

eScholarship

Himalayan Linguistics

Title

Neutralization in Southern Kamrupi Assamese: An Evaluation of k^h, ħ, and x

Permalink

<https://escholarship.org/uc/item/22n946vw>

Journal

Himalayan Linguistics, 25(2)

Author

Kalita, Sourav

Publication Date

2026-09-02

DOI

10.5070/H9.43556

Copyright Information

This work is made available under the terms of a Creative Commons Attribution-NonCommercial License, available at <https://creativecommons.org/licenses/by-nc/4.0/>

Peer reviewed



Languages and Peoples of the Eastern Himalayan Region (LPEHR) comprises an annual special issue of *Himalayan Linguistics* together with occasional special publications. Peer-reviewed and open-access, it focuses on linguistic and ethnographic documentation and description in the Eastern Himalaya.

Languages and People of the Eastern Himalayan Region (LPEHR)

Neutralization in Southern Kamrupi Assamese: An Evaluation of k^h , h , and x

Sourav Kalita
Gauhati University

ABSTRACT

The place of articulation for the Assamese fricative consonant represented by the consonant letters ঞ, ঞ, and ঞ has been a subject of debate for a long time. Linguists from the last and the present centuries have expressed varying attitudes regarding the nature of this fricative sound. Although the prevailing stance among linguists of today aligns with the perspectives of the pioneering linguists of the Assamese language, a small contingent of linguists holds an alternative standpoint, and no consensus has been established thus far. The controversial nature of this particular phoneme is likewise reflected within the Kamrupi dialect as well. Aligned with Standard Assamese, many linguists opine that in the Kamrupi dialect also, this fricative phoneme has a velar place of articulation. This paper, however, argues that this phoneme in Southern Kamrupi Assamese is pre-pharyngeal as far as its place of articulation is concerned. Southern Kamrupi features the velar fricative [x] as well, which occurs as an allophone of /h/. Furthermore, the phoneme / k^h / in Southern Kamrupi is realized as [x] in some environments. Since both /h/ and / k^h / are realized as [x] in certain contexts, it can be argued that this situation in Southern Kamrupi exemplifies the linguistic phenomenon known as phonological neutralization. This phenomenon is observed in the other two varieties of the Kamrupi Dialect as well, i.e., Nalbaria and Barpetia, and this study takes it into account to offer a broader perspective on its occurrence.

KEYWORDS Assamese, Southern Kamrupi, fricative, phoneme, allophone, neutralization

This is a contribution from *Himalayan Linguistics* Vol 25(2): 136–158.
ISSN 1544-7502

© 2025. All rights reserved.

Tables of contents, abstracts, and submission guidelines are available at
escholarship.org/uc/himalayanlinguistics

Neutralization in Southern Kamrupi Assamese: An Evaluation of k^h , h , and $x^\dagger$

Sourav Kalita
Gauhati University

1 Introduction

One of the most controversial facets regarding the sound system of the Assamese language is the longstanding debate over whether Assamese has a pharyngeal or velar fricative in its phonemic inventory. In his seminal work *An Introduction to Assamese Phonology*, G. C. Goswami (1966) states that Assamese features a voiceless velar fricative /x/; and numerous linguists have accepted that the fricative in question is velar, in terms of its place of articulation. However, R. K. Mahanta (1970) points out that Assamese exhibits the rare linguistic presence of the voiceless pre-pharyngeal fricative, which is conventionally represented as /h/; and some linguists have acknowledged that it is, in fact, a pre-pharyngeal rather than a velar fricative. However, there is a lack of empirical evidence to validate the assertions put forth by either of the two parties involved. Therefore, even after such a prolonged period, no clear consensus has been reached about the place of articulation of this particular fricative consonant of the Assamese language.

The present study, however, is dedicated to an in-depth exploration of the nature of this fricative consonant within the Southern Kamrupi variety, which is a regional variety of the Assamese language. The persistent controversy regarding the place of articulation of this fricative phoneme can be observed within the Kamrupi dialect as well. According to U. N. Goswami (1970), Kamrupi incorporates the voiceless velar fricative /x/ in its consonant inventory, which occurs as a phoneme in the dialect. In alignment with this observation, Thakuria (2005) reports that in the Southern Kamrupi variety as well, this specific phoneme is velar in terms of its place of articulation. Similarly, Patgiri (2021) notes that this phoneme has a velar place of articulation in the Nalbaria variety of Assamese. Contrary to these views, Rabha (1994), who worked extensively in the Dudhnoi dialect of Assamese, states that the Dudhnoi dialect features the fricative /h/ in its phonemic inventory. With respect to the Barpetia variety, Sarma (2012) adopts a different position altogether, proposing that in this variety neither /x/ nor /h/ functions as the phoneme; instead, the uvular fricative /χ/ functions as the underlying phoneme. Considering all these varying observations made by different scholars, it becomes apparent that this topic necessitates further investigation, both in Standard Assamese and regional and dialectal varieties. In the current study, however, it has been observed that the speakers of Southern Kamrupi Assamese employ the voiceless pre-pharyngeal fricative /h/ as the phoneme, and the voiceless velar fricative [x] occurs as an allophone of this phoneme. Furthermore, the consonant phoneme / k^h / is realized as [x] in some environments. Therefore, this leads to a context-sensitive neutralization of the contrast between the two phonemes /h/ and / k^h / in Southern Kamrupi Assamese, as both phonemes

[†] I extend my deepest gratitude to my supervisor, Dr Seuji Sharma, Associate Professor, Department of Linguistics, Gauhati University, for her consistent support and guidance throughout the preparation of the manuscript of this paper. I sincerely thank my informants, who gave their valuable time and effort and provided me with the necessary data. Last but not least, I would like to thank the anonymous reviewers for their constructive feedback.

exhibit a shared allophonic realization in the form of the voiceless velar fricative [x].

This paper presents a detailed acoustic analysis of the Southern Kamrupi fricatives /h/ and /x/, which are represented by the consonant letters ঞ, ঞ, and ঞ of the Assamese alphabet. To achieve this objective, a dataset comprised of Southern Kamrupi words containing these three consonant letters has been elicited and recorded from native speakers of the variety. These words have later been analyzed at the segmental level using the free, open-source computer software ‘Praat’, which enables us to investigate different acoustic properties of speech sounds such as frequency, formant structure, pitch, intensity, duration, etc. Drawing on the experimental evidence extracted from Praat, this paper seeks to establish that Southern Kamrupi features both the pre-pharyngeal fricative [h] and the velar fricative [x] in its phonological system. In the first half of this paper, acoustic evidence in support of the presence of both [h] and [x] in Southern Kamrupi Assamese will be produced, which will be followed by a comprehensive discussion of the process of phonemic neutralization of /h/ and /k^h/ in this specific variety of the Assamese language.

2 Overview of Southern Kamrupi Assamese:

Variations are intriguing aspects of language and are the driving force behind a language's appeal. Similar to any other language, Assamese boasts a rich array of dialectal and regional variations. According to Kakati (1941), “Assamese may be divided dialectically into Eastern Assamese and Western Assamese.” He further remarks that in the Western Assam region, several local dialects and regional varieties are found to be spoken across different parts of Kamrup and Goalpara (Kakati, 1941). G. C. Goswami (1982) remarks that Assamese can predominantly be divided into three dialectal divisions: Eastern Assamese (spoken in the eastern districts of Assam and some parts of Nagaon), Central Assamese (spoken in the areas between Nagaon and Guwahati), and Western Assamese (spoken in the regions between Guwahati in the east and the district of Goalpara in the west). He divided the Western Assamese group further into South Kamrupi, North Kamrupi, and Goalparia. Among these three major dialects of Assamese, further regional variations can be observed within the Kamrupi dialect. U. N. Goswami (1970) points out that the Kamrupi dialect is chiefly characterized by three distinct regional varieties: Western, Central, and Southern. Western Kamrupi, also known as Barpetia Assamese, is the variety of Assamese prevalent in the district of Barpeta. The Central Kamrupi variety that he talks about, which is frequently referred to as Nalbaria Assamese nowadays, is the one that is spoken in the district of Nalbari and the neighboring areas. Southern Kamrupi is the variety spoken by the people residing in and around the three legislative assembly constituencies of Palasbari, Chaygaon, and Boko of the Kamrup (rural) district. Figure 1 shows the map of Kamrup (rural) district; the areas within the district where Southern Kamrupi is spoken are circled in red.

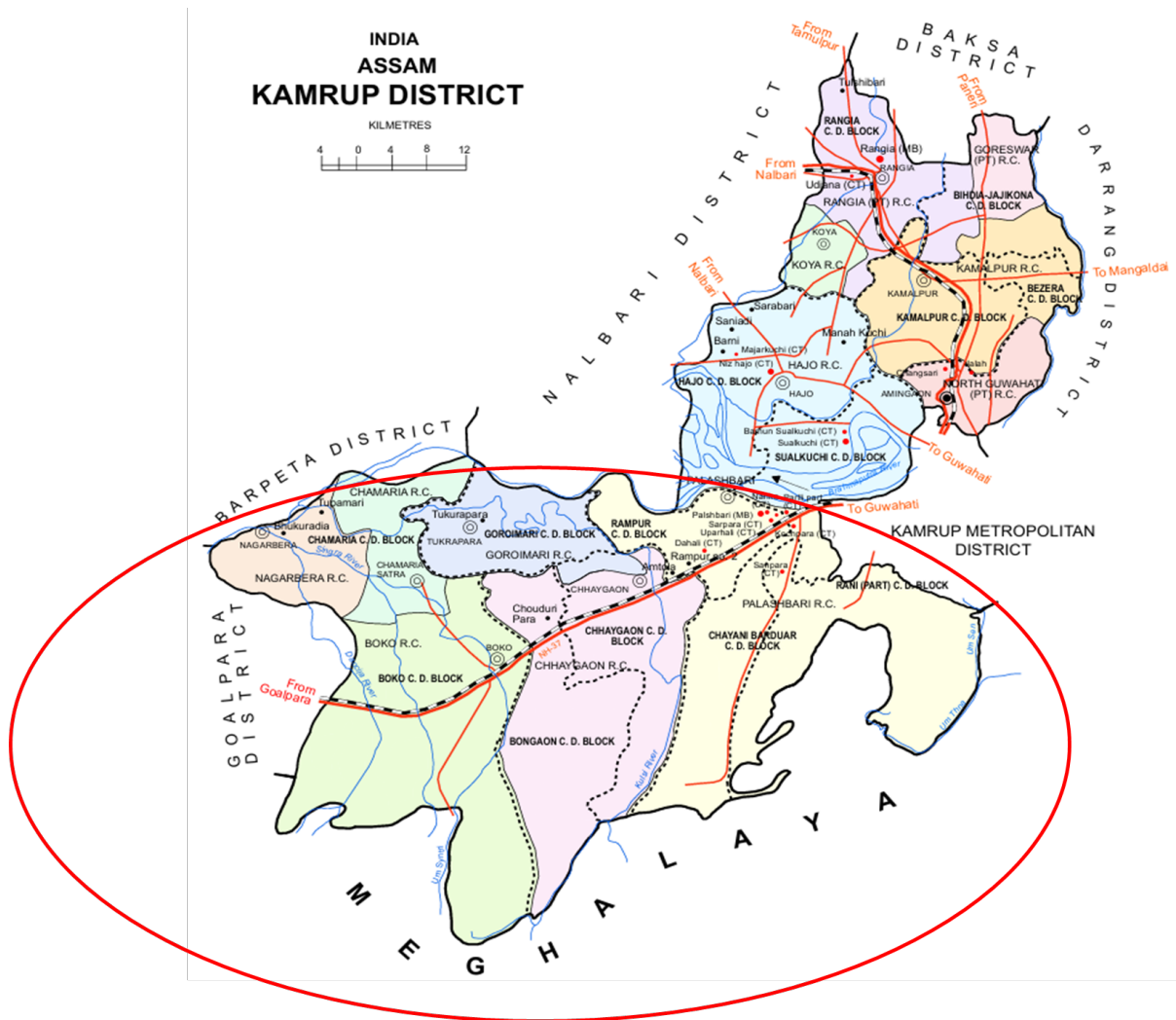


Figure 1 – Map of Kamrup (R) District showing the distribution of Southern Kamrupi Assamese (Source: Directorate of Census Operations, Assam).

As reported by the native speakers of the variety, Southern Kamrupi is spoken primarily along the southern banks of the Brahmaputra River, stretching from the outskirts of Guwahati City in the east down to Dhupdhara and Nagarbera in the west. It can be estimated with a reasonable degree of approximation that this particular variety is spoken within six Tahsils, viz. Nagarbera, Boko, Goroimari, Chamaria, Chaygaon, and Palasbari. The total population of these six Tahsils is 8,11,805. Even though the majority of this population speaks Southern Kamrupi, not everyone speaks it as their native language (variety). Moreover, a small portion of this population does not speak Southern Kamrupi at all. Furthermore, out of the total population of 8,11,805 in these six Tahsils, only 56,598 reside in urban areas (Census 2011).

3 Consonant Inventory of Standard Assamese and Southern Kamrupi Assamese

The earliest accounts of the phonemic inventory of Standard Assamese are traceable to seminal works such as Kakati (1941), G. C. Goswami (1966), and R. K. Mahanta (1970), among others. Apart from some minor articulatory differences, in terms of place and manner, of a few consonants, all three works present a largely identical phonemic inventory of the Assamese consonantal system. These studies highlight six different manners of articulation across five distinct places of articulation. The various places of articulation identified in

Standard Assamese are bilabial, alveolar, palatal, velar, and glottal (G. C. Goswami, 1966). Upon accounting for all the phonemes scattered across these different places of articulation, it is found that Standard Assamese comprises 23 consonant phonemes. Table 1 outlines the consonant phonemes of Standard Assamese as delineated by the pioneering linguists of the Assamese language.

	Bilabial		Alveolar		Palatal	Velar	Glottal
Plosive	p	b	t	d		k	g
	p ^h		t ^h			k ^h	
		b̥		d̥			g̥
Nasal		m		n			ŋ
Trill				r			
Fricative			s	z		x ¹	ɦ
Approximant		w ²			j		
Lateral Approximant				l			

Table 1 – Consonant Phonemes of Standard Assamese (G. C. Goswami, 1966).

While all three studies unanimously agree on the articulatory features of the majority of these consonants, some differences of opinion regarding the manner of articulation for /b̥ d̥ g̥/ and the place of articulation of /x/³ are observed. Although linguists do not make much distinction between voiced aspirated plosives and breathy voiced plosives, and mostly consider them as phonetically similar, Kakati (1941), G. C. Goswami (1966), and G. C. Goswami & Tamuli (2003) used the term voiced aspirated plosives for /b^h d^h g^h/ nevertheless. On the other hand, R. K. Mahanta (1970) and Verma (2002) described /b̥ d̥ g̥/ as breathy-voiced plosives. In this connection, S. Mahanta (2012) likewise notes that /b̥ d̥ g̥/ are characterized by breathy phonation; however, their breathiness tends to be lost in non-initial positions. Since a majority of scholars agree that these consonants are breathy-voiced, this paper employs the symbols /b̥ d̥ g̥/ instead of /b^h d^h g^h/. Regarding the phonation of these three consonants, the same holds true in the Kamrupi dialect. While many renowned scholars use /b^h d^h g^h/ in Kamrupi, their phonation, in fact, is breathy-voiced. Therefore, for the Kamrupi dialect as well, this paper employs /b̥ d̥ g̥/ for the plosives under discussion.

U. N. Goswami (1970) treated the language varieties of Assamese spoken in the undivided Kamrup district as a broader dialectal unit without accounting for the sub-dialectal varieties. In his treatment of this greater Kamrupi dialect, he notes that this variety of Assamese shares a similar set of consonant phonemes with Standard Assamese, except that there is no phonemic semivowel in Kamrupi. Unlike Standard Assamese, Kamrupi does not feature /j/ and /w/ (U. N. Goswami, 1970). Thus, instead of an inventory of 23 consonant phonemes, Kamrupi features a consonantal system comprising only 21 phonemes. The consonant phonemes of the Kamrupi Dialect are presented below in Table 2.

¹ Kakati (1941) notes that /x/ is an unvoiced glottal fricative; G. C. Goswami (1966) labels /x/ as a velar fricative; whereas R. K. Mahanta (1970) argues that this is the pre-pharyngeal fricative /ħ/.

² [w] cannot be classified as a purely bilabial consonant. It has two equally important places of articulation: the lips and the velum. Therefore, [w] is said to have a labial-velar place of articulation. However, due to the constraints of phonetic representation, [w] has been put alongside other bilabial sounds.

³ Since the place of articulation of this fricative is the central concern of this paper, it has been given due consideration in the respective sections. In this section, however, only the manner of articulation for /b̥ d̥ g̥/ is briefly considered.

	Bilabial		Alveolar		Velar		Glottal
	p	b	t	d	k	g	
Plosive	p ^h		t ^h		k ^h		
		b̥		d̥		g̥	
Nasal		m		n		ŋ	
Trill				r			
Fricative			s	z	x ⁴		ɦ
Lateral Approximant				l			

Table 2 – Consonant Phonemes of Kamrupi Dialect (U. N. Goswami, 1970).

In this study, however, it has been observed that Southern Kamrupi Assamese does feature semivowels /j/ and /w/ in its phonemic inventory; however, their distribution is significantly more restricted than that of other consonants. Furthermore, instead of the velar fricative /x/, Southern Kamrupi features the pre-pharyngeal fricative /ħ/ in its phonemic inventory. The presence of the pre-pharyngeal fricative /ħ/ is strongly supported by the pioneering phonetic account of Assamese by R. K. Mahanta (1970). Instead of the traditional label of ‘pharyngeal fricative’, this fricative is labeled as ‘pre-pharyngeal’ in the Assamese language, as it is the anterior part of the pharynx and the root of the tongue that are activated during the formation of the close approximation required for the articulation of this fricative (R. K. Mahanta, 1970, p. 246). As a variety of Assamese, Southern Kamrupi incorporates the same fricative in its phonemic inventory. Acoustic evidence presented in this paper and native speakers’ intuition further reinforce this proposed place of articulation for the fricative /ħ/.

Thus, reflecting a pattern similar to Standard Assamese, Southern Kamrupi also features a total of twenty-three consonants in its phonemic inventory, which are provided below in Table 3.

	Bilabial		Alveolar		Palatal	Velar		Pre-pharyngeal	Glottal
	p	b	t	d		k	g		
Plosive	p ^h		t ^h			k ^h			
		b̥		d̥			g̥		
Nasal		m		n			ŋ		
Trill				r					
Fricative			s	z			ħ		ɦ
Approximant		w ⁵			j				
Lateral Approximant				l					

Table 3 – Consonant Phonemes of Southern Kamrupi Assamese.

Since the phonemic inventory of Southern Kamrupi is nearly identical to that of Standard Assamese, and considering that this paper is chiefly concerned with the phonetic and phonological identity of [ħ] and [x], the rest of the Southern Kamrupi consonants are not considered here in this study. The discussion that follows addresses the two fricatives phonologically in Section 5.1, as well as phonetically in Section 5.2.

⁴ U. N. Goswami (1970) describes [x] as a voiceless post-velar spirant.

⁵ [w] cannot be classified as a purely bilabial consonant. It has two equally important places of articulation: the lips and the velum. Therefore, [w] is said to have a labial-velar place of articulation. However, due to the constraints of phonetic representation, [w] has been put alongside other bilabial sounds.

4 Methodology

In order to realize the objectives of this study, 114 lexical items incorporating the consonant sounds represented by the letters ঞ, ঞ, and ঞ, in word initial position, and 103 items incorporating these consonants in word internal, or word final positions, were selected and systematically elicited from five male and five female speakers, over the age of 40 years, of Southern Kamrupi Assamese. Data was collected using both structured and semi-structured interviews from an equal number of male and female speakers to ensure a balanced representation. The recordings were made using the Zoom H1n Handy Recorder in WAV format at a sampling rate of 96kHz and a 24-bit resolution, in a quiet room with minimal background noise. After the successful collection of necessary data, the recordings were reviewed immediately for sound quality and clarity. Later, individual lexical items were segmented from the larger files with a Praat script. Subsequently, the isolated lexical items were annotated at the segmental level. Special attention was paid to extracting various acoustic features, such as spectrograms, formant patterns, pitch, etc., of the said fricative sounds. An analytic approach was adopted to achieve the objectives and successfully address different issues related to [h] and [x].

Among all acoustic features, the formant patterns of the two fricatives, i.e., [h] and [x], were the ones most extensively examined and utilized. After generating a spectrogram, the mean frequency of the first formant (F1) and the second formant (F2) was systematically measured over the central 50% of the fricative duration. This was done to cut out any influence that the neighbouring vowels might have on the fricative formants. Also, measuring the frequency of formants at any random point of the fricative interval is very unlikely to yield reliable data, as fricatives tend to have unstable resonant structures throughout their duration. Thus, the obtained values for the frequency of F1 and F2, along with other acoustic data, were utilized to phonetically evaluate the status of [h] and [x]⁶ in Southern Kamrupi Assamese.

5 Evaluation of [h] and [x]

In this section, [h] and [x] are subjected to extensive evaluation, both phonologically and phonetically. Firstly, the Southern Kamrupi data were thoroughly examined to determine the phonological status of the fricatives. Drawing on the findings of the phonological investigation and building upon existing literature, this section seeks to establish the phonological status of [h] and [x] in Section 5.1. Secondly, utilizing empirical evidence obtained from existing literature and acoustic evidence generated by this study, the identity of the two fricatives is further reinforced in Section 5.2.

5.1. Phonology of [h] and [x] in Standard and Southern Kamrupi Assamese:

The findings of this study reveal that the voiceless velar fricative [x] does not occur as a phoneme in either Standard Assamese or Southern Kamrupi Assamese. Instead, a comparable fricative sound with an alternate place of articulation functions as the phoneme in both varieties of the Assamese language. This particular fricative, which is represented by the consonant letters ঞ, ঞ, and ঞ of the Assamese alphabet, has been acknowledged as exhibiting a velar place of articulation by G. C. Goswami (1966), G. C. Goswami & Tamuli (2003), S. Mahanta (2012), and Dutta & Kenstowicz (2018). In contrast, Kakati (1941) characterizes this

⁶ Throughout the paper, frequent switching between slash brackets and square brackets can be observed, which is done intentionally, adhering to common phonological practice. Whenever the phonemic status of a fricative is being implied, slash brackets have been used; similarly, when referring to an allophone, square brackets have been employed.

consonant as having a glottal place of articulation, whereas R. K. Mahanta (1970) and Verma (2002) classify it as a pre-pharyngeal fricative. According to Moral (2016), [h̥] is indeed featured in Assamese; however, it occurs as an allophone of /x/, and is not the phoneme itself. Regarding its place of articulation in the Kamrupi dialect, U. N. Goswami (1970) asserts that this consonant exhibits a post-velar place of articulation rather than a distinctly velar one. Taking into account the differing viewpoints of these linguists, it can be inferred that the assertion of a velar place of articulation of this controversial fricative consonant remains inconclusive and lacks robust support.

A similar observation is also reported by Sarma (2012), who notes that in both Standard Assamese and the Barpetia variety of Assamese, [x] is not a phoneme itself; rather, it serves as an allophonic variation of a different phoneme. He claims that in both varieties of the Assamese language, the uvular fricative /χ/ functions as the phoneme, and the velar fricative [x] is found as an allophone of /χ/ in word internal and word final positions. The results presented in this paper are in agreement with the findings of Sarma (2012), as far as the status of [x] is concerned. However, this paper argues that the phoneme, of which [x] is an allophone, is, in fact, the voiceless pre-pharyngeal fricative /h̥/ rather than the voiceless uvular fricative /χ/.

The central argument of this paper is that in the Standard variety as well as the Southern Kamrupi variety of Assamese, the voiceless pre-pharyngeal fricative /h̥/ is the phoneme. Whereas in Standard Assamese /h̥/ preserves its original place of articulation across all contexts, in Southern Kamrupi, the phoneme is realized as [h̥] in absolute initial position only. In junction initial, junction final, and absolute final position, the phoneme is realized as [x]. This makes sense, as numerous leading linguists, among others, Martinet (1970) notes that segments occupying strong positions, such as word initial, are often retained in a language, whereas segments occurring in word internal or word final positions, which are considered weak positions, are often prone to alternation or even elision. Standard Assamese, on the other hand, lacks this alternating variation and employs the voiceless pre-pharyngeal fricative [h̥] across all positions. However, the place of articulation of this consonant may be influenced by the presence of a front vowel in both Standard and Southern Kamrupi Assamese. When preceding or following a front vowel such as /i/, /e/, or /ɛ/, a double articulation involving the simultaneous formation of two closely approximated strictures is realized- one at the palatal region and the other at the pre-pharyngeal area. Therefore, this specific variant may be appropriately classified as a palatal-pre-pharyngeal fricative (R. K. Mahanta, 1970).

The distribution of this particular fricative phoneme in Standard, as well as Southern Kamrupi Assamese, has been demonstrated below with carefully selected examples:

1. In Standard Assamese, /h̥/ is consistently realized as [h̥] across all contexts. A few examples are presented below:

[h̥at] ‘seven’; [bɔrɔh̥un] ‘rain’; [bɔjɔh̥] ‘age’; [h̥aɦɔh̥]⁷ ‘courage’

2. In Southern Kamrupi Assamese, the phoneme /h̥/ has the following allophonic variations:

a) In absolute initial position⁸, it retains its original form, that is, [h̥]. For example:

⁷ In general, square brackets enclose allophonic transcriptions. In this paper, however, despite enclosing whole words in square brackets, only the fricatives under investigation are allophonically transcribed, while all other segments are represented using phonemic transcription.

⁸ **Absolute initial:** word-cum-syllable initial position; **Junction initial:** word internal-cum-syllable initial position; **Junction final:** word internal-cum-syllable final position; **Absolute final:** word-cum-syllable final position.

These terms are taken from R. K. Mahanta (1970) to describe the environments more precisely.

[hət] ‘seven’; [həmɔj] ‘time’; [horu] ‘small’

b) In junction initial position, the voiceless velar fricative [x] is realized. For example:

[bərɔxun] ‘rain’; [baxɔn] ‘lecture’; [tuloxi] ‘Basil/Tulsi’

c) Voiceless velar fricative [x] is realized in junction final position as well, as in the word:

[kaxloti] ‘armpit’

d) In absolute final position, it is likewise articulated as [x]. For example:

[pajɔx] ‘rice pudding’; [hafɔx] ‘courage’; [bɔjax] ‘age’

Instead of considering [x] as the underlying phoneme, which occurs in the widest distribution, this study treats the much-restricted [h] as the phoneme in Southern Kamrupi. The following considerations justify this analytical choice of [h] as the underlying phoneme in Southern Kamrupi:

1. Native speakers’ intuition: The velar fricative [x] does exhibit a much wider distribution than [h]; however, distribution alone is not taken as the sole criterion for determining the underlying phoneme. Since this topic leads to controversy among linguists and scholars of Assamese, native speakers’ judgment is also given due consideration for determining the identity of this fricative phoneme. As speakers⁹ of Southern Kamrupi claim that a distinction is clearly maintained between [h] and [x], and identify [h] as the underlying form, while [x] surfaces only as a positional variant. According to these speakers’ judgements, Southern Kamrupi speakers do not realize the Assamese words for forms such as ‘time’, ‘snake’, and ‘thread’, etc., as <khamay>, <khāp>, and <khutā>, in which the velar fricative [x] would be expected; instead they realize these words as <samay>, <sāp>, and <sutā>¹⁰ respectively, where [h] is consistently attested in absolute initial position.¹¹

2. Cross-varietal and diachronic study: Evidence from Standard Assamese and other regional varieties also points to /h/ as the underlying phoneme. In this regard, the works of R. K. Mahanta (1970), Verma (2002) can be cited, which established /h/ as the phoneme in the standard variety of Assamese. Rabha (1994) reports similar findings in the Dudhnoi dialect of Assamese, where the same consonant /h/ is treated as the phoneme. Likewise, the claims made by Sarma (2012), that both in Standard and Barpetia Dialect, [x] functions as the allophone, even though it is observed the most number of times from a distributional perspective. Based on these observations, it is safe to present /h/ as the underlying phoneme, which is likely to have undergone alternation and is now realized as [x] in non-initial positions in Southern Kamrupi Assamese.

3. Morphophonemic alternations: The strongest evidence supporting the classification of /h/ as the underlying phoneme, instead of the fricative with the widest distribution, i.e., [x], comes from the morphophonemic structure of Southern Kamrupi. This observation can be illustrated by the following examples.

⁹ In addition to a randomly selected subset of Southern Kamrupi speakers, two native speakers with basic knowledge of linguistics were also a part of this study.

¹⁰ The angled brackets are employed to enclose the spelling.

¹¹ It should be noted that these observations pertain specifically to the speech variety under investigation and do not preclude different patterns in other varieties of Assamese.

The word [hubiḍa], meaning ‘convenient’, is a single independent morpheme and has the fricative [h] in the absolute initial position. Similar to Standard Assamese, in Southern Kamrupi as well, the word for ‘inconvenient’ can be derived by adding the negative prefix *o-* to [hubiḍa], resulting in the form [oxubiḍa] ‘inconvenient’, having two morphemes (*o-* and *hubiḍa*), with the fricative occurring in a non-initial position. As evident here, after the addition of the negative prefix *o-*, [h] changed to [x]. Considering this, it can be justifiably argued that [x] has been derived from /h/, and not the other way around. Therefore, it can be concluded that /h/ is the underlying phoneme, even though [x] has a much wider distribution than [h]. This is perfectly consistent with the primary argument of the paper that the phoneme /h/ is realized as [x] in junction initial, junction final, and absolute final positions. A few more examples are provided below.

[hət] ‘honest’ → [xət] ‘dishonest’

[hoibbɔ] ‘genteel’ → [xoibbɔ] ‘mannerless’

[hanti] ‘peace’ → [xanti] ‘unrest’

Considering all these aspects, phonologically, fricative [h] can justifiably be argued to be the phoneme in Southern Kamrupi Assamese, even when its distribution is much more restricted compared to that of [x]. In addition, acoustic evidence is also presented in Section 5.2, which builds upon the observations made by R. K. Mahanta (1970), Verma (2002) regarding the fricative [h] in Standard Assamese.

5.2. Acoustic analysis of [h] and [x]:

With the comprehensive discussion regarding the phonological status of [h] and [x] in place, the focus of this paper now shifts to the phonetic evaluation of the two fricatives. This section is devoted to a detailed acoustic investigation of the two fricatives. The findings of the investigation are discussed under three headings, each addressing a specific acoustic parameter. The three sources of acoustic evidence considered for the evaluation of [h] and [x] are: formant pattern, fricative noise, and LPC spectral analysis. The discussion starts with the assessment of formant patterns.

5.2.1. Formant Patterns:

The first empirical indication regarding the pharyngeal place of articulation of the fricatives comes from their formant patterns. While formant structures are characteristics of vowels, they can also serve as useful acoustic cues for determining the phonetic identity of certain fricative consonants, specifically those with a posterior place of articulation. Although not as prevalent as one might assume, Ladefoged & Maddieson (1996) reports that pharyngeal fricatives do occur in some languages of the world. Arabic is one such language in which the voiceless pharyngeal fricative [ħ] is found. The body of literature addressing the phonetics of pharyngeal fricatives remains limited; nevertheless, McCarthy (1994) presents a comprehensive account of the articulatory and acoustic properties of the pharyngeal fricative of Arabic and some other Semitic languages. In his discussion regarding the voiceless pharyngeal fricative of Arabic, he notes that the value of the first formant (F1) can be as high as 900-1000 Hz for [ħ]; however, F1 gets lowered if the pharyngeal consonant occurs before round vowels such as [u] and [o] (McCarthy, 1994). Comparable findings regarding formant patterns of [h], in

Moses-Columbia¹² and the Ahousaht dialect of the Nuuchah-nulth language¹³, are reported by Bessell (1993), where he observes that [h] shows clear formant structure at and above the 1000 Hz mark. Providing data from the Agul language, Ladefoged & Maddieson (1996) report similar findings:

“The first and second formants come very close together in the pharyngeal fricative, with the first formant having a very high value (well above 1000 Hz at the maximal pharyngeal position for the fricative). The first formant then falls during the early part of the following vowel.”

These acoustic features are especially evident in the Assamese fricative sound that is represented by the letters ঞ, ঞ, and ঞ whenever the fricative occurs in word initial position, provided it does not form a consonant cluster. For example, the word [hat], meaning ‘seven’, features a fricative sound in the absolute initial position. This fricative can be identified as having a pre-pharyngeal¹⁴ place of articulation, as its acoustic qualities exhibit a strong correspondence with the findings outlined by McCarthy (1994) and Ladefoged & Maddieson (1996) regarding pharyngeal fricatives. The waveform for the word [hat], along with the spectrogram and the formant distribution, can be observed in Figure 2.

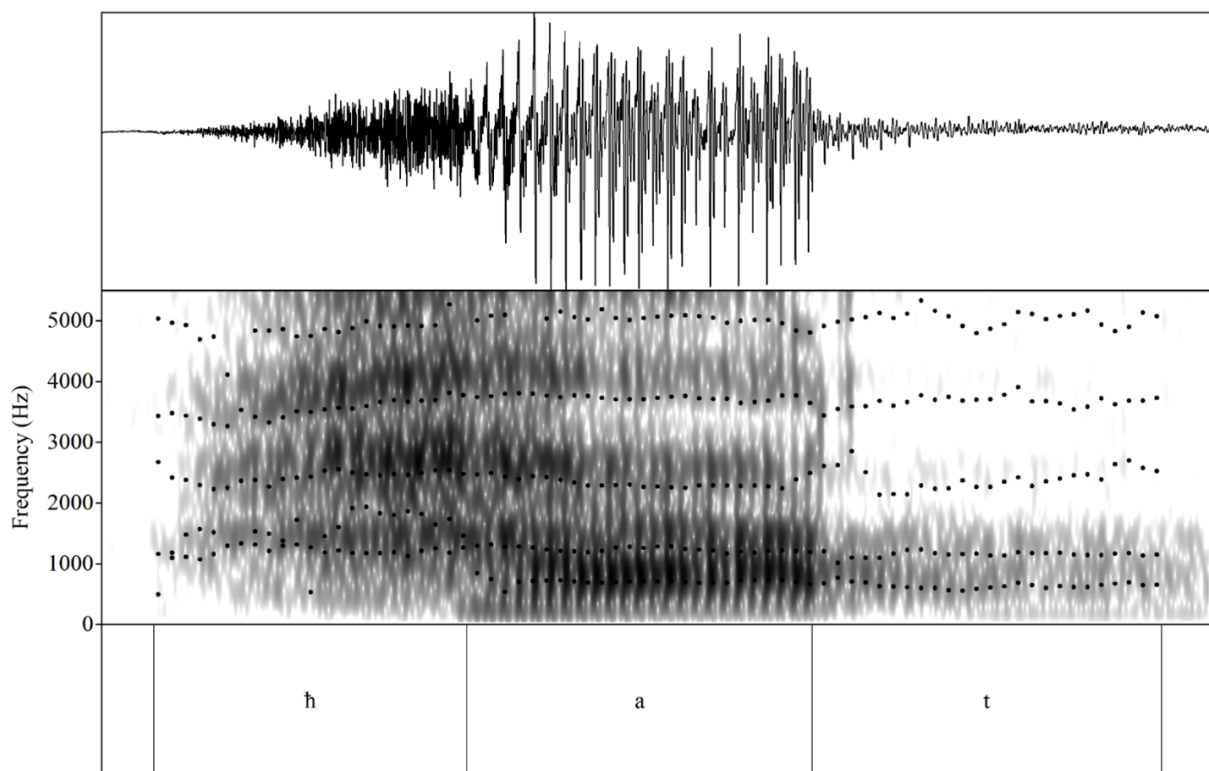


Figure 2 – Waveform and spectrogram, along with the formant distribution for the Southern Kamrupi word [hat] ‘seven’.

In Figure 2, it is evident that, for the greater part of the duration of the fricative [h], the first formant (F1) is above 1000 Hz, with the mean F1 being 1141.38 Hz. Additionally, the first and the second formants (F2) are very close together during the fricative sound, at times reaching

¹² Indigenous to the state of Washington, USA, this language is now considered extinct following the death of the last fluent speaker in 2023.

¹³ This language is spoken in Vancouver Island, British Columbia, USA.

¹⁴ Given the minimal acoustic distinction between a pharyngeal and a pre-pharyngeal fricative, the acoustic characteristics of the former are equally applicable to the analysis of this particular fricative consonant of the Assamese language.

nearly identical values at certain points. This is, however, not the case with the vowel [a] and the plosive [t]. Moreover, F1 can be seen dropping after [h] and during the early part of the vowel before it rises again.

Similar acoustic properties can be noticed in Figure 3 which shows the Praat analysis of the Assamese word [huta], meaning ‘thread’.

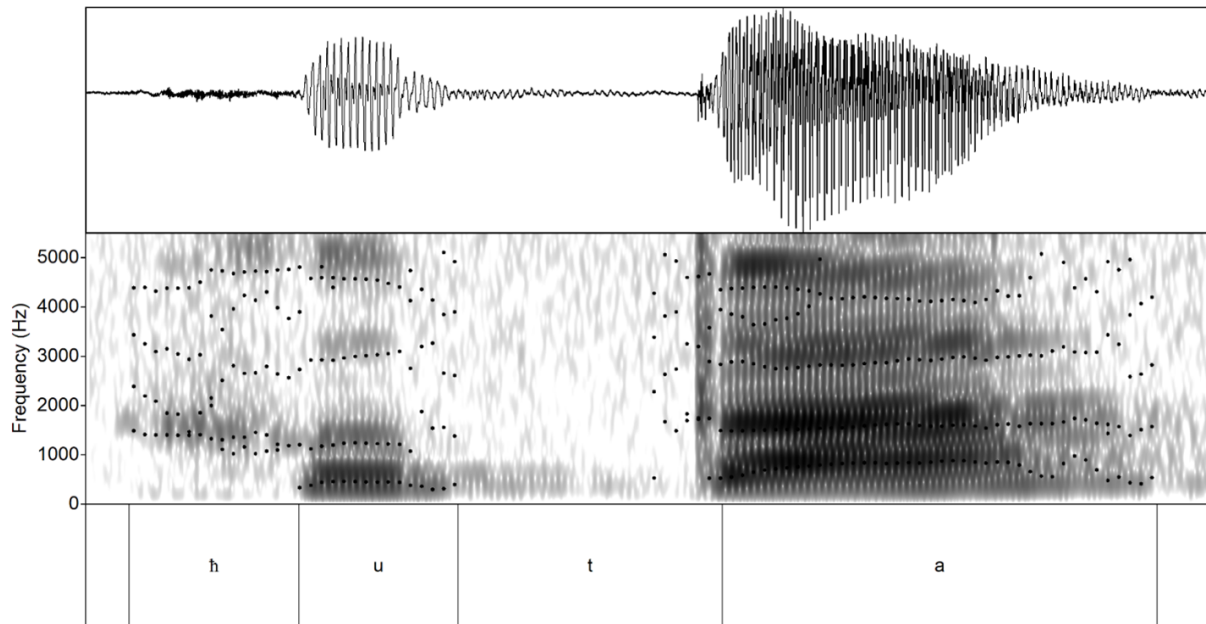


Figure 3 – Waveform and spectrogram, along with the formant distribution for the Southern Kamrupi word [huta] ‘thread’.

It is apparent from Figure 3, that F1 is well above the 1000 Hz mark during most parts of the fricative, with a mean F1 value of 1224.08 Hz. The first and the second formants are in narrow approximation for most of the duration of [h], even if not throughout its entirety. In addition, during the onset of the following vowel [u], it can be observed that F1 gets slightly lowered before returning to its normal frequency again.

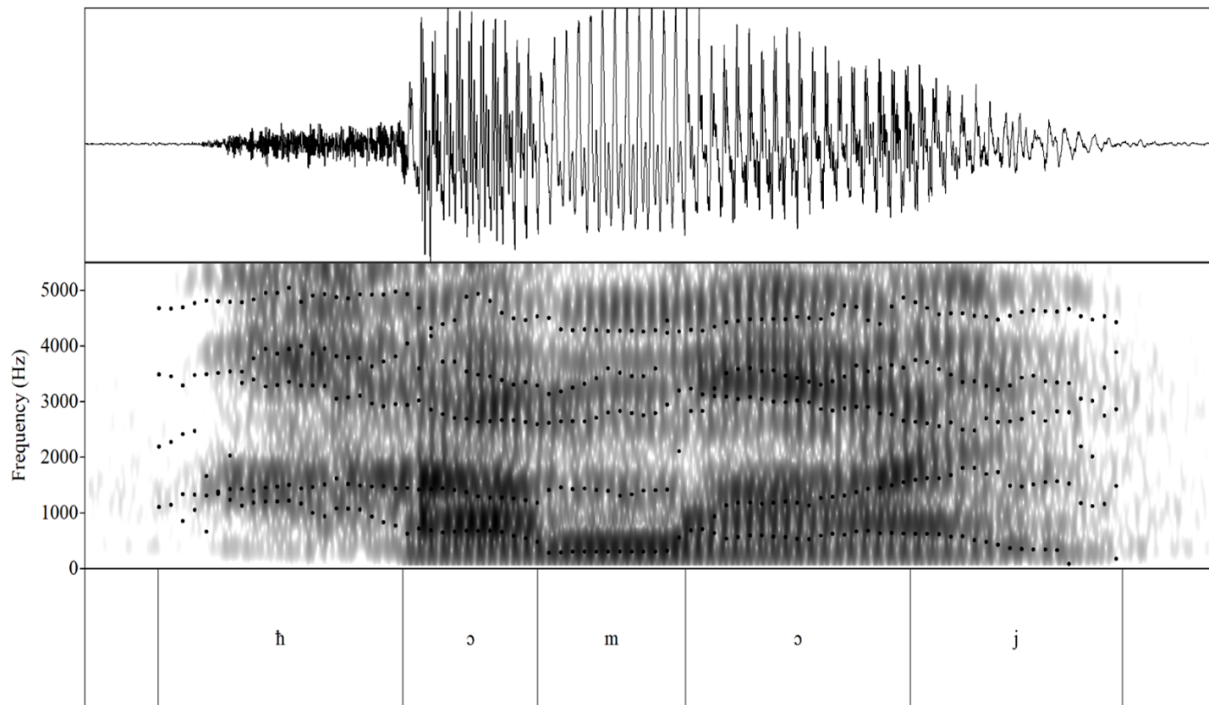


Figure 4 – Waveform and spectrogram, along with the formant distribution for the Southern Kamrupi word [həmɔj] ‘time’.

In Figure 4, it can be observed that while F1 falls below the 900-1000 Hz mark for a few moments during the articulation of [h], it exceeds the specified frequency benchmark for most of the fricative duration, with a mean F1 frequency of 1042.81 Hz. This decrease in the frequency of the first formant during [h] is foreseeable, as it has already been observed that F1 gets lowered whenever [h] is followed by round vowels. F1 and F2 exhibit a close approximation, nonetheless, throughout the whole duration of the fricative sound. Furthermore, F1 can be seen slightly falling during the onset of the following vowel sound, in this case, as well, before it rises again to its normal frequency. These are all characteristic properties of the pharyngeal fricative [h], rather than the velar fricative [x].

Contrary to pharyngeal fricatives, consonants with a velar place of articulation, such as the fricative [x], tend to have a lower frequency value of the first formant. This may plausibly reflect changes in the vocal tract resonance associated with a shortened front cavity as we move from a pharyngeal to a velar position. At the same time, it must also be noted that these properties of fricatives arise from the interaction of multiple resonating cavities, including both the front and back cavities. Talking about the acoustic features of pharyngeals, uvulars, and velars Ladefoged (1996) notes that “when the constriction is in the back of the mouth, the frequency of the first formant depends on the size of the front cavity”. The front cavity shortens as the constriction moves from the pharyngeal to the velar region; consequently, a decrease in the frequency of the first formant may be observed. This could very well be another underlying factor contributing to the higher F1 for [h] than that of [x] (Ladefoged, 1996).

The acoustic features of the fricative [h] that are evident in Figure 2, Figure 3, and Figure 4 are not observed when the fricative occurs in the word internal or word final position. Since in positions other than word initial, the consonant is realized as a velar fricative [x], therefore, the Praat analysis provides us with completely different results.

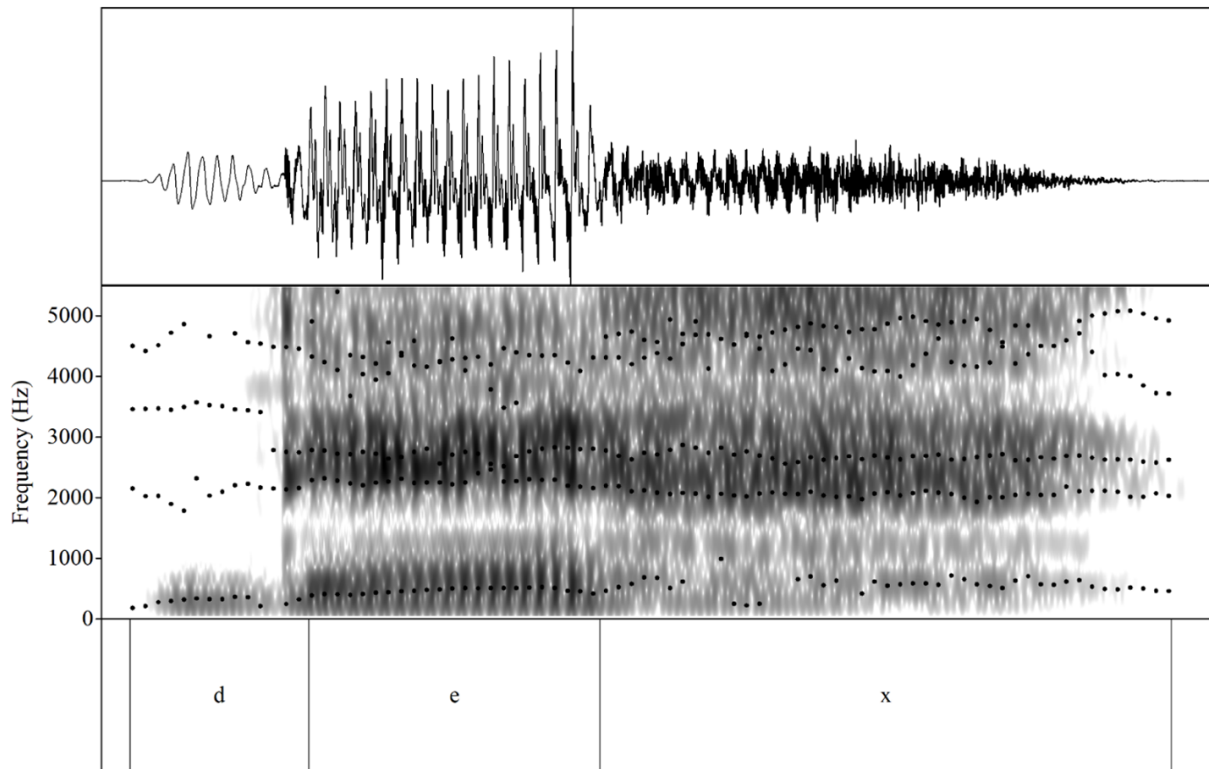


Figure 5 – Waveform and spectrogram, along with the formant distribution for the Southern Kamrupi word [dex] ‘country’.

As can be observed from Figure 5, the waveform, the spectrogram, and the formant pattern differ significantly for the fricative [x], compared to the fricative [h] in Figure 2, Figure 3, and Figure 4. The two formants, i.e., F1 and F2, are markedly apart from each other in Figure 5, with the mean value of F1 being 724.88 Hz, whereas the mean value of F2 reached as high as 2128.83 Hz.

5.2.2. *Fricative Noise:*

The degree of fricative noise is another acoustic difference that can help distinguish the pharyngeal fricatives from the velar fricatives. As noted by Ladefoged (2001), airstream passing through a narrow space creates more fricative noise than the amount of fricative noise generated during airflow through a wider opening. During the production of a velar fricative, the body of the tongue is raised significantly towards the soft palate, creating a narrow space. On the other hand, while producing a pharyngeal fricative, the root of the tongue moves towards the posterior pharyngeal wall, where the space between them remains relatively wider. Subsequently, more friction noise is generated during the production of [x], as the airstream has to escape through a much narrower opening. This is clearly the case with the Southern Kamrupi fricatives, as can be noticed in Figure 6.

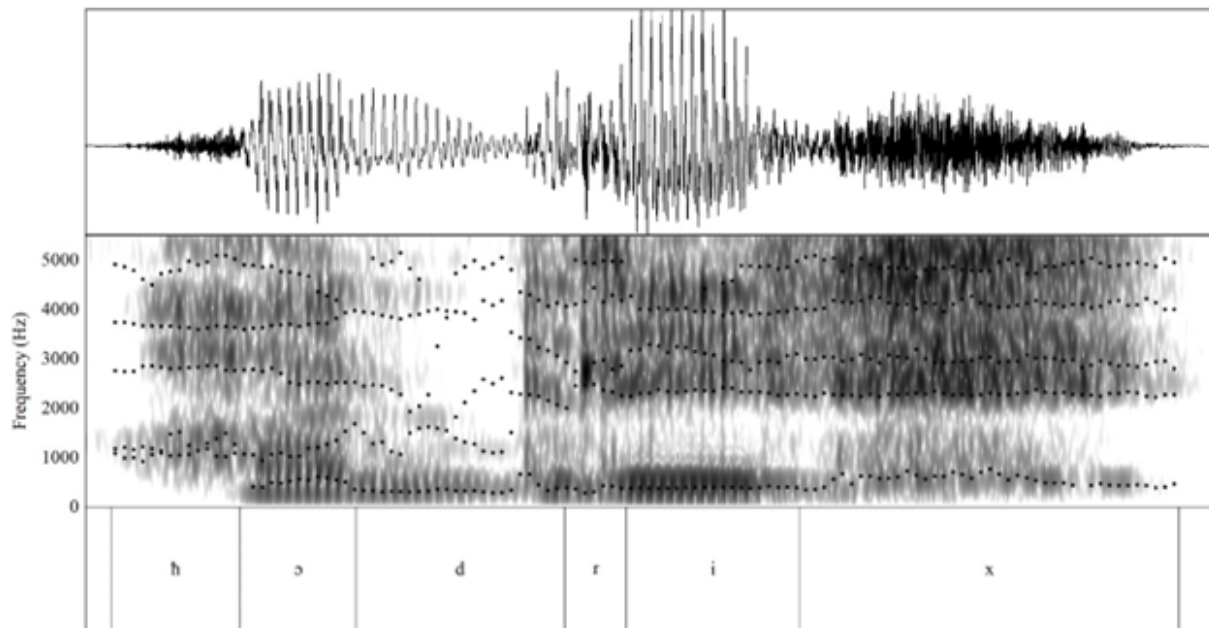


Figure 6 – Waveform and spectrogram, along with the formant distribution for the Southern Kamrupi word [hɔdrix] ‘analogical’.

Not only are the F1 and F2 in close approximation during [h], as reflected in Figure 6, but the mean frequency of F1 is also 1043.07 Hz. In contrast, during [x], F1 and F2 are far apart with a mean F1 frequency of only 549.72 Hz. Moreover, the amount of fricative noise is a lot more during [x], compared to the fricative noise that can be observed during [h]. The same phenomenon is observed in Figure 7.

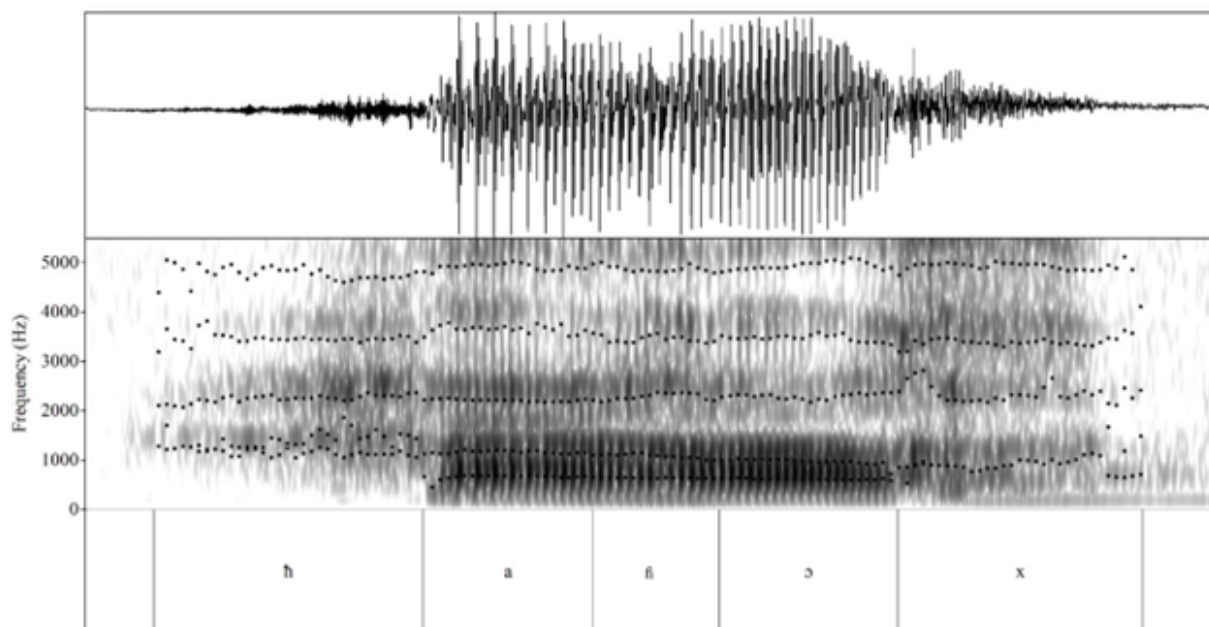


Figure 7 – Waveform and spectrogram, along with the formant distribution for the Southern Kamrupi word [həfɔx] ‘courage’.

As evident from Figure 7, the mean frequency of F1 is 1144.40 Hz during [h] in the word [həfɔx], meaning ‘courage’. F1 and F2 are very close throughout the fricative. Moreover, F1 is

lowered briefly during the initial part of the following vowel before it rises again. By contrast, the F1 and F2 of the fricative [x] are considerably distanced from one another. The mean frequency of the first formant also drops significantly to a mere 864.72 Hz. Furthermore, from the spectrogram, it becomes evident that the amount of fricative noise during [x] is relatively greater than during [h].

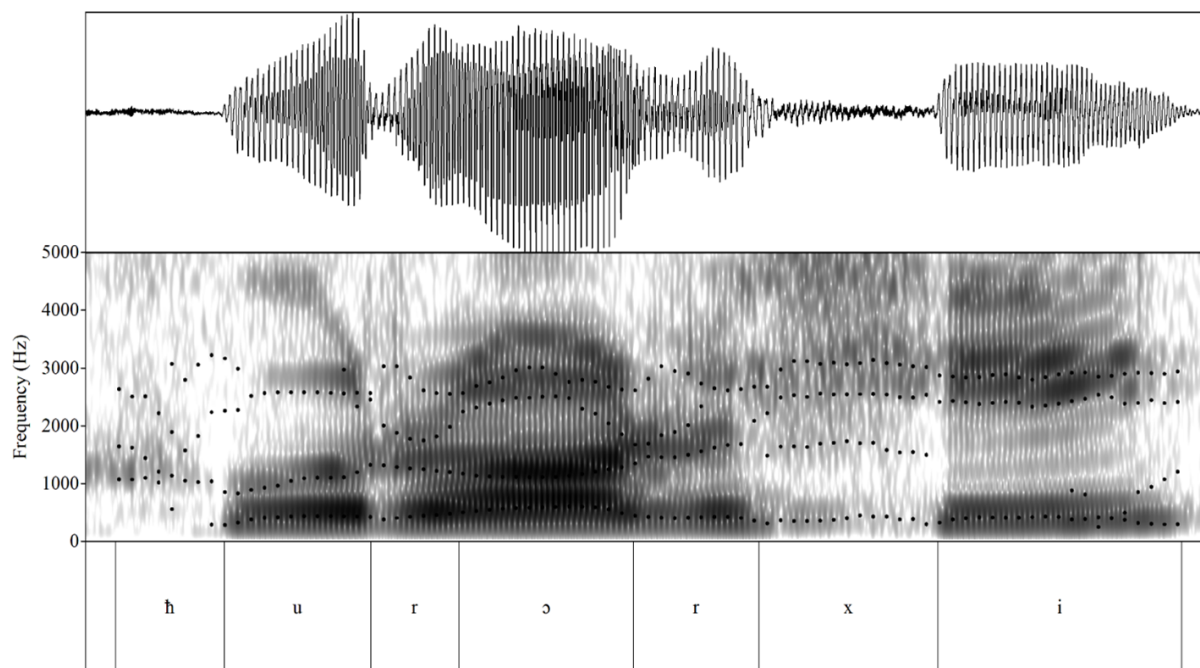


Figure 8 – Waveform and spectrogram, along with the formant distribution for the Southern Kamrupi word [hurɔrxɪ] ‘another name of Narada Muni’.

Another manifestation of this is demonstrated in Figure 8 as well. It is apparent from Figure 8 that the fricative in the absolute initial position of the word exhibits a fundamentally distinct acoustic profile from the fricative [x] in the junction initial position of the final syllable.

5.2.3. *Spectral Peaks:*

The third piece of evidence supporting the presence of both [h] and [x] in the consonantal inventory of Southern Kamrupi Assamese comes from the fricative spectra of the two sounds. Hughes & Halle (1956) report that the acoustic spectra of fricatives sharing the same place of articulation and articulated by any single speaker will exhibit peaks occurring at consistently higher frequency levels, compared to those of other fricatives articulated at more posterior positions within the oral tract, as produced by the same speaker. The spectral peaks progressively shift towards lower frequency ranges as the place of articulation transitions from the velar to the uvular and subsequently to the pharyngeal region within the vocal tract.

Commenting on the relationship between the size of the oral cavity in front of a stricture and the acoustic spectrum of fricatives, Flemming (1995) notes, “The fricative noise source is filtered by the front cavity, so the peaks in the fricative spectrum are at the resonant frequencies of the front cavity.” A larger cavity results in lower resonant frequencies, which in turn lowers the frequency of the first peak in the fricative spectrum (Flemming, 1995).

This concept can be generalized to include the Assamese velar and pre-pharyngeal fricatives as well. Given that the front cavity is significantly larger during the articulation of [h] than during

that of [x], it can be inferred that the resonant frequency will be correspondingly lower for [h]; consequently, a lower frequency of the first peak in the acoustic spectrum of [h] is anticipated. The spectral analyses of the Southern Kamrupi [h] and [x] reveal these characteristic patterns. Figure 9 and Figure 10 exhibit the acoustic spectra of the Southern Kamrupi pre-pharyngeal and velar fricatives, respectively. The horizontal axis, showing the frequency, is scaled in 1 kHz (1000 Hz) intervals, while the vertical axis measures amplitude in 10 dB intervals.

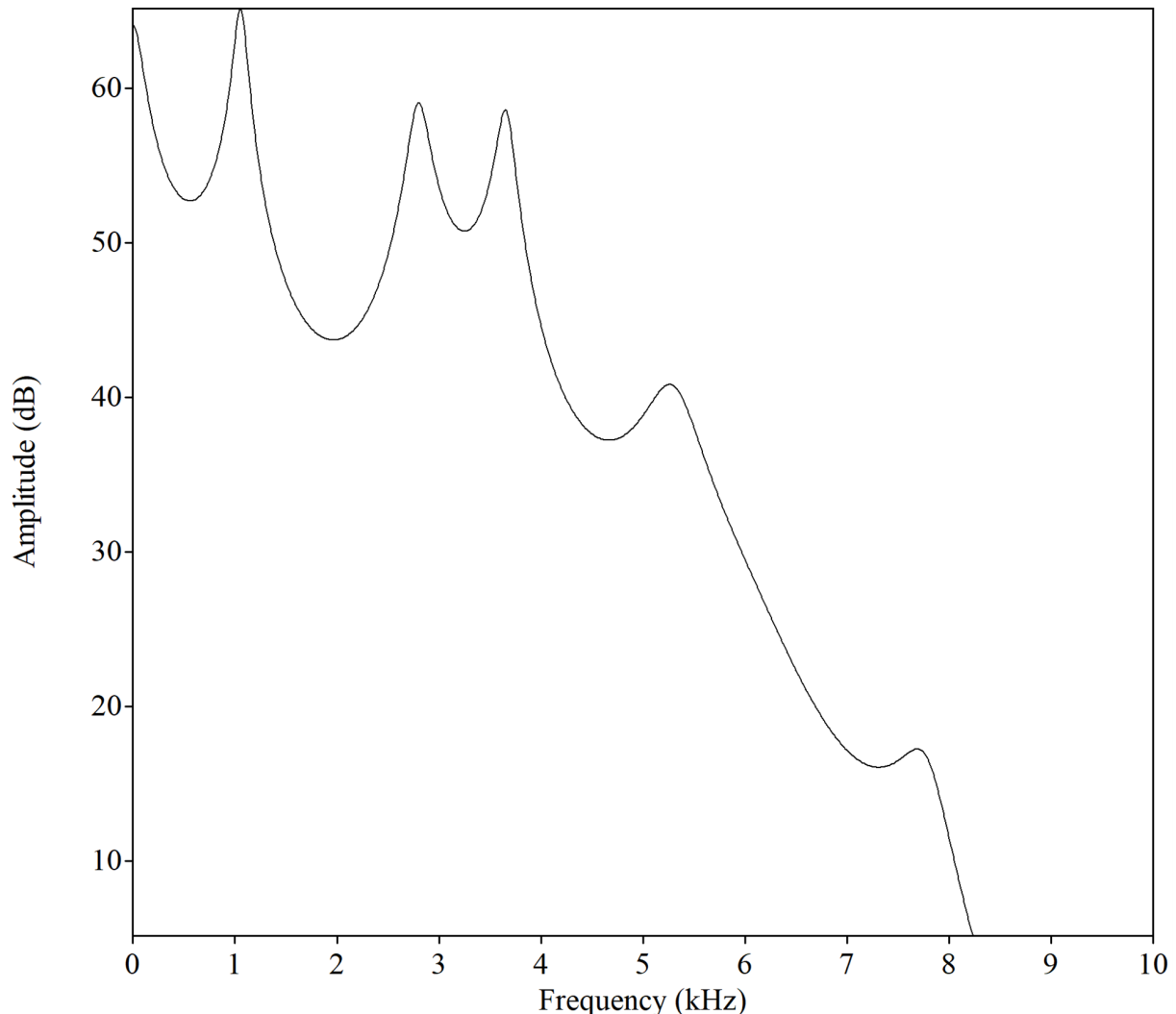


Figure 9 – LPC Spectrum of [h] extracted from the word [haxɔn] ‘reign’, illustrating the relatively lower frequency of the first spectral peak. The spectrum was generated from a representative analysis window within the fricative noise.

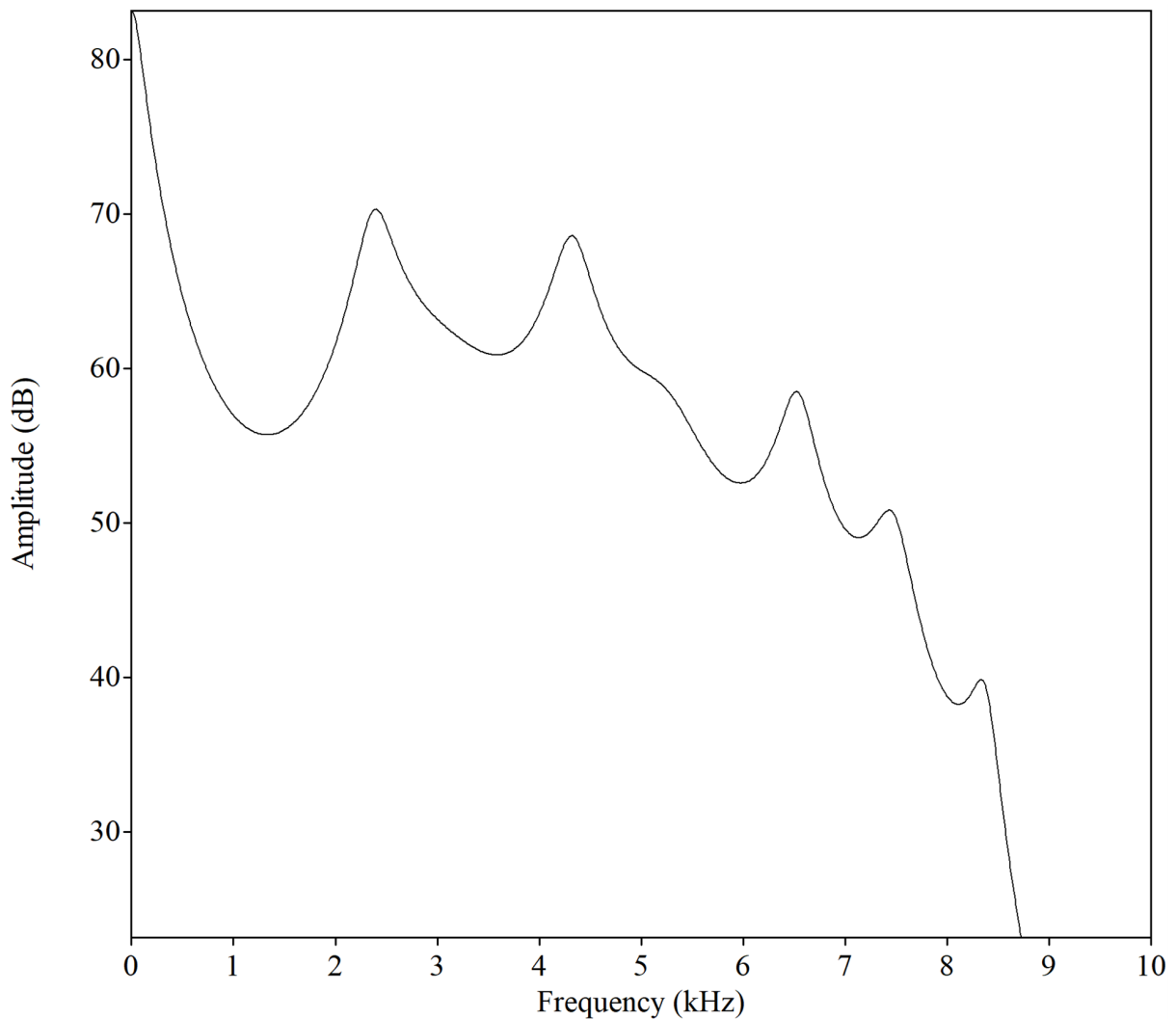


Figure 10 – LPC Spectrum of [x] extracted from the word [haxɔn] ‘reign’, illustrating the relatively higher frequency of the first spectral peak. The spectrum was generated from a representative analysis window within the fricative noise.

Figure 9 and Figure 10 reveal that the Southern Kamrupi fricative [h] displays spectral peaks at relatively lower frequency levels than those associated with the fricative [x]. Furthermore, from the diagrams, it becomes evident that the frequency of the first peak of [h] is relatively lower than that of [x]. While the frequency of the first peak of [h] is seen to be somewhere around 1 kHz, for [x] it is around the 2.4 kHz mark. This further reinforces the proposition that Southern Kamrupi does feature both a pre-pharyngeal and a velar fricative. Furthermore, these spectra of [h] and [x] correspond closely to those provided by Ladefoged & Maddieson (1996).

To provide an overall summary of the acoustic measurements, Table 4 below presents the descriptive statistics for the F1 and F2 values of [h] and [x], including the sample size (n), mean, standard deviation (SD), and range, all of which are reported in Hz.

Fricative	n	Mean F1	SD	Range	Mean F2	SD	Range
[h]	114	1035.61	106.33	769–1307	1440.97	113.26	1157–1589
[x]	103	717.74	159.56	449–1028	1964.95	239.83	1406–2346

Table 4 – Descriptive Summary of the Acoustic Measurements for [h] and [x] of Southern Kamrupi Assamese.

Upon evaluating all the evidence presented so far, it may be concluded that Southern Kamrupi indeed features both the pre-pharyngeal and the velar fricative in its phonological system. In addition to the voiceless pre-pharyngeal fricative [h], which occurs as the phoneme, the voiceless velar fricative [x] is also featured in the phonological system of Southern Kamrupi, which occurs as an allophone of the phoneme in word internal and word final positions.

6 Neutralization of /h/ and /k^h/:

The analysis presented in the preceding section clearly establishes the presence of the pre-pharyngeal fricative phoneme /h/ in Southern Kamrupi, as well as the status of the velar fricative [x] as an allophone of /h/. In addition, the voiceless velar plosive /k^h/ of Southern Kamrupi exhibits an allophonic variation, wherein it is realized as the fricative [x] in certain phonological environments. This phenomenon is also observed in Standard Assamese, as R. K. Mahanta (1970) reports that the voiceless velar fricative occurs as an allophone of Standard Assamese /k^h/ in absolute final, junction initial, and junction final positions. The following words illustrate the fricativization of the phoneme /k^h/ in Standard Assamese:

/nɔk^h/ [nɔx] ‘nail’

/murk^hɔ/ [murxɔ] ‘idiot’

/lak^htokia/ [laxtokia] ‘a place in Guwahati’

As already mentioned, the process of fricativization of the phoneme /k^h/ is similarly observed in Southern Kamrupi Assamese as well. However, whereas /k^h/ is consistently realized as [x] in absolute final position of Southern Kamrupi words, in junction initial and junction final positions both a plosive and a fricative articulation of the phoneme are observed; that is, [k^h] and [x] are in free variation. A few Southern Kamrupi words illustrating this phenomenon are provided below:

/nimɔk^h/ [nimɔx] ‘salt’

/bak^har/ [bak^har] [baxar] ‘gunpowder’

/bɔk^hlu/ [bɔk^hlu] [bɔxlu] ‘someone who is always hungry’

A spectrogram showing the fricativization of the plosive /k^h/ has been provided in Figure 11. As evident from the spectrogram, the plosive /k^h/ underwent the process of spirantization or fricativization and was articulated as [x] in the word internal position. However, as demonstrated by the examples above, due to various factors such as speech rate, individual variation, and sociolinguistic influences, the phoneme may alternatively exhibit a plosive realization in word internal position.

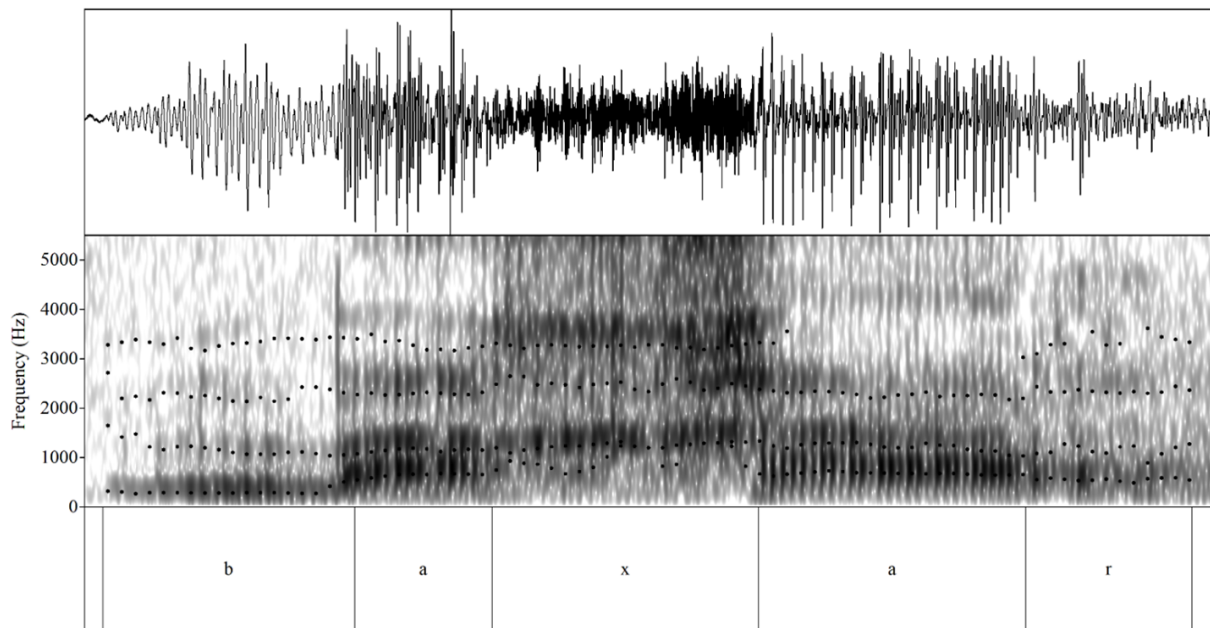


Figure 11 – Waveform and spectrogram, along with the formant distribution for the Southern Kamrupi word [baxar] ‘gunpowder’.

Neutralization refers to a process where distinctions between phonemes that exist in other places in a certain language are no longer observed in specific environments (Roach, 2009). This phenomenon is effectively demonstrated through the Southern Kamrupi words listed above. As evident from the examples, the contrast between the phoneme /k^h/ and /h/ is occasionally lost in junction initial and junction final positions, while it is consistently lost in absolute final position. However, their contrast is systematically preserved in absolute initial position. Therefore, it can be inferred that Southern Kamrupi /k^h/ and /h/ undergo complete phonemic neutralization, i.e., categorical neutralization, occasionally in word internal positions, and consistently in absolute final position.

7 Status of [h] and [x] in Nalbaria and Barpetia varieties of Assamese:

The controversy regarding the phonetic identity of these fricatives persists in the other two varieties of the Kamrupi dialect as well, i.e., the Barpetia and the Nalbaria varieties. Although this paper is primarily concerned with addressing this issue in the Southern Kamrupi variety, it also briefly extends the discussion to Barpetia and Nalbaria Assamese, as these two varieties are also part of the greater Kamrupi dialect, and as it is quite likely that the findings of this paper are of relevance for the two other varieties. Similar to Southern Kamrupi Assamese, the presence of the pre-pharyngeal fricative [h] and the velar fricative [x] warrants careful consideration in the Nalbaria and the Barpetia varieties of the Kamrupi dialect as well. The spectrograms provided in Figure 12 and Figure 13 offer preliminary evidence regarding the presence of these two consonants in the other two regional varieties of the Kamrupi dialect.

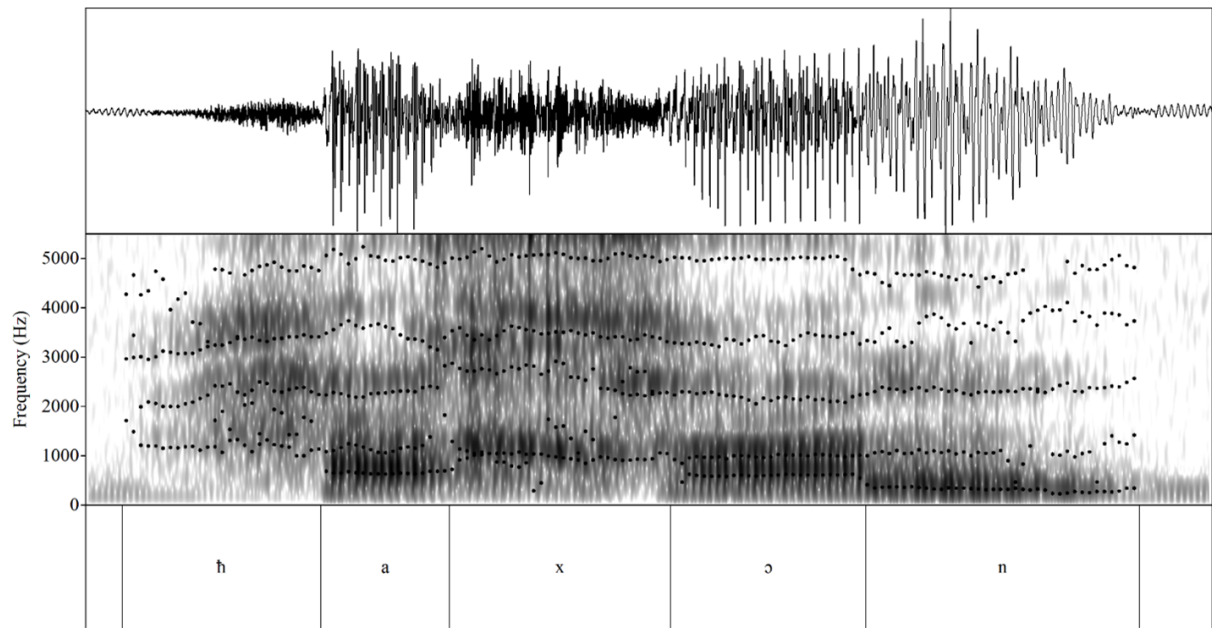


Figure 12 – Waveform and spectrogram, along with the formant distribution for the word [haxɔn] ‘reign’ in Nalbaria Assamese.

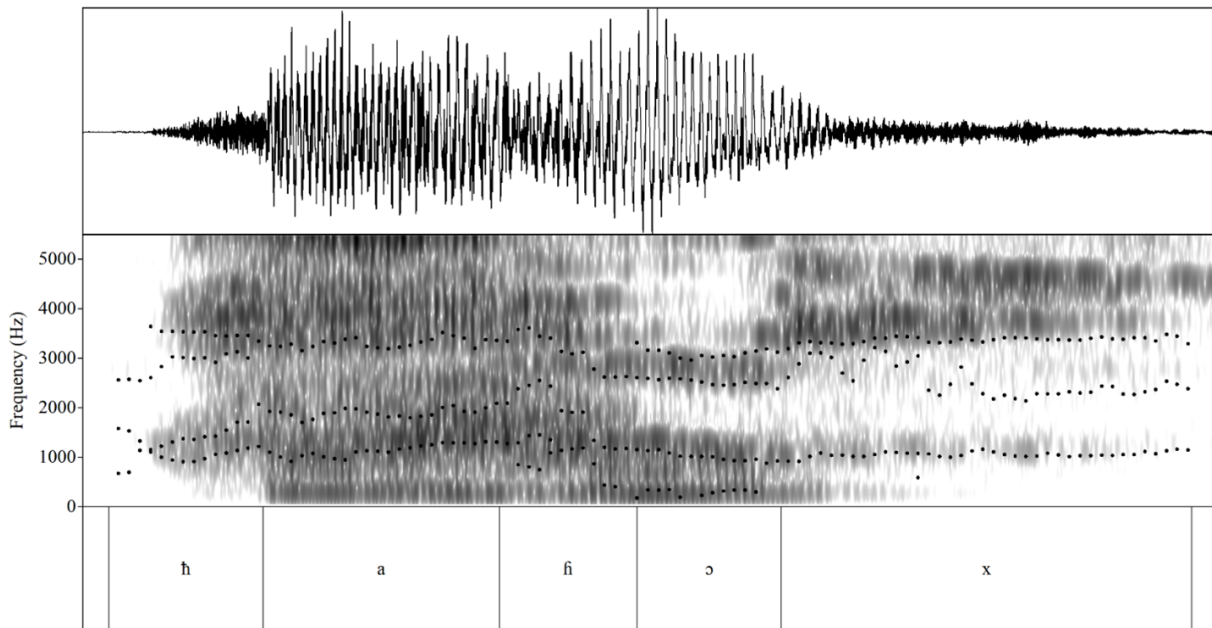


Figure 13 – Waveform and spectrogram, along with the formant distribution for the word [hahɔx] ‘courage’ in Barpetia Assamese.

The suggestive evidence from Figure 12 and Figure 13 makes it hard to rule out the possibility that both the Nalbaria and the Barpetia varieties of the Kamrupi Dialect might also feature the same two fricatives, i.e., the pre-pharyngeal fricative [h] and the velar fricative [x] in their consonant inventory. Similar to the Southern Kamrupi, in these two regional varieties as well, it is likely that the pre-pharyngeal fricative /h/ functions as the phoneme, and the velar fricative [x] occurs as a context-specific allophone. However, the limited dataset does not permit a definitive conclusion and therefore remains a subject for further instrumental investigation in the Nalbaria and Barpetia varieties of Assamese.

Furthermore, in these two regional varieties, the phoneme /k^h/ has a fricative realization; it is articulated as [x], optionally in junction initial and junction final positions, and consistently in absolute final position. Provided that adequate evidence is found in support of /h/ as a phoneme, in these two varieties of Assamese as well, it would be safe to say that the contrast between the phonemes /h/ and /k^h/ is neutralized in the Nalbaria and Barpetia varieties of Assamese as well, since both /h/ and /k^h/ are realized as [x] in certain environments.

8 Conclusion:

Upon meticulous observation and scrutiny, it can be argued that Southern Kamrupi features the voiceless pre-pharyngeal fricative /h/ as a phoneme. The spectrograms, formant patterns, and acoustic spectra derived from LPC analysis collectively suggest the presence of the pre-pharyngeal fricative. Also, the voiceless velar fricative [x] emerges as a context-dependent allophone of this phoneme, appearing in junction initial, junction final, and absolute final positions. Furthermore, as evidenced by the spectrograms and the Southern Kamrupi examples, both /k^h/ and /h/ are realized as [x] in certain overlapping environments. Since any attempt to identify the underlying form of [x] proves to be unwarranted, it can be concluded that in Southern Kamrupi Assamese, /h/ and /k^h/ undergo context-specific categorical neutralization.

References:

- Census 2011. Kamrup District. Government of Assam, India. (n.d.). <https://kamrup.assam.gov.in/information-and-services/census-2011>
- Bessell, N. J. (1993). Preliminary Notes on Some Pacific Northwest Coast Pharyngeals. *28th International Conference on Salish and Neighboring Languages*, 1–18.
- Dutta, H., & Kenstowicz, M. (2018). The Phonology and Phonetics of Laryngeal Stop Contrasts in Assamese. In *From Sounds to Structures: Beyond the Veil of Maya* (pp. 30–64). Walter de Gruyter GmbH. <https://doi.org/10.1515/9781501506734-002>
- Flemming, E. S. (1995). *Auditory Representations in Phonology*. University of California, Los Angeles.
- Goswami, G. C. (1966). *An Introduction to Assamese Phonology* (First Edition). Poona: Deccan College Postgraduate and Research Institute.
- Goswami, G. C. (1982). *Structure of Assamese*. Gauhati University Publication Department.
- Goswami, G. C., & Tamuli, J. (2003). Asamiya. In G. Cardona & D. Jain (Eds.), *The Indo-Aryan Languages* (pp. 391–443). Routledge.
- Goswami, U. N. (1970). *A Study on Kamrupi: A Dialect of Assamese*. Guwahati: Gauhati University, Department of Historical and Antiquarian Studies.
- Hughes, G. W., & Halle, M. (1956). Spectral Properties of Fricative Consonants. *The Journal of the Acoustical Society of America*, 28(2), 303–310. <https://doi.org/10.1121/1.1908271>
- Kakati, B. (1941). *Assamese: Its Formation and Development* (First Edition). Government of Assam, Guwahati, Assam.
- Ladefoged, P. (1996). *Elements of Acoustic Phonetics* (Second Edition). University of Chicago Press.
- Ladefoged, P. (2001). *Vowels and Consonants: An Introduction to the Sounds of Languages*. Blackwell Publishers.

Ladefoged, P., & Maddieson, I. (1996). *The Sounds of the World's Languages*. Blackwell Publisher.

Mahanta, R. K. (1970). *A Phonetic and Phonological Study of Assamese*. School of Oriental and African Studies (University of London).

Mahanta, S. (2012). Assamese. *Journal of the International Phonetic Association*, 42(2), 217–224. <https://doi.org/10.1017/S0025100312000096>

Martinet, A. (1970). *Économie des Changements Phonétiques: Traité de Phonologie Diachronique* (F. S. A. Berne, Ed.; Troisième édition).

McCarthy, J. J. (1994). The Phonetics and Phonology of Semitic Pharyngeals. *Phonological Structure and Phonetic Form: Papers in Laboratory Phonology III*, 191.

Moral, D. (2016). *Byabaharik Dhani Bijnan* (2nd ed.). Banalata.

Patgiri, B. (2021). *Phonological Structure of Nalbaria Assamese*. School of Humanities and Social Sciences, Tezpur University.

Rabha, R. C. (1994). *A Descriptive Analysis of the Dudhnoi Dialect of Assamese*. Gauhati University.

Roach, P. (2009). *English Phonetics and Phonology: A Practical Course*. Cambridge University Press.

Sarma, M. K. (2012). *Aspects of the Phonology of Assamese and Assamese English*. School of Language Sciences, The English and Foreign Languages University.

Thakuria, P. C. (2005). *Daksin Kamrupar Anusuchita Sampradayar Samaj aru Kathita Asamiya: Eti Adhyayan*. PhD Thesis: Gauhati University.

Verma, A. (2002). *Sound Patterns of English and Assamese: A Study in Contrastive Ontogenetics*. Gauhati University.