bok, Dak	/ʃagum/	
	Kby	/ʃagub/	

/n/: voiced alveolar nasal

#_V	Atk	/nalbəŋ/	'wet', as in surface
	Kby	/nalɸəŋ/	
CV._V	Atk, Bok, Dak	/ʃanum/	'water'
	Kby	/tʃanom/	
V_#	Atk, Kby	/ʔuran/	'rain'
	Bok, Dak	/ʔoran/	

/ŋ/: voiced velar nasal			
CV_C	Ibl ²	/buŋdol/ /boŋdol/ /bundol/	'rainbow'
V_#	Bok, Dak Kby	/dirum/ /?adironŋ/	'shadow'

Fricatives There is only one fricative in PIBL, the voiceless alveolar fricative *s. The reflexes [s] and [ʃ] had a relatively equal distribution among the four varieties in the word-initial, intervocalic, and word-final positions; thus, making it difficult to infer the underlying form. There was no discovered literature on the complementary distribution of the two fricatives in Ibl. Ultimately, it was decided that the pre-phoneme will be reconstructed as *s due for two reasons. First, the reflex [s] is applied consistently in Kby, which is hypothesized to be the older variety of Ibl; thus, the probability of its forms' similarity to PIBL might be higher than the other varieties. Second, proto-forms from higher subgroupings of lexical items with the reflexes in question usually manifest [s] over [ʃ]. Hence, *s was deemed to be the pre-phoneme from which these reflexes stemmed. For comparative purposes, the proto-forms retrieved from Himes (1998) and Blust and Trussel's "The Austronesian Comparative Dictionary" (2020) will also be included in the examples below.

/s/: voiceless alveolar fricative			
#_V	Atk Bok Kby Dak	/səkkit/ /səkkit/ /sək ^h it/ /ʃakit/	'sun'
		Cf. PPH *sikat, PNU SC *sigít	
CV_V	Bok Kby Dak	/ʔəmbasa/ /ʔʌmbaʃa/ /ʔumbʌʃa/	'wet', as in soaked
		Cf. PMP *baseq	
V_#	Atk, Bok Kby	/ʔajɔʃ/ /ʔajus/	'current, flow'
		Cf. PMP *qarus	

Lateral Approximants There is one lateral approximant in PIBL. This segment appears in word-final positions, as well as in between consonant and vowel segments.

²Ibl datasets from SIL without any indicated variety were consulted for lexical items that were not included in the Cruz et al. (2018b) and Lyman and Wolfenden (2018) datasets.

On the contrary, word-initial and intervocalic *l becomes [d], as discussed by Himes (1998), Ruffolo (2004), and Ameda et al. (2011).

/l/: voiced alveolar lateral approximant

#_V	Kby	/dabi/	'night'
CV_V	Atk, Bok, Kby, Dak	/talaw/	'star'
V_CV	Atk, Bok, Kby	/qɔlpɔt/	'cloud'
	Dak	/kilput/	
V_#	Bok, Dak	/ʔamol/	'dew'
	Kby	/ʔamul/	

Glides There are two voiced glides in PIBL. First is the voiced labial-velar approximant *w, which only appears in the word-final position in the datasets. Second is the voiced palatal glide *j, which appears in intervocalic environments.

/w/: voiced labial-velar approximant

#_V	Atk, Bok, Kby, Dak	/talaw/	'star'
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/j/: voiced palatal approximant

CV_V	Atk, Bok	/ʔajɔf/	'current, flow'
	Kby	/ʔajus/	

5.1.2 Vowels

A four-vowel system was reconstructed for PIBL, which was also consistently posited by the referenced phonological studies. The vowels /i/ and /a/ were consistently noted by the four studies; therefore, these were included in the inventory. Additionally, Cruz et al.'s (2018a) analyses on the Ibl vowel phonemes were consulted to reconstruct the open middle and close middle back vowels as /u/ and the central vowels as /ə/. For the diphthongs present in Bok, Dak /kejrol/ and Atk /ʔaqqɔw/, it was decided that these might have been due to vowel breaking since its cognates from the other varieties do not exhibit diphthongs. Thus, these were reconstructed as one vowel only.

The reflexes of PIBL vowels will be shown below to further visualize how the pre-phonemes were derived. Again, due to the limited data available, some of the positions were not represented. However, this does not necessarily mean that the pre-phonemes do not occur in the unrepresented positions.

/i/: close front unrounded vowel

C_C	Bok, Dak	/kejrol/	'thunder'
	Kby	/kerol/	

	Atk, Bok, Kby	/təgʔin/	'cold', as in weather
	Dak	/tʌgin/	
C_#	Atk, Bok	/ʔəddaβi/	'night'
	Kby	/dabi/	
	Dak	/ʔadabi/	

/u/: close back rounded vowel

C_C	Atk, Kby	/ʔuran/	'rain'
	Bok, Dak	/ʔɔran/	
C_#	Atk	/ʔaqqəw/	'day'
	Bok	/ʔak ^h u/	
	Kby, Dak	/ʔaku/	

/ə/: close-mid central unrounded vowel

C_C	Bok, Dak	/tabʌn/	'sky'
	Kby	/tavin/	
	Atk	/nalbəŋ/	'wet', as in surface
	Kby	/nalφəŋ/	

/a/: open front unrounded vowel

C_C	Atk, Bok	/ʔəmpətəŋ/	'warm'
	Kby	/pətəŋ/	
	Dak	/patəŋ/	

5.2 Reconstructed Pre-Forms

From the phonemic inventory of PIBL, 24 lexical items were analyzed, and 25 items were reconstructed from these. These items can be categorized into two semantic domains: astronomy (cloud, sun, moon, stars, sky, day, night, evening, and shadow) and meteorology (water, current/flow, dew, dust, mud, rain, thunder, lightning, rainbow, cold, hot, warm, wet, and dry). Moreover, suprasegmentals such as vowel length, pitch, and stress were not considered since only one of the datasets had phonetic transcriptions. The reconstructed PIBL lexical items are listed in Table 8. Meanwhile, the correspondences can be perused in Section 9.3.

Most of the lexical items were reconstructed just by substituting the reflexes with the reconstructed phonemes, such as the following:

PIBL			
*qulput	Atk, Bok, Kby	qəlpət	'cloud'
	Dak	kilput	

*dapuq	Atk, Kby Bok Dak	tapɔq ʃabuk dapok	'dust'
*bulan	Atk, Bok, Dak Kby	bulan ɸulan	'moon'
*pitək	Bok, Kby, Dak	pitək	'mud'
*ʔudan	Atk, Kby Bok, Dak	ʔuran ʔɔran	'rain'
*buɟlul	Ibl	buɟdol boɟdol bundol	'rainbow'
*ʔaliduɟ	Bok, Dak Kby	dirum ʔadiroɟ	'shadow'
*tabən	Bok, Dak Kby	tabən tavin	'sky'
*talaw	Atk, Bok, Kby, Dak	talaw	'star'
*danum	Atk, Bok, Dak Kby	ʃanum tʃanɔm	'water'
*dagəm	Atk Bok, Dak Kby	tʃagəm ʃagum ʃagub	'wind'

Meanwhile, the following reconstructions were not as straightforward as others. Common phonological processes such as sound addition, vowel breaking, and sound loss were considered in reconstructing the following lexical items. Moreover, since it has been proven by Ruffolo (2004) and Cruz et al. (2018a) that geminated consonants in Ibl are allophones of their non-geminated forms, geminated consonants were not included in the reconstruction. It can also be observed that the reconstructed pre-forms below are similar to the Kby forms since these forms are either lesser used or exhibit simpler forms than the other varieties.

PIBL

*ʔaku	Atk Bok Kby, Dak	ʔaqqɔw ʔak ^h u ʔaku	'day'
*kidul	Bok, Dak Kby	kejrol kerol	'thunder'
*maʔdəm	Bok, Dak Kby	mafem maʔfem	'evening'

*səkit	Atk	səkkit	‘sun’
	Bok	səkit	
	Kby	səkk ^h it	
	Dak	ʃakit	

Some reconstructions also manifested the reflexes of the uvular trill *R. These were mostly consistent with the /l/ or /g/ reflexes of the Southern Cordilleran languages. However, one reconstruction exhibited /j/ instead of the expected reflexes. The reconstructions from higher groupings taken from Blust and Trussel (2020) were included for comparison.

PIBL			
*labi	Atk, Bok	ʔəddaβi	‘night’
	Kby	ɖabi	
	Dak	ʔadabi	
	Cf. PAN	*Rabi-an	
*ʔamul	Bok, Dak	ʔamol	‘dew’
	Kby	ʔamul	
	Cf. PMP	*lamuR	
*ʔajus	Atk, Bok	ʔajɔʃ	‘current, flow’
	Kby	ʔajus	
	Cf. PMP	*qaRus	
*bagilat	Kby	bugidat	‘lightning’
	Ibl	bagidat	
	Cf. PWMP	*maR-kilat	

Some lexical items needed clarifications regarding their semantic nuances. To achieve this, a native Ibl speaker from Benguet was consulted. For the lexical items ‘cold’ and ‘wet’, the six datasets provided two distinct forms for each. It was revealed that one meant ‘cold’ as in weather, while the other meant ‘cold’ to the touch. For ‘wet’, one held the meaning of ‘wet’ as in soaked, while the other meant ‘wet’ as in surface. Lastly, the lexical items ‘hot’ and ‘warm’ had the same reconstruction *ʔəm-pətaŋ. As such, it was treated as one reconstruction that held both meanings. A morpheme boundary symbol was also included in some of the following reconstructions to separate the complex morpheme from the root word.

PIBL			
*təgʔin	Atk	təgʔin	‘cold’, as in weather
	Bok	təg.ʔin, tʌgin	
	Kby	təgʔin	
	Dak	tʌgin	

*ʔaŋ-qətit	Kby ʔaŋkʌtit Ibl (ʔʌŋ)qʌtit, ʔʌŋkatit	‘cold’, as in to touch
*ʔəm-basa	Bok ʔəmbasa Kby ʔʌmbaʃa Dak ʔumbʌʃa Ibl (ʔʌm)basa	‘wet’, as in soaked
*nalbəŋ	Atk nalbəŋ Bok nalbiŋ Kby nalɸəŋ Ibl (na)lbʌŋ, nalbʌŋ	‘wet’, as in surface
*ʔəm-pətəŋ	Bok ʔanatoŋ Kby ʔampatoŋ Dak ʔampatoŋ Ibl (ʔʌm)pʌtəŋ	‘hot’
*ʔəm-pətəŋ	Atk ʔəmpətəŋ Bok ʔəmpətəŋ, pataŋ Kby pətəŋ, ʔampataŋ Dak pataŋ	‘warm’

Table 8
Reconstructed Pre-Ibaloi Terms

PIBL Reconstruction	Gloss
*ʔajus	‘current, flow’
*ʔaku	‘day’
*ʔaliduŋ	‘shadow’
*ʔamul	‘dew’
*ʔaŋ-qətit	‘cold’, as in to touch
*ʔə-magʔan	‘dry’
*ʔəm-basa	‘wet’, as in soaked
*ʔəm-pətəŋ	‘hot, warm’
*ʔudan	‘rain’
*bagilat	‘lightning’
*bulan	‘moon’
*buŋdul	‘rainbow’
*dagəm	‘wind’
*danum	‘water’
*dapuq	‘dust’
*kidul	‘thunder’
*labi	‘night’
*maʔdəm	‘evening’

PIBL Reconstruction	Gloss
*nalbəŋ	'wet', as in surface
*pitək	'mud'
*qulput	'cloud'
*səkɪt	'sun'
*tabən	'sky'
*talaw	'star'
*təgʔin	'cold', as in weather

6 Conclusion and Recommendations

Consulting four phonological studies on Ibl and four of its varieties, the researchers reconstructed 19 phonemes in PIBL: 15 of which are consonant phonemes (*b, *p, *d, *t, *g, *k, *q, *ʔ, *m, *n, *ŋ, *s, *j, *w, and *l) and four are vowel phonemes (*i, *u, *ə, and *a). Among these, the pepet or fourth vowel was reconstructed as *ə, while open middle and close middle back vowels were reconstructed as *u. Pre-vowels *i and *a were unanimously included in previous Ibl phonological studies; thus, these were included in the pre-phonemic inventory. Moreover, most of the pre-consonants were reconstructed using the majority rules principle. Meanwhile, some pre-phonemes like *b, *d, *j, and *l needed an extensive look into previous phonological studies to determine their underlying forms from their reflexes. Conversely, pre-phoneme *s was derived from consulting reflexes from Kby and higher subgroupings.

Most of the 25 lexical items were reconstructed by substituting the reflexes with the pre-phonemes, while some of the lexical items require consideration for common phonological processes to reconstruct the items' pre-forms. Additionally, Ibaloi, identified under PSC languages, manifested the expected reflex of the uvular trill *R as either *l with the allophone [d] in word-initial and intervocalic position, or *g. However, there was one exception where it was manifested as *j which might be explained further by expanding the word list to see other instances of where this might happen. Furthermore, some lexical items needed clarifications regarding their semantic nuances, resulting in lexical items with converging and diverging meanings.

Among the four varieties discussed, Kby seems to be the closest to PIBL. Himes (1998) cited oral tradition of how Ibaloi speakers migrated from Pangasinan, northward toward present-day Kabayan (p. 174). This coincides with Ruffolo's (2004) description where they identified Kabayan as the homeland of Ibaloi speakers with multiple varieties among each barangay, and that they live alongside Kankanaey and Kalanguya speakers. This supports Dyen's (1956) conclusion that the place of higher linguistic diversity can be inferred as the point of dispersion.

The researchers acknowledge that further delving into the varieties mentioned by Ruffolo (2004) and adding more lexical items to the 25 that were reconstructed in this study would uncover even more information about PIBL that could account for the lapses in this study if there are any. Moreover, studies may further explore the rela-

tionship between ethnoastronomy and agriculture which could then be developed into a cultural reconstruction of PIBL. Semantic domains peripherally related to the discussed could also add significant insight into said cultural reconstruction if the aim is to be holistic. For example, the addition of lexical inventory from other natural phenomena such as earthquakes and erosion, and even from naturally occurring landscapes and bodies of water.

Finally, the Cordillera Central mountain range, the people that till and shape its soil, and the sky above it has stood formidable, ceaseless, and eternal since the day of their ancestors. It is the hope that they will continue to preserve and nurture one another, and without a doubt, continue to resist the waves of neocolonialism that try to upend the mountains from the very base on which it stands.

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7 References

- Ambrosio, D. L. (2010). *Balatik: Etnoastronomiya, kalangitan sa kabihasnang Pilipino*. University of the Philippines Press.
- Ameda, C., Tigo, G. A., Mesa, V. B., Ballard, L., & Afable, P. O. (2011). *Ibaloy dictionary, phonology, grammar, morphophonemics*. Diteng Inc.; Cordillera Studies Center.
- Ballard, D. L. (1966–1970). *Inibaloi 1966 wordlist* [Data set]. SIL International. <https://www.sil.org/resources/archives/76986>
- Blust, R., & Trussel, S. (2020, June 21). *The Austronesian comparative dictionary*. <https://www.trussel2.com/ACD/>
- Carling, J. (2001, October). *The Cordillera experience*. Asia Society. <https://asiasociety.org/cordillera-experience>
- Crowley, T., & Bower, C. (2013). *An introduction to historical linguistics* (4th ed.). Oxford University Press.
- Cruz, N., Dordas, Q., Olayres Jr., M., Perez, J. G., & Tricano, J. (2018a). *An acoustic analysis of Ibaloi sounds* [Unpublished undergraduate paper]. Department of Linguistics, University of the Philippines Diliman.
- Cruz, N., Dordas, Q., Olayres Jr., M., Perez, J. G., & Tricano, J. (2018b). *Phonological comparison of Atok, Bokod, and Kabayan varieties* [Unpublished data set]. Department of Linguistics, University of the Philippines Diliman.

- Dyen, I. (1956). Language distribution and migration theory. *Language*, 32(4), 611–626. <https://doi.org/10.2307/411084>
- Eberhard, D. M., Simons, G. F., & Fennig, C. D. (Eds.). (2021). *Ethnologue: Languages of the world* (24th ed.). SIL International. <https://www.ethnologue.com/language/ibl>
- Elkins, R. E. (1962). *Inibaloi 1962 wordlist* [Data set]. SIL International. <https://www.sil.org/resources/archives/76984>
- Environmental Justice Atlas. (2017, February 27). *San Roque Multipurpose Project, Philippines*. Environmental Justice Atlas. <https://ejatlas.org/conflict/san-roque-multipurpose-project>
- Hammarström, H., Forkel, R., Haspelmath, M., & Bank, S. (Eds.). (n.d.). *Spoken L1 language: Ibaloi*. Glottolog. <https://glottolog.org/resource/languoid/id/ibal1244>
- Himes, R. S. (1998). The Southern Cordilleran group of Philippine languages. *Oceanic Linguistics*, 37(1), 120–177. <https://doi.org/10.2307/3623282>
- Launio, C. C., Batani, R. S., Galagal, C., Folloso, R., & Labon, K. O. (2020). Local knowledge on climate hazards, weather forecasts and adaptation strategies: Case of cool highlands in Benguet, Philippines. *Philippine Agricultural Scientist*, 103, 67–79.
- Lyman, T., & Wolfenden, E. (2018). *Inibaloi, Benguet sub-province Yale linguistic questionnaire* [Data set]. SIL International. <https://www.sil.org/resources/archives/76987>
- Moss, C. R. (1920). Nabaloi law and ritual. *University of California Publications in American Archaeology and Ethnology*, 15(3), 207–342. <https://digitalassets.lib.berkeley.edu/anthpubs/ucb/text/ucp015-005.pdf>
- Murphy, K. M. (2017). A quiet harvest: Linkage between ritual, seed selection and the historical use of the finger-bladed knife as a traditional plant breeding tool in Ifugao, Philippines. *Journal of Ethnobiology and Ethnomedicine*, 13(3). <https://doi.org/10.1186/s13002-016-0124-9>
- Peneyra, I. D. U. (2003). *Isang rekonstrusyong internal ng Tagalog batay sa mga piling dayalek* [Unpublished doctoral dissertation]. University of the Philippines Diliman.
- Philippine Statistics Authority Cordillera Administrative Region. (2020, May 6). *Regional compendium of environment statistics component 1: Environmental conditions and quality physical conditions*. <https://rssocar.psa.gov.ph/content/rces-component-1-environmental-conditions-and-quality-physical-conditions>
- Ruffolo, R. (2004). *Topics in the morpho-syntax of Ibaloy, Northern Philippines* [Unpublished doctoral dissertation]. Australian National University. <https://doi.org/10.2591/1/5d723e2907653>
- Tartlet, R. K. (2001). The Cordillera people's alliance: Mining and indigenous rights in the Luzon highlands. *Cultural Survival Quarterly*, 25(1). <https://www.culturalsurvival.org/publications/cultural-survival-quarterly/cordillera-peoples-alliance-mining-and-indigenous-rights>
- Wimbish, J. S. (1984). *Ibaloi - Baguio, Benguet wordlist* [Data set]. SIL International. <https://www.sil.org/resources/archives/76799>

World Rainforest Movement. (2001, January 13). *Philippines: Local people against the San Roque dam*. World Rainforest Movement. <https://www.wrm.org.uy/bulletin-articles/philippines-local-people-against-the-san-roque-dam>

8 List of Abbreviations

PAN	Proto-Austronesian	PIBL	Pre-Ibaloi
PMP	Proto-Malayo-Polynesian	Ifa	Ifugao
PWMP	Proto-Western Malayo-Polynesian	Kyj	Karaw
PPH	Proto-Philippine	Kak	Kalanguya
PC	Proto-Cordilleran	KNKS	Southern Kankanaey
PSC	Proto-Southern Cordilleran	Pag	Pangasinan
PWSC	Proto-Western Southern Cordilleran	Ibl	Ibaloi
PNuSC	Proto-Nuclear Southern Cordilleran	Atk ³	Atok
		Bok ³	Bokod
		Kby ³	Kabayan
		Dak ³	Daklan

³These languages have no ISO codes. Their abbreviations are derived from Himes's "The Southern Cordilleran Group of Philippine Languages" (1998).

9 Appendix

9.1 Consonant Correspondences Among Four Ibaloi Varieties

*	Atk					Bkd					Kby					Dak				
	#_V	VC_V	CV_V	V_CV	V_#	#_V	VC_V	CV_V	V_CV	V_#	#_V	VC_V	CV_V	V_CV	V_#	#_V	VC_V	CV_V	V_CV	V_#
*b	b	b				b	b	b			b	b	b			b	b	b		
			β					β			φ	φ								
*p	p	p				p	p				p	p	p			p	p	p		
								b					v							
*d	t										t					d				
											tʃ									
			r					ʃ				ʃ	ʃ			ʃ		ʃ		
*t	t		t		t	t		t		t		t		t	t		t		t	
*g			g	g				g	g				g	g				g		
*k			k			k		k		k		k		k	k		k		k	
			q										g					k		
*q	q				q	q				q				q						
*ʔ	ʔ	ʔ				ʔ	ʔ			ʔ	ʔ			ʔ		k	ʔ			k
*m			m	m	m	m		m	m	m	m		m	m	m	m		m	m	m
								n												
*n	n		n		n	n		n		n		n		n				n		n
*ŋ					ŋ					ŋ		ŋ		ŋ						ŋ
					m					m				m						m
*s	s				ʃ	s		s		s		s		s						
			l	l				l	l	l		l	l	l		l		l	l	l
*l	d		d			d		d		d		d		d		d		d		w
*w					w					w				w						w
*j			j					j	j				j					j		

9.2 Vowel Correspondences Among Four Ibaloi Varieties

*	Atk		Bkd		Kby		Dak	
	C_C	C_#	C_C	C_#	C_C	C_#	C_C	C_#
*i		i	i	i	i	i	i	
			e		e		e	
*u	ɔ		ɔ		ɔ		ɔ	
	u		u	u	u	u	u	
			ʌ		ʌ		ʌ	
					i			
*ə	ə		ə		ə			
	a						a	
							u	
*a	a		a		a		a	
			ə					
							u	

9.3 Comparative Analysis of Some Astronomical and Meteorological Cognate Terms From Previous Ibaloi Studies

Gloss	PIBL	Atk		Bkd		Kby		Dak		Ibl		
		Cruz et al. (2018a)	Cruz et al. (2018a)	Lyman and Wolfenden (2018)	Cruz et al. (2018a)	Lyman and Wolfenden (2018)	Lyman and Wolfenden (2018)	Elkins (1962)	Ballard (1966–1970)	Wimbish (1984)	Ambrosio (2010)	
cloud	*qulput	'qɔl.pɔt	'qɔl.pɔt	kilput	'qɔl.pɔt	kolput	kilput	qolpot	qolpot	kolpot	kolpot	
cold ⁴	*təgʔin, *ʔaŋ-qətit	təg.'ʔin	'təg.ʔin	təgin	'təg.ʔin	ʔaŋkətit	təgin	(ʔaŋ)qətit	(ʔaŋ)qətit	ʔaŋkətit	-	
current, flow	*ʔajus	ʔa.'jɔf	'ʔa.jɔf	ʔajos	'ʔa:jus	ʔumbuluf	buluf	-	-	-	-	
day	*ʔaku	ʔaq.'qɔw	'ʔa.k ^h u	ʔaku	ʔa.'ku	kakawan	ʔaku	ʔakaw	ʔakaw	ʔakuw	ʔakuw	
dew	*ʔamul	-	-	ʔamol	-	ʔamul	ʔamol	-	-	-	-	
dry	*ʔə-magʔan	ʔə.'ma:g.ʔan	ʔə.'mɛg.ʔan	baga	naʔ.'tjan	ʔamagan	ʔumagan	(ʔa)magʔan	(ʔa)mag(ʔan)	ʔamagʔan	-	
dust	*dapuq	ta.'pɔq	'ʃa.buk	dapok	ta'.pɔq	dɔpuk	dapok	tapok, tʃɔpʔol	tapoq, tʃɔpʔal	tapok	-	
evening	*maʔdəm	-	-	maʔem	-	maʔfem	maʔem	-	-	-	-	
hot ⁵	*ʔəm-pətaŋ	-	-	ʔanatoŋ	-	ʔampatoŋ	ʔampatoŋ	(ʔam)pətaŋ	(am)pətaŋ	ʔampətaŋ	-	
lightning	*bagilat	-	-	kejmat	-	bugidat	bagidat	bagidat	bagidat	kimat	bagidat	
moon	*bulan	'bu:.lan	bu.'lan	bulan	'ɸu:.lan	bulan	bulan	bulan	bolan	bulan	bolan	
mud	*pitək	-	-	pitək	-	pitək	pitək	pitək	pitək, pitoy	pitək	-	
night	*labi	ʔəd.'da:βi	ʔəd.'da.βi	ʔadabi	da.'bi	malabi	ʔadabi	dabi, kalabijan	kalabian	dabi	-	
rain	*ʔudan	'ʔu:.ran	'ʔɔ.ran	ʔuran	ʔɔ.'ran	ʔunuran	ʔuran	ʔoran	ʔoran	ʔoran	oran	
rainbow	*buŋlul	-	-	-	-	-	-	buŋdol	boŋdol	bundol	boŋdol	
shadow	*ʔaliduŋ	-	-	dirum	-	ʔadiroŋ	dirum	ʔadiroŋ	ʔadiroŋ	ʔadirom	-	
sky	*tabən	naʔ.'qa:jaŋ	'da:ŋit	tabən	naʔ.'ka:jaŋ	tavin	tabən	tabən	tabən	doŋit, naʔkajaŋ	tabin	
star	*talaw	ta:.'law	'ta:law	paʔiŋʃiŋ	ta.'law	talaw	talaw	talaw	talaw	talaw	talaw	
sun	*səkɪt	sək.'kit	sə.'kit	ʃakit	sək.'k ^h it	ʔak ^ʔ u	ʃakit	-	-	səkɪt	-	
thunder	*kidul	-	-	kejrol	-	kerol	kejrol	qirol	kirol	kerol	kirol	

Gloss	PIBL	Atk	Bkd	Kby		Dak	Ibl				
		Cruz et al. (2018a)	Cruz et al. (2018a)	Lyman and Wolfenden (2018)	Cruz et al. (2018a)	Lyman and Wolfenden (2018)	Lyman and Wolfenden (2018)	Elkins (1962)	Ballard (1966–1970)	Wimbish (1984)	Ambrosio (2010)
warm ⁵	*ʔəm-pətaj	ʔəm.pə.'taj	ʔəm.'pə.taj	pataj	pə.taj	ʔampataj	pataj	-	-	-	-
water	*danum	'ja:.num	'ja.num	fanum	tja.'nɔm	tfanum	fanum	tfanom	tfanom	fanom	-
wet ⁴	*nalbəj, *ʔəm-basa	na:l.bəj	'ʔəm.ba.sa	nalbiŋ	nal.φəj	ʔambafa	ʔumbafa	(na)lbaŋ, (ʔam)basa	nalbaŋ, (ʔam)basa	ʔambasa	-
wind	*dagəm	tfa.'gəm	ʃagum	'fa:.gəm	ʃagub	'fa:.gəm	ʃagum	tʃagam	tʃagam	ʃagam	tʃagim

⁴These items have the same reflexes; hence, they were considered as one form. However, these were separated in this table to present the reflexes provided by the datasets.

⁵These items manifested two different forms that were confirmed by the informant to have relevant semantic nuances; therefore, two forms were reconstructed.