



Pando Phonology Write-Up



Pando Language Development Team
2019

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Thank You

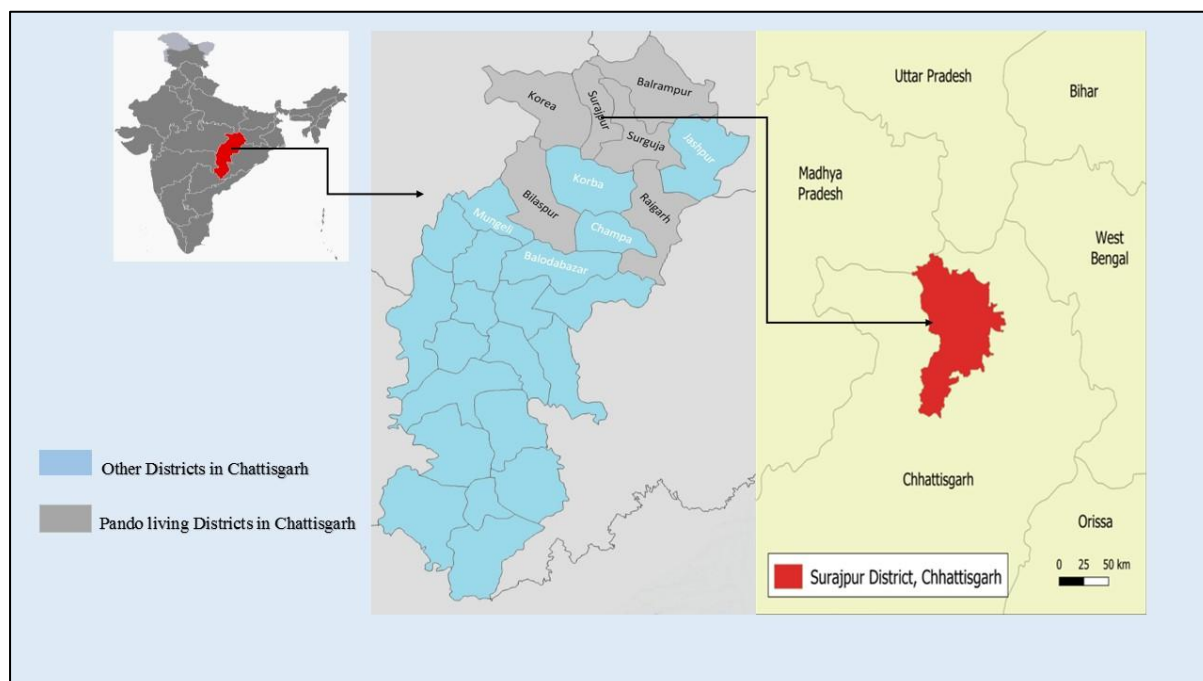
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1. INTRODUCTION

1.1 ABOUT PANDO PEOPLE

The Pando people are a Scheduled Tribe (ST) of India. There are about 2,50,000 Pando people living in the north and northeastern parts of Chhattisgarh. They are concentrated primarily in the districts of Surajpur, Koriya, Balrampur, and Raigarh, but they can also be found in neighbouring parts of Surgujia and Bilaspur districts. Map 1 shows the location of the Pando populations in Chhattisgarh. The Pando people practice Hinduism and earn their livelihood through labour, cultivation, cattle, birds, and the forest.



Map 1: Chhattisgarh State with Pando districts shaded grey.

1.2 PANDO LANGUAGE

The Pando people speak an Indo-Aryan language variety. Their language does not have its own ISO code, because it is not generally recognized as a distinct Indo-Aryan language. According to recent sociolinguistic surveys, Pando exhibits a high degree of lexical similarity with Surgujia, and the Pando people have good comprehension of Surgujia. However, this might be because Surgujia is used as a language of wider communication, not necessarily because Pando is a dialect of Surgujia. According to the survey, Surgujia speakers report poor comprehension of Pando speech. The sociolinguistic surveys cited above indicate that the Pando language is vital and is used in every area of village life by people of all ages.

1.3 PURPOSE OF STUDY

The analysis presented here is based on research conducted from April 2017 to March 2019. The analysis was done on a corpus of 1600 words collected through conversations, language-learning classes and stories.

Introduction

This phonemic summary of the Pando language was undertaken as part of the Pando language development. The analysis in this paper is based on the dialect spoken in Surajpur district of Chhattisgarh. The Pando community as a whole consider this dialect to be the most widely accepted and intelligible of the varieties spoken in this region.

The main purpose of this research is to have a thorough understanding of the Pando sound system. We expect that this study will contribute to the documentation of the language and production of easy-to-use teaching materials in the Pando language. We believe that, with the help of this study, good literacy material can be developed using the Devanagiri script so that the community can become familiar with the sounds and symbols of their own language. Pando people would really love to have a script for their own language. By this study we can help them practice their language in written form. In this way more people will be interested in literacy. As for now, many do not send female children to school. But when they have a script in their own language they may be motivated to learn. Thus, this study will encourage an interest and love for their mother language.

1.4 THE LANGUAGE ASSISTANTS

The data in this study was collected in several Pando villages, but mainly from Gehwani village in Surajpur District. Many people contributed for the data collection. They all helped us to record the sounds of the words so that we could enter our data into FLEEx (software) for analysis.

1.5 SYMBOLS AND ABBREVIATION

[]	Phonetic data
//	Phonemic data
VI	Voiceless
Vd	Voiced
C	Consonant
V	Vowel
.	Syllable break
ĩ	Nasalized

All phonetic symbols are from the International Phonetic Alphabet.

2. SEGMENTATION ISSUES

2.1 ASPIRATION

Following the South Asian tradition, phonetic sequences such as [ph], [tʰ], [tʰh], [kh], and [bʰ], [dʰ], [dʰh], [dʒʰ], [gʰ], are interpreted as aspirated units: [pʰ], [tʰ], [tʰh], [kʰ] and [bʰ], [dʰ], [dʰh], [dʒʰ], [gʰ], respectively. In our data, we also find sonorant+[h] sequences, including [mh], [nh], [rh], [lh], and [ʀh]. For example:

/kumhar/	[kumɦar]	‘potter’	0532
/pʌnhi/	[pʌnɦi]	‘shoes’	0604
/surhi/	[surɦi]	‘rice beetle’	1564
/tʃilhi/	[tʃilɦi]	‘rope covered inside of drum’	1355
/noɦa/	[noɦa]	‘crowd’	0150

These sequences could be interpreted as aspirated sonorants, parallel to the stops. This interpretation has been proposed for some Indo-Aryan languages including Bundeli. However, we have interpreted them as consonant sequences for the following reasons:

- The phoneme /h/ (which is realized as phonetic [ɦ] in most positions) occurs independently in syllable onsets (i.e., word-initial, intervocalic, and stem-final positions).
- Unlike aspirated stops, sequences of sonorant+[ɦ] do not occur in unambiguous syllable onset and coda positions (e.g., word-initially or word-finally). They occur only in word-medial positions in our data, where they can be interpreted as coda-onset sequences separated by a syllable boundary.

This interpretation is consistent with the syllable structure of the language and avoids the need to posit additional phonemes.

2.2 VOWEL SEQUENCES AND DIPHTHONGS

Pando has various vowel sequences, including [iu], [ui], [ia], [ai], [ua], [au], and [eo]. These have all been interpreted as true sequences, not as diphthongs (units). However, we have interpreted [ʌi] and [ʌu] as diphthongs, [ʌⁱ] and [ʌ^u], for the following reasons:

- [ʌⁱ] and [ʌ^u] occur more frequently than other vowel sequences in our data.
- [ʌⁱ] and [ʌ^u] are always clearly limited to one syllable, whereas other vowel sequences are either two syllables or ambiguous (and possibly variable) with respect to syllable assignment (e.g., /tʃʌl.ua/ ~ /tʃʌl.u.a/ ‘part of neck’).
- [ʌⁱ] is sometimes pronounced as [ɛ] or [æ] by some speakers, with little or no diphthongal quality.¹

This interpretation should be regarded as tentative, pending further research.

¹ Yadav (1996: 15) describes a similar pattern of variation for Maithili /æ/.

3. THE PHONEMIC INVENTORY

3.1 CONSONANT PHONEMES

	Bilabial		Dental / Alveolar		Retroflex		Post-alveolar		Palatal		Velar		Glottal	
Plosive	p	b	t	d	ʈ	ɖ					k	g		
	p ^h	b ^h	t ^h	d ^h	ʈ ^h	ɖ ^h					k ^h	g ^h		
Affricate							tʃ	dʒ						
							tʃ ^h	dʒ ^h						
Fricative			s										h	
Nasal		m		n										
Trill				r										
Flap						ɾ								
Lateral				l										
Approximant		w							j					

3.2 VOWEL PHONEMES

	Front	Central	Back
Close	i		u
Close-mid	e		o
Open-mid	Λ ⁱ	Λ	Λ ^u
Open		a	

	Front	Central	Back
Close	ĩ		ũ
Close-mid	ẽ		õ
Open-mid	ĩ ⁱ	ĩ	ĩ ^u
Open		ã	

4. DESCRIPTION OF PHONEMES

4.1 CONSONANTS

4.1.1 Stops

Pando has stops as five places of articulation: labial, dental, retroflex, palatal, and velar. The palatal stops are realized as laminal post-alveolar affricates. All other stops are realized as unaffricated plosives. All stops contrast for voicing and aspiration.

4.1.1.1 Bilabial Stops

/p/	[p]	a voiceless unaspirated bilabial plosive	
/pirai/	[pirai]	‘to crush seed for oil’	1562
/ʌnpɾʈʃʰ/	[ʌnpɾʈʃʰ]	‘indigestion’	1320
/sāp/	[sāp]	‘snake’	0624
/b/	[b]	a voiced unaspirated bilabial plosive	
/bipʰe/	[bipʰe]	‘thursday’	0700
/amba/	[amba]	‘mango’	0935
/gulab/	[gulab]	‘rose’	0568
/pʰ/	[pʰ]	a voiceless aspirated bilabial plosive	
/pʰipʰili/	[pʰipʰili]	‘butterfly’	0092
/gʌlpʰuli/	[gʌlpʰuli]	‘mumps’	0090
/sʌmpʰ/	[sʌmpʰ]	‘aniseed’	0015
/bʰ/	[bʰ]	a voiced aspirated bilabial plosive	
/bʰinsar/	[bʰinsar]	‘midnight’	1483
/bilbʰʌŋʈi/	[bilbʰʌŋʈi]	‘tomato’	0708
/dʒebabʰ/	[dʒebabʰ]	‘answer’	0832

4.1.1.2 Dental Stops

/t̪/	[t̪]	a voiceless unaspirated dental plosive	
/t̪inuwã/	[t̪inuwã]	‘lice’	0851
/bʰit̪ʌr/	[bʰit̪ʌr]	‘inside’	0339
/kʌsʌrʌt̪/	[kʌsʌrʌt̪]	‘exercise’	0219
/d̪/	[d̪]	a voiced unaspirated dental plosive	
/d̪ija/	[d̪ija]	‘lamp’	0375
/kind̪ra/	[kind̪ra]	‘local guitar’	0280
/d̪ʌwad̪/	[d̪ʌwad̪]	‘ink’	0337

Description of Phonemes

/tʰ/	[tʰ]	a voiceless aspirated dental plosive	
/tʰukʰ/	[tʰu:kʰ]	‘to spit’	1189
/paʈʰʌn/	[paʈʰʌn]	‘part of arrow’	1130
/tiʈʰ/	[ti:ʈʰ]	‘bitter’	1105
/dʰ/	[dʰ]	a voiced aspirated dental plosive	
/dʰip/	[dʰip]	‘to warm up’	0867
/beɖʰa/	[beɖʰa]	‘nostils’	1194
/baɳdʰ/	[baɳdʰ]	‘to tie’	1047

4.1.1.3 Retroflex Stops

/ɭ/	[ɭ]	a voiceless unaspirated retroflex plosive	
/tipka/	[tipʂka]	‘point’	0873
/sʌpʈai/	[sʌpʈai]	‘bend’	0816
/bʌrwʌɭ/	[bʌrwʌɭ]	‘pimple’	0916
/ɖ/	[ɖ]	a voiced unaspirated retroflex plosive	
/ɖimba/	[ɖimba]	‘egg’	0971
/riɳɖola/	[riɳɖoli]	‘widower’	1461
/riɖ/	[ri:ɖ]	‘back bone’	1126
/tʰ/	[tʰ]	a voiceless aspirated retroflex plosive	
/tʰil/	[tʰi:l]	‘hump of ox’	0821
/pitʰi/	[pitʰi]	‘back’	0646
/miʈʰ/	[mi:ʈʰ]	‘sweet’	0659
/dʰ/	[dʰ]	a voiced aspirated retroflex plosive	
/dʰina/	[dʰina]	‘lice’	0358
/ɖaɖʰi/	[ɖaɖʰi]	‘jaw’	1210
/sonɖʰ/	[sonɖʰ]	‘trunk of elephant’	0829

4.1.1.4 Palatal (Post-alveolar) Stops

/tʃ/	[tʃ]	a voiceless unaspirated laminal post-alveolar affricate	
/tʃirko/	[tʃirko]	‘bolete mushroom’	1101
/pitʃʌri/	[pitʃʌri]	‘pus in eye’	0982
/pētʃ/	[pētʃ]	‘groove of nose ring’	0959
/dʒ/	[dʒ]	a voiced unaspirated laminal post-alveolar affricate	
/dʒiw/	[dʒiw]	‘spirit’	1473
/paɳdʒʌr/	[paɳdʒʌr]	‘rib’	0551

Description of Phonemes

/peḍ̃/	[pe:ḍ̃]	‘rice soup’	0555
/tʃʰ/	[tʃʰ] a voiceless aspirated laminal post-alveolar affricate		
/tʃʰita/	[tʃʰita]	‘custard apple’	0158
/bitʃʰʌl/	[bitʃʰʌl]	‘slip’	1586
/natʃʰ/	[natʃʰ]	‘dance’	0163
/ḍ̃ʒʰ/	[ḍ̃ʒʰ] a voiced aspirated laminal post-alveolar affricate		
/ḍ̃ʒʰinga/	[ḍ̃ʒʰiŋga]	‘prawn’	0535
/ʌḍ̃ʒʰe/	[ʌḍ̃ʒʰe]	‘now’	0477
/sand̃ʒʰ/	[sand̃ʒʰ]	‘evening’	0217

4.1.1.5 Velar Stops

/k/	[k] a voiceless unaspirated velar plosive		
/kilo/	[kilo]	‘weight measurement’	0760
/sirki/	[sirki]	‘mat’	0411
/pʌlʌŋk/	[pʌlʌŋk]	‘bed made of plywood’	0641
/g/	[g] a voiced unaspirated velar plosive		
/gir/	[gir]	‘to fall’	1115
/sʌlgʌm/	[sʌlgʌm]	‘beetroot’	0049
/sung/	[su:ŋg]	‘to smell’	1058
/kʰ/	[kʰ] a voiceless aspirated velar plosive		
/kʰili/	[kʰili]	‘screw’	0583
/nikʰa/	[nikʰa]	‘nit’	0946
/ḍ̃ekʰ/	[ḍ̃ekʰ]	‘to see’	1272
/gʰ/	[gʰ] a voiced aspirated velar plosive		
/gʰam/	[gʰam]	‘sunlight’	1024
/singʰʌn/	[singʰʌn]	‘durt in the nose’	1067
/ḍ̃ʒʌngʰ/	[ḍ̃ʒʌngʰ]	‘thigh bone’	0685

4.1.2 Nasals

/m/	[m] a voiced bilabial nasal		
/mis/	[mi:s]	‘thresh the flour’	0697
/kusmũs/	[kusmũ:s]	‘warm water’	1148
/iram/	[iram]	‘therefore’	0682

Description of Phonemes

/n/	[ɳ] a voiced dental nasal occurring before dental stops		
/kindar/	[kindar]	‘again’	0008
/indara/	[indara]	‘well’	0762
/bandar/	[bandar]	‘monkey’	0426
	[ɳ] a voiced retroflex nasal occurring before retroflex stops		
/rinḍoli/	[rinḍoli]	‘widow’	1463
/pinḍiri/	[pinḍiri]	‘calf muscle’	1407
/pendra/	[pendra]	‘bel fruit’	0293
	[ɲ] a voiced palatal nasal occurring before palatal stops		
/pandʒar/	[pandʒar]	‘rib bone’	1233
/pindʒarʃa/	[pindʒarʃa]	‘cage of bird’	1284
/mandʒʰ/	[mandʒʰ]	‘to wash vessel’	0858
	[ŋ] a voiced velar nasal occurring before velar stops		
/dʒʰinga/	[dʒʰinga]	‘prawn’	1512
/singi/	[singi]	‘instrument used to catch demon’	1452
/beng/	[beng]	‘frog’	0270
	[n] a voiced alveolar nasal occurring elsewhere		
/nibu/	[nibu]	‘lemon’	0383
/gini/	[gini]	‘cymbals musical instrument’	1050
/uplain/	[uplain]	‘to float’	1104

4.1.3 Fricatives

/s/	[ʂ] a voiceless retroflex fricative occurring before retroflex stops		
/muʂta/	[muʂta]	‘rat’	0548
	[s] a voiceless alveolar fricative occurring elsewhere		
/sika/	[sika]	‘meat’	1265
/munʂarija/	[munʂarija]	‘pillow’	0515
/bis/	[bi:s]	‘twenty’	0725
/h/	[h] a voiceless glottal fricative occurring word-initially		
/ham/	[ham]	‘we’	0754
	[ɦ] a voiced glottal fricative occurring elsewhere		
/pʌɦar/	[pʌɦar]	‘mountain’	0889
/tʊɦi/	[tʊɦi]	‘orphan female’	1462
/bah/	[baɦ]	‘hand’	0304

Description of Phonemes

4.1.4 Liquids

/r/ [r] a voiced alveolar flap occurring between vowels

/bara/	[bara]	‘twelve’	0724
/d ^h ire/	[d ^h ire]	‘slow’	0621
/purus/	[purus]	‘husband’	0325

[r] a voiced alveolar trill occurring elsewhere

/risai/	[risai]	‘felt bad’	1106
/lebra/	[lebra]	‘lips’	0389
/bΛ ¹ r/	[bΛ ¹ r]	‘plum’	0523

/ɽ/ [ɽ] a voiced retroflex flap

/gaɽi/	[gaɽi]	‘vehicle’	0737
/piɽhi/	[piɽhi]	‘generation’	1298
/uɽ/	[uɽ]	‘fly’	0970

/l/ [l] a voiced alveolar lateral approximant

/lim/	[li:m]	‘neem tree’	0463
/pilija/	[pilija]	‘jaundice’	0348
/bΛl/	[bΛl]	‘strength’	0648

4.1.5 Central Approximants

/j/ [j] a voiced palatal central approximant

/pijas/	[pijas]	‘thirsty’	0690
/kΛɽija/	[kΛɽija]	‘black’	0059
/gaj/	[gaj]	‘cow’	0145

/w/ [w] a voiced labial central approximant

/nΛrwã/	[nΛrwã]	‘river’	0561
/sewã/	[sewã]	‘praying’	0534
/aw/	[aw]	‘to come’	0136

4.2 VOWELS

Pando has six basic vowels and two diphthongs. Each vowel and diphthong has a contrasting nasal counterpart. Vowel length is not contrastive. In our data (which consists of words elicited in isolation) vowels tend to be longer in one syllable words and in final syllables. This is often (but not consistently) noted in our phonetic transcription. Further research is required to determine if prosodic factors, such as stress and syllable structure, play a role in conditioning vowel length. All vowels are voiced.

Description of Phonemes

4.2.1 Oral Vowels

/i/	[i] a close front unrounded vowel		
/inam/	[inam]	‘things got freely’	0267
/pis/	[pi:s]	‘grind’	0841
/matʃ ^h i/	[matʃ ^h i]	‘house fly’	0322
/u/	[u] a close back rounded vowel		
/up ^h ar/	[up ^h ar]	‘open mouth’	1365
/buʈa/	[buʈa]	‘work’	0797
/tʃehu/	[tʃehu]	‘jaw’	1400
/e/	[e] a close-mid front unrounded vowel		
/ema/	[ema]	‘here’	0001
/penḍi/	[penḍi]	‘downside of round’	0570
/nʌbe/	[nʌbe]	‘ninety’	0472
/o/	[o] a close-mid back rounded vowel		
/osʌr/	[osʌr]	‘opportunity’	0488
/boʈ ^h /	[boʈ ^h]	‘to twist to make rope’	1529
/mo/	[mo]	‘I’	0332
/ʌ/	[ʌ] an open-mid central unrounded vowel		
/ʌmli/	[ʌmli]	‘tamrin’	0667
/p ^h ʌr/	[p ^h ʌr]	‘fruits’	0272
/lʌtʌ/	[lʌtʌ]	‘sweet made from mahu’	1368
/a/	[a] an open central unrounded vowel		
/aḍi/	[aḍi]	‘ginger’	0278
/nas/	[nas]	‘become bad’	1247
/amba/	[amba]	‘mango’	0935
/ʌ ⁱ /	[ʌ ⁱ] an open-mid front-central unrounded falling diphthong, in free variation with an open-mid or near-open front unrounded vowel ([ʌ ⁱ]~[ɛ]~[æ]).		
/ʌ ⁱ ne/	[ʌ ⁱ ne]	‘other’	1227
/korʌ ⁱ nʌ/	[korʌ ⁱ nʌ]	‘tongue cleaner’	0712
/k ^h inʌ ⁱ /	[k ^h inʌ ⁱ]	‘to stitch (with machine)’	0642
/ʌ ^u /	[ʌ ^u] a voiced open-mid back-central rounded falling diphthong		
/pʌ ^u rʌn/	[pʌ ^u rʌn]	‘backstroke (swimming)’	1571
/nʌ ^u /	[nʌ ^u]	‘nine’	0469

Description of Phonemes

4.2.2 Nasalized Vowels

All vowels are somewhat nasalized in the context of nasal consonants. They are also prone to spontaneous nasalization in the context of (breathy) voiced aspirates, /h/ ([ɦ]), and /w/. However, nasalization is not always predictable and must be regarded as phonemic.

/ĩ/	[ĩ] a close front unrounded nasalized vowel		
/t̪ũĩr/	[t̪ũĩr]	‘sound made by rat’	1603
/ẽ/	[ẽ] a close-mid front unrounded nasalized vowel		
/pẽt̪/	[pẽt̪]	‘groove of nose ring’	0959
/ũ/	[ũ] a close back rounded nasalised vowel		
/k ^h ũt̪i/	[k ^h ũt̪i]	‘sharp’	1022
/õ/	[õ] a close-mid back rounded nasalized vowel		
/t̪õ/	[t̪õ]	‘you’	0801
/ĩ/	[ĩ] an open-mid central unrounded nasalized vowel		
/kĩwĩl/	[kĩwĩl]	‘lotus’	0399
/ã/	[ã] an open central unrounded nasalized vowel		
/dãt̪ ^h /	[dãt̪ ^h]	‘teeth’	0673
/ĩ ⁱ /	[ĩ ⁱ] an open-mid front-central unrounded nasalized falling diphthong		
/pĩ ⁱ t̪ar/	[pĩ ⁱ t̪ar]	‘plain ground’	0243
/ũ ^u /	[ũ ^u] an open-mid back-central rounded nasalized falling diphthong		
/dũ ^u ri/	[dũ ^u ri]	‘to thresh sheaf with ox’	1484

5. EVIDENCE OF CONTRAST

5.1 CONSONANTS

5.1.1 Stops

Pando contrasts stops at five places of articulation: bilabial, dental, retroflex, palatal (post-alveolar), and velar. Examples of (near-)minimal pairs include:

/pan/	[pan]	‘leaf’	1057
/ṭan/	[ṭan]	‘very far’	0228
/ṭaŋg/	[ṭaŋg]	‘hang’	1364
/tʃan/	[tʃan]	‘to cut vegetables’	1249
/kan/	[kan]	‘ear’	0193

At each place of articulation, stops contrast for voicing and aspiration. Examples of minimal and near-minimal pairs are provided below.

/p/ and /b/

/pongi/	[pongi]	‘hand bone’	1099
/bongi/	[bongi]	‘wood’	1023
/pʌḍri/	[pʌḍri]	‘red bug’	1508
/bʌḍri/	[bʌḍri]	‘cloud’	0127
/kʰʌpra/	[kʰʌpra]	‘roof tiles’	0486
/lebra/	[lebra]	‘lips’	0389

/p/ and /pʰ/

/pak/	[pak]	‘pus’	0885
/pʰakʰ/	[pʰakʰ]	‘to cut goat’	1261
/tʰopi/	[tʰopi]	‘to gag’	1633
/pʰopʰi/	[pʰopʰi]	‘syrup’	1145

/b/ and /bʰ/

/beṭi/	[beṭi]	‘wife’s sister’s daughter’	0782
/bʰeṭi/	[bʰeṭi]	‘mourn’	0814
/bawã/	[bawã]	‘beggar’	1312
/bʰãwa/	[bʰãwa]	‘wild cat’	0266
/ḍimba/	[ḍimba]	‘egg’	0971
/ḍambʰa/	[ḍambʰa]	‘big lemon’	0054

Evidence of Contrast

/p^h/ and /b^h/

/p ^h uk ^h /	[p ^h u:k ^h]	‘to blow’	1144
/b ^h uk ^h /	[b ^h u:k ^h]	‘hungry’	0324
/sap ^h i/	[sap ^h i]	‘towel’	0713
/tʃab ^h i/	[tʃab ^h i]	‘key’	0359

/t/ and /d/

/tāt ^h /	[tāt ^h]	‘hot’	0321
/dāt ^h /	[dāt ^h]	‘teeth’	0673
/goṭi/	[goṭi]	‘clan’	1285
/goḍi/	[goḍi]	‘brain’	0074

/t/ and /t^h/

/tʌbʌla/	[tʌbʌla]	‘tabala musical instrument’	1094
/t ^h ʌpori/	[t ^h ʌpori]	‘clap’	0123
/paṭʌr/	[paṭʌr]	‘slim’	0620
/paṭ ^h ʌn/	[paṭ ^h ʌn]	‘part of arrow’	1190
/saṭ/	[saṭ]	‘seven’	0593
/maṭ ^h /	[maṭ ^h]	‘forehead’	0259

/d/ and /d^h/

/ḍona/	[ḍona]	‘leaf sauce’	1315
/d ^h o/	[d ^h o]	‘to wash’	1052
/aḍi/	[aḍi]	‘ginger’	0278
/baḍ ^h i/	[baḍ ^h i]	‘rope covered around drum’	1353
/k ^h and/	[k ^h and]	‘shoulder’	0609
/niṇḍ ^h /	[niṇḍ ^h]	‘clean between plants’	1575

/t^h/ and /d^h/

/t ^h opi/	[t ^h opi]	‘to gag’	1633
/d ^h o/	[d ^h o]	‘to wash’	1052
/b ^h uṭ ^h /	[b ^h u:ṭ ^h]	‘demon after death’	1288
/buḍ ^h /	[bu:ḍ ^h]	‘wednesday’	0757

Evidence of Contrast

/t/ and /d/

/taŋg/	[taŋg]	‘hang’	1364
/daŋg/	[daŋg]	‘fishing rod’	1264
/tʊkni/	[tʊkəni]	‘medium size basket’	0871
/dʊkni/	[dʊkəni]	‘to enter’	1368
/tʃimʈa/	[tʃimʈa]	‘tongs’	0125
/tʌmda/	[tʌmda]	‘to search in the dark’	1611

/t/ and /tʰ/

/tʌrra/	[tʌr:a]	‘green frog’	1091
/tʰʌrra/	[tʰʌr:a]	‘black rice’	1406
/pʌtija/	[pʌtija]	‘long wood used for roof’	1080
/pʌtʰija/	[pʌtʰija]	‘female goat’	1175

/d/ and /dʰ/

/dar/	[dar]	‘branch’	0075
/dʰar/	[dʰar]	‘to wash rice’	1197
/kʌda/	[kʌda]	‘tooth decay’	0865
/kʌdʰa/	[kʌdʰa]	‘flour beetle’	1622

/tʰ/ and /dʰ/

/tʰar/	[tʰar]	‘cold’	1135
/dʰar/	[dʰar]	‘to wash rice’	1197
/ʌtʰʌna/	[ʌtʰʌna]	‘50 paisa’	1602
/bʌdʰʌni/	[bʌdʰʌni]	‘broom’	0082
/uʈʰ/	[u:ʈʰ]	‘camel’	0096
/buʈʰ/	[bu:ʈʰ]	‘sink’	0838

/tʃ/ and /dʒ/

/tʃan/	[tʃan]	‘to cut vegetable’	1249
/dʒan/	[dʒan]	‘sunset’	0878
/tʃal/	[tʃal]	‘to separate rice with seive’	0884
/dʒal/	[dʒal]	‘net’	0465
/pʌntʃi/	[pʌntʃi]	‘part of sling shot’	1109

Evidence of Contrast

/gʌndʒi/	[gʌndʒi]	‘undershirt’	0739
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/tʃ/ and /tʃʰ/

/tʃan/	[tʃan]	‘to cut vegetable’	1249
/tʃʰan/	[tʃʰan]	‘to separate tea with sieve’	1256

/tʃuʈki/	[tʃuʈki]	‘make sound with finger’	1520
/tʃʰuʈki/	[tʃʰuʈki]	‘second wife’	1503

/dʒ/ and /dʒʰ/

/dʒam/	[dʒam]	‘to freeze’	1068
/dʒʰana/	[dʒʰana]	‘tent made of leaves’	0983

/kodʒʌra/	[kodʒʌra]	‘centipede’	0109
/odʒʰʌra/	[odʒʰʌra]	‘part of jackfruit’	1466

/mʌndʒeni/	[mʌndʒeni]	‘sandpaper’	1141
/mandʒʰeni/	[mandʒʰeni]	‘lunch’	0402

/tʃʰ/ and /dʒʰ/

/tʃʰuri/	[tʃʰu:ri]	‘knife’	0367
/dʒʰuri/	[dʒʰuri]	‘firewood for cooking’	0857

/sotʃʰ/	[sotʃʰ]	‘to think’	1321
/sodʒʰ/	[sodʒʰ]	‘straight’	1200

/k/ and /g/

/kaɖi/	[kaɖi]	‘match stick’	1491
/gaɖi/	[gaɖi]	‘vehicle’	0737

/konɖa/	[konɖa]	‘dumb’	1435
/gonɖa/	[gonɖa]	‘marigold’	0407

/rekʌn/	[rekʌn]	‘to groan with pain’	1588
/ɖegʌn/	[ɖegʌn]	‘jump and run’	0351

/k/ and /kʰ/

/kãɖi/	[kãɖi]	‘nail’	0455
/kʰaɖi/	[kʰaɖi]	‘wooden bed’	0795

/pak/	[pak]	‘pus’	0885
/pʰakʰ/	[pʰakʰ]	‘to cut goat’	1261

Evidence of Contrast

/g/ and /g^h/

/geḍur/	[geḍur]	‘bat (bird, small)’	0040
/g ^h erawa/	[g ^h erawa]	‘local wall’	1228
/p ^h agun/	[p ^h agun]	‘holy festival’	0315
/ag ^h u/	[ag ^h u]	‘front’	0271
/bag/	[bag]	‘tiger’	0701
/mag ^h /	[mag ^h]	‘august’	0027

/k^h/ and /g^h/

/k ^h opti/	[k ^h opti]	‘cocnut shell’	0121
/g ^h opti/	[g ^h opti]	‘skull’	0998
/k ^h aṭi/	[k ^h aṭi]	‘wooden bed’	0795
/g ^h aṭi/	[g ^h aṭi]	‘uvula’	0495

5.1.2 Fricatives

/t͡ʃ/ and /s/

/t͡ʃal/	[t͡ʃal]	‘to separate rice with sieve’	0884
/sal/	[sal]	‘year’	1494
/basi/	[basi]	‘night rice eaten in morning’	0430
/b ^h at͡ʃi/	[b ^h at͡ʃi]	‘wife’s brother’s daughter’	0771

/s/ and /h/

/sal/	[sal]	‘year’	1494
/hal/	[hal]	‘plough’	1092
/basi/	[basi]	‘night rice eaten in the morning’	0430
/bahĩ/	[bahĩ]	‘arm to palm’	0023

5.1.3 Nasals

/b/ and /m/

/bala/	[bala]	‘ear ring’	0194
/mala/	[mala]	‘chain’	0110
/gobʌr/	[gobʌr]	‘cow dung’	1125
/somar/	[somar]	‘monday’	0425

Evidence of Contrast

/ɖ/ and /n/

/ɖãtʰ/	[ɖãtʰ]	‘teeth’	0673
/natʰ/	[natʰ]	‘kick’	1389
/kʰeda/	[kʰeda]	‘to hunt’	1200
/kena/	[kena]	‘one type of weed’	1250

/m/ and /n/

/matʰ/	[matʰ]	‘forehead’	0259
/natʰ/	[natʰ]	‘kick’	1389
/kema/	[kema]	‘where’	0764
/kena/	[kena]	‘one type of weed’	1250

5.1.4 Liquids

/ɖ/ and /l/

/dai/	[dai:]	‘mother’	0436
/lai/	[lai]	‘popcon’	0958
/laɖa/	[laɖa]	‘hip’	0313
/pala/	[pala]	‘snow’	0333

/ɖ/ and /r/

/ɖabi/	[ɖabi]	‘rice stalk’	1428
/raɖi/	[raɖi]	‘night’	0468
/laɖa/	[laɖa]	‘hip’	0313
/para/	[para]	‘place’	0516

/ɖ/ and /ɽ/

/edɖi/	[edɖi]	‘heel’	0311
/bʌɽiɦʌn/	[bʌɽiɦʌn]	‘good’	1061
/kaɖi/	[kaɖi]	‘match stick’	0413
/gaɽi/	[gaɽi]	‘vehicle’	0737

/r/ and /l/

/rakʰ/	[rakʰ]	‘ash’	1085
/lakʰ/	[lakʰ]	‘lakh’	0374

Evidence of Contrast

/para/	[para]	‘place’	0516
/pala/	[pala]	‘snow’	0333

/t̪ar/	[t̪ar]	‘four’	0262
/t̪al/	[t̪al]	‘to separate rice with sieve’	0884

/r/ and /ɾ/

/od̪ʰʌra/	[od̪ʰʌra]	‘part of jackfruit’	1466
/od̪ʰʌɾa/	[od̪ʰʌɾa]	‘large intestine’	1594

/d̪ʌr/	[d̪ʌr]	‘fever’	1129
/d̪ʌɾ/	[d̪ʌɾ]	‘root’	0566

5.1.5 Approximants

/b/ and /w/

/gobʌr/	[gobʌr]	‘cow dung’	1125
/rowan/	[rowan]	‘crying’	0151

/t̪ab/	[t̪ab]	‘to bite’	1211
/gaw/	[gaw]	‘village’	0741

/d̪/ and /j/

/kad̪ʌr/	[kad̪ʌr]	‘eye liner’	0224
/kajʌr/	[kajʌr]	‘enemy’	0213

/bad̪ʌ/	[bad̪ʌ]	‘music instrument’	0444
/d̪ija/	[d̪ija]	‘lamp’	0375

/l/ and /j/

/t̪ila/	[t̪ila]	‘another kind of algae’	0811
/t̪ija/	[t̪ija]	‘chick’	0879

/l/ and /w/

/d̪ʌla/	[d̪ʌla]	‘cataracts’	0863
/d̪ʌwã/	[d̪ʌwã]	‘oats’	0563

/bala/	[bala]	‘ear ring’	0194
/bawã/	[bawã]	‘beggar’	1312

Evidence of Contrast

/j/ and /w/

/gaj/	[gaj]	‘cow’	0145
/gaw/	[gaw]	‘to sing’	0917
/mΛja/	[mΛja]	‘love’	0401
/tΛwã/	[tΛwã]	‘pan’	0497

5.2 VOWELS

5.2.1 Vowel Quality

/i/ and /e/

/d ^h ina/	[d ^h ina]	‘lice’	0679
/ɖena/	[ɖena]	‘wings’	0789
/t ^h oʈi/	[t ^h oʈi]	‘last daughter’	0376
/t ^h oʈe/	[t ^h oʈe]	‘short’	0608

/e/ and /a/

/mela/	[mela]	‘fair’	0122
/mala/	[mala]	‘chain’	0110
/ten/	[ten]	‘oil’	1149
/tan/	[tan]	‘very far’	0228

/u/ and /o/

/pus/	[pus]	‘July’	0350
/pos/	[pos]	‘domestic’	1347
/d̪uʰar/	[d̪uʰar]	‘greetings with action’	1542
/d̪oʰar/	[d̪oʰar]	‘hug’	0323

/o/ and /a/

/okΛr/	[okΛr]	‘their’	0768
/ak ^h ir/	[ak ^h ir]	‘if’	1043
/pos/	[pos]	‘domestic’	1374
/pas/	[pas]	‘Maua after five days’	1074
/koʈo/	[koʈo]	‘ear wax’	0195
/koʈ ^h a/	[koʈ ^h a]	‘cattle shield’	1539

Evidence of Contrast

/a/ and /ʌ/

/bani/	[bani]	‘stripes of snakes’	1581
/bʌni/	[bʌni]	‘wages’	0744
/d̪ʰar/	[d̪ʰar]	‘times’	1330
/d̪ʰʌr/	[d̪ʰʌr]	‘to hold’	0929

/e/ and /ʌ/

/ber/	[ber]	‘sun’	0653
/bʌr/	[bʌr]	‘banyan tree’	0036
/peɳɖra/	[peɳɖra]	‘bell fruit’	0293
/pʌɳɖra/	[pʌɳɖra]	‘fair male’	0403

/o/ and /ʌ/

/poɭa/	[poɭa]	‘small intestine’	0340
/pʌɭa/	[pʌɭa]	‘along rod used to level ground’	1628
/gori/	[go:ri]	‘medium color female’	0418
/gʌri/	[gʌri]	‘hook of fishing rod’	1328

/e/ and /ʌⁱ/

/ber/	[ber]	‘sun’	0653
/bʌ ⁱ r/	[bʌ ⁱ r]	‘plum’	0523
/bera/	[bera]	‘thick metal bangle’	1443
/b ^h ʌ ⁱ ra/	[b ^h ʌ ⁱ ra]	‘dove’	1439

/o/ and /ʌ^u/

/bora/	[bora]	‘sack’	0573
/bʌ ^u rʌ ⁱ /	[bʌ ^u rʌ ⁱ]	‘mad’	0845

5.2.2 Vowel Nasalisation

/i/ and /ĩ/

/pʌnhi/	[pʌnhi]	‘shoes’	0604
/bahĩ/	[bahĩ]	‘arm to palm’	0023

/e/ and /ẽ/

/t̪ed̪ʰ/	[t̪e:d̪ʰ]	‘to talk loudly’	0043
/pēt̪̃/	[pēt̪̃]	‘groove of nose ring’	0959

Evidence of Contrast

/u/ and /ũ/

/t̪ehu/	[t̪ehu]	‘jaw’	0731
/gɬhũ/	[gɬhũ]	‘wheat’	0763

/o/ and /õ/

/so/	[so:]	‘hundred’	0003
/t̪õ/	[t̪õ]	‘you’	0801

/ɬ/ and /ã/

/d̪ewɬr/	[d̪ewɬr]	‘husband younger brother’	0330
/kãwãl/	[kãwãl]	‘lotus’	0399

/a/ and /ã/

/sas/	[sas]	‘to breath’	0868
/sãs/	[sãs]	‘wife’s mother’	0777

/sɬtuwa/	[sɬtuwa]	‘ragi’	0545
/sɬtuwã/	[sɬtuwã]	‘seventh’	0595

/k ^h at̪i/	[k ^h at̪i]	‘wooden bed’	0795
/kãt̪i/	[kãt̪i]	‘nail’	0455

/ɬⁱ/ and /ãⁱ/

/bɬ ⁱ s/	[bɬ ⁱ s]	‘sit’	0612
/b ^h ã ⁱ sa/	[b ^h ã ⁱ sa]	‘shield cap mushroom’	1168

/ɬ^u/ and /ã^u/

/t̪ ^h ɬ ^u k ^h /	[t̪ ^h ɬ ^u k ^h]	‘fry’	1543
/t̪ ^h ã ^u kɬ ^h /	[t̪ ^h ã ^u kɬ ^h]	‘door frame’	0965

6. SYLLABLE STRUCTURE

A syllable is a unit of sound composed of a central peak of sonority (usually a vowel) and the consonants that cluster around this central peak. Pando has a basic (C)V(C)(C) syllable template. Examples are listed below.

V				
/i/	[i:]	V	‘this’	0693
/u/	[u:]	V	‘that’	0680
VC				
/ek/	[ek]	VC	‘one’	0483
/aṭʰ/	[aṭʰ]	VC	‘eight’	0201
CV				
/mo/	[mo]	CV	‘I’	0332
/tõ/	[tõ]	CV	‘you’	0801
CVC				
/pis/	[pis]	CVC	‘grind’	0841
/kan/	[kan]	CVC	‘ear’	0193
VCC				
/undṛʌ ⁱ /	[undṛʌ ⁱ]	VCC.CV	‘too much dirty’	1059
/ʌndṛa/	[ʌndṛa]	VCC.CV	‘boy’	1336
CVCC				
/beng/	[beng]	CVCC	‘frog’	0270
/baṇḍ/	[baṇḍ]	CVCC	‘to tie’	1047

Pando also has some VV sequences (see section 7.5). It is not clear if they constitute one or two syllables. If they constitute a single syllable, then the syllable template might be (C)(V)V(C)(C).

7. DISTRIBUTION OF PHONEMES

7.1 DISTRIBUTION OF CONSONANTS IN WORDS & SYLLABLES

The table below lists the frequency of each consonant phoneme in various phonotactic positions within our data corpus, including word-initial before a vowel (#_V), intervocalic (V_V), word-medial after another consonant (VC_V), word-medial before another consonant (V_CV), and word-final after a vowel (V_#). The first three environments represent syllable onset positions; the last two represent syllable coda positions.

Phoneme	#_V	V_V	VC_V	V_CV	V_#
/p/	157	24	17	14	8
/p ^h /	39	10	7	0	4
/b/	193	32	33	6	6
/b ^h /	47	6	6	0	4
/t/	47	63	23	8	24
/t ^h /	7	13	2	1	21
/d/	61	36	28	4	9
/d ^h /	20	9	5	1	7
/t̪/	64	84	22	31	27
/t̪ ^h /	25	21	1	6	24
/d̪/	69	32	31	5	7
/d̪ ^h /	31	10	3	0	3
/t̪ʃ/	130	39	14	1	12
/t̪ʃ ^h /	41	18	5	1	11
/d̪ʃ/	90	32	24	4	14
/d̪ʃ ^h /	31	6	10	1	7
/t̪ʃ/	176	84	63	34	37
/t̪ʃ ^h /	55	34	11	4	27
/d̪ʒ/	117	38	57	2	6
/d̪ʒ ^h /	37	14	13	0	4
/k/	112	67	21	26	56
/k ^h /	38	74	43	5	8
/g/	157	24	17	14	8
/g ^h /	39	10	7	0	4
/s/	193	32	33	6	6
/h/	47	6	6	0	4
/m/	101	25	14	34	12
/n/	64	103	26	159	133
/r/	33	224	47	108	176
/ɹ/	0	20	2	12	6
/l/	37	90	14	33	35
/w/	0	60	17	8	21
/j/	0	69	0	2	3

Distribution of Phonemes

As shown in the table above, /t/, /w/, and /j/ do not occur word-initially. Aspirated stops and /h/ are rare in syllable coda position (word-medially before another consonant and word-finally).

7.2 COMPLEX ONSETS AND CODAS

Pando does not have complex onsets. Complex codas consist mostly of homorganic nasal+stop sequences. Some examples are listed below.

/sʌmpʰ/	[sʌmpʰ]	CVCC	‘anise’	0015
/kʰand/	[kʰand]	CVCC	‘shoulder’	0609
/sonɖʰ/	[sonɖʰ]	CVCC	‘trunk of elephant’	0829
/mandʒʰ/	[mandʒʰ]	CVCC	‘to wash vessels’	0858
/beng/	[beng]	CVCC	‘frog’	0270

There are only two exceptions in our data:

/tʰʌrs/	[tʰʌrs]	CVCC	‘looking good’	1642
/ʌmberɖʰ/	[ʌmberɖʰ]	VC.CVCC	‘sour’	1110

In word-medial CCC sequences, the first two consonants are typically homorganic nasals and stops, while the third is typically a trill or flap. Some examples include the following:

/undrʌʰi/	[undrʌʰi]	VCC.CV	‘too much dirty’	1059
/pendra/	[pendra]	CVCC.CV	‘bell fruit’	0293

There are a few exceptions to this generalization, including the following:

/kohndʌ/	[kohndʌ]	CVCC.CV	‘pumpkin’	0538
/tehngʌn/	[tehngʌn]	CVCC.CV	‘peep’	1500
/morndʌ/	[morndʌ]	CVCC.CV	‘pairy ring mushroom’	0864
/ʌrndʒi/	[ʌrndʒi]	CVCC.CV	‘type of fruit’	1392

7.3 GEMINATES

Gemination does not appear to be a significant feature of Pando. There are only a few examples of geminate consonants in our data, mostly involving /kk/ and /rr/. Examples of /kk/ might be conditioned by a preceding short /ʌ/, but examples of /rr/ are unmistakably long trills. This topic may require further research.

/kk/	/tʃʌkka/	[tʃʌkka]	‘tire’	0728
/rr/	/barri/	[bar:i]	‘small hornet’	0318
	/kʌrra/	[kʌr:a]	‘mew cat’	0850
	/gʰʌrri/	[gʰʌri]	‘well pulley’	1527

7.4 RETROFLEX CONSONANT HARMONY

Dental and retroflex stops do not co-occur within the same root. If a root contains two coronal stops, they must agree with respect to retroflexion or non-retroflexion (cf. Arsenault 2015). The table below shows word-initial $C_1V(N)C_2$ sequences in which C_1 and C_2 represent dental stops, retroflex stops, or /ɾ/, V represents an intervening vowel, and N represents an optional homorganic nasal.

$C_1 \backslash C_2$	t, t ^h , d, d ^h	ɖ, ɖ ^h , ɗ, ɗ ^h	ɾ
t, t ^h , d, d ^h	13	0	0
ɖ, ɖ ^h , ɗ, ɗ ^h	0	31	1

Examples of words containing two coronal stops are listed below:

/t̪at̪ ^h /	[t̪at̪ ^h]	‘hot’	0321
/ɖãt̪ ^h /	[ɖãt̪ ^h]	‘teeth’	0673
/ɖ ^h und̪ara/	[ɖ ^h und̪ara]	‘fog’	1183
/t̪at̪i/	[t̪at̪i]	‘gate’	0275
/ɖat̪ ^h /	[ɖat̪ ^h]	‘mushroom stem’	0934
/t̪enda/	[t̪enda]	‘bamboo used to draw water’	1415

7.5 VOWEL SEQUENCES

Pando allows some vowel sequences. In most cases, it is difficult to determine if they constitute one or two syllables. Both pronunciations may be possible. Some examples are listed below.

$V_1 \backslash V_2$	i, ĩ	u, ũ	e, ě	o, õ	ʌ, ʌ̃	a, ă
i, ĩ	0	1	0	0	0	4
u, ũ	6	0	0	0	0	8
e, ě	0	0	0	1	0	0
o, õ	0	0	0	0	0	0
ʌ, ʌ̃	0	0	0	0	0	0
a, ă	22	3	0	0	0	0

/t̪ũĩr/	[t̪ũĩr]	‘sound made by rat’	1603
/t̪ĩũt̪i/	[t̪ĩũt̪i]	‘type of ant’	1338
/piad̪ɜ̃/	[piad̪ɜ̃]	‘onion’	0484
/suari/	[suari]	‘type of vessel’	0893
/seo/	[seo]	‘apple’	0019
/ɖai/	[ɖai]	‘mother’	0436
/au/	[au]	‘and’	0997

8. BIBLIOGRAPHY

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