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# Pando Phonology Write-Up

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**Pando Language Development Team**  
2019

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Thank You

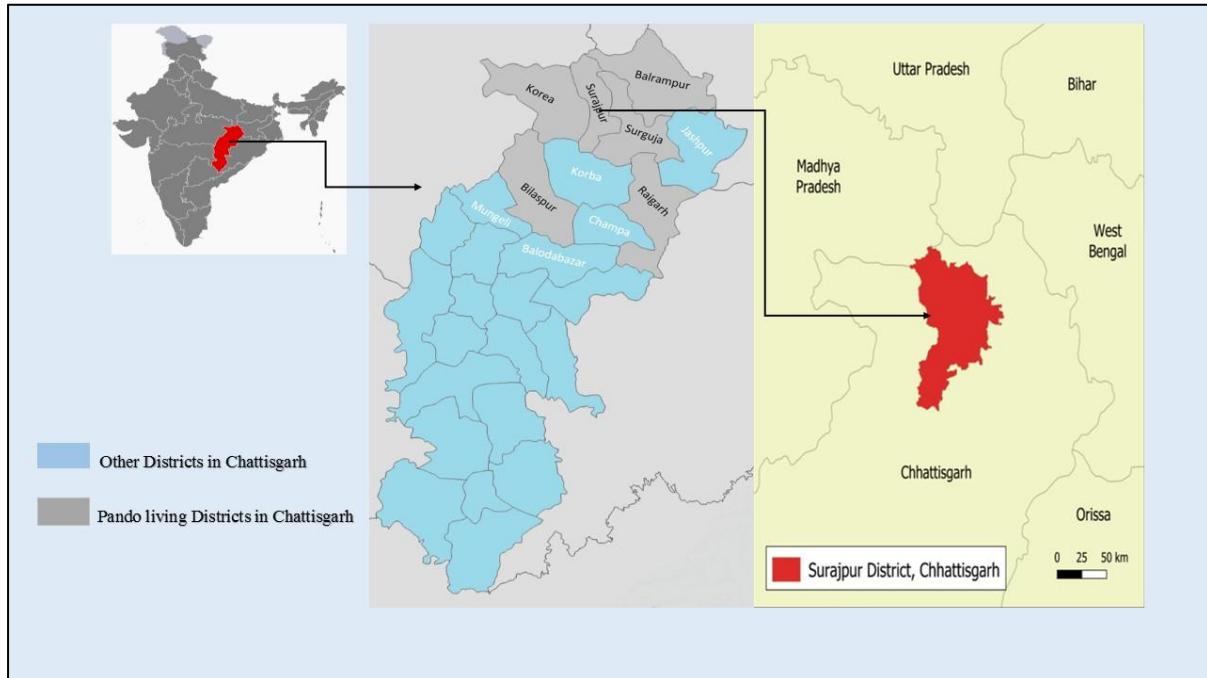
Pando language development team

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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 Surguja 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 Surguja, and the Pando people have good comprehension of Surguja. However, this might be because Surguja is used as a language of wider communication, not necessarily because Pando is a dialect of Surguja. According to the survey, Surguja 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 FLEX (software) for analysis.

### 1.5 SYMBOLS AND ABBREVIATION

- [ ] Phonetic data
- // Phonemic data
- Vl 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], [t<sup>h</sup>], [th], [tʃ<sup>h</sup>], [kh], and [b<sup>h</sup>], [d<sup>h</sup>], [dʒ<sup>h</sup>], [g<sup>h</sup>], are interpreted as aspirated units: [p<sup>h</sup>], [t<sup>h</sup>], [t<sup>h</sup>], [tʃ<sup>h</sup>], [k<sup>h</sup>] and [b<sup>h</sup>], [d<sup>h</sup>], [d<sup>h</sup>], [dʒ<sup>h</sup>], [g<sup>h</sup>], respectively. In our data, we also find sonorant+[h] sequences, including [mf<sup>h</sup>], [nf<sup>h</sup>], [rf<sup>h</sup>], [lh<sup>h</sup>], and [rh<sup>h</sup>]. For example:

/kumhar/	[kumfhar]	'potter'	0532
/pʌnhi/	[pʌnfi]	'shoes'	0604
/surhi/	[surfi]	'rice beetle'	1564
/tʃilhi/	[tʃilfi]	'rope covered inside of drum'	1355
/noʃha/	[noʃfa]	'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 [h] in most positions) occurs independently in syllable onsets (i.e., word-initial, intervocalic, and stem-final positions).
- Unlike aspirated stops, sequences of sonorant+[h] 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 [ai] and [au] as diphthongs, [ʌ<sup>i</sup>] and [ʌ<sup>u</sup>], for the following reasons:

- [ʌ<sup>i</sup>] and [ʌ<sup>u</sup>] occur more frequently than other vowel sequences in our data.
- [ʌ<sup>i</sup>] and [ʌ<sup>u</sup>] 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., /tʌl.u.a/ ~ /tʌl.u.a/ 'part of neck').
- [ʌ<sup>i</sup>] is sometimes pronounced as [ɛ] or [æ] by some speakers, with little or no diphthongal quality.<sup>1</sup>

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

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

## The Phonemic Inventory

### 3. THE PHONEMIC INVENTORY

#### 3.1 CONSONANT PHONEMES

	Bilabial		Dental / Alveolar		Retroflex		Post-alveolar		Palatal		Velar		Glottal	
Plosive	p	b	t̪	d̪	t̪	d̪					k	g		
	p <sup>h</sup>	b <sup>h</sup>	t̪ <sup>h</sup>	d̪ <sup>h</sup>	t̪ <sup>h</sup>	d̪ <sup>h</sup>					k <sup>h</sup>	g <sup>h</sup>		
Affricate							t̪ʃ	d̪ʒ						
							t̪ʃ <sup>h</sup>	d̪ʒ <sup>h</sup>						
Fricative			s											h
Nasal		m		n										
Trill				r										
Flap						t̪								
Lateral				l										
Approximant		w								j				

#### 3.2 VOWEL PHONEMES

	Front	Central	Back
Close	i		u
Close-mid	e		o
Open-mid	ʌ <sup>i</sup>	ʌ	ʌ <sup>u</sup>
Open		a	

	Front	Central	Back
Close	ĩ		ũ
Close-mid	ẽ		õ
Open-mid	ã <sup>i</sup>	ã	ã <sup>u</sup>
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
/ʌnpʌtʃʰ/	[ʌnpʌtʃʰ]	‘indigestion’	1320
/sãp/	[sãp]	‘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
/bilbʰʌŋji/	[bilbʰʌŋji]	‘tomato’	0708
/dʒebabʰ/	[dʒebabʰ]	‘answer’	0832

##### 4.1.1.2 *Dental Stops*

/t/ [t] a voiceless unaspirated dental plosive

/tinuwã/	[tinuwã]	‘lice’	0851
/bʰit̪ər/	[bʰit̪ər]	‘inside’	0339
/kʌsʌrʌt̪/	[kʌsʌrʌt̪]	‘exercise’	0219

/d/ [d] a voiced unaspirated dental plosive

/d̪iʃa/	[d̪iʃa]	‘lamp’	0375
/kɪn̪d̪ra/	[kɪn̪d̪ra]	‘local guitar’	0280
/d̪wad̪/	[d̪wad̪]	‘ink’	0337

## Description of Phonemes

/t <sup>h</sup> /	[t <sup>h</sup> ] a voiceless aspirated dental plosive		
/t <sup>h</sup> uk <sup>h</sup> /	[t <sup>h</sup> u:k <sup>h</sup> ]	‘to spit’	1189
/paṭ <sup>h</sup> ʌn/	[paṭ <sup>h</sup> ʌn]	‘part of arrow’	1130
/tit <sup>h</sup> /	[ti:t <sup>h</sup> ]	‘bitter’	1105
/d <sup>h</sup> /	[d <sup>h</sup> ] a voiced aspirated dental plosive		
/d <sup>h</sup> ip/	[d <sup>h</sup> ip]	‘to warm up’	0867
/bed <sup>h</sup> a/	[bed <sup>h</sup> a]	‘nostils’	1194
/band <sup>h</sup> /	[band <sup>h</sup> ]	‘to tie’	1047

### 4.1.1.3 Retroflex Stops

/ʈ/	[ʈ] a voiceless unaspirated retroflex plosive		
/ʈipka/	[ʈip̥ka]	‘point’	0873
/sɳʈai/	[sɳʈai]	‘bend’	0816
/bɳʈwʈ/	[bɳʈwʈ]	‘pimple’	0916
/ɖ/	[ɖ] a voiced unaspirated retroflex plosive		
/ɖimba/	[ɖimba]	‘egg’	0971
/rindola/	[rindoli]	‘widower’	1461
/riɖ/	[ri:ɖ]	‘back bone’	1126
/ʈʰ/	[ʈʰ] a voiceless aspirated retroflex plosive		
/ʈʰil/	[ʈʰil]	‘hump of ox’	0821
/pit <sup>h</sup> i/	[pit <sup>h</sup> i]	‘back’	0646
/mit <sup>h</sup> /	[mi:t <sup>h</sup> ]	‘sweet’	0659
/ɖʰ/	[ɖʰ] a voiced aspirated retroflex plosive		
/ɖʰina/	[ɖʰina]	‘lice’	0358
/ɖad <sup>h</sup> i/	[ɖad <sup>h</sup> i]	‘jaw’	1210
/sonɖ <sup>h</sup> /	[sonɖ <sup>h</sup> ]	‘trunk of elephant’	0829

### 4.1.1.4 Palatal (Post-alveolar) Stops

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

## Description of Phonemes

/pedʒ/	[pe:dʒ]	‘rice soup’	0555
/tʃʰ/	[tʃʰ]	a voiceless aspirated laminal post-alveolar affricate	
/tʃʰita/	[tʃʰita]	‘custard apple’	0158
/bitʃʰal/	[bitʃʰal]	‘slip’	1586
/natʃʰ/	[natʃʰ]	‘dance’	0163
/dʒʰ/	[dʒʰ]	a voiced aspirated laminal post-alveolar affricate	
/dʒʰinga/	[dʒʰinga]	‘prawn’	0535
/ʌdʒʰe/	[ʌdʒʰe]	‘now’	0477
/sandʒʰ/	[sandʒʰ]	‘evening’	0217

### 4.1.1.5 Velar Stops

/k/	[k]	a voiceless unaspirated velar plosive	
/kilo/	[kilo]	‘weight measurement’	0760
/sirkī/	[sirkī]	‘mat’	0411
/pʌlʌnk/	[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
/dékʰ/	[dékʰ]	‘to see’	1272
/gʰ/	[gʰ]	a voiced aspirated velar plosive	
/gʰam/	[gʰam]	‘sunlight’	1024
/singʰʌn/	[singʰʌn]	‘durt in the nose’	1067
/dʒangʰ/	[dʒangʰ]	‘thigh bone’	0685

### 4.1.2 Nasals

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

## Description of Phonemes

/n/ [ɳ] a voiced dental nasal occurring before dental stops

/kindər/	[kindər]	‘again’	0008
/indara/	[indara]	‘well’	0762
/bandər/	[bandər]	‘monkey’	0426

[ɳ] a voiced retroflex nasal occurring before retroflex stops

/rindoli/	[rindoli]	‘widow’	1463
/pind̪iri/	[pind̪iri]	‘calf muscle’	1407
/pend̪ra/	[pend̪ra]	‘bel fruit’	0293

[ɳ] a voiced palatal nasal occurring before palatal stops

/pandʒər/	[pandʒər]	‘rib bone’	1233
/pindʒər/	[pindʒər]	‘cage of bird’	1284
/mandʒh/	[mandʒh]	‘to wash vessel’	0858

[ɳ] 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

/musta/	[muʂta]	‘rat’	0548
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[s] a voiceless alveolar fricative occurring elsewhere

/sikar/	[sikar]	‘meat’	1265
/munsərija/	[munsərija]	‘pillow’	0515
/bis/	[bi:s]	‘twenty’	0725

/h/ [h] a voiceless glottal fricative occurring word-initially

/ham/	[ham]	‘we’	0754
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[ɦ] a voiced glottal fricative occurring elsewhere

/pɦar/	[pɦar]	‘mountain’	0889
/tɦrhi/	[tɦrhi]	‘orphan female’	1462
/bɦ/	[bɦ]	‘hand’	0304

## Description of Phonemes

### 4.1.4 Liquids

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

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

[r] a voiced alveolar trill occurring elsewhere

/risai/	[risai]	‘felt bad’	1106
/lebra/	[lebra]	‘lips’	0389
/bʌ̥r/	[bʌ̥r]	‘plum’	0523

/t̪/ [t̪] a voiced retroflex flap

/gaʈi/	[gaʈi]	‘vehicle’	0737
/piʈhi/	[piʈhi]	‘generation’	1298
/uʈ/	[u:ʈ]	‘fly’	0970

/l/ [l] a voiced alveolar lateral approximant

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

### 4.1.5 Central Approximants

/j/ [j] a voiced palatal central approximant

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

/w/ [w] a voiced labial central approximant

/nʌ̥rwā/	[nʌ̥rwā]	‘river’	0561
/sewā/	[sewā]	‘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
/matʃhi/	[matʃhi]	‘house fly’	0322

/u/ [u] a close back rounded vowel

/up <sup>h</sup> ar/	[up <sup>h</sup> ar]	‘open mouth’	1365
/buṭa/	[buṭa]	‘work’	0797
/tʃehu/	[tʃehu]	‘jaw’	1400

/e/ [e] a close-mid front unrounded vowel

/ema/	[ema]	‘here’	0001
/pendi/	[pendi]	‘downside of round’	0570
/nʌbe/	[nʌbe]	‘ninety’	0472

/o/ [o] a close-mid back rounded vowel

/osʌr/	[osʌr]	‘opportunity’	0488
/bot <sup>h</sup> /	[bot <sup>h</sup> ]	‘to twist to make rope’	1529
/mo/	[mo]	‘I’	0332

/ʌ/ [ʌ] an open-mid central unrounded vowel

/ʌmli/	[ʌmli]	‘tamrin’	0667
/p <sup>h</sup> ʌr/	[p <sup>h</sup> ʌr]	‘fruits’	0272
/lʌtʌ/	[lʌtʌ]	‘sweet made from mahu’	1368

/a/ [a] an open central unrounded vowel

/ađi/	[ađi]	‘ginger’	0278
/nas/	[nas]	‘become bad’	1247
/amba/	[amba]	‘mango’	0935

/ʌ<sup>i</sup>/ [ʌ<sup>i</sup>] an open-mid front-central unrounded falling diphthong, in free variation with an open-mid or near-open front unrounded vowel ([ʌ<sup>i</sup>]~[ɛ]~[æ]).

/ʌ <sup>i</sup> ne/	[ʌ <sup>i</sup> ne]	‘other’	1227
/korʌ <sup>i</sup> nʌ/	[korʌ <sup>i</sup> nʌ]	‘tongue cleaner’	0712
/k <sup>h</sup> inʌ <sup>i</sup> /	[k <sup>h</sup> inʌ <sup>i</sup> ]	‘to stitch (with machine)’	0642

/ʌ<sup>u</sup>/ [ʌ<sup>u</sup>] a voiced open-mid back-central rounded falling diphthong

/pʌ <sup>u</sup> rʌn/	[pʌ <sup>u</sup> rʌn]	‘backstroke (swimming)’	1571
/nʌ <sup>u</sup> /	[nʌ <sup>u</sup> ]	‘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.

/i/	[i]	a close front unrounded nasalized vowel	
	/tʃu̇ɪr/	[tʃu̇ɪr]	‘sound made by rat’
/e/	[e]	a close-mid front unrounded nasalized vowel	
	/p̥ėtʃ/	[p̥ėtʃ]	‘groove of nose ring’
/u/	[u]	a close back rounded nasalised vowel	
	/kʰu̇ʊ̇tʃi/	[kʰu̇ʊ̇tʃi]	‘sharp’
/ɔ/	[ɔ]	a close-mid back rounded nasalized vowel	
	/tɔ/	[tɔ]	‘you’
/ʌ/	[ʌ]	an open-mid central unrounded nasalized vowel	
	/kʌwʌl/	[kʌwʌl]	‘lotus’
/ɑ/	[ɑ]	an open central unrounded nasalized vowel	
	/d̥ɑtʰ/	[d̥ɑtʰ]	‘teeth’
/ʌ̇i/	[ʌ̇i]	an open-mid front-central unrounded nasalized falling diphthong	
	/pʌ̇i̥tʌ̇r/	[pʌ̇i̥tʌ̇r]	‘plain ground’
/ʌ̇u/	[ʌ̇u]	an open-mid back-central rounded nasalized falling diphthong	
	/d̥ʌ̇u̥ri/	[d̥ʌ̇u̥ri]	‘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
/tan/	[tan]	‘very far’	0228
/tang/	[tang]	‘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
/pʌdri/	[pʌdəri]	‘red bug’	1508
/bʌdri/	[bʌdəri]	‘cloud’	0127
/k <sup>h</sup> ʌpra/	[k <sup>h</sup> ʌpra]	‘roof tiles’	0486
/lebra/	[lebra]	‘lips’	0389

#### /p/ and /p<sup>h</sup>/

/pak/	[pak]	‘pus’	0885
/p <sup>h</sup> ak <sup>h</sup> /	[p <sup>h</sup> ak <sup>h</sup> ]	‘to cut goat’	1261
/t <sup>h</sup> opi/	[t <sup>h</sup> opi]	‘to gag’	1633
/p <sup>h</sup> op <sup>h</sup> i/	[p <sup>h</sup> op <sup>h</sup> i]	‘syrup’	1145

#### /b/ and /b<sup>h</sup>/

/beṭi/	[beṭi]	‘wife’s sister’s daughter’	0782
/b <sup>h</sup> etj/	[b <sup>h</sup> etj]	‘mourn’	0814
/bawā/	[bawā]	‘beggar’	1312
/b <sup>h</sup> āwa/	[b <sup>h</sup> āwa]	‘wild cat’	0266
/qimba/	[qimba]	‘egg’	0971
/qamb <sup>h</sup> a/	[qamb <sup>h</sup> a]	‘big lemon’	0054

## Evidence of Contrast

### /p<sup>h</sup>/ and /b<sup>h</sup>/

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

### /t/ and /d/

/tat <sup>h</sup> /	[tat <sup>h</sup> ]	‘hot’	0321
/dăt <sup>h</sup> /	[dăt <sup>h</sup> ]	‘teeth’	0673
/got <sup>h</sup> i/	[got <sup>h</sup> i]	‘clan’	1285
/god <sup>h</sup> i/	[god <sup>h</sup> i]	‘brain’	0074

### /t/ and /t<sup>h</sup>/

/tʌbʌla/	[tʌbʌla]	‘tabala musical instrument’	1094
/t <sup>h</sup> ʌpori/	[t <sup>h</sup> ʌpori]	‘clap’	0123
/paṭʌr/	[paṭʌr]	‘slim’	0620
/paṭ <sup>h</sup> ʌn/	[paṭ <sup>h</sup> ʌn]	‘part of arrow’	1190
/sat <sup>h</sup> /	[sat <sup>h</sup> ]	‘seven’	0593
/mat <sup>h</sup> /	[mat <sup>h</sup> ]	‘forehead’	0259

### /d/ and /d<sup>h</sup>/

/dona/	[dona]	‘leaf sauce’	1315
/d <sup>h</sup> o/	[d <sup>h</sup> o]	‘to wash’	1052
/adi/	[adi]	‘ginger’	0278
/bad <sup>h</sup> i/	[bad <sup>h</sup> i]	‘rope covered around drum’	1353
/k <sup>h</sup> and <sup>h</sup> /	[k <sup>h</sup> and <sup>h</sup> ]	‘shoulder’	0609
/nind <sup>h</sup> /	[nind <sup>h</sup> ]	‘clean between plants’	1575

### /t<sup>h</sup>/ and /d<sup>h</sup>/

/t <sup>h</sup> opi/	[t <sup>h</sup> opi]	‘to gag’	1633
/d <sup>h</sup> o/	[d <sup>h</sup> o]	‘to wash’	1052
/b <sup>h</sup> ut <sup>h</sup> /	[b <sup>h</sup> u:t <sup>h</sup> ]	‘demon after death’	1288
/buḍ <sup>h</sup> /	[bu:ḍ <sup>h</sup> ]	‘wednesday’	0757

## Evidence of Contrast

### /t/ and /d/

/tang/	[tang]	‘hang’	1364
/dang/	[dang]	‘fishing rod’	1264
/tukni/	[tukəni]	‘medium size basket’	0871
/dukni/	[dukəni]	‘to enter’	1368
/tʃimṭa/	[tʃimṭa]	‘tongs’	0125
/tʌmḍa/	[tʌmḍa]	‘to search in the dark’	1611

### /t/ and /t<sup>h</sup>/

/tʌrra/	[tʌr:a]	‘green frog’	1091
/t <sup>h</sup> ʌrra/	[t <sup>h</sup> ʌr:a]	‘black rice’	1406
/pʌtʃa/	[pʌtʃa]	‘long wood used for roof’	1080
/pʌt <sup>h</sup> ʃa/	[pʌt <sup>h</sup> ʃa]	‘female goat’	1175

### /d/ and /d<sup>h</sup>/

/dər/	[də:r]	‘branch’	0075
/d <sup>h</sup> ər/	[d <sup>h</sup> ər]	‘to wash rice’	1197
/kʌdə/	[kʌdə]	‘tooth decay’	0865
/kʌd <sup>h</sup> a/	[kʌd <sup>h</sup> a]	‘flour beetle’	1622

### /t<sup>h</sup>/ and /d<sup>h</sup>/

/t <sup>h</sup> ar/	[t <sup>h</sup> ar]	‘cold’	1135
/d <sup>h</sup> ar/	[d <sup>h</sup> ar]	‘to wash rice’	1197
/ʌt <sup>h</sup> ʌna/	[ʌt <sup>h</sup> ʌna]	‘50 paisa’	1602
/bʌd <sup>h</sup> ʌni/	[bʌd <sup>h</sup> ʌni]	‘broom’	0082
/u:t <sup>h</sup> /	[u:t <sup>h</sup> ]	‘camel’	0096
/bu:d <sup>h</sup> /	[bu:d <sup>h</sup> ]	‘sink’	0838

### /tʃ/ and /dʒ/

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

## Evidence of Contrast

/gʌndʒi/	[gʌndʒi]	‘undershirt’	0739
<b>/tʃ/ and /tʃʰ/</b>			
/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
<b>/dʒ/ and /dʒʰ/</b>			
/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
<b>/tʃʰ/ and /dʒʰ/</b>			
/tʃʰuri/	[tʃʰu:ri]	‘knife’	0367
/dʒʰuri/	[dʒʰu:ri]	‘firewood for cooking’	0857
/sotʃʰ/	[sotʃʰ]	‘to think’	1321
/sodʒʰ/	[sodʒʰ]	‘straight’	1200
<b>/k/ and /g/</b>			
/kaɖi/	[kaɖi]	‘match stick’	1491
/gaʈi/	[gaʈi]	‘vehicle’	0737
/konda/	[konda]	‘dumb’	1435
/gonda/	[gonda]	‘marigold’	0407
/rekʌn/	[rekʌn]	‘to groan with pain’	1588
/degʌn/	[degʌn]	‘jump and run’	0351
<b>/k/ and /kʰ/</b>			
/kãʈi/	[kãʈi]	‘nail’	0455
/kʰaʈi/	[kʰaʈi]	‘wooden bed’	0795
/pak/	[pak]	‘pus’	0885
/pʰakʰ/	[pʰakʰ]	‘to cut goat’	1261

## Evidence of Contrast

### /g/ and /g<sup>h</sup>/

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

### /k<sup>h</sup>/ and /g<sup>h</sup>/

/k <sup>h</sup> opti/	[k <sup>h</sup> opti]	‘coconut shell’	0121
/g <sup>h</sup> opti/	[g <sup>h</sup> opti]	‘skull’	0998
/k <sup>h</sup> atj/	[k <sup>h</sup> atj]	‘wooden bed’	0795
/g <sup>h</sup> atj/	[g <sup>h</sup> atj]	‘uvula’	0495

### 5.1.2 Fricatives

#### /tʃ/ and /s/

/tʃal/	[tʃal]	‘to separate rice with sieve’	0884
/sal/	[sal]	‘year’	1494
/basi/	[basi]	‘night rice eaten in morning’	0430
/b <sup>h</sup> atʃi/	[b <sup>h</sup> atʃi]	‘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
/bah <sup>h</sup> /	[bah <sup>h</sup> ]	‘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
/samar/	[samar]	‘monday’	0425

## Evidence of Contrast

### /d/ and /n/

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

### /m/ and /n/

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

### 5.1.4 Liquids

#### /d/ and /l/

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

#### /d/ and /r/

/dabi/	[dabi]	‘rice stalk’	1428
/raṭi/	[raṭi]	‘night’	0468
/lada/	[lada]	‘hip’	0313
/para/	[para]	‘place’	0516

#### /d/ and /ṭ/

/ed̥i/	[ed̥i]	‘heel’	0311
/bəṭihən/	[bəṭihən]	‘good’	1061
/kad̥i/	[kad̥i]	‘match stick’	0413
/gaṭi/	[gaṭi]	‘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 /t̪/

/oðʒʰʌra/	[oðʒʰʌra]	‘part of jackfruit’	1466
/oðʒʰʌt̪a/	[oðʒʰʌt̪a]	‘large intestine’	1594
/dʒʌr/	[dʒʌr]	‘fever’	1129
/dʒʌt̪/	[dʒʌt̪]	‘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

#### /dʒ/ and /j/

/kadʒʌr/	[kadʒʌr]	‘eye liner’	0224
/kajʌr/	[kajʌr]	‘enemy’	0213
/badʒa/	[badʒa]	‘music instrument’	0444
/d̪ija/	[d̪ija]	‘lamp’	0375

#### /l/ and /j/

/t̪fila/	[t̪fila]	‘another kind of algae’	0811
/t̪fija/	[t̪fija]	‘chick’	0879

#### /l/ and /w/

/dʒala/	[dʒala]	‘cataracts’	0863
/dʒawā/	[dʒawā]	‘oats’	0563
/bala/	[bala]	‘ear ring’	0194
/bawā/	[bawā]	‘beggar’	1312

## Evidence of Contrast

### /j/ and /w/

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

## 5.2 VOWELS

### 5.2.1 Vowel Quality

#### /i/ and /e/

/d <sup>h</sup> ina/	[d <sup>h</sup> ina]	‘lice’	0679
/d <sup>h</sup> ena/	[d <sup>h</sup> ena]	‘wings’	0789
/t <sup>h</sup> noti/	[t <sup>h</sup> noti]	‘last daughter’	0376
/t <sup>h</sup> note/	[t <sup>h</sup> note]	‘short’	0608

#### /e/ and /a/

/mela/	[mela]	‘fair’	0122
/mala/	[mala]	‘chain’	0110
/t <sup>h</sup> en/	[t <sup>h</sup> en]	‘oil’	1149
/t <sup>h</sup> an/	[t <sup>h</sup> an]	‘very far’	0228

#### /u/ and /o/

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

#### /o/ and /a/

/ok <sup>h</sup> ar/	[ok <sup>h</sup> ar]	‘their’	0768
/ak <sup>h</sup> ir/	[ak <sup>h</sup> ir]	‘if’	1043
/pos/	[pos]	‘domestic’	1374
/pas/	[pas]	‘Maua after five days’	1074
/koto/	[koto]	‘ear wax’	0195
/kot <sup>h</sup> a/	[kot <sup>h</sup> a]	‘cattle shield’	1539

## Evidence of Contrast

### /a/ and /ʌ/

/bani/	[bani]	‘stripes of snakes’	1581
/bʌni/	[bʌni]	‘wages’	0744
/d <sup>h</sup> ar/	[d <sup>h</sup> ar]	‘times’	1330
/d <sup>h</sup> ʌr/	[d <sup>h</sup> ʌr]	‘to hold’	0929

### /e/ and /ʌ/

/ber/	[ber]	‘sun’	0653
/bʌr/	[bʌr]	‘banyan tree’	0036
/pendra/	[pen <sup>h</sup> dra]	‘bell fruit’	0293
/pʌndra/	[pʌn <sup>h</sup> dra]	‘fair male’	0403

### /o/ and /ʌ/

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

### /e/ and /ʌ<sup>i</sup>/

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

### /o/ and /ʌ<sup>u</sup>/

/bora/	[bora]	‘sack’	0573
/bʌ <sup>u</sup> rʌ <sup>i</sup> /	[bʌ <sup>u</sup> rʌ <sup>i</sup> ]	‘mad’	0845

## 5.2.2 Vowel Nasalisation

### /i/ and /ɪ/

/pʌnhi/	[pʌnhi]	‘shoes’	0604
/bah <sup>h</sup> /	[bah <sup>h</sup> ]	‘arm to palm’	0023

### /e/ and /ɛ/

/ted <sup>h</sup> /	[te:d <sup>h</sup> ]	‘to talk loudly’	0043
/p <sup>h</sup> et <sup>h</sup> /	[p <sup>h</sup> et <sup>h</sup> ]	‘groove of nose ring’	0959

## Evidence of Contrast

### /u/ and /ũ/

/tʃehu/	[tʃehu]	‘jaw’	0731
/gʌhũ/	[gʌhũ]	‘wheat’	0763

### /o/ and /õ/

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

### /ʌ/ and /ã/

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

### /a/ and /ã/

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

/sãtuwa/	[sãtuwa]	‘ragi’	0545
/sãtuwã/	[sãtuwã]	‘seventh’	0595

/k <sup>h</sup> atj/	[k <sup>h</sup> atj]	‘wooden bed’	0795
/kãtj/	[kãtj]	‘nail’	0455

### /ʌ<sup>i</sup>/ and /ã<sup>i</sup>/

/bʌ <sup>i</sup> s/	[bʌ <sup>i</sup> s]	‘sit’	0612
/b <sup>h</sup> ã <sup>i</sup> sa/	[b <sup>h</sup> ã <sup>i</sup> sa]	‘shield cap mushroom’	1168

### /ʌ<sup>u</sup>/ and /ã<sup>u</sup>/

/tʃ <sup>h</sup> ʌ <sup>u</sup> k <sup>h</sup> /	[tʃ <sup>h</sup> ʌ <sup>u</sup> k <sup>h</sup> ]	‘fry’	1543
/tʃã <sup>u</sup> kʌt <sup>h</sup> /	[tʃã <sup>u</sup> kʌt <sup>h</sup> ]	‘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
/at <sup>h</sup> /	[at <sup>h</sup> ]	VC	‘eight’	0201

### CV

/mo/	[mo]	CV	‘I’	0332
/t <sup>h</sup> o/	[t <sup>h</sup> o]	CV	‘you’	0801

### CVC

/pis/	[pis]	CVC	‘grind’	0841
/kan/	[kan]	CVC	‘ear’	0193

### VCC

/undr <sup>h</sup> a <sup>i</sup> /	[undr <sup>h</sup> a <sup>i</sup> ]	VCC.CV	‘too much dirty’	1059
/Andra/	[Andra]	VCC.CV	‘boy’	1336

### CVCC

/beng/	[beng]	CVCC	‘frog’	0270
/band/	[band]	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 <sup>h</sup> /	39	10	7	0	4
/b/	193	32	33	6	6
/b <sup>h</sup> /	47	6	6	0	4
/t/	47	63	23	8	24
/t <sup>b</sup> /	7	13	2	1	21
/d/	61	36	28	4	9
/d <sup>h</sup> /	20	9	5	1	7
/t <sub>h</sub> /	64	84	22	31	27
/t <sup>b</sup> <sub>h</sub> /	25	21	1	6	24
/d <sub>h</sub> /	69	32	31	5	7
/d <sup>h</sup> <sub>h</sub> /	31	10	3	0	3
/t <sub>l</sub> /	130	39	14	1	12
/t <sup>b</sup> <sub>l</sub> /	41	18	5	1	11
/d <sub>l</sub> /	90	32	24	4	14
/d <sup>h</sup> <sub>l</sub> /	31	6	10	1	7
/tʃ/	176	84	63	34	37
/tʃ <sup>h</sup> /	55	34	11	4	27
/dʒ/	117	38	57	2	6
/dʒ <sup>h</sup> /	37	14	13	0	4
/k/	112	67	21	26	56
/k <sup>h</sup> /	38	74	43	5	8
/g/	157	24	17	14	8
/g <sup>h</sup> /	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
/t <sub>r</sub> /	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.

/sʌmp <sup>h</sup> /	[sʌmp <sup>h</sup> ]	CVCC	‘anise’	0015
/kʰand <sup>h</sup> /	[kʰand <sup>h</sup> ]	CVCC	‘shoulder’	0609
/sond <sup>h</sup> /	[sond <sup>h</sup> ]	CVCC	‘trunk of elephant’	0829
/mandʒ <sup>h</sup> /	[mandʒ <sup>h</sup> ]	CVCC	‘to wash vessels’	0858
/beng/	[beng]	CVCC	‘frog’	0270

There are only two exceptions in our data:

/tʌrs/	[tʌrs]	CVCC	‘looking good’	1642
/ʌmbert <sup>h</sup> /	[ʌmbert <sup>h</sup> ]	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:

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

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

/kohndə/	[kohndə]	CVCC.CV	‘pumpkin’	0538
/tehngʌn/	[tehngʌn]	CVCC.CV	‘peep’	1500
/morndə/	[morndə]	CVCC.CV	‘pairy ring mushroom’	0864
/ʌrndi/	[ʌrndi]	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/	/tʃʌkkə/	[tʃʌkkə]	‘tire’	0728
/rr/	/barri/	[barri]	‘small hornet’	0318
	/kʌrra/	[kʌrra]	‘mew cat’	0850
	/g <sup>h</sup> ʌrri/	[g <sup>h</sup> ʌrri]	‘well pulley’	1527

## Distribution of Phonemes

### 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<sub>1</sub>V(N)C<sub>2</sub> sequences in which C<sub>1</sub> and C<sub>2</sub> represent dental stops, retroflex stops, or /ʈ/, V represents an intervening vowel, and N represents an optional homorganic nasal.

C <sub>1</sub> \C <sub>2</sub>	t, t <sup>h</sup> , d, d <sup>h</sup>	t, t <sup>h</sup> , d, d <sup>h</sup>	ʈ
t, t <sup>h</sup> , d, d <sup>h</sup>	13	0	0
t, t <sup>h</sup> , d, d <sup>h</sup>	0	31	1

Examples of words containing two coronal stops are listed below:

/tat <sup>h</sup> /	[tat <sup>h</sup> ]	'hot'	0321
/dat <sup>h</sup> /	[dat <sup>h</sup> ]	'teeth'	0673
/dundra/	[dundra]	'fog'	1183
/tati/	[tati]	'gate'	0275
/dat <sup>h</sup> /	[dat <sup>h</sup> ]	'mushroom stem'	0934
/tenda/	[tenda]	'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 <sub>1</sub> \V <sub>2</sub>	i, 	u, 	e, 	o, 	, 	a, 
i, 	0	1	0	0	0	4
u, 	6	0	0	0	0	8
e, 	0	0	0	1	0	0
o, 	0	0	0	0	0	0
, 	0	0	0	0	0	0
a, 	22	3	0	0	0	0

/tur/	[tur]	'sound made by rat'	1603
/tit/	[tit]	'type of ant'	1338
/pi/	[pi]	'onion'	0484
/su/	[su]	'type of vessel'	0893
/se/	[se]	'apple'	0019
/dai/	[dai]	'mother'	0436
/au/	[au]	'and'	0997

## 8. BIBLIOGRAPHY

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