Africa & Asia, No 4, 2004, pp 163-180 ISSN 1650-2019
Dept of Oriental and African Languages, Göteborg University

Preliminaries to the phonetic structure of the Bantu language Mpiemo

Christina Thornell & Yasuko Nagano-Madsen

Department of Oriental and African Languages
Göteborg University

christina.thornell@african gu se
yasuko.madsen@japan.gu.se

1. Introduction [1]

This paper explores some of the major phonetic features of the Bantu language Mpiemo (A86c, according to Guthrie 1971) spoken in the border area between the Central African Republic and Cameroon.

As pointed out by Maddieson (2003:15), phonetic studies of the Bantu languages are rare despite their great diversities and potential contribution to the comparative historical research of Bantu, the only exception being the studies on the clicks and other exotic consonants in the southern area of the African continent. In addition, the phonetic structure of Mpiemo may be of special interest since this language belongs to the A group that is considered to be among the oldest Bantu languages, and yet so little is known about Mpiemo's exact phonetic characteristics. Such a study is also an urgent one as Mpiemo is going through a drastic change due to the multilingualism in the area.

The analysis of the phonetic characteristics of Mpiemo presented in this paper is based on the recording of items in a word list Thornell obtained during field trips to Nola in the Central African Republic in 2000 and 2004. The present study is founded on the basic phonological descriptions of Mpiemo by Thornell (1999, 2001) and Fester (2002). Since the data analysed constituted a recording of a general word list rather than a list focusing on any specific phonetic features, this paper should be regarded as preliminary study on which further and more specific phonetic studies can be based.

---

[1] Various people connected to the different denominations have told us that manuscripts are likely to be found in their archives which are closed to the public.

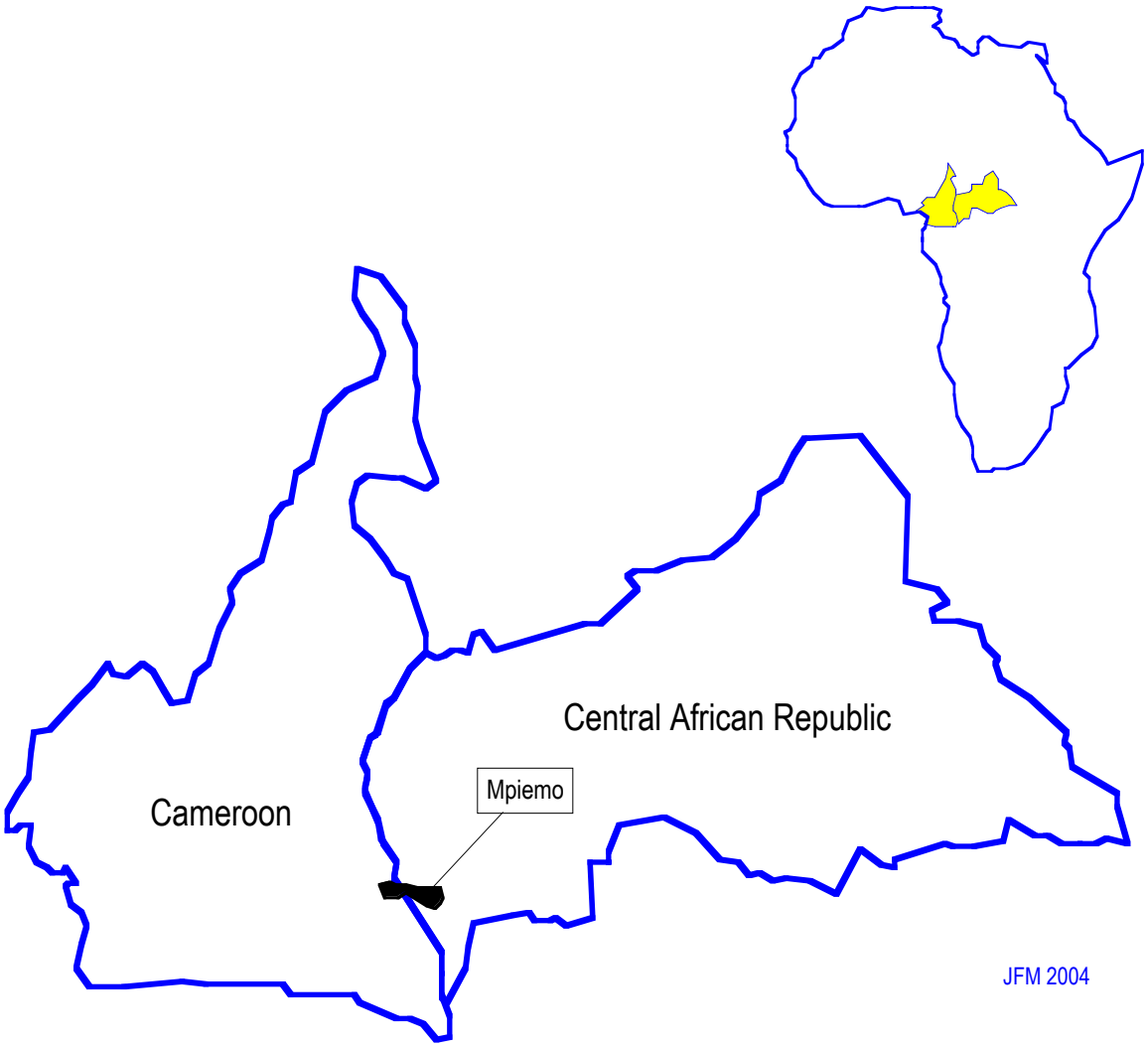


Figure 1. Approximate location of the area where Mpiemo is spoken.

1.1 Previous works on Mpiemo phonetics and phonology

Previous works on Mpiemo were found in Biandji (1989, 1991), who presented an inventory of phonemes as an introduction to his studies on the Mpiemo nominal class system and verb morphology, respectively. The variety of Mpiemo dealt with in his study is the same as that in the present study, that is, the Mpiemo spoken in the urban area of Nola.

Thornell (1999, 2001) presented a phonological description, which Fester (2002) has refined. In addition, Thornell & Tronnier (1999) and Tronnier & Thornell (2000) present brief acoustic analyses of prenasalisation in Mpiemo.

As for other varieties of Mpiemo, Beavon (1978, 1986, n.d.) presents a basic phonological description of the Bijuki dialect spoken in Cameroon, while Wanabenetsia, Beavon & Nkali (1986) present a word list of the same geographical variety containing about 1 400 items.

1.2 Data collection and analysis

The data used for the present study were collected by Thornell during her fieldwork in the urban area of Nola in the Central African Republic in 2000 and 2004. The study is based on responses from one male informant, complemented by a second male informant in some parts.[2] Both informants were native Mpiemo speakers between 40 and 50 years of age, who have lived in Nola for the greater part of their lives.

Nola used to be predominantly Mpiemo-speaking, but multilingualism gradually took over.[3] Besides their mother tongue, most of Nola's residents today are proficient in Sango (a recent creole which could be classified as an Ubangi language). A large number of people are to varying degrees proficient in Gbaya (an Ubangi language) and French. The recorded material, mainly nouns and verbs, was based the word list provided by Wanabenetsia et al. (1986) and a word list consisting of approximately 300 words derived from Thornell's earlier fieldwork. Recordings were made in a quiet room by using a cassette tape recorder (Sony TC-D5 PROII) with an electret condenser microphone (Sony ECM-66B). The recording was sampled, that is, digitally encoded sound for reuse as part of a recording at 20 000 Hz and analysed by using the SUGI Speech Analyzer installed on computer.

2. Vowels

2.1 Vowel phonemes

Most Bantu languages attest a five- or seven-vowel system, except for the northwest region of Africa where Mpiemo is spoken. Indeed, some of the neighbouring languages of Mpiemo such as Makaa (A83), described by Heath (2003), is claimed to have a nine-vowel system. For Mpiemo, however, Beavon (1978, 1986, n.d.), Thornell (2001) as well as Fester (2002) posit a seven-vowelsystem. Furthermore, Thornell (idem) and Fester (idem) both maintain not only that this phonemic quantity distinction exists, but also that nasalisation is allophonic and found primarily before syllable coda nasals.

2 We are grateful to Zacharie Metekouli and Abel Mabessimo, teachers at the secondary school at Nola, for their willingness to share their knowledge of their mother tongue with us, and for their patience in the recordings. We are also thankful to Hubert Nkoumou (MA) in Yaoundé, who assisted in parts of the recordings.

3 For details of the sociolinguistic factors, see Thornell (2004).

The seven vowel phonemes posited are as follows:

i		u
e		o
ɛ		ɔ
	a	

Some of the (near-)minimal pairs are the following: [4]

[i] and [e]	:	[m̀píɔ́]	‘rain’
		[m̀péɔ́]	‘meat’
[e], [ɛ] and [a]	:	[ɓé]	second person plural personal pronoun
		[ɓɛ́]	third person plural personal pronoun
		[ɓá]	‘two’
[ɔ] and [o]	:	[àɓɔ̀ɣí]	‘melon’
		[àɓóɣí]	‘buttocks, seat’
		[g^{w}ɔ́]	‘mushroom’
		[àg^{w}ó]	‘kill’
[o] and [u]	:	[àwólí]	‘tie’
		[àwúlí]	‘boil’

2.2 Vowel formant frequencies

A plot of vowel distribution in Mpiemo is shown in figure 2, where the distances along the axes are scaled to reflect auditory perceptual intervals of the vowels. Mean values for formant 1 (F1) and formant 2 (F2) in Hz, the standard deviation, and the number of samples for the vowel formant means in Mpiemo are shown in table 1 of the Appendix hereto.

Maddieson (2003:18) notes two types of vowel inventories for Bantu languages: one in which spacing is even, and the other in which the spacing is crowded in the higher part of the vowel space. The vowel space obtained for Mpiemo has few characteristics in comparison with those reported in Maddieson

[4] An acute accent “´” marks an impressionistically determined high tone, and a grave accent “`” marks an impressionistically determined low tone.

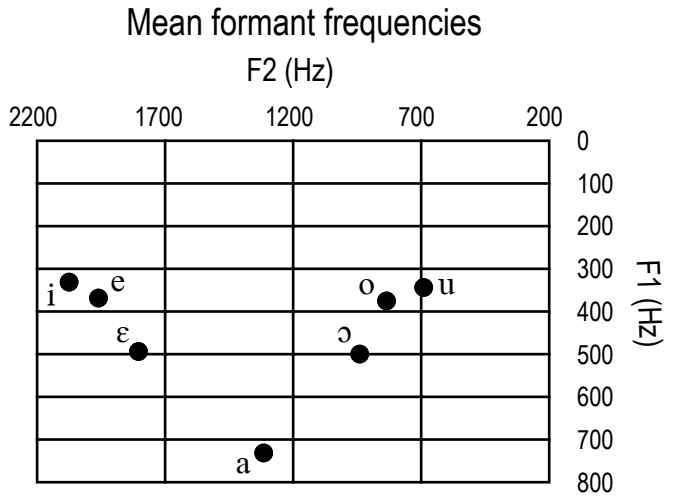


Figure 2. Mean formant frequencies of Mpiemo vowels.

(idem). For one, regarding the seven-vowel system, the F1 values of /i/ and /u/ are so high that they became very close to /e/ and /o/, respectively. The Mpiemo vowel system is similar to the system Maddieson (idem) reprorts for Nyamwezi, where the spacing of vowels is fairly even. Yet, the Mpiemo vowel space has some concentration to in the lower F1 values, implying that the two-way distinction suggested by Maddieson (idem) can be modified further.

It should be noted that the samples used in extracting the F1 and F2 values for Mpiemo were not identical in environment and sample number. The influence of the adjacent consonant was considerably large, meaning that /a/ adjacent to a palatal consonant has an F2 value close to 1 500 Hz, while the F2 value is much lower (retracted) adjacent to velar consonant. In addition the difference between /o/ and /u/ is rather hard to distinguish both auditorally and acoustically. It should also be noted that there are not many words contrasted by means of these two vowels.

2.3 Vowel sequences and long vowels

Mpiemo allows a sequence of two or more non-identical vowels as well as a phonetically long vowel. Since previous literature has not mentioned the sequence of two vowels, we will first describe their possible combinations. The quality and quantity of phonetically short and long vowels will also be examined.

2.3.1 Possible vowel sequences

A sequence of more than two non-identical vowels can occur, as in [béáá] ‘bad’,

	i	e	ɛ	a	ɔ	o	u
i		mpiemo	yiɛ	ntia	awiɔ	mbio	
e				pea	ɓeɔ	ɓiɗeɔ	geu
ɛ		lɛe		mɛa	pɛɔ	pɛo	gɛu
a			ataɛ				
ɔ		ndɔe					
o		nkoe	nkoɛ	koala	koɔ		
u	adui					aguo	

Table 1. Possible vowel sequences, with examples in which the vowel in the vertical axis is the first element

but the occurrence of such long vowel sequences is not common. We will only treat a sequence of two vowels in this section. The examination of a sequence of two non-identical vowels revealed the combinations displayed in table 1.

2.3.2 Quality of phonetically short and long vowels

The quality and duration of a phonetically long vowel was compared with those of its short counterpart. Figure 3 shows a plot of F1 and F2 for short and long /e, ɛ, a, ɔ, o/. For the detailed F1 and F2 values, see table 2 in the Appendix hereto. Note that /i/ and /u/ pairs are missing, as we did not find any such pairs in the word list. The short [a] and long [aː] had identical F1 and F2 values. Likewise, [e] and [eː] as well as [ɛ] and [ɛː] had very close values. When the short and long vowels differed, it was mainly due to their backness, that is, one being more centralised than its counterpart, although no consistency was observed as to whether it was the short or the long vowel that was centralised. Some of the long vowels were articulated very weakly, and long vowels tended to have a lower pitch. However, we were not able to establish the consistency of this latter feature.

Combined with an auditory impression, the difference observed for short and long vowels fell within the range regarded as “basically the same in quality”.

2.3.3 Difference in duration

The difference in duration between a pair of phonetically short and long vowels was compared for the same samples used for comparison of quality above. The

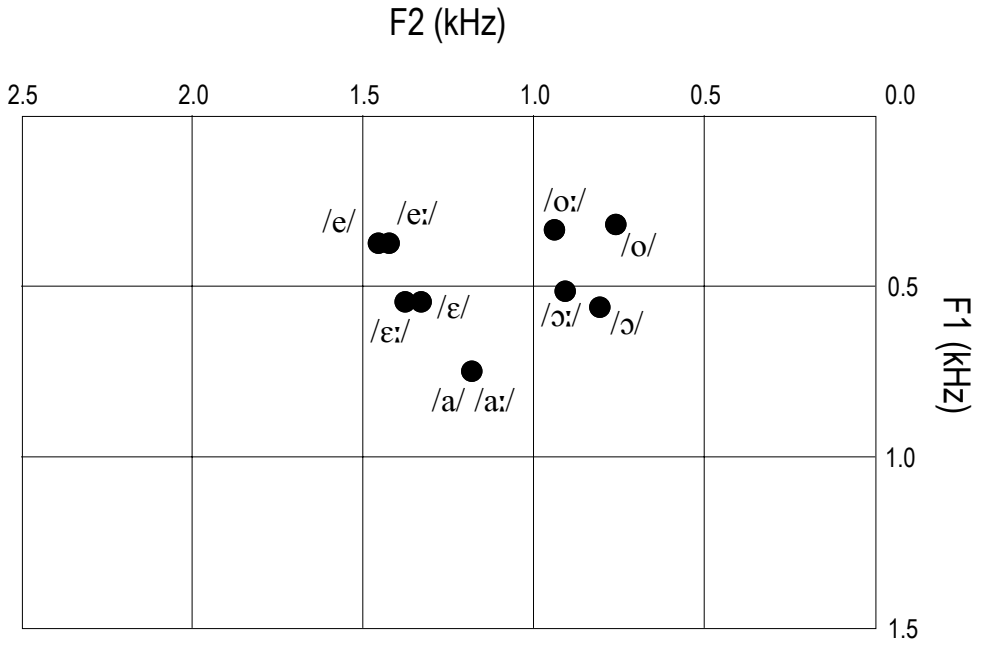


Figure 3. Vowel formant for short and long [e, ɛ, a, ɔ, o] in Mpiemo.

Vowels were extracted from the following word pairs:

[ɓé] second person plural personal pronoun	[àɓèː] ‘get cooked’
[ɓɛ́] third person plural personal pronoun	[àɓɛ̀ː] ‘see’
[ɓá] ‘two’	[ɓáː] ‘fish’
[g^{w}ɔ́] ‘mushroom’	[g^{w}ɔ́ː] ‘fault’
[àɓó] ‘break’	[àɓóː] ‘bamboo’

duration of a phohnetically long vowel was usually well over double its short counterpart in the same or similar context. The duration of a long vowel was comparable with that of two short vowels in sequence. Moreover, a phonetically long vowel could have a different tone within it, as in [àtɔ̀ɔ́] ‘fall in drops’. This evidence regarding vowel duration, together with the evidence presented in respect of vowel quality, supports treating the phonetically long vowel in Mpiemo as a geminate of its short counterpart. Figure 4 shows fundamental frequency (henceforth F0) contours of phonetically short and long vowels.

2.4 Nasalised vowels

Nasalised vowels are often perceived in Mpiemo. Figure 5 is an acoustic exemplification of the term [antã], ‘the plant *Dioscorea bulbifera*’, where the second [a] is nasalised. A comparison of the related sound wave and spectrogram shows the difference between a vowel [a] followed by a nasal

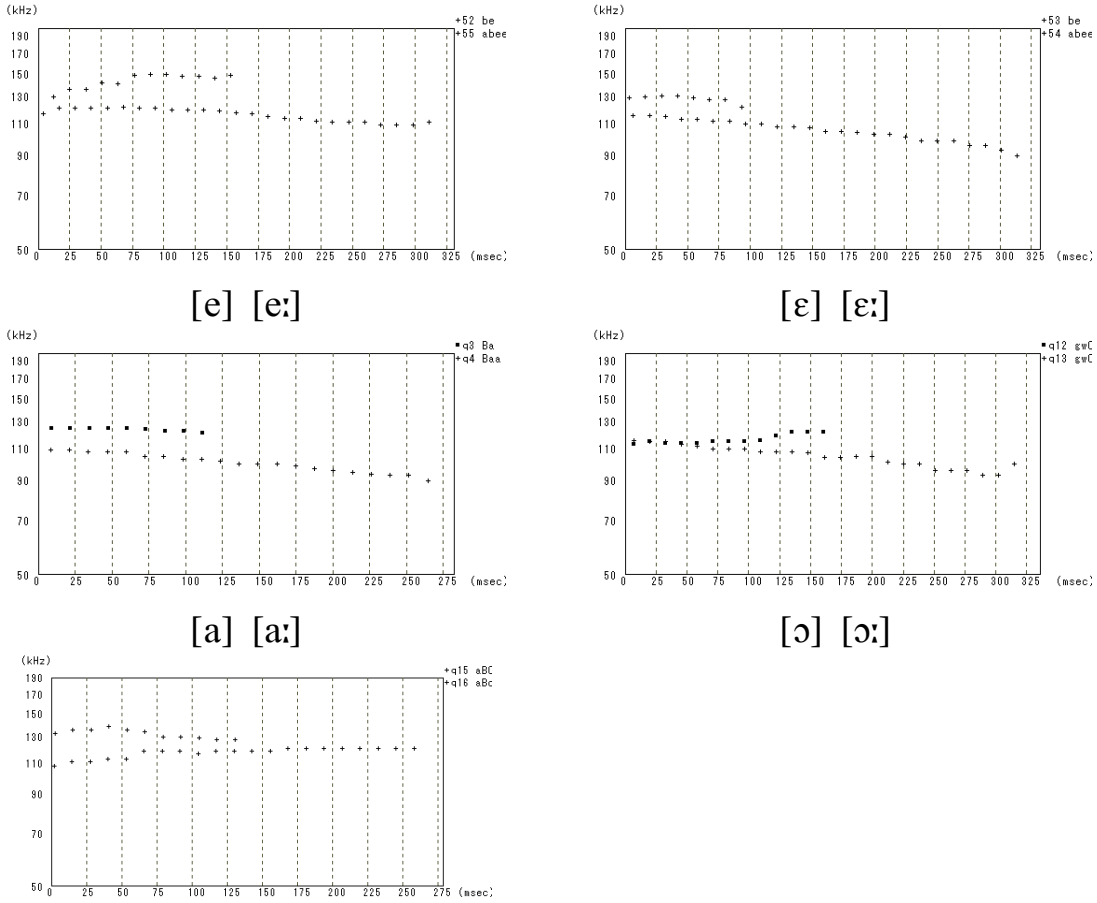


Figure 4. F0 contours for contrastive vowel pairs.

Vowels were extracted from the following word pairs:

[ɓé] second person plural personal pronoun	[àɓèː] ‘get cooked’
[ɓɛ́] third person plural personal pronoun	[àɓɛ̀ː] ‘see’
[ɓá] ‘two’	[ɓáː] ‘fish’
[g^{w}ɔ́] ‘mushroom’	[g^{w}ɔ́ː] ‘fault’
[àɓó] ‘break’	[àɓóː] ‘bamboo’

consonant [n] and a vowel that has been nasalised. Nasalisation is fairly clearly perceived, but there seems to be no clear acoustic feature to indicate the nasalisation directly.

2.5 Vowels accompanied by a fricative

Some word- or utterance-final vowels, typically [i] but sometimes others as well, were accompanied by a voiceless fricative [ç] (see figures 8 and 9 for examples of vowels with fricatives). There was also a token where the entire

	BL	LD	A	PA	P	V	LV	G
Stops	p b		t d		c ɟ	k g	k͡p g͡b	
Labialised stops						k^w g^w		
Implosives	ɓ		ɗ					
Nasals	m		n		ɲ	ŋ		
Tap/Trill			r					
Fricatives	β	f	s z	ʃ		ɣ		h
Approximants					j			
Lateral			l					

Table 2. Major Mpiemo sounds.
BL = bilabial; LD = labiodental; A = alveolar; P = palatal; V = velar; LV = labiovelar; G = glottal.

sound [i] was virtually voiceless [i̥]. At present, the exact distribution and phonemic status of these vowels is not clear and would require more investigation.

3. Consonants

Table 2 below shows some of the major allophones found in Mpiemo. In this section, we will acoustically exemplify some that are of particular interest. Doubly articulated labio-velar stops, for example, are only found in loan words derived from the Ubangi language, Gbaya. Bantu languages of the northwest are known to possess implosives and this applies to Mpiemo as well, where the bilabial and alveolar implosives are attested. Some of the voiced stops regularly become fricatives intervocalically, that is, [ɣ] is found instead of [g] between vowels, and [β] is found instead of [ɓ] or [b] between vowels if the following vowel is [i] and/or [u].

3.1 Implosives [ɓ] and [ɗ]

In Mpiemo, the implosives [ɓ] and [ɗ] appear frequently. In the early description of Mpiemo (Beavon 1978), these implosives are treated as separate phonemes that are in contrast with egressive ones. Thornell (1999, 2001), however, argues

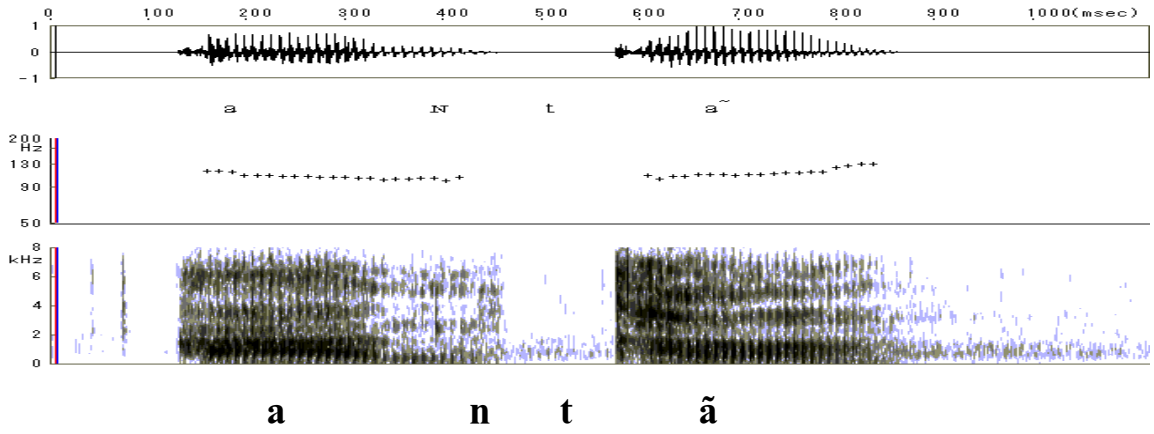


Figure 5. Sound wave, F0 contour, and spectrogram for the word [antã], ‘the plant *Dioscorea bulbifera*’

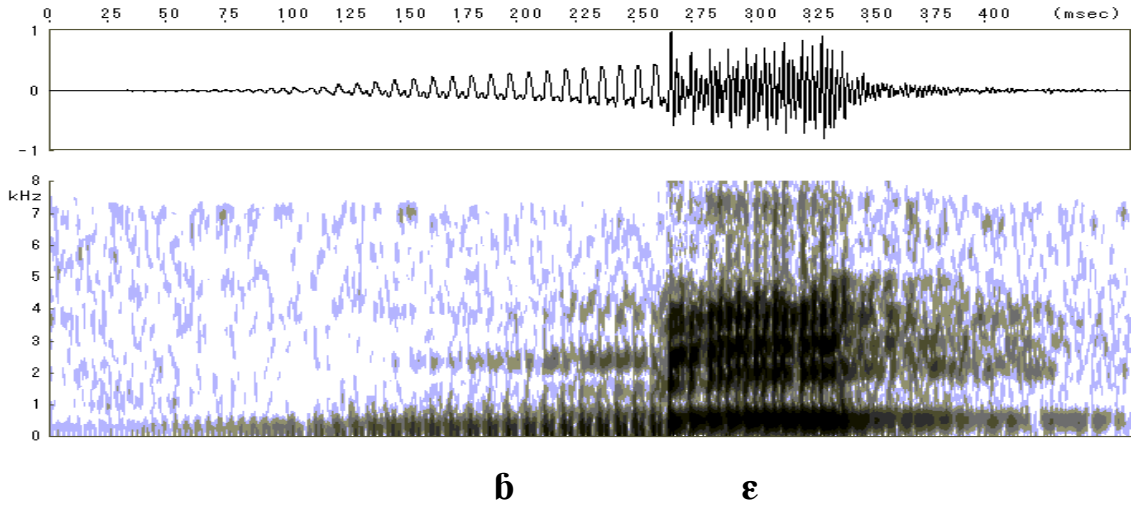


Figure 6. Sound wave and spectrogram illustrating the word-/utterance-initial [ɓ] in [ɓɛ́] third person singular (class 2) possessive.

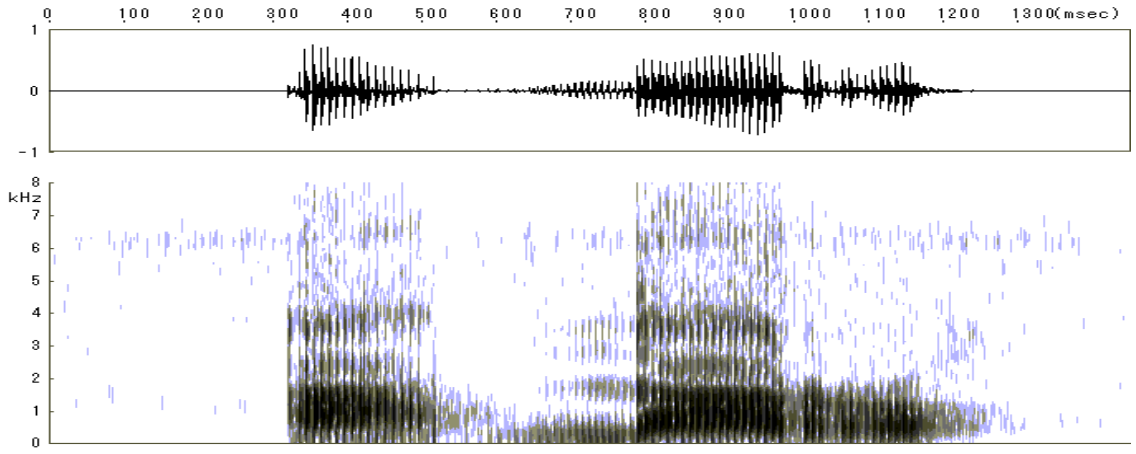


Figure 7. Sound wave and spectrogram illustrating the word-medial implosive in [àɗáró] ‘slick’.

that Beavon's (idem) data are based on the Bijugi dialect, as this is spoken in Cameroon, and that the small number of examples he uses is not strong enough evidence to treat the two implosives as separate phonemes. Thornell instead suggests that the implosives in question are allophones of the same phoneme together with their egressive counterparts [ɓ] and [d], respectively. This treatment was also supported by Fester (2002). The exact distribution of these allophones as well as the allophone to regard as the basic one has not yet been determined, however. Thornell (1999, 2001) states that [ɓ] and [d] are found before the close vowels [i] and [u] as well as after a nasal, while the implosives appear in all other positions. In intervocalic position, [ɓ] is usually articulated with strong friction, so it becomes more appropriate to use [β]. It should be noted that this distribution rule is based on two informants only, and Thornell has noted some cases where the above distribution rule does not hold. The implosive allophones and their egressive counterparts may occur in free variation before [a]. We also need to consider the rapid changes under way in Mpiemo due to the pressures of multilingualism.

3.1.1 Acoustic phonetic realisations of implosives

The implosives in Mpiemo seem to vary in phonetic quality. At present, it is not clear whether such variance is due to the phonological or phonetic environment or whether it is unpredictable. In this section, some of the typical implosive tokens are acoustically exemplified.

Figure 6 acoustically exemplifies a typical bilabial implosive in word-initial position. The voicing can be observed to build up gradually towards the end of the stop occlusion, which is shown in the trumpet-shaped sound wave.

Examples of implosives in intervocalic position are shown in figure 7 for [àɗáró] 'slick'. Here again, voicing increases gradually during the stop occlusion, as occurred when the implosive was in word-/utterance-initial position (see figure 6). This build-up of voicing during occlusion for implosives becomes clear when these tokens are compared with those of the egressive stops [b] and [d] in the token [adiβiç] 'open' in figure 8. For [d], the voicing gradually ceases during the occlusion while [b] is realised as a fricative. Note that both stops occur before the close vowel [i], the distribution rule dictating that implosives cannot occur in that environment in Mpiemo. Similarly, voiced stops are realised as egressive stops after a nasal, as in [m̀bɛ́líç] 'a sick person', shown in figure 9. Note that, in this position, there is no build-up of voicing during the occlusion, and that the duration of the occlusion phase is much shorter than for voiced stops not preceded by a nasal.

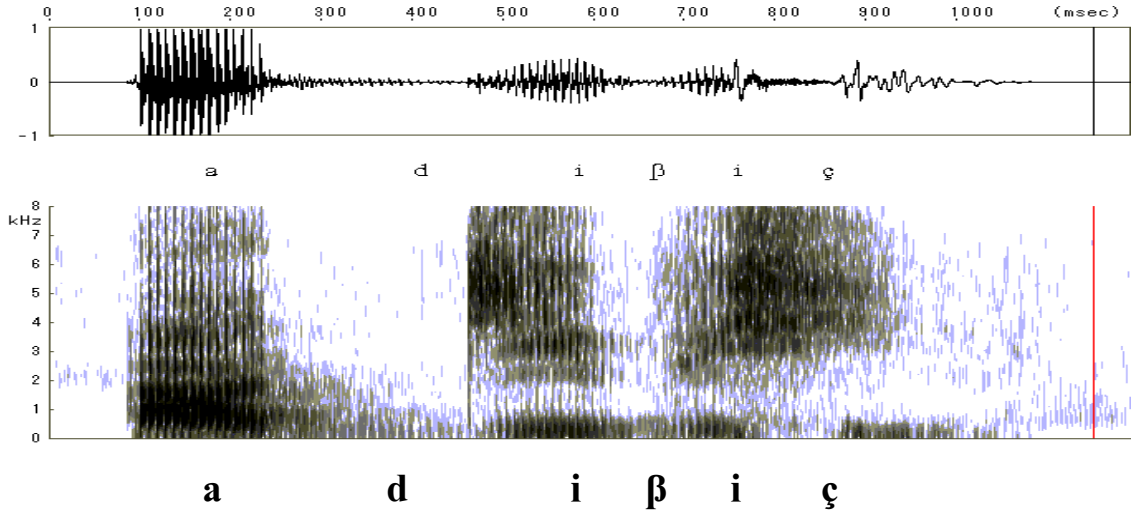


Figure 8. Sound wave and spectrogram illustrating egressive [d] and [b] in the word [adiβiç] ‘open’.

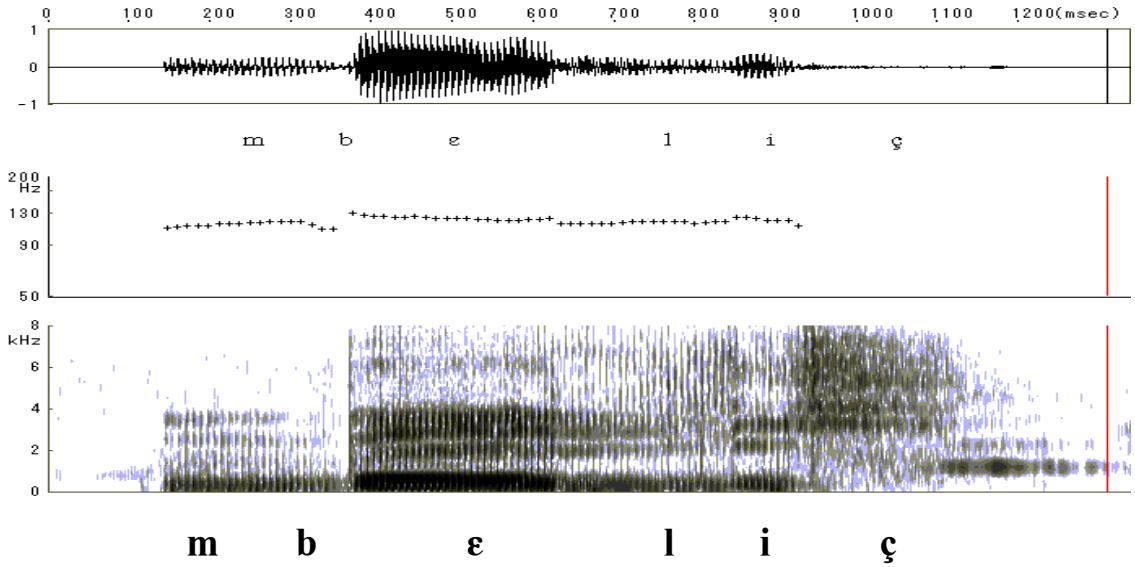
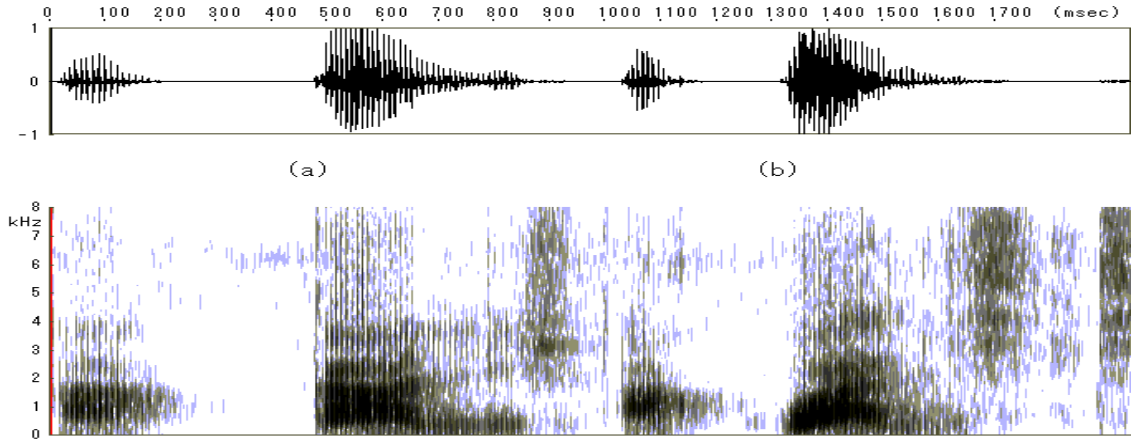


Figure 9. Sound wave, F0 contour and spectrogram for the word [m̀bɛ́líç] ‘a sick person’.

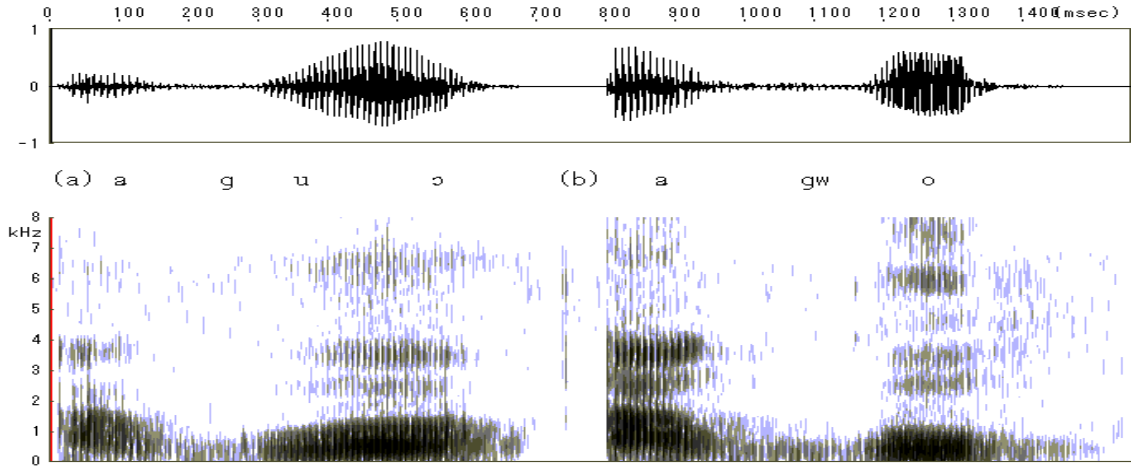
3.2 Labialised velar stops [k^{w}] and [g^{w}]

Mpiemo has a textbook-case articulation of the labialised velar stops [k^{w}] and [g^{w}]. The question arises as to whether they are in complementary distribution with [k] and [g] or whether they form separate phonemes. There are near-minimal pairs such as [àkálíç] ‘put on’ vs. [àk^{w}àlìç] ‘love’ and [àgúɔ́] ‘know’ vs. [àg^{w}ó] ‘kill’. Although there are few (near-)minimal pairs, the occurrences of labialised velar stops are fairly restricted. The sound [g^{w}] is found mostly



a k a l i ç — a k^w a l i ç

Fig.10. Sound wave and spectrogram for the words (a) [àkálíç] ‘put on’ vs. (b) [àk^wàlìç] ‘love’.



a g u ɔ — a g^w o

Fig. 11. Sound wave and spectrogram for the words [àgúɔ́] ‘know’ vs. [àg^wó] ‘kill’.

before [o] and [ɔ], while [k^w] is found before [a]. Clearly, the distribution of these stops deserves further investigation.

Figure 10 displays the sound wave and spectrogram for the words [àkálíç] ‘put on’ and [àk^wàlìç] ‘love’, respectively. Observe that, in the second word, there is a sharp upward transition of F1 and F2 towards the vowel [a], indicating the presence of a labial articulation [^{w}] directly after the stop’s occlusion. When [k^w] and [g^w] are followed by a back vowel, these upward and downward F1 and F2 transition is not obvious. The labialised velar differs clearly in timing

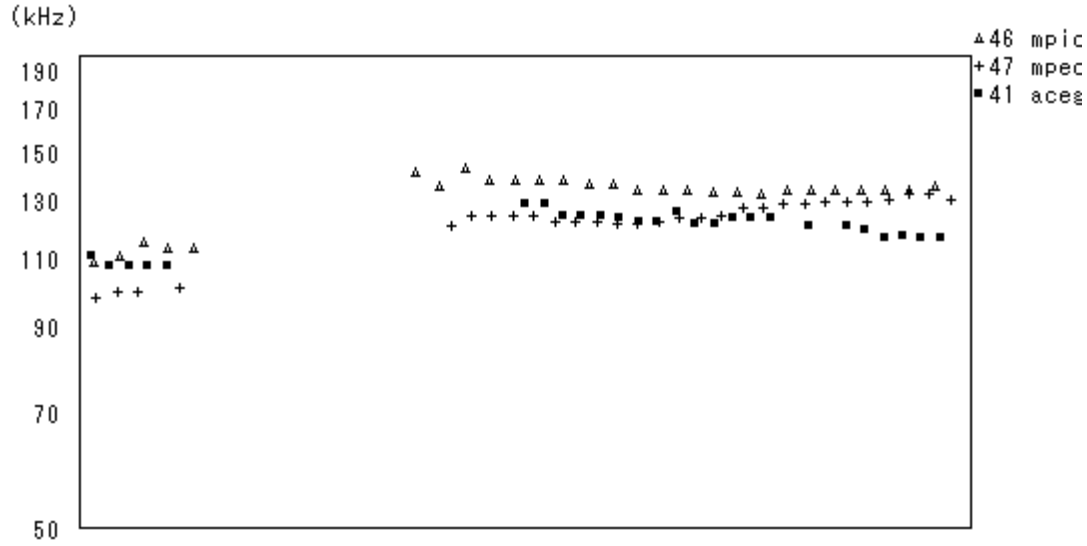


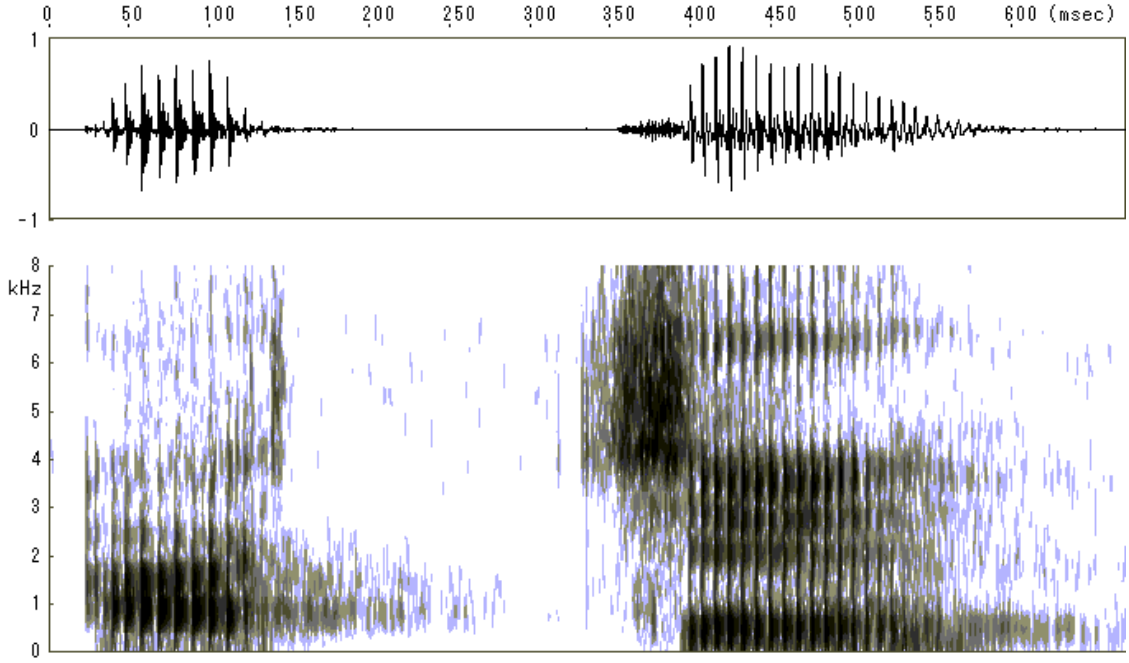
Fig. 12. F0 contour for [m̀píó] ‘rain’, [m̀péó] ‘meat’ and [àcegí] ‘hill’.

from the word with [u]. Compare the words [àgúɔ́] ‘know’ and [àg^{w}ó] ‘kill’ in figure 11. In the former, the duration of the sequence [uɔ] is much longer, while for the latter, the duration of the vowel is substantially that of a single vowel.

3.3 Prenasalised stops

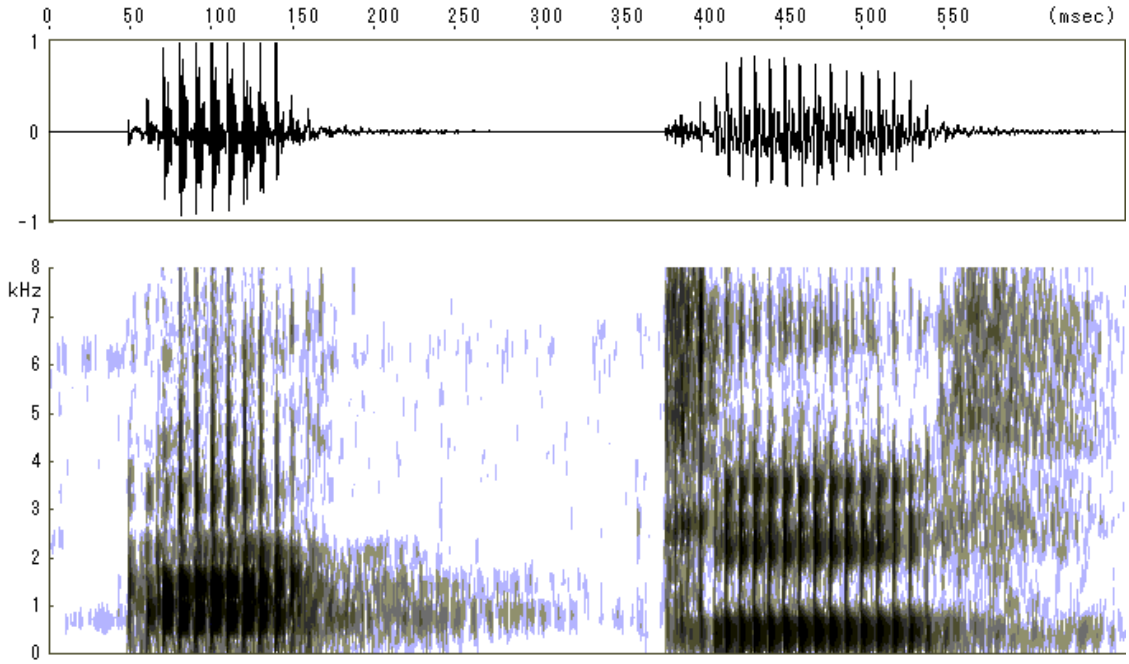
Whether the word-initial nasal that precedes a stop should be analysed as a prenasalised stop, that is, one entity, or a combination of a nasal and a stop, is a matter of debate (cfr Fester 2002). Our evidence shows, from a purely phonetic point of view, that [m] is analogous to the prefix /a/ both in its pitch height and in the durational timing. Figure 12 shows the F0 contours for [m̀píó] ‘rain’, [m̀péó] ‘meat’ and [àcegí] ‘hill’. Observe that the F0 contours of the three words have relatively identical durational timing and F0 height. This implies that the words [m̀píó] ‘rain’ and [m̀péó] ‘meat’ can be segmented as trisyllabic, that is, [m̀-pí-ó] ‘rain’ and [m̀-pé-ó] ‘meat’, respectively, like [à-ce-gí] ‘hill’. Furthermore, if we consider the [m̀pí] sequence as monosyllabic, then there is a change in tone within a syllable and this may not be an ideal treatment.

Prenasalisation in Bantu has received some attention (see, for instance, Janson 1999; Tronnier & Thornell 2000), but the exact phonetic characteristics of prenasalisation are largely unknown. Obviously, this area also needs further study.



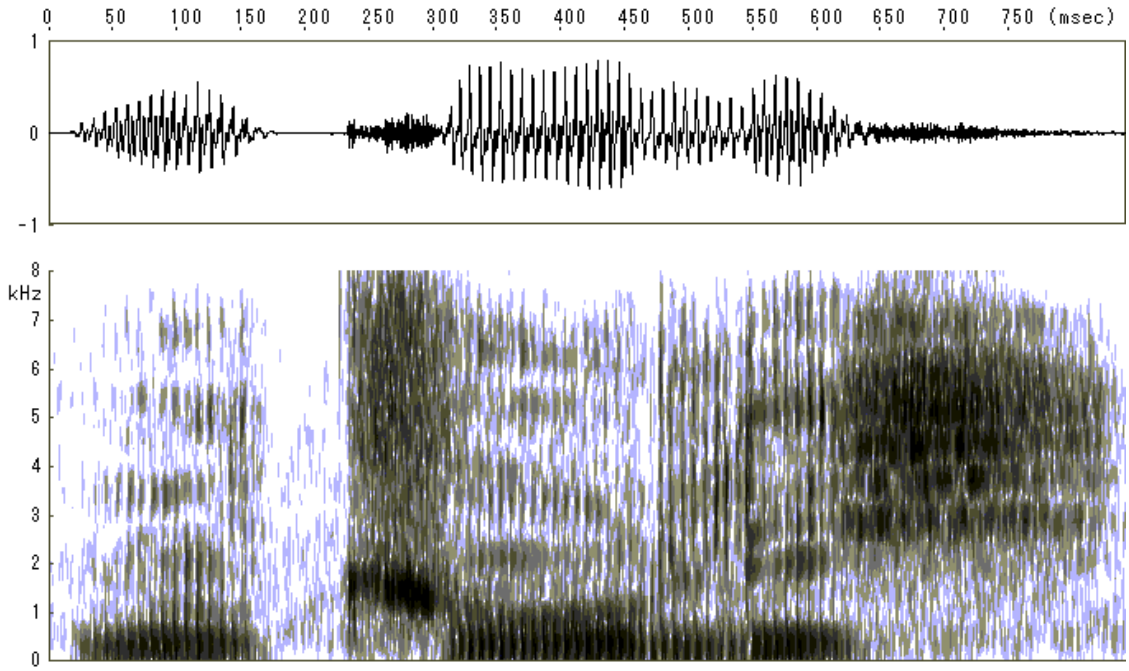
a **c** **ɛ**

Fig. 13. Sound wave and spectrogram of the word [àcɛ́] ‘take one’s guard’ with a fricative release.



a **k** **ɛ**

Fig. 14. Sound wave and spectrogram of the word [àkɛ̀] ‘go’.



ŋ k u l i ç

Fig. 15. Sound wave, F0 contour, and spectrogram of the word [ŋ̀kúlíç] 'the plant *Pseudospondias microcarpa*'.

3.4 Release of stops

Some of the Mpiemo stops are released with strong voice-onset time (VOT) or released with friction. Release with friction was regularly observed for palatal stops [c] and [ɟ]. When a voiceless stop is preceded by a nasal and followed by close vowels /i/ or /u/, it is usually articulated forcefully and released as a fricative of considerable length. Figures 13, 14 and 15 acoustically exemplify the Mpiemo words [àcɛ́] 'take one's guard', [àkɛ̀] 'go' and [ŋ̀kúlíç] 'the plant *Pseudospondias microcarpa*', where each occlusion phase is followed by a fricative phase.

4. Final remarks

The present study revealed a number of interesting phonetic features in Mpiemo that deserve further study. Since the phonetic analyses presented in this study are based on only one informant, even though some aspects were complemented by a second informant, it would be necessary to confirm and extend the main findings here.

REFERENCES

Beavon, Keith. [No date.] Mpyemo phonology and verb morphology. Unpublished manuscript. Société Internationale de Linguistique, Yaoundé.

———. 1978. Provisional description of the segmental phonemes and noun classes of the Mpyémó language (Bìjúgí dialect). Société Internationale de Linguistique, Yaoundé.

———. 1986. Phonologie mpyɛmɔ-français. Société Internationale de Linguistique, Yaoundé.

Biandji, Dieudonné. 1989. La classification nominale de la langue mpyemo. Mémoire de license. Université de Bangui.

———. 1991. Le verbe en mpyemo, langue bantu. Mémoire de maitrise. Université de Bangui.

Fester, Bradley. 2002. A brief phonological description of the Mpiemo language. Unpublished manuscript. University of North Dakota, Grand Forks.

Guthrie, Malcolm. 1971. *Comparative Bantu*, vol 2. London: Gregg Press.

Heath, Teresa. 2003. Makaa (A83). In: *The Bantu languages*, pp 335-348. Edited by Derek Nurse & Gérard Philippson. London: Routledge.

Janson, Tore. 1999. Prenasalised voiced aspirated stops in Changana/Tsonga. In: *Proceedings Fonetik 99: the Swedish phonetics conference, June 2–4 1999*, pp 89-92. Department of Linguistics, Göteborg University.

Maddieson, Ian. 2003. The sounds of the Bantu languages. In: *The Bantu languages*, pp 15–41. Edited by Derek Nurse & Gérard Philippson. London: Routledge.

Thornell, Christina. 1999. Fonemsystemet i modern mpiakombo. Unpublished manuscript. Department of Oriental and African Languages, Göteborg University.

———. 2001. La phonologie du mpiemo. Unpublished manuscript. Department of Oriental and African Languages, Göteborg University.

———. 2004. Minoritetsspråket mpiemos sociolingvistiska kontext. To appear in *Africa & Asia*, 5.

Thornell, Christina; Tronnier, Mechtild. 1999. Morphological function, syllabic and phonetic form of nasal+plosive combinations in the Bantu language Mpiemo. In: *Proceedings Fonetik 99: the Swedish phonetics conference, June 2–4, 1999*, pp 137-140. Department of Linguistics, Göteborg University.

Tronnier, Mechtild; Thornell, Christina. 2000. On the initial aggregation of nasality and stops in the Bantu language Mpiemo. In: *Proceedings Fonetik 2000*. Högskolan Skövde.

Wanabenetsia, Justin-Laurent; Beavon, Keith; Nkali, Lazare Mbaro. 1986. Vocabulaire mpyɛmɔ-français. Manuscrit non-publié. Société Internationale de Linguistique, Yaoundé.

APPENDIX

Vowel	F1 (SD)	F2 (SD)	Sample size
i	319 (19)	2 048 (107)	17
e	383 (23)	1 986 (75)	11
ɛ	502 (18)	1 825 (70)	6
a	736 (47)	1 301 (182)	36
ɔ	503 (28)	951 (99)	28
o	381 (10)	861 (115)	18
u	361 (15)	694 (17)	6

Table 1. Mean F1 and F2 in Hz, standard deviation (SD), and the number of samples for the vowel formant means in Mpiemo.

Word	Gloss	F1	F2
ɓé	second person plural personal pronoun	343	1 968
àɓèː	‘get cooked’	343	1 937
ɓɛ́	third person plural personal pronoun	515	1 812
àɓɛ̀ː	‘see’	515	1 906
ɓá	‘two’	750	1 187
ɓàː	‘fish’	750	1 187
g^{w}ɔ́	‘mushroom’	546	796
g^{w}ɔ̀ː	‘fault’	500	890
àɓó	‘break’	375	765
àɓóː	‘bamboo’	375	953

Table 2. Mean F1 and F2 for the phonetically long and short vowel pairs in Mpiemo.