On the initial aggregation of nasality and stops in the Bantu language Mpiemo

Mechtild Tronnier* and Christina Thornell*
*Department of Linguistics and Phonetics, Lund University
*Department of Oriental and African Languages, Göteborg University

Abstract
The pronunciation of initial stops and those with a nasal preceding it varies substantially in Mpiemo. Equivalence of the pronunciation of allophones in the two categories may lead to a contraction of phonological categories in the future. The potential of such a process seems to be supported by the difference in language awareness of speakers of different age.

Introduction
Mpiemo is a Bantu language spoken in the south-western part of the Central African Republic. It does not have a standard writing system and is only transmitted orally. Investigations on the current state of the language show that rapid and substantial changes in the morphological (Thornell, forthcoming) and the phonological system take place. This is obvious from the documented language awareness of speakers of different generations and levels of education (Thornell 2000, forthcoming). Some older speakers, who were available for the fieldwork recordings and who were involved in earlier translation work, took a language preserving attitude. They would often require the transcript and the pronunciation of certain sounds in relation to the morphology of the language, which they themselves did not necessarily produce in exactly the same context. Younger speakers would leave out sounds in their transcription where required by speakers of the older generation.

In this study the focus is on the character of nasality which precedes stops initial to noun stems and in the plural prefix – and the lack of nasality in the same place and how the variation can influence a possible change in their phonological role. Nasalised parts of the speech stream were observed to be produced in homorganic articulation with the stops. A brief overview over the role of nasals in the nominal class system is given first.

Morphology
Mpiemo contains a nominal class system like other Bantu languages. Nouns with the same pattern of grammatical agreement and which display the corresponding prefix belong to the same nominal class. Mpiemo is currently undergoing changes so that the historical morphological function of a prefix as a class marker (e.g. a noun initial nasal for class 1 and class 9) is not as clear anymore. In such a case a nasal rather seems to be incorporated in the noun stem (Thornell & Tronnier, 1999; Thornell, forthcoming).

Data analysis
The data investigated in this study was recorded in the Central African Republic by C. Thornell. It was produced by a younger male speaker of Mpiemo. It comprises a list of nouns, some of which belong to a nominal class which presumably was marked by an initial nasal in a historical state of the morphology of the language. Furthermore, prevocalic voiced and unvoiced stops occurred in the nouns. These nouns were pronounced in isolation, preceded by the plural prefix bi-/be- and imbedded in the phrase i ne ... ‘there is ....’. Thus the presence, absence and the character of nasalisation prior to the stops in the nouns and in the plural prefix was investigated and compared.
For that purpose the recordings were transferred to a Unix-computer and analysed in the program Waves+ (Entropics). With the help of interactive listening and visual information about the waveform and the spectrogram of the section of speech in question, judgements about nasalisation were made. In addition to the auditory impression, phonetic correlates like the shape of the waveform/periods, waveform intensity and duration and spectral patterns were taken into consideration to single out nasalisation.

**Distribution of nasalisation**

The occurrence and character of a nasal portion prior to a stop varies considerably in the material. This is due to the type of stop (voiced or voiceless), the type of word (noun of a particular nominal class or word introduced by the plural prefix) and the position of the stop in the word or utterance (initially and isolated, medially with preceding prefix or in a phrase). In the following the representative patterns are listed, sorted by the type of word they belong to.

**Noun initial position**

*With voiced stop*

For these conditions the number of investigated nouns was 14, which were recorded without greater disturbance. In the ideal case, clear nasalisation is audible and visible in all three positions (Figure 1). In the case of voiced stops nasalisation is present for all tokens in the diverse context. In some cases, nasalisation is not quite as strong as in the shown ideal case, but nevertheless clearly observable. Medially, however, nasalisation not always shows up as a nasal consonant but also occurs as a strongly nasalised vowel. This was observed mostly where the front high (palatal) vowel precedes a palatal sound noun initially (Figure 4).

![Figure 1](image1.png)

Figure 1. Waveform of the word Ø.mbombi ‘package’ (left) with a clear realisation of an initial nasal and bi.mbombi ‘PL.package’ (right) with a clear realisation of a nasal after the plural morpheme bi-.

*With voiceless stop*

The number of investigated nouns for these conditions was 25. As for the voiced stops, in the ideal case of the voiceless stops clear nasalisation should also be audible and visible in all three positions, which occurs for 19 instances (Figure 2). However, the intensity of such a nasal

![Figure 2](image2.png)

Figure 2. Waveform of the word Ø mpi ‘dog’ (left) with a clear realisation of an initial nasal and be.mpi ‘PL.dog’ (right) with a clear realisation of a nasal after the plural morpheme be-.
portion varies considerably (Figure 5). In six other cases any indication of nasality is lacking for the noun uttered in isolation. However, when the noun was not produced in isolation nasalisation was observable, which showed up in the form of a nasal consonant or in some cases as a nasal vowel.

**Prefix initial position**

The investigated number of words with the plural prefix *be-* was 8 and with *bi-* 22. The ideal case for an initial voiced stop would be the short occurrence of a low intensity periodicity, which could be referred to as glottal oscillation during the occlusive phase of the stop. This was present in the data (Figure 6). However, in many tokens a longer passage of periodicity was present, some of which showed a section of fairly high intensity (Figure 3). Other samples showed long passages of relatively low intensity periodicity, which was structured in two sections, varying in the shape of the periods of the waveform (Figure 3). For both kinds of samples nasalisation was noticed. In these samples similarity of the shape of the waveform and of the intensity with the nasal event prior to a voiceless stop introducing the type of noun stem considered above was registered. It was further noticed that in many cases the initial /b/ of the prefix *be-* was realised as an approximant, not accomplishing at a bilabial occlusion. For some cases no judgement could be made as to whether the occurrence of periodicity was due to nasalisation or introductory oscillation to the voiced stop.

![Figure 3. Waveform of the word bi.mo 'PL.stomach' (left) with a clear realisation of an initial nasal and the section i ne bi.b- of the phrase i ne bi.bandi 'there are places' (right) with a clear realisation of an nasal before the plural morpheme bi- in a phrase.](image)

**Discussion and Conclusion**

The data presented us with examples of phonetic phenomena, which reflect the Mpiemo language at the current stage of development. Voiced stops seemed to nourish the realisation of nasalisation based on the fact that voicing is a feature both sounds have in common. Clear nasalisation was thus present for the nouns with voiced stops in most cases for all positions. Although mainly produced as a nasal consonant, its manifestation as a nasal vowel also occurred. Thus the nasal, historically derived from a noun class morpheme, was present in the signal, but could be assimilated to the adjacent sounds.

Nasalisation was also present in many cases together with the voiced stops introducing the plural morpheme, which historically did not include a nasal. Hereby a long stretch of periodicity showed up including a nasalised phase, which was assumed to be necessary due to a limitation in air pressure increase behind the oral obstruction so that an escape of some air through the nasal cavity would be likely. Nasal resonance shows up because of the oscillating glottis.

For the case of a voiceless stop in the noun, nasality was not present in some cases when the noun was produced in isolation, but occurred when it was preceded by a plural morpheme or when it was placed in a phrase. Thus one can assume that the elision of an initial nasal is based on anticipatory assimilation, where the voicing of the underlying nasal is assimilated
to the voiceless stop. Even low intensity occurrence of periodicity prior to a voiceless stop would be judged as a nasal, since there is no phonetic motivation why there should be voicing initiating a voiceless sound.

For reasons of parallelism, in the cases where nasality showed up in voiced and voiceless variants in the noun stem, a nasal is suggested to account for a phoneme by itself. However, the diversity of realisations of the voiced stop /b/ introducing the plural morpheme – including strongly nasalised variants – clearly have an influence on the perception of a native speaker. What was an allophone to /b/ on morphological grounds cannot be distinguished from a sequence of /mb/ anymore. It is therefore possible that a contraction of these two phonemes take place in the future. Ohala’s explanation to language change which is based on the misapprehension of the speech signal (Ohala, 1993) could account for such an effect. From the current language stage it is however doubted that native speakers would accept a noun medial /mb/-sequence to be produced without a phase of nasalisation. Perception experiments would be necessary to support this assumption.

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References
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Figure 4. Waveform of the word bi.ndza ‘PL.lie’ with a clear realisation of an nasal vowel after the plural morpheme bi-.

Figure 5. Waveform of the word Ø.mpala ‘cottage’ with a weak realisation of an initial nasal.

Figure 6. Waveform of the word bi.ntami ‘PL.hoop nett’ where low intensity oscillation occurs with the initial stop.

Figure 7. Waveform of the word bi.sumbi ‘PL.river’ which shows a structured waveform with the initial stop.