Mid vowel and nasal vowel production in young adult French speakers on Mayotte Island in the Indian Ocean

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ABSTRACT

Phonetic and phonological variation in French spoken around the world has been well documented over the last few decades thanks to the Phonology of Contemporary French research project. However, little is known of the variety spoken on Mayotte Island, which was recently made a French department. This is despite its rich linguistic landscape, with two distinct languages: Shimaore, a Sabaki-Bantu language and Kibushi, an Austronesian language. For example, whereas French has upwards of 13 oral vowels and 4 nasal vowels, Shimaore has 5 oral vowels and 3 nasal vowels: a, i, u, e, o, ĩ, ẽ, and õ. It is unclear how Shimaore speakers adapt the complex and varying French vowel system, particularly for the mid vowels and considering the 'loi de position.' This study looks at mid vowels and nasal vowels spoken by eight speakers in Mayotte. It looks at the vowel space, overlap and distance.

Keywords: loi de position, French, Mayotte, vowel space, nasals

1. INTRODUCTION

Thanks to the Phonology of Contemporary French research project, phonetic and phonological variation in French spoken around the world has been well documented over the past few decades (see [1]). From prosody to phonetics, the ways in which French speakers differ by variety is better understood, including aspects concerning language contact. However, there are still French speaking regions yet to be explored. Mayotte Island, which was integrated in 2011 as the nation's most recent *department*, is one location where little to nothing is known about its spoken French. Located in the Mozambique Channel in the Indian Ocean, Mayotte is a small tropical island with a rich linguistic and cultural landscape. Two principal local languages exist: Shimaore, a Sabaki-Bantu language and Kibushi, an Austronesian language. Dialects of both languages are observed and are often distinguished by village and region. Shimaore and its dialects from neighbouring Comorian islands is the most dominant, whereas only 15% of locals speak a variety of Kibushi [2].

French is the language of instruction and administration according to law. In practice, a sizable portion of the population does not speak or understand French [3, 4]. With younger generations attending school from 3 years of age, this proportion will certainly decrease. Much discussion has been made over how to label the French language in Mayotte: Is it a second language or a foreign language? Most agree that it is the language of schooling, in which first contact with it often comes from within the classroom walls.

Indeed, any well-attuned ear can hear unique aspects of the French spoken on the island, be it related to syntax, vocabulary, prosody, or phonetics. Yet, little to nothing is known about Maore French, particularly its pronunciation. This despite the language contact with Shimaore and Kibushi resulting in potential phonological and phonetic variation. For example, French has upwards of 13 oral vowels and 4 nasal vowels: a, i, u, e, o, y, ɛ, ø, œ, ɔ, ɑ, ɛː, ə, ɛ̃, ɔ̃, ɑ̃, and œ̃. However, Shimaore has 5 oral vowels and 3 nasal vowels: a, i, u, e, o, ĩ, ẽ, and õ. It is unclear how Shimaore speakers adapt the complex and varying French vowel system, particularly for the mid vowels and considering the 'loi de position' in which mid vowels are open in a closed syllable position and closed when in an open syllable [5]. Thus, it may be interesting to explore the vowel pairs /e/~/ɛ/, /ø/~/œ/, and /o/~/ɔ/ (E, Ø and O, respectively) [6] when used by Maore. In addition, given the presence of some nasal vowels in Shimaore, it remains unclear how the nasal vowels from the two languages map onto each other.

This study looks at mid vowels and nasal vowels in the spoken French of Mayotte. It particularly looks at the vowel space as well as overlap and distance.

2. METHOD

The project was inspired by the Phonology of Contemporary French research project. It adopted their protocol for data elicitation, including the reading of a wordlist, paragraphs, as well as a semi-directive interview. Eight participants, of which four women, were recorded in 1m^2 soundproof booth at the Centre universitaire de formation et de recherche de Mayotte using an Apex 435B condenser microphone, Presonus audiobox with a sampling rate of 44,100 Hz. Participants were undergraduate students who had gone through the French public education system on the island. All but one participant spoke Shimaore or a variety of it. Speaker 00M25 only spoken French.

Participation was voluntary.

Analyses of vowel space and Euclidean distance were done using R [7] with the help of PhonR [8]. Norm was used to normalized formants by Lobanov methods [9]. For overlap, Spectral Overlap Assessment Metric (SOAM) measurements were obtained using Wassink's VOIS3D [10].

The following PFC words were analysed:

/e/~/ɛ/ aspect, baignoire, beauté, bouleverser, bêtement, cinquième, des genêts, des jeunets, dégeler, déjeuner, épais, épais, épier, épée, étrier, étriller ex-femme, ex-mari, explosion, extraordinaire, fêtard, fête, fêter, infect, liège, lierre, miette, millionnaire, mouette, muette, médecin, niais, nier, nièce, piquais, piquer, piquet, piqué, pécheur, pêcheur, quatrième, relier, rhinocéros, scier, trouer

/o/~/ɔ/ agneau, beauté, botté, explosion, extraordinaire, gnôle, millionnaire, paume, pomme, rauque, rhinocéros, roc, socialisme

/ø/~/œ/ creuse, creux, des jeunets, déjeuner, feutre, jeune, jeûne, meurtre, peuple, pécheur, pêcheur

/ɛ̃/ brin, cinquième, infect, influence, intact, médecin,

/ɔ̃/ compagne, compagnie, blond, explosion, million,

/ɑ̃/ bêtement, blanc, influence, vous prendriez

/œ̃/ brun

3. RESULTS

As can be seen in Figure 1, participants tend to reduce vowel spaces for the /o/- /ɔ/ pairs while maintaining differentiation for the anterior /e/~/ɛ/ pairs, with the latter sound having a larger variation space. As for /ø/~/œ/, the two vowels tend to be similar in terms of formants, with /œ/ having more variation in height realization. The only significant difference found for formants and vowel pair was for F1 in the /e/~/ɛ/ pair ($\chi 2$ = 473.06, df = 344, p-value = 4.56e-06)

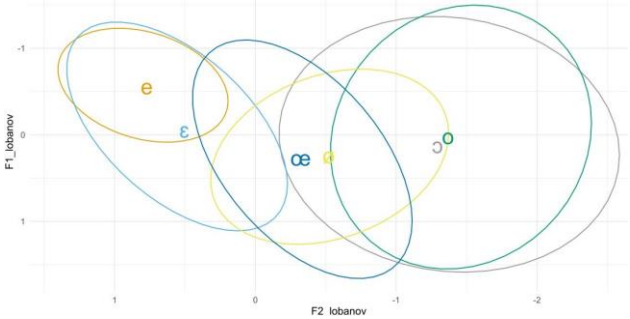

Figure 1: Lobanov-transformed oral mid-vowel space for all participants

Individual differences can be noted in Figure 2, particularly for /e/~/ɛ/ and /ø/~/œ/. Some participants distinguish between these pairs, whereas others tend to merge them. While varying slightly in degree, participants do not strongly distinguish between the open and closed O. No significant differences were found per individual.

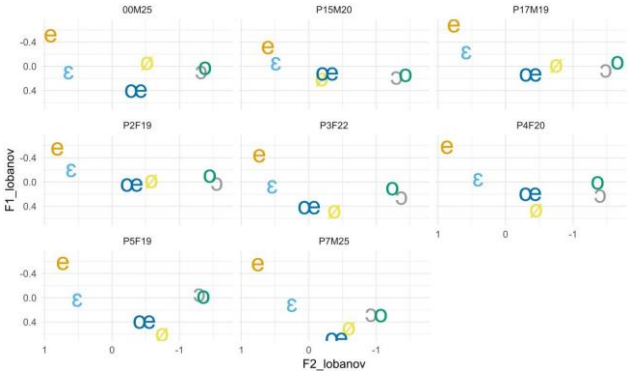

Figure 2: Lobanov-transformed oral mid-vowel plots per participant

In fact, looking at measures of distance and overlap, we can see that for /o/~/ɔ/, Euclidean distances are relatively close and SOAM measures indicate a near overlap of vowel space. On the other hand, for /e/~/ɛ/, Euclidean distances and SOAM measures show a more distinct vowel space for many of the participants, such as 00M25 and P3F22. Participants P7M25 and P4F20, however, have the vowels that share vowel space. The same can be said for /ø/~/œ/, where some participants pronounce these vowels similarly (P7M25 & P4F20) whereas others maintain a difference (00M25 & P17M19).

Vowel pair	Participant	Euclidean distance	SOAM score
/o/- /ɔ/	00M25	24.18	.850
	P2F19	56.86	.974
	P3F22	65.03	.973
	P4F20	42.87	.926
	P5F19	29.33	.820
	P7M25	50.19	.911
	P15M20	50.05	.870
	P17M19	76.93	.837
/e/~/ɛ/	00M25	139.96	.417
	P2F19	137.81	.690
	P3F22	137.21	.641
	P4F20	262.09	.742
	P5F19	156.84	.897
	P7M25	203.87	1.00
	P15M20	53.48	.970
	P17M19	106.73	.671
/ø/~/œ/	00M25	94.27	.532
	P2F19	150.55	.692
	P3F22	161.24	.911
	P4F20	69.03	.912
	P5F19	137.46	.932
	P7M25	70.12	1.00

	P15M20	32.08	.862
	P17M19	168.57	.362

Table 1: Euclidean distances and SOAM scores per participant and vowel pair

Figure 3 offers a visualization of SOAM scores to demonstrate the variation in overlap among the three vowel pairs and among speakers. As can be seen the greatest difference for /e/~/ɛ/ is seen with 00M25 and for /ø/~/œ/, P17M19 distinguishes them the most. P7M25 tends to merge all three vowel pairs.

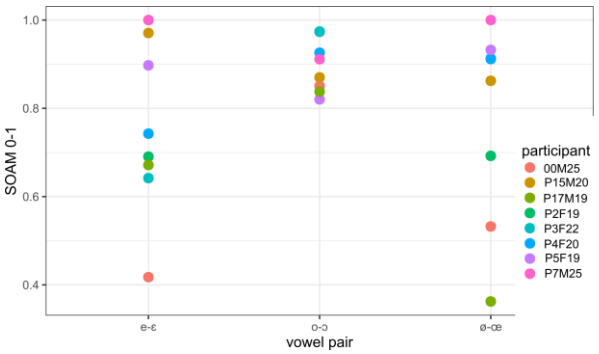

Figure 3: SOAM scores by vowel pair and participant

As for the nasal vowels Figure 4 illustrates the overall averages. As can be seen, there is much overlap in the vowel spaces as well as a nesting tendency, in which /œ̃/ production occurs within the vowel spaces of the other three nasals. /ɔ̃/ has the most variation in its elliptic space, occurring in posterior, anterior, open, and closed positions.

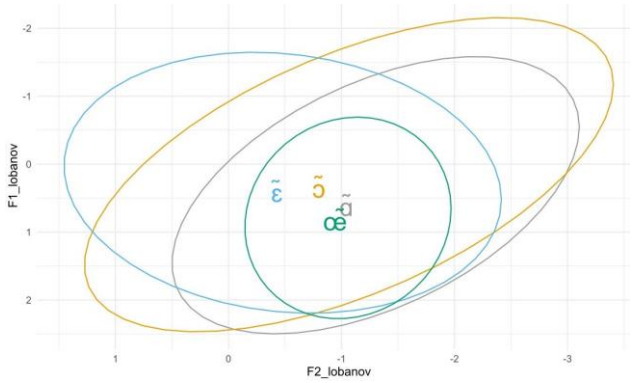

Figure 4: Lobanov-transformed nasal vowel plots averages

As for individual differences, Figure 5 shows variation among the eight speakers. For example, P2F19, P3F22 and P4F20 (middle row) have distributions that are close, dispersed, and overlapping, respectively. Curiously, some participants have an /ɔ̃/ that is anterior and/or open. The same can be said of the height of some participants' /ɑ̃/, which are closed rather than open.

Figure 5: Lobanov-transformed nasal vowel plots per participant

4. DISCUSSION

Looking at the overall group and individual differences concerning the three mid-vowel pairs /e/~/ɛ/, /ø/~/œ/, and /o/~/ɔ/, it is apparent that this latter vowel pair is merging for the speakers, such that little to no distinction is made between the two. The same can be said for /ø/~/œ/, except that variation among speakers reveals that some merge the sounds more than others. /e/~/ɛ/ appear to mostly maintain distinction in open and closed syllables per 'loi de position.' Given Mayotte's unique linguistic landscape, it is difficult to directly compare these results with other French speaking regions, including in the Indian Ocean, such as the fact that there are no Creoles on the island, unlike La Réunion Island or the Seychelles Islands. Nevertheless, a recent case study of Mauritius French showed that speakers maintain distinction between the mid-vowels in question according to the 'loi de position' [11]. A case study on the French spoken in Bangui in the Central African Republic, although it is noted that other speakers tend to not make a distinction between the open-mid and closed-mid vowels [12]. As for the nasal vowels, it appears that speakers vary in their pronunciation of them, with some nearly completely merging the four. It cannot be clearly stated that Maore French has three or four nasals, as is the case of La Réunion Island and Guadeloupe Island, respectively [13].

Considering that participants read from a list, it is assumed that the controlled environment would have elicited careful, enunciated speech from speakers. That is, the vowel spaces would be as large as possible. Given this assumption, it appears that some vowels in question are not distinguished for speakers and that the 'loi de position' is not always adhered to. Much is yet needed to understand this phenomenon, including a look at less controlled speech, speakers with other demographic profiles, as well as the other vowels in the French language inventory.

5. REFERENCES

[1] Detey, S., Durand, J., Laks, B., Lyche, C. (eds). 2016. *Varieties of spoken French*. Oxford University Press.

[2] Jamet, R. 2016. *Dictionnaire kibushi-français. Dzoumogné*. Mayotte: Association SHIME.

[3] Insee. 2007. Mayotte : les langues en 2007. https://www.insee.fr/fr/statistiques/2569783#consulter

[4] Insee Mayotte Infos. 2014. Les difficultés face à l'écrit en langue française. Quatre jeunes sur dix en grande difficulté à l'écrit à Mayotte. *Population* 70, 1-6.

[5] Detey, S., Racine, I., Kawaguchi, Y. Eychenne, J. (eds) 2016. La pronunciation du français dans le monde. Du natif à l'apprenant. CLE International.

[6] Scherrer, Y., Boula de Mareüil, P., Jean-Philippe Goldman, J.P. 2015. Crowdsourced mapping of pronunciation variants in European French *Proc. 18th ICPhS* Glasgow, 1-5.

[7] R Core Team. 2017. R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. https://www.R-project.org/

[8] McCloy, D. R. 2016. phonR: tools for phoneticians and phonologists. R package version 1.0-7.

[9] Norm, the Vowel Normalization and Plotting Suite http://lingtools.uoregon.edu/norm/norm1_help.php

[10] Wassink, A. B. 2006. A geometric representation of spectral and temporal vowel features: Quantification of vowel overlap in three varieties, *Journal of the Acoustical Society of America*, 119(4), pp 2334-2350.

[11] Ledegen, G., Lyche, C. 2016. French in Mauritius. A speaker from Quatre-Bornes. In S. Detey, J. Durand, B. Laks, C. Lyche. (eds). 2016. *Varieties of spoken French*. Oxford University Press, 256-267.

[12] Bordal Steien, G., Boutin, A. B., Beyom, R. 2016. French in the Central African Republic. A speaker from Bangui. In S. Detey, J. Durand, B. Laks, C. Lyche. (eds). 2016. *Varieties of spoken French*. Oxford University Press, 236-246.

[13] Pustka, E., Ledegen, G. 2016. Le français dans les DROM. In S. Detey, I. Racine, Y. Kawaguchi & J. Eychenne (eds), *La pronunciation du français dans le monde. Du natif à l'apprenant*. CLE International, 69-72.