Indonesian Phonetics

Ryan Sie LIGN 110

1 Bahasa Indonesia

Indonesian, known as Bahasa Indonesia to its speakers, is the official language of Indonesia today, with approximately 43 million native speakers, and about 156 million more who speak it as a second language (Indonesia Census 2010). It is a very close relative to Malay within the Austronesian language family. Outside of Indonesia, Indonesian is spoken abroad by people of Indonesian background in countries such as the United States, the Netherlands, and Singapore.

My consultant for this project is Guido Sie, a native Indonesian speaker who grew up in Surabaya, Indonesia. In addition to Indonesian, he also speaks English, and is familiar with Dutch and Javanese from his experiences growing up in Surabaya. He has been living in the United States for over 35 years now, though still uses Indonesian to converse with friends and family periodically. Indonesian orthography uses the roman alphabet like English, and Guido is able to read Indonesian clearly.

The primary source of outside knowledge used to supplement this report is the journal article *Indonesian* by Craig Soderberg and Kenneth Olson. This article covers the phonetics of Indonesian, and was published in *Journal of the International Phonetic Association: Illustrations of the IPA* in 2008. I used both examples from this article, as well as other words that Guido and I agreed on.

2 Consonants

There are a total of 22 consonant phonemes in Indonesian, shown below.

	Bilabial	Labio-dental	Dental	Alveolar	Post-Alveolar	Palatal	Velar	Glottal
Stop	рb		ţ	d			k g	3
Affricate					tf dz			
Fricative		f		S Z	ſ			h
Nasal	m			n		n	ŋ	
Flap/Trill				r				
Approximant	W					j		
Lateral Ap-				1				
proximant								

It is interesting to note that every consonant in Indonesian appears as a separate phoneme. While there are an abundance of consonant allophones, each one also appears in other

contexts as their own phonemes. As we will discuss later however, this is not the case with vowels.

Below is a list of Indonesian words demonstrating these different phonemes. The examples are provided in the same order as in the given recording. Each word is given via IPA transcription (broad form is included if different than narrow form), Indonesian orthography, and an English translation. Most consonants are demonstrated word-initially preceding the vowel /a/.

The first group shows the bilabial and labio-dental sounds: /p/, /b/, /m/, /w/, /f/:

```
1. ['palin] / palin/ paling 'most'
2. ['bali] Bali (name of an island)
3. ['malu] malu 'ashamed'
4. ['wali] wali 'guardian'
5. ['fak'ta] fakta 'fact'
```

The next group illustrates the alveolar and post-alveolar fricatives /z/, /s/, /f/, as well as the two alveolar liquids /r/, and /l/:

```
6. ['zat'] zat 'substance'
7. [sa'bʊʔ] /sabuk/ sabuk 'belt, sash'
8. ['ʃaban] syaban 'Sha'ban, 8th month of the Islamic calendar'
9. [ra'bu] rabu 'Wednesday'
10. ['labu] labu 'squash, gourd'
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```
      11. ['tfari]
      cari
      'find'

      12. ['tfari]
      jari
      'finger'

      13. ['tfari]
      tari
      'dance'

      14. ['dari]
      dari
      'from'
```

The following words consist of the remaining nasal phonemes /n/, /n/, and /n/:

```
15. [naˈrasi] narasi 'narrative'
16. [ˈparɪs] /paris/ nyaris 'almost'
17. [ŋanˈt̪ʊʔ] /ŋant̪uʔ/ ngantuk 'sleepy'
```

The next group shows the palatal approximant j, and the velar stops k and g:

```
18. ['jan] yang 'that, which'
19. ['kantən] /kantən/ kantəng 'bag'
20. ['gantən] /gantun/ gantung 'hanging'
```

Lastly we compare the two glottal consonants /2/ and /h/. Because /2/ does not appear word initially as a phoneme, we frame both consonants between two /a/ vowels:

```
21. ['ma?af] ma'af 'sorry'
22. ['paha] paha 'thigh'
```

According to Soderberg and Olson, /?/ appears as a phoneme exclusively between two vowels in three situations. It may appear in words like in (21), found most often in words of Arabic origin. It may also appear between a affixes and stems which meet at vowel boundaries.

3 Vowels

There are a total of 6 vowel phonemes in Indonesian, shown below, with 4 additional vowel allophones shown in parentheses.

	Front	Central	Back
High	i		u
High-mid	(1)		(v)
	e		О
Mid		Э	
Low-mid	(٤)		(c)
Low		a	

Below are words illustrating the six separate vowel phonemes. The first four show contrasts between /i/, /a/, /u/, and /o/. Each vowel in this group is framed between /b/ and /r/.

23.	[ˈbiru]	biru	'blue'
24.	[ˈbaru]	baru	'new'
25.	buˈruʔ]	buruk	'bad, poor'
26.	boro budur	Borobudur	(name of a temple in Central Java)

The next pair compares the remaining two vowel phonemes /e/ and /ə/, using the frame /b?b/:

```
27. ['bebas] bebas 'free'
28. [bə'brapa] beberapa 'several'
```

4 Allophones

As mentioned previously, the various consonant allophones in Indonesian all appear as separate phonemes themselves. However, some consonants have features still worth discussing, which have already appeared in the words above. For instance, the voiceless stops /p/, /t/, and /k/ are all produced unaspirated. In addition, all are unreleased in syllable final position, as seen in (5) - fakta - ['fak'ta] and (6) - zat - ['zat']. In fact, in some words, syllable final /k/ was realized as [?]. This behavior can be seen above in the words (7) - sabuk - [sa'bu?] and (17) - ngantuk - [nan'tu?]. According to Soderberg and Olson, this behavior occurs only in non-loanwords, which explains why the change

was not present in ['fak'ta]. There are many other interesting consonant allophones, but the rest of the section will be devoted to discussing vowels, which consist of entirely new sounds.

The 4 vowels [I], [v], and [D] appear as allophones in Indonesian of /i/, /e/, /u/, and /o/, respectively. They are typically lowered in a final closed syllable, or in a penultimate syllable which is followed by a final closed syllable whose vowel agrees in height (Soderberg and Olson, 2008). Guido seemed to closely follow this pattern throughout the recording.

To demonstrate, here is a pair of words demonstrating $[\varepsilon]$ as an allophone of $/\varepsilon$:

```
29. /sepele/ [səˈpele] sepele 'not important' 30. /oleh/ [oˈlɛh] oleh 'by'
```

In [sə'pele], the open final syllable /le/ is produced with an unchanged [e]. In [o'lɛh] however, the presence of the /h/ in the closed final syllable /leh/ results in /e/ being lowered to [ϵ]. In addition, although /e/ matches /o/ in height, we see that the initial /o/ is *not* lowered to [ϵ].

Similarly, the next pair illustrates [5] as an allophone of /o/:

```
31. /toko/ ['toko] toko 'store'
32. /tokoh/ [to'koh] tokoh 'figure, character'
```

As before, the open final syllable /ko/ in ['toko] is produced with an unchanged [o] vowel. On the other hand, the closed final syllable /koh/ in [tɔ'kɔh] is produced with the lowered [ɔ]. In addition, this time we also see that in the penultimate syllable /to/ in [tɔ'kɔh], the /o/ is also lowered to [ɔ], since /o/ agrees in height with itself. Meanwhile the /o/ in the penultimate syllable /to/ of ['toko] remains unchanged, since the following /ko/ is not closed.

The fact that the first pair of words spoken by Guido did not follow the penultimate vowel-height rule suggests that this specific rule may be less prominent in his dialect. More discussion of this appears later on in final section of this report - Section 6, the sentence.

An example of [I] as an allophone of /i/ can be seen in (1) - paling - ['paling] and (16) - nyaris - [naris]. Similarly, evidence of [v] as an allophone of /u/ is present in (7) - sabuk - [sa'bv?] and (17) - ngantuk - [nan'tv?].

One behavior displayed that is worth noting is that /u/ was not always realized as [v] in a final closed syllable. For example, in (25) - buruk - [buˈruʔ], and (26) - borobudur - [boroˈbudur], the /u/ in the final closed syllable remained unchanged. On another note, it appeared that in some contexts, /u/ in a final closed syllable was lowered to /o/. For instance, in (20) - gantung - [gantung - [gantung], /u/ is realized as [o]. Now one might argue that perhaps /o/ is the actually phoneme present for this specific word. However, if this were the case, we would have expected it to lower to [ɔ], since it appears in a final closed syllable. In fact, in the preceding word (19) - kantong - [kantung], the final syllable /ton/ is realized as [ton]. So if the vowel phoneme

in the final syllable of ['ganton] was really /o/, we would expect its behavior to mirror the /ton/ to [ton] change. Since it does not, then it seems more likely that we are actually seeing the phoneme /u/ being lowered to [o]. This behavior is again seen in words (34) and (35) in the next section.

Similarly, Guido sometimes produced /a/ with a different vowel quality for certain words. After checking the formant listings of a sample of 7 words containing /a/, here is what I found:

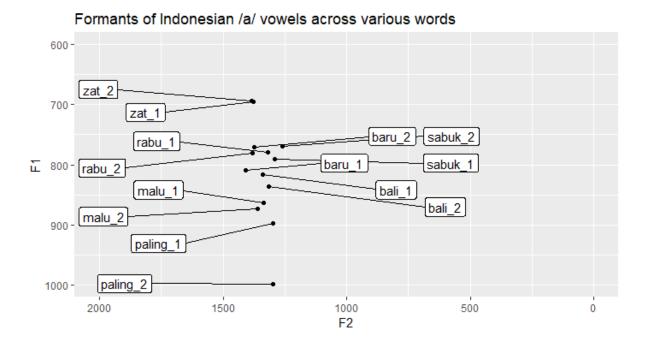


Figure 1: F1 and F2 listings of /a/ vowels across various words

Figure 1 shows that /a/ is most often produced with F1 around 800 and F2 around 1300. However, in some contexts, the F1 seems to differ significantly. In particular, (6) - zat - ['zat] - 'substance', seems to show a lower than typical F1, being produced with a higher /a/. On the other hand, (1) - paling - ['paling] - 'most', seems to have a higher F1 than usual, being produced with a lower /a/. One theory I had initially was perhaps it had something to do with the fact that ['zat] is a word of Arabic origin. However, checking the formants for another word of Arabic origin, (22) - ['ma?af] showed F1 - 860, F2 - 1250, which is around the average. Thus, there does not seem to be any obvious systematic pattern to why these /a/ formants differ.

5 Stress

According to Soderberg and Olson, the primary stress in unaffixed Indonesian words typically appears on the penultimate syllable. The primary exception to this rule is if the penultimate syllable contains $/\vartheta$. In this case, the stress will most often move to the final syllable, though some dialects may move it to the previous syllable in certain contexts. In addition, stress does not display any phonemic contrast in Indonesian.

Below are a few examples demonstrating how Guido applied stress in the absence and presence of a $/\theta$ / in the penultimate syllable.

```
33. /pintu/ ['pintu] pintu 'door'
34. /pərut/ [pə'rot] perut 'stomach
35. /səbəlum/ [ˌsəbə'lom] sebelum 'before'
```

While he did demonstrate the penultimate to ultimate stress change with the presence of /ə/in the penultimate syllable, he also applied the change in other contexts where the vowel in the penultimate syllable differed.

For instance, in the some of the preceding words he moved the stress to the final syllable, though the vowel in the penultimate syllable was /a/: (7) - sabuk - [sa'bv?] - 'belt, sash'; (9) rabu - [ra'bu] - 'Wednesday'; and (17) - ngantuk - [nan'tv?] - 'sleepy';

Similarly, in (25) - buruk - [buˈruʔ] - 'bad, poor', stress changes to the ultimate syllable following /u/, and in (30) - oleh - [oˈlɛh] - 'by' and (32) - tokoh - [tɔˈkɔh] - 'figure, character', stress changes to the ultimate syllable following /o/.

Upon asking him about this behavior, he said that it was just the natural way he has always said those words. As a result, the most likely explanation is that it is simply a feature of the dialect of Indonesian he grew up speaking in Surabaya. In particular, perhaps it has something to do with the coda of the final syllable. One pattern I noticed among the words discussed above is that 5 out of the 6 ended in one of the two glottal consonants - /?/ or /h/. However, more data and research would be needed to test the hypothesis.

6 Sentence

Below is a short sentence in Indonesian demonstrating a couple of the words above in a single utterance. It is provided in broad and narrow IPA, as well as a gloss and in Indonesian orthography.

/tolon	buku	jaŋ	biru	$\operatorname{dibunkus}/$
[ˈtoləŋ	'buku	'jaŋ	'biru	di'buŋkʊs]
please	book	that (is)	blue	passive-wrap
Tolong	buku	yang	biru	dibungkus.

[&]quot;Please wrap the blue book".

Again we see the allophones [5] and [σ] in the final closed syllables of ['tolon] and [di'bunkus], respectively. Note that the /o/ in the penultimate syllable /to/ remains unchanged in ['tolon]. Similarly, the /u/ of the penultimate syllable /bun/ in [di'bunkus] remains unchanged, even though /u/ agrees with itself in height. This acts as more evidence that the penultimate vowel-height allophone rule change is not as prominent in the dialect of Indonesian Guido speaks.

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ILLUSTRATIONS OF THE IPA

Indonesian

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Indonesian is an Austronesian language, closely related to Malay. Malay served as a lingua franca throughout the Malay Archipelago for centuries, and a variant of Malay was adopted as the official language of Indonesia when independence was declared in 1945. The variety described here is sometimes referred to as Standard Indonesian. Its autoglossonym is 'Bahasa Indonesia'.

Indonesian is the language of government and the medium of instruction in schools, and it is used in an increasingly wide sphere of social interaction, including interethnic communication, religion, and mass communication. There is an increasingly large population of speakers for whom Indonesian is their first language, particularly in the Jakarta area. An estimated 23 million people speak Indonesian as a first language and an additional 140 million speak it as a second language (Grimes 1996, Gordon 2005). For a recent discussion of its classification within Austronesian, see Adelaar (2005).

Indonesian exhibits much regional variation. When spoken as a second language, it is strongly influenced by the regional language of the speaker. This has been documented for the vowel system by van Zanten (1989), and multiple aspects of the influence of Javanese on Indonesian have been shown by Adisasmito-Smith (2004).

Studies of Indonesian phonology (in varying degrees of detail) include MacDonald (1976), Dardjowidjojo (1978), Lapoliwa (1981), Prentice (1987), Echols & Shadily (1989), Alieva, Arakin, Ogloblin & Sirk (1991), Moeliono & Grimes (1995), and Sneddon (1996). In addition, some Indonesian language learning guides discuss aspects of Indonesian phonology (Atmosumarto 1994, Barker 1992, Kwee 1993, Steinhauer 2002, and Wolff, Oetomo & Fietkiewicz 1992). Recent theoretical treatments include Cohn (1989, 1993, 2005), Kenstowicz (1995), Adisasmito-Smith & Cohn (1996), and Cohn & McCarthy (1998).

'The North Wind and the Sun' was translated from English into Indonesian by Daniel Darmawan. A Malay version of the text is found in IPA (1949: 39f.). The text and the individual words illustrating the various sounds were read by Petrus Widjaja, a male speaker of Indonesian, 66 years of age at the time of the recording. Mr. Widjaja was born in Central Java, and his speech reflects the variety of Indonesian spoken there. He lived on Java until he moved to Texas in 1998. Besides Indonesian, he also speaks Javanese, Dutch, English, and German.

Consonants

	Bilabial	Labio- dental	Dental	Alveolar	Post- alveolar	Palatal	Velar	Glottal
Plosive & affricate	p b		ţ	d	t∫ dʒ		k g	(?)
Nasal	m			n		ŋ	ŋ	
Flap/trill				r				
Fricative		(f)		s (z)	(J)			h
Approximant	W					j		
Lateral approximant				1				

p	'pat∫at	pacat	'leech' 'clear away, cut through (jungle, grass, etc.)' 'enter' 'fact' 'face'
b	'babat	babat	
m	'masu?	masuk	
f	'fakta	fakta	
w	'wad3ah	wajah	
t	ˈt̪abir	tabir	'curtain, partition' 'kind of portable balanced scale' 'dragon' 'Wednesday' 'belt, sash, loincloth' 'essence, substance' 'gourd, squash'
d	ˈdat∫iŋ	dacing	
n	ˈnaga	naga	
r	ˈrabu	rabu	
s	ˈsabuʔ	sabuk	
z	ˈzat̪	zat	
l	ˈlabu	labu	
t∫	't∫akap	cakap	'clever' 'needle' 'pleasant, comfortable' 'condition' 'sure, certain, convinced'
d3	'dʒarum	jarum	
n	'naman	nyaman	
∫	'∫araţ	syarat	
j	'jakin	yakin	
k	ˈkata	kata	'word' 'freshwater fish, snake-head fish' 'moth'
g	ˈgabus	gabus	
ŋ	ŋəˈŋat̯	ngengat	
?	'ma?af	maaf	'forgive, pardon' 'pest, infection'
h	'hama	hama	

The voiceless plosives /p/, /t/, and /k/ are unaspirated, and they are unreleased in syllable-final position. Syllable-final /k/ becomes [?], as in becak ['betʃa?] 'pedicab, tricycle', but this does not apply in some loan words, e.g. ['fakta] 'fact', nor does it apply in some regional variants. The voiced plosives may be somewhat breathy. The alveolar consonants /d/, /n/, and /s/ are dental in some regional variants.

The speaker normally pronounced the alveolar rhotic /r/ as a trill [r], but he sometimes produced a flap [r], especially in intervocalic position. In some regional variants, /h/ optionally deletes between non-identical vowels, e.g. ['lihat] \sim ['liat] 'to see', and word-finally, e.g. ['sudah] \sim ['sudah] 'already'. The speaker produced the /h/ in both of these words.

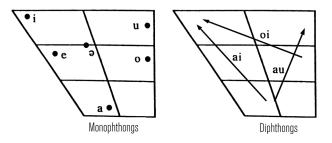
The consonants in parentheses on the consonant chart are found only in loan words and may exhibit variation in their pronunciation. For example, f is optionally realized as [p] as in [fikir] \sim [pikir] 'think'. (The speaker produced the latter.) The symbol $\langle v \rangle$ found in

loan words is voiceless in the speaker's pronunciation, e.g. variasi [fari'asi] 'variation'. The marginal phoneme /x/ (written $\langle kh \rangle$) is now generally being replaced by /k/, but [x] may still be heard in the speech of older speakers. For example, in the recorded text, the speaker produced [x] in the word akhirnya [a'xirna] 'final, last'.

The voiced plosives /b/, /d/, and /g/ do not occur word-finally in the native vocabulary. When they occur in borrowed forms, they are realized as voiceless plosives [p], $[t_{ij}]$, and [k], e.g. murid ['murit] 'student'.

The glottal stop [?] occurs in four environments. First, it occurs as an allophone of /k/ syllable-finally, as mentioned above. Second, it occurs between vowels in some words of Arabic origin, e.g. *maaf* ['ma?af] 'forgive, pardon'. Third, it occurs between a prefix ending in a vowel and a stem beginning with a vowel, irrespective of the vowel quality, e.g. *seorang* [sə'?oraŋ] 'a person', *keenam* [kə?ə'nam] 'sixth'. Fourth, it occurs between a stem ending in /a/ and a stem or suffix beginning with /a/, e.g. *keadaan* [kə?a'da?an] 'existence, situation'.

Vowels



i	'biar	biar	'to allow'
e	'bet∫a?	becak	'pedicab, tricycle'
Э	bə'nar	benar	'correct, right'
a	'baba <u>t</u>	babat	'tripe of ruminants and pigs'
u	'buah	buah	'fruit'
O	'bobo <u>t</u>	bobot	'heavy'
aj	'pantaj	pantai	'beach'
aw	'pisaw	pisau	'knife'
oj	səˈpoj-səˈpoj	sepoi-sepoi	'breezy'

The vowels /i, e, o, u/ generally lower to $[i, \varepsilon, o, \upsilon]$ in a final closed syllable. In addition, they lower to $[i, \varepsilon, o, \upsilon]$ in a penultimate syllable that precedes a final closed syllable when the vowels of the two syllables agree in height. These patterns are subject to regional variation. See van Zanten (1989) and Adisasmito-Smith (2004) for further discussion.

Both /e/ and /ə/ are written $\langle e \rangle$, though /e/ can be written as $\langle \acute{e} \rangle$ to disambiguate the pronunciation. The diphthongs occur only root-finally.

Stress

Stress in Indonesian is predictable. Unaffixed words in isolation have primary stress on the penultimate syllable, but if the vowel in the penultimate syllable is a schwa /ə/, the stress usually occurs on the ultimate syllable (depending on the dialect).

'pint u	pintu	'door'
'sampaj	sampai	'arrive'
'tola?	tolak	'refuse'
'masu?	masuk	'enter'
bə'lum	belum	'not yet'
pəˈrut̪	perut	'stomach
əˈmas	emas	'gold'
bəˈras	beras	'rice'

Transcription of recorded passage

saŋ'aŋin u'tara dan saŋ mata'hari sə'daŋ bərdə'bat tən'taŋ si'apa dian'tara mə'reka jaŋ 'paliŋ 'hebat || kə'tika məlin'taslah sə 'oraŋ pə'lantʃoŋ | jaŋ tər'buŋkus 'deŋan 'dʒubah ha'ŋatɲa || mə'reka sə'tudʒu | 'dʒika saŋ'aŋin u'tara | bər'hasil | məm'buat si pə'lantʃoŋ tərsə'but məm'buka dʒu'bahŋa | 'maka 'dialah jaŋ mən'dʒadi tər'hebat dian'tara mə'reka || dan | saŋ 'aŋin u'tara pun | bər'tiup sə'kuat 'muŋkin || 'namun | sə'makin 'kuat ia bər'tiup | sə'makin 'erat | pu'lalah | si pə'lantʃoŋ məmə'lu? dʒu'bahŋa || sə'hiŋga 'pada a'xirna | saŋ 'aŋin u'tara 'itu | mənə'rahlah || sə'karaŋ | ti'balah gi'liran saŋ mata'hari | 'untu? | bər'sinar 'deŋan ha'ŋatɲa || dan 'sa?at 'itu pun si pə'lantʃoŋ məm'buka dʒu'bahŋa | sə'hiŋga | məm'buat saŋ 'aŋin u'tara 'harus mə'ŋakui || 'bahwa | saŋ mataha'rilah | jaŋ lə'bih 'hebat | dari 'pada saŋ 'aŋin u'tara 'itu sən'diri.

Orthographic version

Sang Angin Utara dan Sang Matahari sedang berdebat tentang siapa diantara mereka yang paling hebat, ketika melintaslah seorang pelancong yang terbungkus dengan jubah hangatnya. Mereka setuju jika Sang Angin Utara berhasil membuat si pelancong tersebut membuka jubahnya, maka dialah yang menjadi terhebat diantara mereka. Dan Sang Angin Utara pun bertiup sekuat mungkin, namun semakin kuat ia bertiup semakin erat pulalah si pelancong memeluk jubahnya, sehingga pada akhirnya Sang Angin Utara itu menyerahlah. Sekarang tibalah giliran Sang Matahari untuk bersinar dengan hangatnya, dan saat itupun si pelancong membuka jubahnya sehingga membuat Sang Angin Utara harus mengakui bahwa Sang Mataharilah yang lebih hebat dari pada Sang Angin Utara itu sendiri.

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