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## PRE-PAUSAL DEVOICING AND GLOTTALISATION IN VARIETIES OF THE SOUTH-WESTERN ARABIAN PENINSULA

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### ABSTRACT\*

A wide range of modern Arabic dialects exhibit devoicing in pre-pausal (utterance-final) position. These include Cairene [20], Gulf Arabic, San'ani [8], [18], Manaxah [19], Central Highland Yemeni dialects [1], Rijal Alma' (Asiri p.c.), Central Sudanese (Dickins p.c.), Çukurova [15], Kinderib [9], E. Fayyum [2]. In some dialects, pausal devoicing is reported to be accompanied by aspiration (e.g. Cairene, [19]), in others by glottalisation (e.g. Fayyum, [2]; Manaxah, [18]; San'ani, [8], [18]).

As preliminary work to a study of pausal phenomena in the south-western Arabian Peninsula, we examine data from two Arabic dialects – San'ani (SA), spoken in the Old City of San'a, Yemen, and the Asiri dialect of Rijal Alma' (RA) – and from Mehriyöt, an eastern dialect of the modern south Arabian language, Mehri, spoken in Yemen. We begin by presenting a summary of pausal phenomena in SA. We then consider the behaviour of final oral stops – velar, coronal and labial – final coronal fricatives, final nasals and liquids, and final vowels. Initial comparison with data from RA and Mehriyöt indicates that utterance-final devoicing is more advanced in SA than in the other varieties, and involves a greater range of segment types.

The first set of pausal examples were extracted from Watson's recordings of spontaneous SA monologues on the Semitic Spracharchiv. The main speaker is a young semi-educated woman.<sup>1</sup> Those forms which exist as lexemes in RA, plus lexemes involving similar pre-pausal segments in comparable syllable types, were recorded utterance-finally by Yahya Asiri, a native speaker of RA. Pausal forms for Mehriyöt were extracted from the late Alexander Sima's recordings of spontaneous speech on the Semitic sound archive [16]. The Mehriyöt speaker is a low- to semi-educated early middle-aged man. Data were analysed using the phonetic analysis programme PRAAT ([www.praat.org](http://www.praat.org)).

**Keywords:** Pause, final devoicing, glottalisation, aspiration, ejectives

### 1. INTRODUCTION

Devoicing of final obstruents has occurred many times independently throughout linguistic history, resulting in similar patterns across unrelated languages. Ohala [13] and Blevins [3], [4] suggest that natural physiological and psychological forces lead to this common devoicing pattern: it is both difficult for speakers to maintain modal voice in obstruents, and a challenge for listeners to perceive a voicing distinction in pre-pausal position, where stops are often not released. Thus, both the nature of the final sound and its prosodic position mitigate against voicing.

All other things being equal, aerodynamic voicing constraints state that devoicing of obstruents is more likely in dorsals than in coronals, and more likely in coronals than in labials due to the differing oral cavity air volumes. All other things being equal, the probability of devoicing of obstruents increases with the length of the segment [14], [4].

Final devoicing has different manifestations across the world's languages: it may involve lenition – loss of a marked feature ([voice]), as in Dutch and Polish [7]; it may, on the other hand, involve fortition – addition of a marked feature – either [spread glottis], resulting in aspiration, as in German, or [constricted glottis], resulting in glottal closure or glottal constriction, as in Standard Thai [6], SA [12], [18] and Mehri [17].

Neutralisation processes are predicted to involve lenition – the loss rather than gain of a marked feature – thus devoicing through loss of [voice] is likely to be more common than devoicing involving addition of either [spread] or [constricted]; the synchronic motivation for final fortition, however, lies in the marking of phrase boundaries, which may be generalised to word and syllable boundaries [3], [4], [11]. Thus the demarcative function of signalling the prosodic edge – in this case, utterance-finality – gives final fortition further force and enhances the likelihood of its occurrence.

All three varieties examined here are marked by pre-pausal devoicing of obstruents with concomitant or pre-glottal closure. The data

suggest that final fortition is a gradient phenomenon, where the relative timing of glottal and oral closures varies according to the language variety, and the pre-pausal syllable and segment types.

## 2. PAUSAL FEATURES IN SAN'ANI

1. Post-vocalic glottal closure in environments [-VV]/-VVC]/-VVS]. In the case of -VC], glottal closure follows or coincides with oral closure. In the case of -VS], the sonorant is often audible and spectrographically visible.

2. Glottalic release of oral stops (/g,k/ > /d,t/ > /b/). /b/ pre-glottalised, but may be released with some aspiration.

4. Non-realisation of nasals (/n/ > /m/) in -VCS].

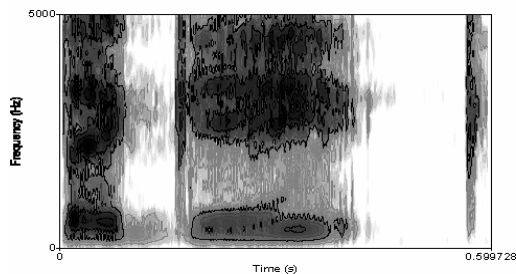
5. Pre-glottalisation, and devoicing or non-realisation of final sonorant consonants in environment -VVS]; relative probability of non-realisation among sonorants is /n/ > /m/ > /l/ > /r/.

6. Significant lengthening of pre-pausal vowels, fricatives and affricates (c. 200% length of non-pre-pausal counterparts).

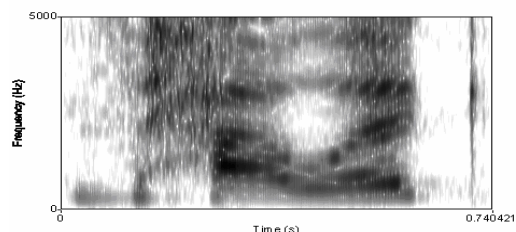
7. Weakening in intensity in lower frequencies of final fricatives.

### 2.1. Final obstruents

#### 2.1.1. Velar stops

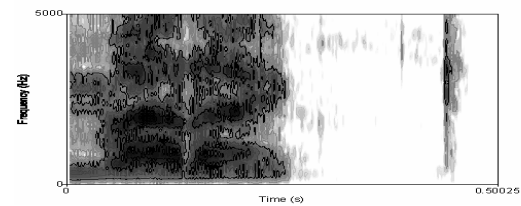


dagi:g 'flour'. Final 195 msec 100% unvoiced frames. Glottalised closure precedes oral closure (incomplete velar pinch). Closure period 153 msec. Glottalic release of final /g/ = [k'].



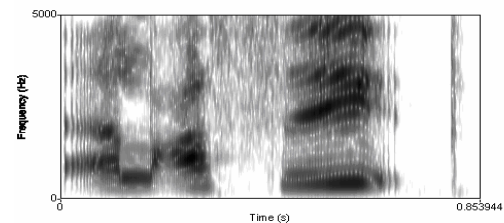
zaħa:wug '[spicy dip]'. Final 100 msec 100% unvoiced frames. Oral closure coincides with

glottal closure (incomplete velar pinch). Closure period 86 msec. Glottalic release of /g/ = [k'].

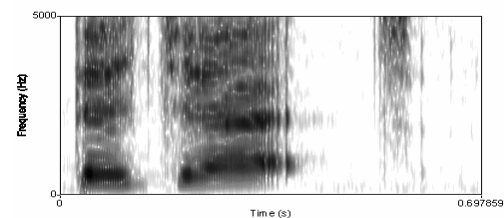


marag 'broth'. Complete oral closure prior to glottal closure (complete velar pinch). Glottalic release of /g/ = [k']. Significantly longer closure period than for *zaħa:wug*– 173 msec.

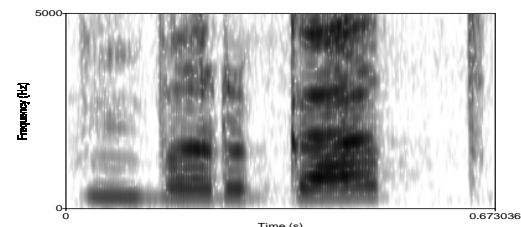
#### 2.1.2. Coronal stops



'al-ħas'i:d 'porridge'. Glottal closure precedes oral closure. Closure period 110 msec. Final 154 msec 100% unvoiced frames. Glottalic release of /d/ = [t'] (cp. 4.1).

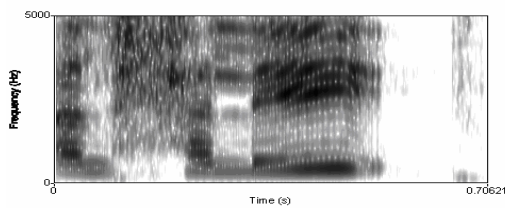


daħa:ğ 'chicken'. Final 305 msec 100% unvoiced frames. Glottal closure precedes oral closure. Significant lengthening of final affricate (81 v. 34 msec) and glottalic release (cp. 3.1).



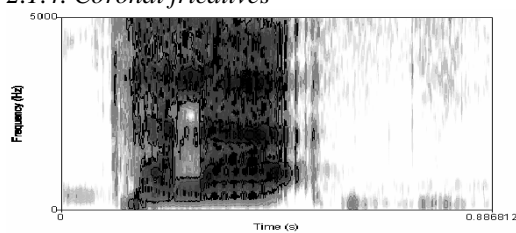
mubargat<sup>ʕ</sup> 'lumpy'. Glottal closure slightly precedes oral closure – absence of glottalised striations, but no audible trace of /t<sup>ʕ</sup>/ before final release. Closure period of c. 120 msec. Glottalic release of /t<sup>ʕ</sup>/ = [t<sup>ʕ</sup>].

### 2.1.3. Labial stops

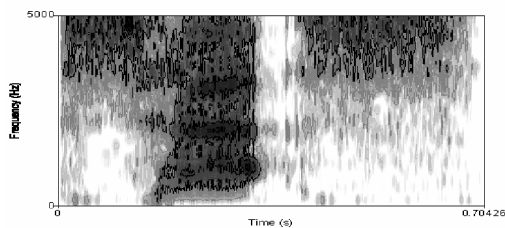


al-hali:b ‘the milk’. Final 164 msec 100% unvoiced frames. Closure period c. 100 msec. Glottal closure precedes oral closure; /b/ released with some aspiration = [ʔ<sup>h</sup>].

### 2.1.4. Coronal fricatives



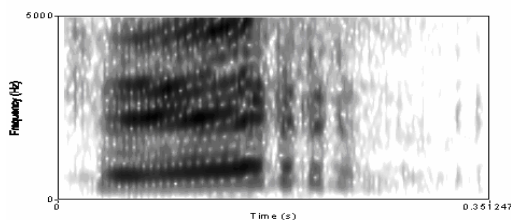
θala:θ ‘three’. Final 388 msec 100% unvoiced frames. Complete glottal closure before pre-pausal fricative. Significant lengthening and drop in intensity in lower frequencies of final fricative.



bi-ša:š ‘with a cloth’. Glottal closure precedes oral closure. Final 333 msec 100% unvoiced frames. Final fricative over twice length of initial fricative (305 msec v. 146 msec).

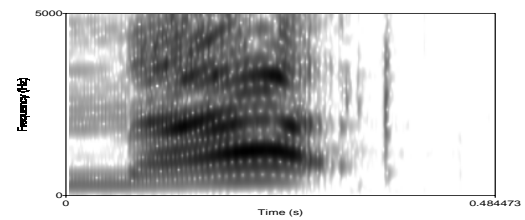
## 2.2. Final sonorants

### 2.2.1. Final sonorants in environment -VCS]

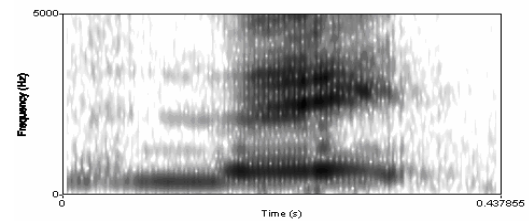


firn ‘oven’. Complete lack of visibility of final /n/. /r/ realised as trill with 4 taps, possibly to compensate for loss of /n/. Final 94 msec 100% unvoiced frames.

### 2.2.2. Final sonorants in environment -VVS]

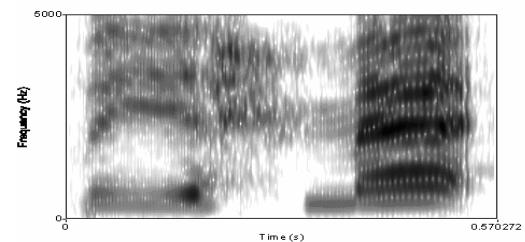


na:r ‘fire’. Glottal closure precedes oral closure. Closure period 85 msec. /r/ realised with total lack of voice.

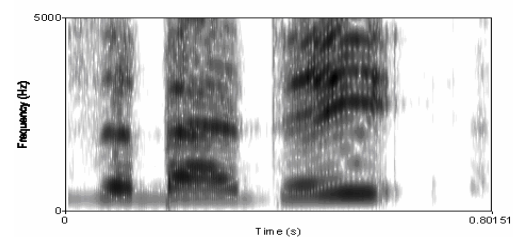


iθnayn ‘two’. Glottal closure following diphthong. Complete lack of visibility of final /n/ (cp. 3.2).

## 2.3. Final vowels



bi-yihma: ‘it m. heats up’. Pre-pausal glottal closure. Complete voicing until 557 msec when voice decays to 80% unvoiced frames. Final 33 msec 100% unvoiced frames.

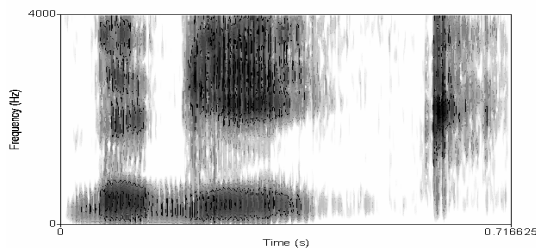


zaba:di ‘yoghurt’. Pre-pausal glottal closure. Final long vowel almost twice the length of the penultimate long vowel (227 msec v. 134 msec).

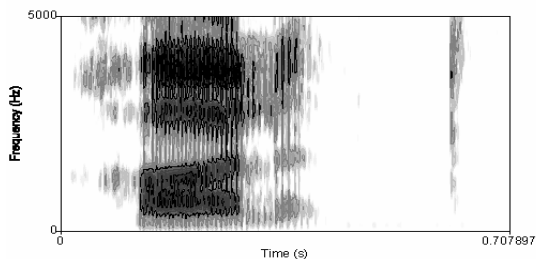
### 3. PAUSAL FEATURES IN RIJAL ALMA ‘

1. Devoicing of utterance-final obstruents.
2. In contrast to SA and Mehriyöt, complete absence of glottalised striations irrespective of final syllable type.
3. Glottalic release of utterance-final oral stops in both -VC] and -VVC] environments.
4. Significant lengthening of all segment types in utterance-final position (> 300% length of non-pre-pausal counterparts).
5. Partial devoicing of utterance-final nasals and the lateral in environment -VVS].
6. Non-release of final nasals and the lateral.

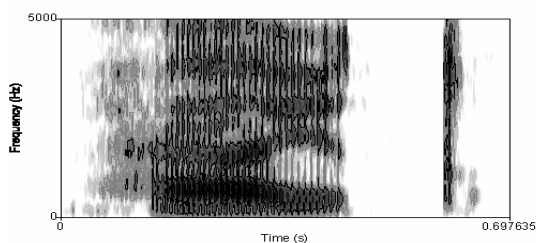
#### 3.1. Final obstruents



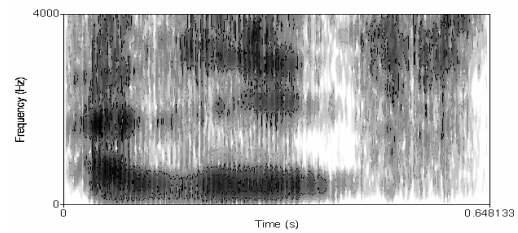
dagi:g ‘flour’. No glottalised striations. Oral closure precedes glottal closure. Glottalic release of final /g/ = [k’] (cp. 2.1.1).



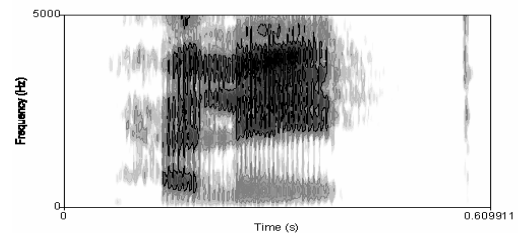
xa:lid ‘Khalid’ [personal name]. Closure period 212 msec. Oral closure precedes glottal closure – absence of glottalised striations. /d/ fully devoiced and released on glottalic airstream (cp. 2.1.2).



ha:yitʿ ‘wall’. Closure period 145 msec. Oral closure slightly precedes glottal closure. /tʿ/ released on glottalic airstream = [t’] (cp. 2.1.2).

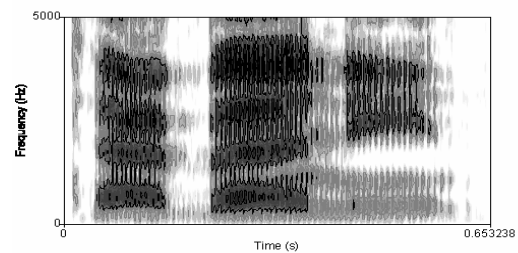


ʕazi:z ‘dear’. Some creaky phonation before contact for final /z/. Complete lack of voice in pre-pausal fricative. Pre-pausal /z/ over three times length of intervocalic /z/ (cp. 2.1.4).

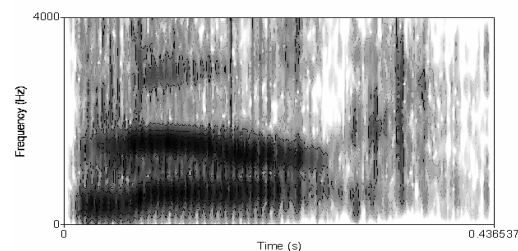


hali:b ‘milk’. Closure period 174 msec. Oral closure precedes glottal closure. /b/ fully devoiced with weak glottalic release. (cp. 2.1.3)

#### 3.2. Final sonorants



taʕba:ni:n ‘tired m.pl.’ Lengthening of pre-pausal /n/ with gradual decay in voicing. In contrast to SA, /n/ weakly visible and audible, though unreleased (cp. 2.2.2).



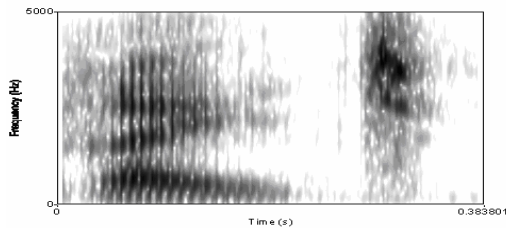
na:r ‘fire’. Some creaky phonation before closure for /r/. /r/ realised as fully devoiced trill with 5 taps (cp. 2.2.1).



#### 4. PAUSAL FEATURES IN MEHRIYŌT

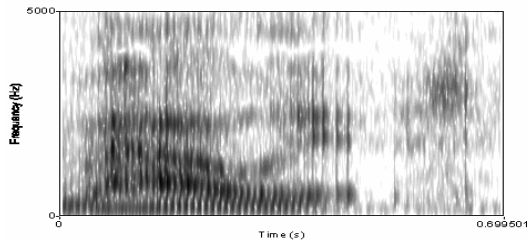
1. Devoicing of utterance-final obstruents.
2. Pre-pausal glottal closure following a long vowel in the environments -VV]/-VVC]/-VVS].
3. Glottalic release of pre-glottalised obstruents neutralising phonological distinction between ejectives and non-ejective obstruents.
4. Utterance-final sonorants pre-glottalised, but released with partial voicing.

##### 4.1. Final obstruents



gayğ ‘man’. Glottal closure precedes oral closure. Pre-closure creaky phonation. Closure period c. 50 msec. /ğ/ maintains some voicing (88.8% unvoiced frames from beginning of frication to end of spectrogram) (cp. 2.1.2).

##### 4.2. Final sonorants



bi-ħa:we:l ‘firstly’. Glottal closure precedes /l/ for period of 87 msec. Pre-closure creaky phonation. /l/ realised partially with voice (final 82 msec = 75% unvoiced frames) (cp. 2.2.2).

#### 5. CONCLUSION

An initial investigation of pausal phenomena in three south-west Arabian peninsula varieties has shown gradient differences both in utterance-final devoicing and in utterance-final fortition. In all varieties, final obstruents are devoiced and, at least in final -VVC] syllables, stops are released on a glottalic airstream; in contrast to SA, nasal and lateral sonorants are only partially devoiced in RA and Mehriyōt, however, and neither pre-glottalised nor released in RA. This finding supports the implicational relationship that ‘if a

language has any laryngealized sonorants it has glottalic or laryngealized stops. 19/20 95%’ [10]. A second significant difference between the language varieties is the length and relative timing of glottal and oral closures; while all language varieties exhibit degrees of utterance-final glottalisation for at least some segment types, SA shows both earlier and longer glottal closure for all segment types. Thus, our initial findings suggest that of the three varieties, SA represents the most advanced stage of final devoicing and fortition.

In SA, analysis shows no significant difference in length of the pre-consonantal vowel or of the glottal closure before final voiced as opposed to final voiceless phonemes, indicating neutralization of voice in pre-pausal position;<sup>2</sup> nasals are not spectrographically visible in the environment -VCN]; following a long vowel, nasals and the lateral are barely visible or not visible suggesting overlapping glottal and oral gestures; in this environment, the tap is pre-glottalised and fully devoiced but visible; final long vowels are post-glottalised; all final obstruents are glottalised, however glottalised striations are significantly clearer in final syllables with long vowels/diphthongs than in those with short vowels, and the period of closure is generally shorter in -VC] syllables than -VVC] syllables (however, cf. *marag* ‘broth’ (2.1.1)). The glottalisation of final sonorants appears to be dependent on stress, with sonorants in final -VS] syllables in unstressed words more likely to be audible, voiced and non-glottalised. For SA, more work needs to be done on words ending in -VS] to see the role played by sentence and word stress in pre-pausal glottalisation of sonorants – impressionistically sonorants in short final syllables are realised, but involve a degree of glottalisation in stressed or post-stressed syllables such as: *byinzil* ‘it m. goes down’ and *laykin* ‘but’.

In RA, pre-pausal voiced obstruents are realised without voice in all syllable types. Oral stops are not pre-glottalised, but are released on a glottalic airstream, suggesting late glottal closure. Final nasal and lateral sonorants are realised, though unreleased, significantly lengthened and subject to partial devoicing following long vowels.

In Mehriyōt, pre-pausal obstruents are realised mainly without voice. Pre-pausal glottal closure occurs both after long vowels and where a

pre-pausal consonant follows a long vowel. Oral release precedes glottal release in final obstruents, which are commonly realised as voiceless ejectives [17]; in contrast to SA, glottal and oral closures do not overlap in pre-pausal sonorants, which, though pre-glottalised, maintain some voicing.

## 6. REFERENCES

- [1] Behnstedt, P. 1985. *Die nordjemenitischen Dialekte. Teil I. Atlas*. Wiesbaden: Dr Ludwig Reichert.
- [2] Behnstedt, P. & M. Woidich 2005. *Arabische Dialektgeographie*. Wiesbaden: Harrassowitz.
- [3] Blevins, J. 2004. *Evolutionary Phonology*. Cambridge: CUP
- [4] Blevins, J. 2006. A theoretical synopsis of Evolutionary Phonology. *Theoretical Linguistics* 32: 117–166.
- [5] Foulkes, P. & G. Docherty 2006. The social life of phonetics and phonology. *Journal of Phonetics* 34: 409–438.
- [6] Henderson, E.J.A. 1964. Marginalia in Siamese phonetic studies. In D. Abercrombie, D.B. Fry, P.A.D. MacCarthy, N.C. Scott & J.L.M. Trim (eds.), *In Honour of David Jones*. Longmans, Green & Co: London. 415–424.
- [7] Iverson, G.K. & J.C. Salmons 2006. On the typology of final laryngeal neutralization: Evolutionary Phonology and Laryngeal Realism. *Theoretical Linguistics* 32: 205–216.
- [8] Jastrow, O. 1984. Zur Phonologie und Phonetik des San'anischen. In H. Kopp & G. Schweizer (eds.), *Entwicklungsprozesse in der Arabischen Republik Jemen*. Wiesbaden: Dr Ludwig Reichert, 289–304.
- [9] Jastrow, O. 2003. *Arabische Texte aus Kinderib*. Wiesbaden: Harrassowitz.
- [10] Maddieson, I. 1984. *Patterns of Sounds*. Cambridge: Cambridge University Press.
- [11] Michaud, A. 2004. Final consonants and glottalization: New perspectives from Hanoi Vietnamese. *Phonetica* 61: 119–146.
- [12] Na'im-Sanbar, S. 1994. Contribution a l'étude de l'accent yemenite: Le parler des femmes de l'ancienne generation. *ZAL* 27 : 67-89.
- [13] Ohala, J.J. 1983. The phonetics of sound change. In C. Jones (ed.), *Historical Linguistics: Problems and Perspectives*. London: Longman. 237–278.
- [14] Ohala, J.J. 1997. Aerodynamics of phonology. *Proceedings of the Seoul International Conference on Linguistics*. Seoul: Linguistic Society of Korea, 92–97.
- [15] Prochazka, S. 2002. *Die arabischen Dialekte der Çukurova (Südtürkei)*. Wiesbaden: Harrassowitz.
- [16] <http://semitistik.uni-hd.de/askari/index.htm>
- [17] Simeone-Senelle, M-Cl. 1997. Modern South Arabian. In R. Hetzron (ed.), *The Semitic Languages*. London: Routledge, 378–423.
- [17] Watson, J.C.E. 2002. *The Phonology and Morphology of Arabic*. Oxford: OUP.
- [19] Werbeck, W. 2001. *Laut- und Formenlehre des nordjemenitische-arabischen Dialekts von Manaḥa*. Arabica Rhema.
- [20] Woidich, M. 2006. *Das Kairenische. Eine Grammatik*. Wiesbaden: Harrassowitz.

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\* Thanks are due to Barry Heselwood for assistance with the acoustic analysis.

<sup>1</sup> A study of sociophonetic variation [5] is planned for future research: male and female speakers of all ages exhibit pausal glottalisation in SA; however, impressionistically, glottal closure in men's speech is reached more gradually and appears to involve laryngealised or creaky phonation.

<sup>2</sup> [Voice] is neutralised in geminates in SA – oral geminate stops are devoiced [18]. In RA, by contrast fully voiced oral geminates occur, further suggesting that SA represents a more advanced stage of final devoicing.