Acoustic Analysis of Vowels: Sakurabiat Language

Ana Carolina Alves
(UFPA/MPEG/Bolsista do Programa BECA-IEB/Fundação Moore)

supervisor: Drª Ana Vilacy Galucio
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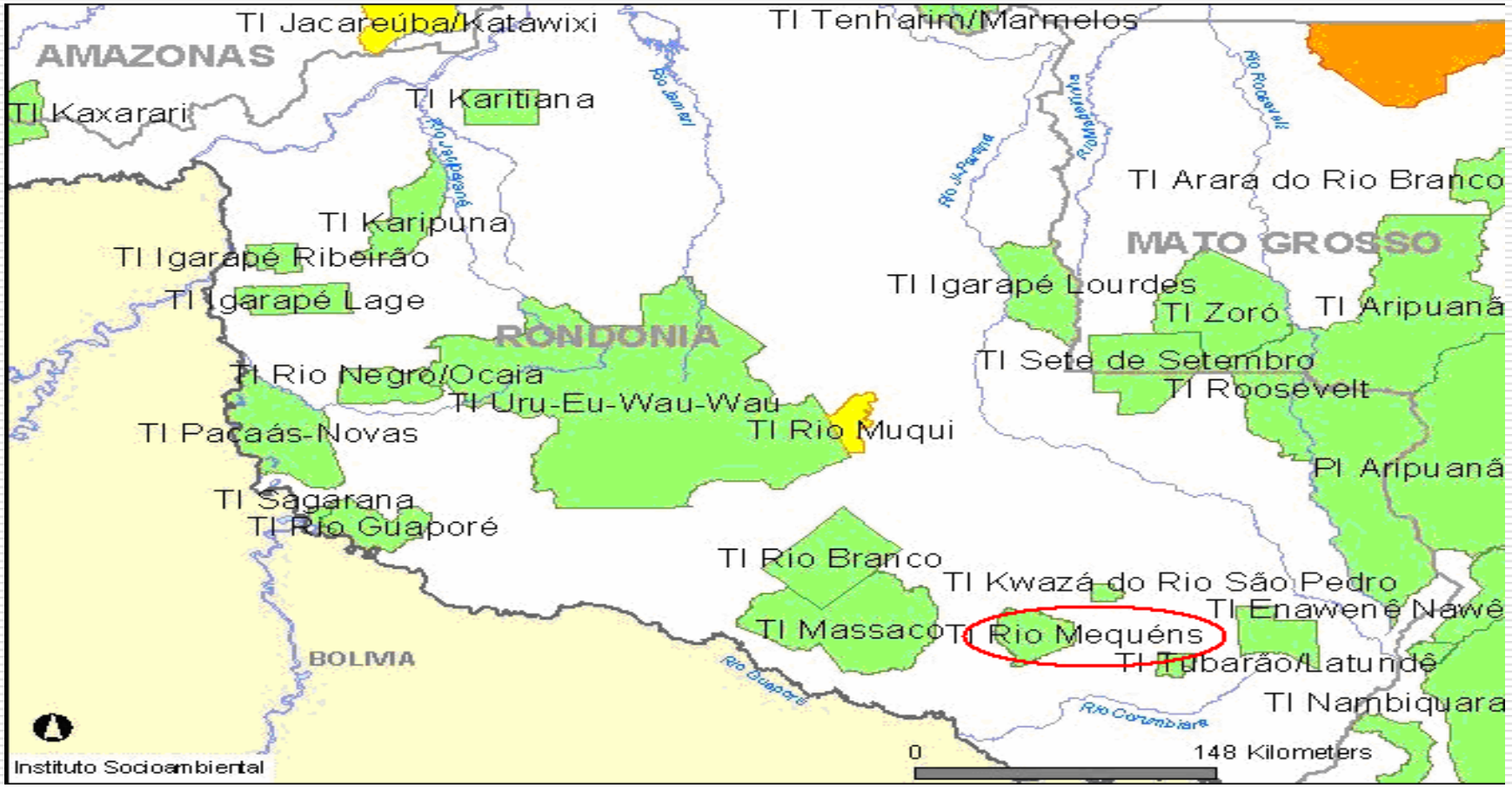
Overview

- Introduction
- Goals
- Results
- Conclusion and implications
- References

Introduction: the Sakurabiat language and its location

The Sakurabiat Lg is spoken in the área indígena Rio Mequéns, in the State of Rondônia, Brazil

Introduction: the Sakurabiat language and its location



Map of the Indigenous Reserves in the State of Rondônia

Introduction: the Sakurabiat language and its location

The Sakurabiat language, also known as Mekens, belongs to the Tupari linguistic family.

This language is one of the most endangered Tupian languages, because there are only 23 speakers and there is no transmition to the new generation (Galucio,2006).

Goal

Report on an acoustic study of the short and long oral vowels in Sakurabiat

Phonetic chart of the oral vowels in Sakurabiat

Front	Central	Back
[i, iː]	[ɨ, ɨː]	
		[o, oː]
[ɛ, ɛː]		
	[a, aː]	

Phonological chart

Front	Central	Back
/i, iː/	/ɨ, ɨː/	
		/o, oː/
/ɛ, ɛː/		
	/a, aː/	

Acoustic Analysis: Data collection

Data collected in 2007 using *Solid State Recorder PMD660* and head-worn microphone *Shure WH20XLR*

Native speakers: two average men (MY/OY)

Corpus collected: 8 repetitions (excp. for [ɔː] and [ɛː]) of each vowel for both speakers/approximately 143 measurements.

Material: Systematization

Two-syllable words (except *ipɛːtkʷa*);
Carrier sentence: _____ *tɛ ɛkɛ;* _____ is this one;
CVC

[a] itap / otat
[ɛ] itɛp / itɛk
[i] kɨjpit / ikip
[ɨ] tapsɨt / ikɨp
[o] itop / ikop

[aː] itaːp / ipaːk
[ɛː] ipɛːtkwa
[iː] itiːt / ipiːp
[ɨː] ipɨːk / ikɨːt
[oː] ipoːt

Methodology

1. Data Transcription

2. Data Selection

3. Acoustic analysis of Sakurabiat oral vowels

Acoustic Cues

1. Length

Relates to the time of production of a sound. It is relevant for the distinction between short and long vowels.

2. Formants

The principal acoustic cues for making the distinction of the vocalic sounds are the formants. "*The formant frequencies are the frequencies at which the supralaryngeal filter would let maximum acoustic energy through* " (Liberman e Blumstein, 1988, p.67)

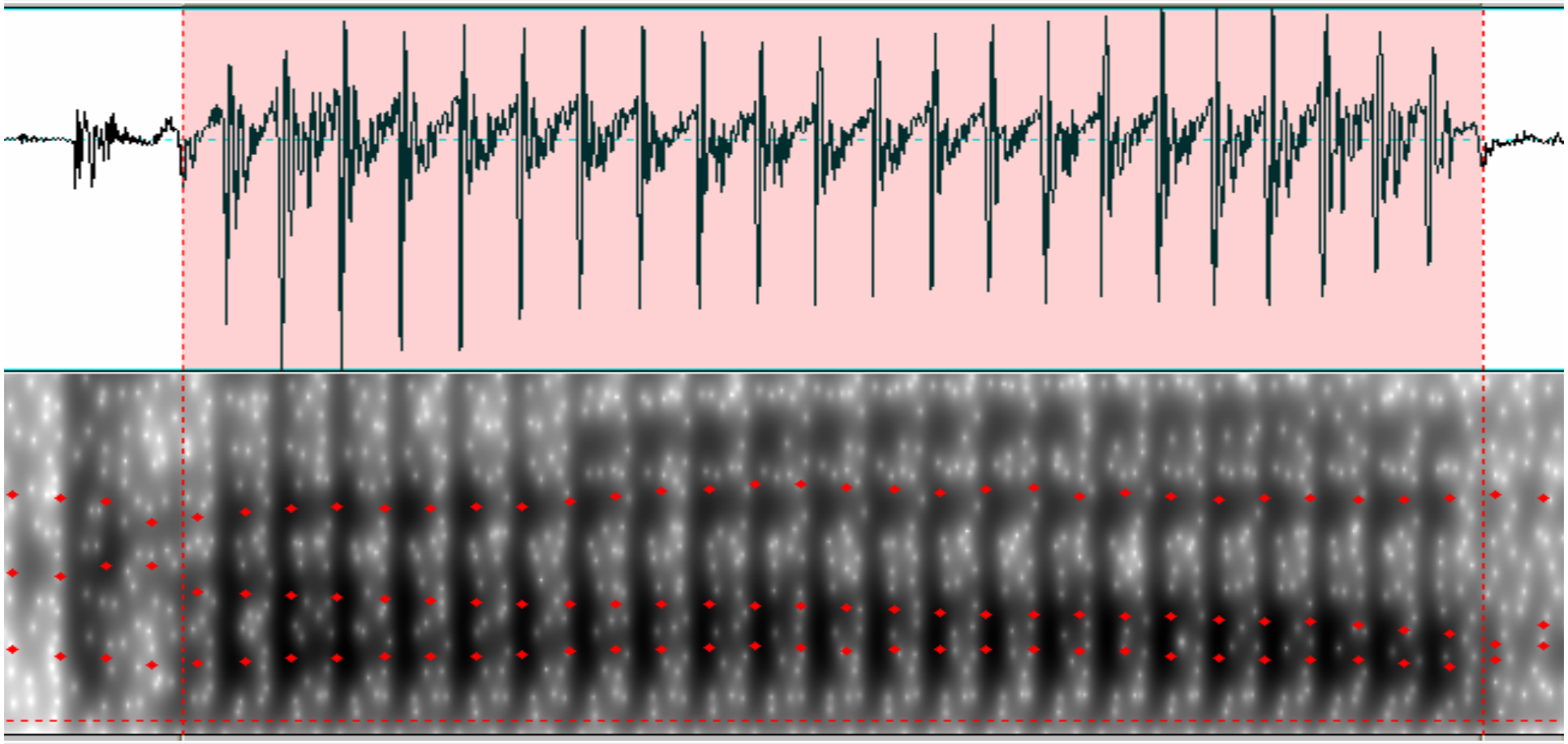
Methodology

Instrumental analysis – *Praat*, *Formant Explorer*.

Length - miliseconds (ms)

Formants (F1 e F2)– Herz (Hz)

Methodology:Proceedings to get the length and the formants frequencies.



Vowel ***a*** *of the word* ***itap*** “your hair”.

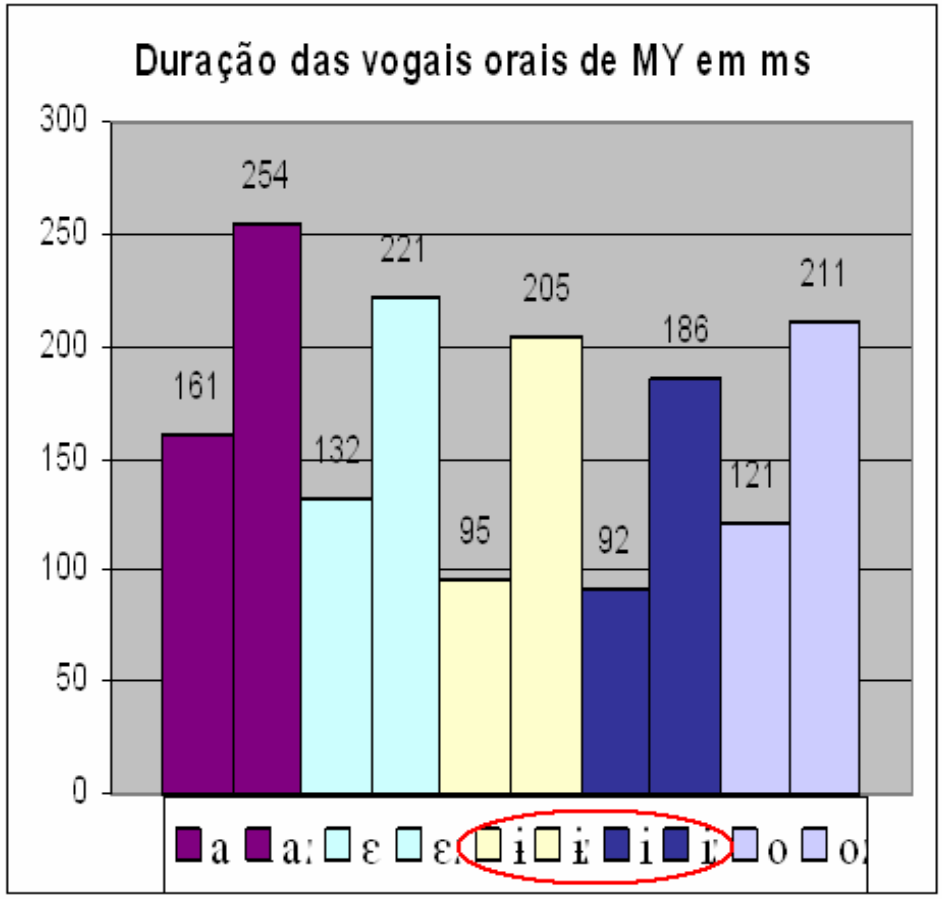
Results

1 Length

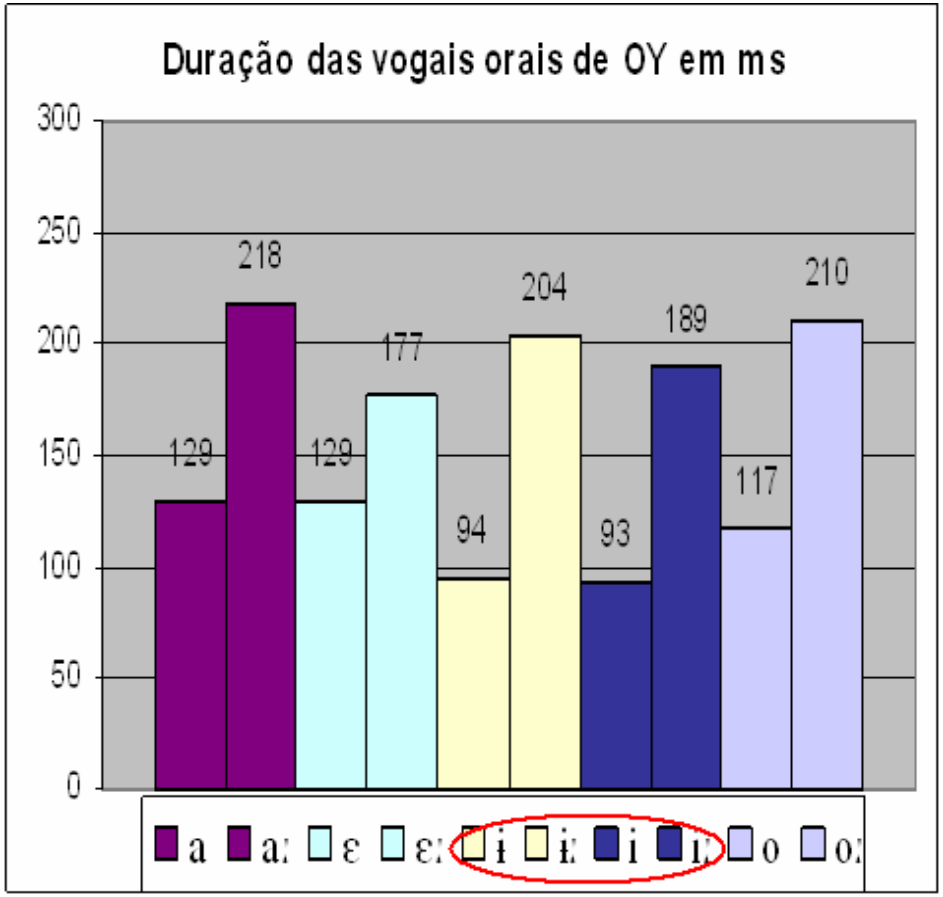
2 Dispersion in the acoustic area

- 2.1 Short vowels
- 2.2 Long vowels

Results: 1Length



Length average values for MY



Length average values for OY

Results

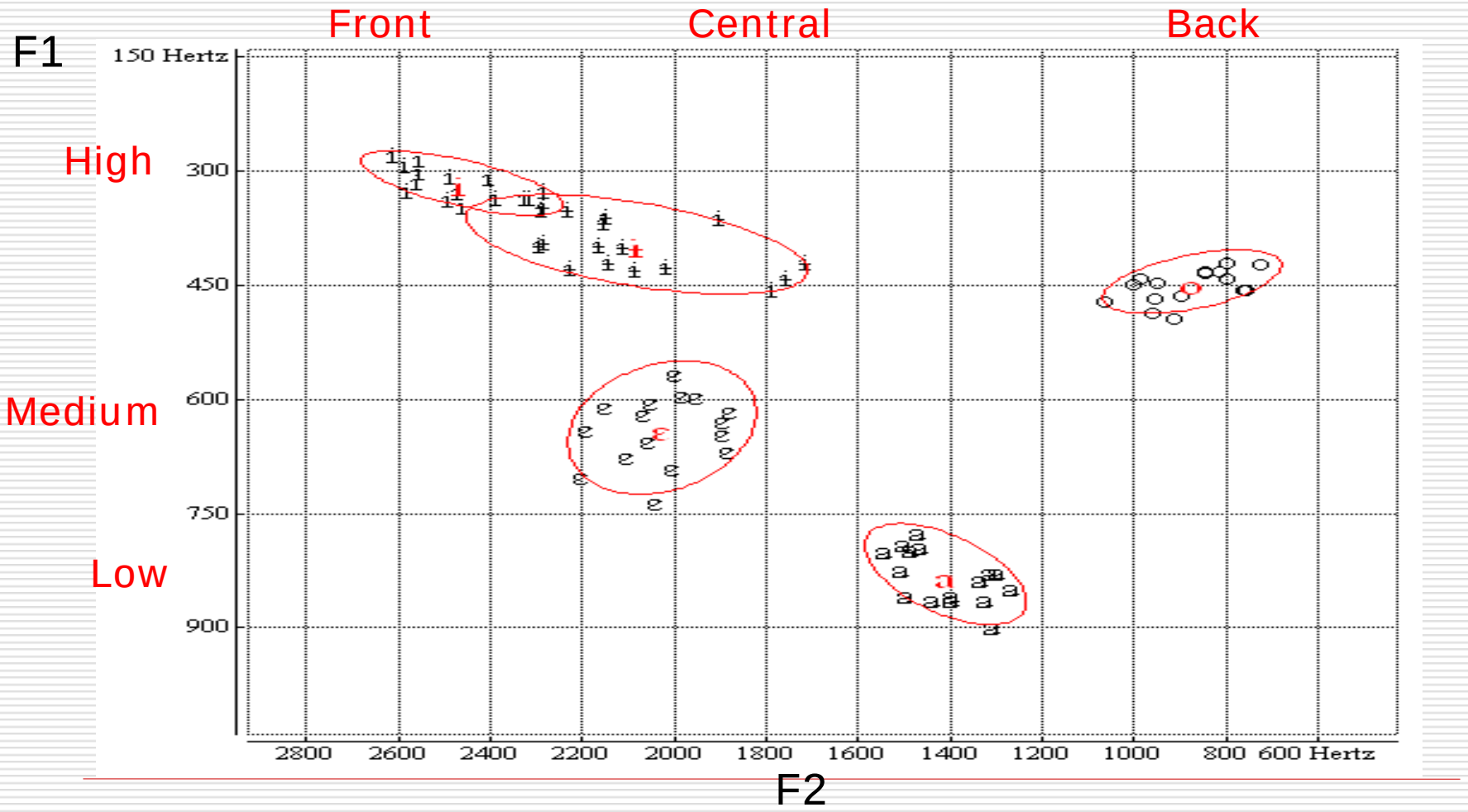
2 Vowel Dispersion

2.1 Short vowels

Average values for F1/F2 and standart deviation

	F1		F2	
	Md	Dp	Md	Dp
a	829	33	1410	88
ɛ	637	44	2027	102
i	315	21	2462	110
ɨ	396	33	2082	186
o	445	21	873	97

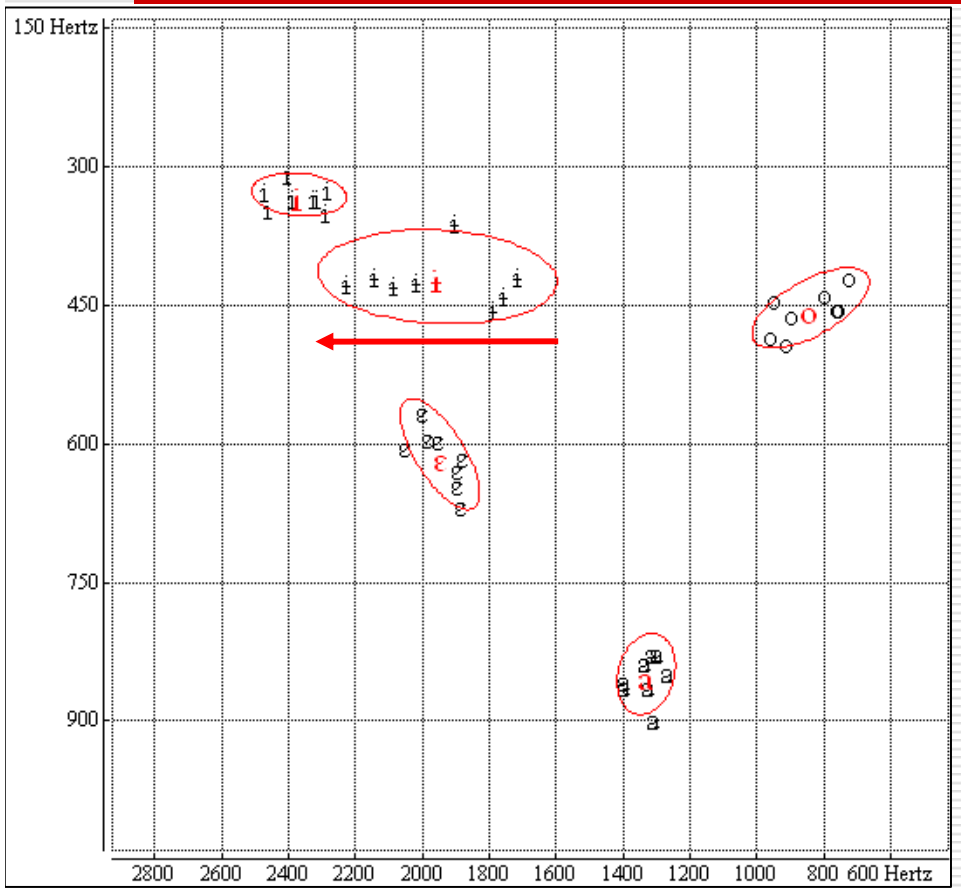
2. Vowel Dispersion



F1/F2 distribution for short oral vowels in Sakurabiat

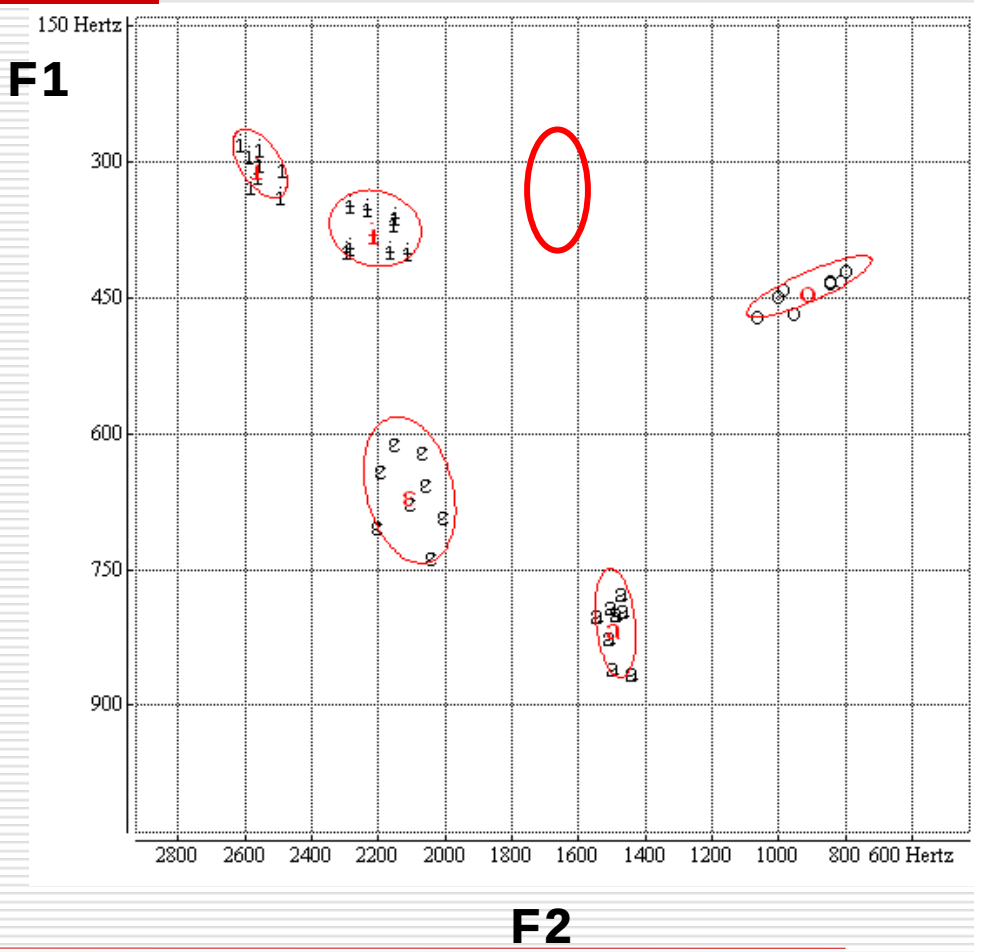
2. Vowel Dispersion by Speakers

speaker MY



F1/F2 distribution for MY

speaker OY



F1/F2 distribution for OY

Vowel [ɨ] – speaker MY

Sentence	Gloss analisada	Rep	speaker	F1	F2
tapsɨt tɛ ɛkɛ	Manioc	1	MY	417	1715
tapsɨt tɛ ɛkɛ	Manioc	2	MY	437	1760
tapsɨt tɛ ɛkɛ	Manioc	3	MY	452	1788
tapsɨt tɛ ɛkɛ	Manioc	4	MY	358	1905
ikɨp tɛ ɛkɛ	His Leg	1	MY	426	2086
ikɨp tɛ ɛkɛ	His Leg	2	MY	416	2142
ikɨp tɛ ɛkɛ	His Leg	3	MY	423	2226
ikɨp tɛ ɛkɛ	His Leg	4	MY	421	2020

Variation of F2 frequencies to MY

Vowel [ɨ] – speaker OY

Sentence	Gloss	Rep	Speaker	F1	F2
tapsɨt tɛ ɛkɛ	Manioc	1	OY	394	2295
tapsɨt tɛ ɛkɛ	Manioc	2	OY	390	2286
tapsɨt tɛ ɛkɛ	Manioc	3	OY	395	2112
tapsɨt tɛ ɛkɛ	Manioc	4	OY	394	2167
ikɨp tɛ ɛkɛ	His leg	1	OY	364	2153
ikɨp tɛ ɛkɛ	His leg	2	OY	343	2285
ikɨp tɛ ɛkɛ	His leg	3	OY	347	2232
ikɨp tɛ ɛkɛ	His leg	4	OY	357	2147

Variation of F2 frequencies to OY

Results

2 Vowels Dispersion

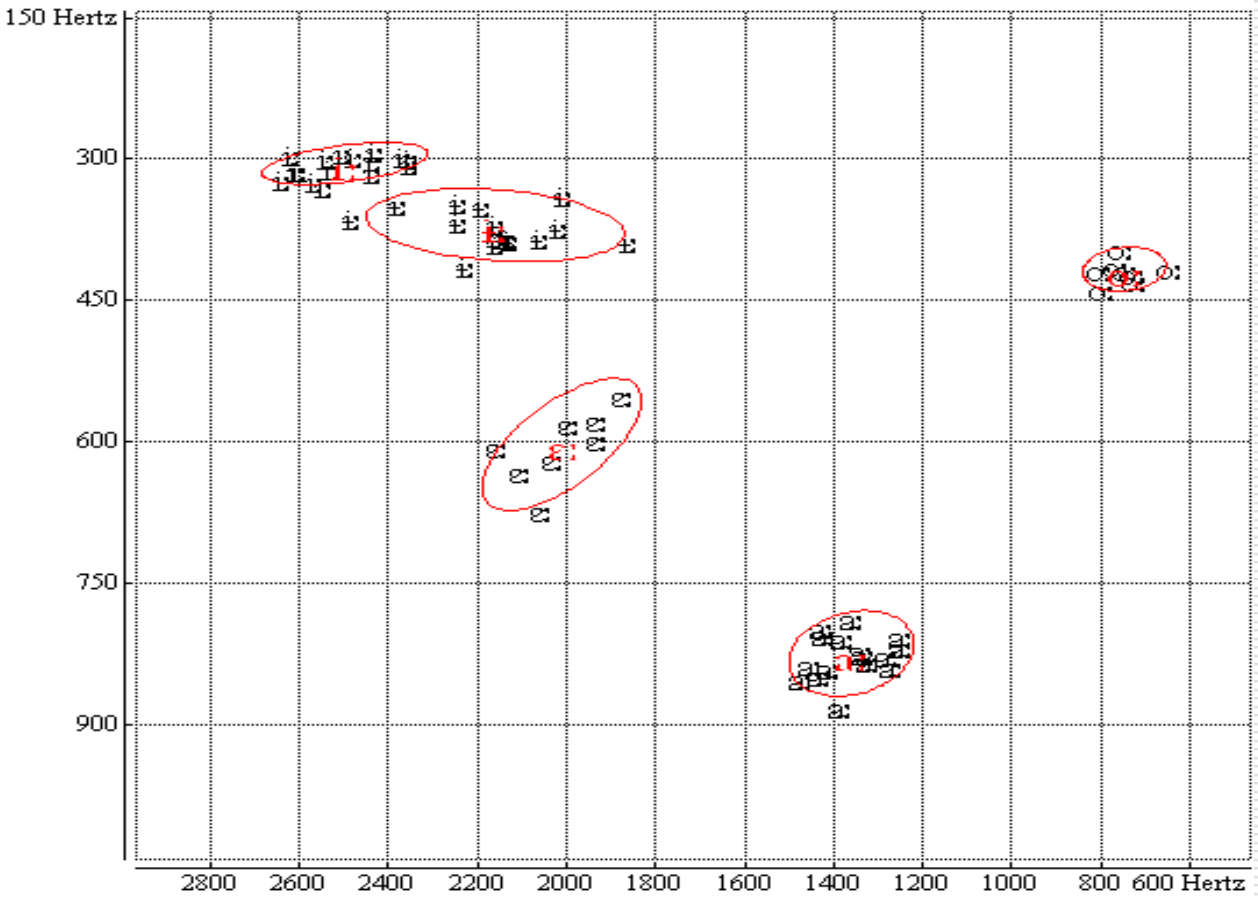
- 2.1 Short vowels
- 2.2 Long Vowels

Formants average values and standart deviation

	F1	
	Md	Dp
[aː]	825	23
[ɛː]	603	35
[iː]	304	11
[ɨː]	370	12
[oː]	417	12

F2	
Md	Dp
1360	70
2010	89
2497	93
2160	145
748	47

Vowels Dispersion



F1

F2

F1/F2 distribution for long oral vowels in Sakurabiat

Vowel [ɨː] – speaker MY

Sentence	Gloss	Rep	Speaker	F1	F2
ikɨːt tɛ ɛkɛ	His salt	1	MY	385	1861
ikɨːt tɛ ɛkɛ	His salt	2	MY	381	2132
ikɨːt tɛ ɛkɛ	His salt	3	MY	381	2056
ikɨːt tɛ ɛkɛ	His salt	4	MY	383	2123
ipɨːk tɛ ɛkɛ	black	1	MY	371	2015
ipɨːk tɛ ɛkɛ	black	2	MY	388	2154
ipɨːk tɛ ɛkɛ	black	3	MY	365	2242
ipɨːk tɛ ɛkɛ	black	4	MY	411	2223

Variation of F2 frequencies to MY

Vowel [ɨː] – speaker OY

Frase	Gloss	Rep	Speaker	F1	F2
ikɨːt tɛ ɛkɛ	salt	1	OY	344	2241
ikɨːt tɛ ɛkɛ	salt	2	OY	348	2188
ikɨːt tɛ ɛkɛ	salt	3	OY	366	2156
ikɨːt tɛ ɛkɛ	salt	4	OY	381	2141
ipɨːk tɛ ɛkɛ	black	1	OY	337	2006
ipɨːk tɛ ɛkɛ	black	2	OY	347	2376
ipɨːk tɛ ɛkɛ	black	3	OY	362	2480

Variation of F2 frequencies to OY

Conclusion and implications

- Both speakers really distiguish 10 segments of oral quality: 5 short vowels and 5 long vowels.

- The phonemic vowel /ɨ/ is phonetically more front and lower than expected. It should be described phonetically not as a high central vowel [ɨ], but rather as [ɪ], that is, a lax high front vowel.

Conclusion and implications

- A new phonetic chart should be:

Front	Central	Back
[i, iː]		
[ɪ, ɪː]		[o, oː]
[ɛ, ɛː]		
	[a, aː]	

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