

Fronting of /u/ in Iranian Sistani

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Abstract

The subject of this study is fronting of the back rounded vowel /u/ in the Iranian Sistani dialect. A close rounded vowel with central-to-front pronunciation is described by Grjunberg (1963) for the Sistani spoken in Turkmenistan. Field studies show that there is also a central vowel [ɯ] in the Iranian dialect of Sistani. This article describes the pronunciation [ɯ] as a general fronting of *u* > *ɯ*, which is the main realization of this phoneme in Iranian Sistani, and a further fronting of *ɯ* to [ʏ] as an allophonic variant in contact with coronal consonants. Among educated speakers living in urban areas however, there is occasionally a pronunciation close to [u] under the influence of Persian. Vowel harmony is another phenomenon that can be observed in the dialect under investigation. It will briefly be described insofar as it is relevant for the vowels under discussion.¹

1. Introduction

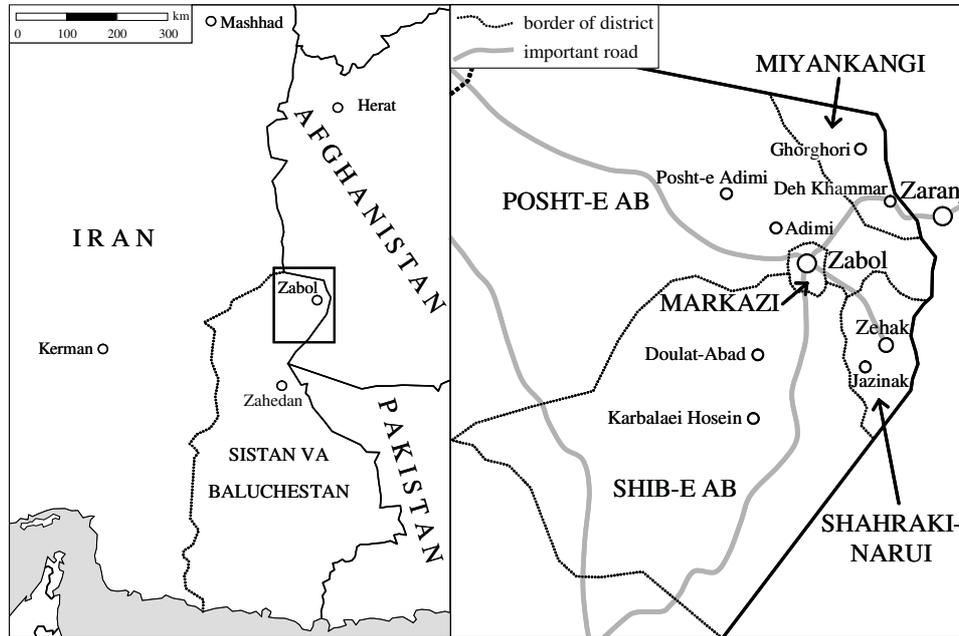
Sistani is spoken in the Sistan region of Afghanistan, in the south of Turkmenistan, and in the southeast of the Islamic Republic of Iran. Nowadays there are also many Sistani speakers living in the Golestan province of Iran. The Iranian Sistani dialect is spoken by 90% of a total of about 350,000 inhabitants in the Sistan region of the province of Sistan and Baluchestan.²

Although Iranian Sistani is spoken with very slight dialect variations in the different parts of Iranian Sistan (so minor that they can be ignored in this study), the data for this investigation were gathered from all five districts in order to obtain more certain and accurate results.

This paper is concerned with the analysis of fronting of *u* in Iranian Sistani. Field studies suggest the absence of a back vowel [u] in the vowel series of this dialect, and the presence of the central vowel [ɯ] instead. Furthermore, it seems that *ɯ* has moved towards a front vowel [ʏ] in certain environments, namely in contact with dental, alveolar, and post-alveolar consonants [+coronal]. The fronting in Iranian Sistani thus involves both a general fronting of *u* to *ɯ*, which is the main realization of this phoneme, and also a further fronting to [ʏ] in certain environments (allophonic variation). However, the argument in the article is on a phonetic rather than on a phonological level, and there will be no attempt at describing the full vowel inventory of Sistani in this article.

¹ We would like to thank the phoneticians Dr. Pétur Helgason, Uppsala University, and Gunilla Andersson, SIL International, for their cooperation during and after the Phonetic Workshop in Uppsala, 13-16 August 2007, and to them, as well as to Dr. Anja Geumann, Frankfurt a.M. University, for their comments on drafts of this article. We are also very grateful to our Sistani informants.

² <http://www.sci.org.ir>



Map 1: Iranian Sistan and Places of Interview

One might ask if there is a fronting process involved or if this vowel was a central /ʊ/ originally. However, since Sistani is regarded as a dialect of Persian (WINDFUHR 1989: 248, BEARMAN et al. 2003: 427), which (synchronically as well as historically) has /u/, but no */ʊ/ in its vowel system, it is reasonable to assume that /ʊ/ cannot be original to Sistani. Furthermore, a vowel /u/ has been claimed for Sistani itself (thus GRJUNBERG 1963 on the vowel system of the Sistani dialect spoken in Sarakhs of Turkmenistan, see Section 2). Another argument for *u*-fronting is that this phenomenon is also encountered in some other Iranian languages and dialects (see Section 3).

The data corpus for this investigation was gathered during the summer of 2007 by elicitation and by interviewing 16 speakers (10 males and 6 females) aged between 40 and 102, from the five districts Markazi (in the centre; data from Zabol), Posht-e Ab (in the northwest; data from Adimi and Posht-e Adimi), Shib-e Ab (in the southwest; Karbalaei Hosein, Tutti, Doulat-Abad), Miyankangi (in the northeast; villages of Sadaki, Ghorghori, Takht-e Edalat, Deh Khammar), and Shahraki-Narui (in the southeast; Vaselo, Jazinak) (see Map 1).

During the interview, the informants were asked in guided conversation to produce the relevant sounds. Free conversation and telling life stories were other ways of assembling data. The data were recorded on an MP3 player or directly into the computer.

2. Previous Studies

Several studies of Sistani have been made in different areas of Sistan, e.g. by LAZARD (1974) and WERYHO (1962). AHANGAR (2003) describes the Sakva dialect of Shib-e Ab, DUSTI (2001) the dialect of Posht-e Ab, BARJASTEH DELFOROOZ (1996) the one of the Markazi region, OMRANI (1996, 1999) the variety of the town of Zabol. In none of these works is the fronting of /u/ to a central $\#$ mentioned. Glossaries are another kind of works that indicate pronunciation, but the matter of fronting of /u/ is not evident in the transliteration of the Sistani words in the available glossaries (e.g. PARVAZ 1980, MOHAMMADI KHOMAK 2000, and BAHARI 2004).

In his description of the Sistani spoken in Sarakhs of Turkmenistan, GRJUNBERG (1963) recognizes three *u*-vowels, which he notes as /u/, /ũ/ and /ü/; i.e. he believes that there is also a high rounded vowel that is not articulated at the back of the oral cavity. He describes /u/ as a close back slightly rounded vowel, historically corresponding to both /ū/ and /ō/, e.g. /suz/ “burning”; /ũ/ as a close-mid back slightly rounded vowel, which corresponds to the historical /ū/ (i.e. to the literary modern Persian *o*), e.g. (examples in Grjunberg’s notation) /bũz/ “goat” and /gũl/ “flower”; and /ü/ as a close rounded vowel which has a range of pronunciation between the central and front rows, where the central variant is found after labial plosives and in unstressed positions, e.g. /pül/ “money”, /büd/ “was”, /kü’ča/ “lane”, and a more open variant [Y] realized in other positions, e.g. /tüt/ [tyt] “berry” (GRJUNBERG 1963: 77–78).³

3. Theoretical Aspects of Fronting

Fronting is one of the natural phonological processes that take place in many languages. It can be either a general process, or it can be conditioned both by other vowels and by consonants. One common conditioning factor is the occurrence of front vowels in neighbouring syllables (BURQUEST 2001: 122–124), a kind of vowel harmony. Such vowel assimilation may be either regressive or progressive. “The regressive form can be illustrated by the Germanic *i*-umlaut, which shows a process of fronting. In this process back vowels in general become fronted before a following /i/ or /j/, normally with one or more consonants intervening” (LASS 1988: 171).

Fronting of back vowels has been observed in many languages. For instance, “coronals can condition fronting of vowels. Cantonese, as an example, has a maximal system of vowels contrasting front and back rounded vowels, but back rounded vowels cannot appear between coronal consonants: /tyt/ ‘to take off’ */tut/, /tøn/ ‘a shield’ */ton/. This distributional restriction can be understood as resulting from fronting of vowels between coronals” (FLEMMING 2003: 335). In Slavic languages, fronting of back vowels in contact with palatal consonants has been observed (RUBACH 2005).

In other languages, fronting of a certain vowel occurs as a general process which affects a sound in all its environments without any obvious conditioning factors.

³ Sincere thanks to Dr. Serge Axenov for translating Grjunberg’s description of these vowels into English for us.

Language contact can, of course, contribute to explaining such a general fronting process.

HARRINGTON et al. (2007) investigate /u/-fronting in Southern British English Received Pronunciation (RP). Their studies showed that /u/ has become fronted in the last 50 years in Southern British English RP.

Fronting has been observed for various other Iranian languages as well, such as Mazandarani, Semnani and Sorkhei (LECOQ 1989: 250). For instance, in the Delvari dialect spoken in Delvar, in the Bushehr province of the southwest of Iran, there is evidence of fronting of /u/ to /i/. In KORD ZAFARANLU KAMBUZIA / MAMASANI'S opinion (2006: 88), the change of /u/ to /i/ happens because of the common features which these two vowels share, e.g., [+high], [+tense]. Some examples of this alternation are /puk/ → /pik/ "hollow", /su'zan/ → /si'zan/ "needle", /dur/ → /dir/ "far", /pah'lu/ → /pah'li/ "beside".

This kind of change also exists in other languages and dialects spoken in the south and east of Iran, e.g. in Dashtestani and Liravi, which are neighbouring dialects of Delvari and are very similar to it (AKBARZADE 2002: 27 cited by KORD ZAFARANLU KAMBUZIA / MAMASANI 2006: 88), in Lari,⁴ and in Southern Balochi (ELFENBEIN 1990: X).

ABBASI (2007: 65, 68, 85) investigated vowel change in the dialects spoken in the regions of Birjand, such as Nehbandani, which is located in southern Khorasan, to the north of Sistan. He showed that in Nehbandani /u/ has moved forward towards /i/ and in some places to /e/, e.g. /'nabud/ → /'nabid/ "was not", /'budam/ → /'bidam, 'bedam/ "I was", /pul/ → /pil/ "money", /ga'lu/ → /ga'li/ "throat". He also points out that the V+C combination /ow/ has moved forward and changed to /ej/, e.g. /dow'lat/ → /dej'lat/ "government".

4. Data analysis

4.1 Spectrograms and formants

Spectrograms are "a way of making visible the patterns of energy in the acoustic signal" (*Handbook* 1999: 5). In the spectrum of the sound waves, some parts of the columns are darker than others. The darker areas or bands occur at the frequencies of high energy and are called formants (LAVER 1994: 103, ESTAJI 2006: 151). The shape or colour of a sound is determined by the placement of its formants.

The spectrograms in Fig. 1 show the formants of cardinal vowels (male speaker), indicated by arrows for [i] and [u]. For a male speaker, the lowest possible position for the first formant, F1, is about 150–200 Hz and the highest is about 900–1000 Hz. The lowest possible F2 is about 550–600 Hz and the highest possible F2 is about 2300–2500 Hz. For instance, in a front high vowel such as [i], F1 is low (below 500 Hz) and F2 is high (2500 Hz). In the back high vowel [u], F1 is low and F2 is also low so that F1 and F2 tend to merge into one "fat" formant around 500 Hz. In back rounded vowels, any formants above 1000 Hz (below 5000 Hz) tend to be very weak.

⁴ Field observations by Carina Jahani, March 2009. See also KAMIOKA / YAMADA (1979: xii).

Cardinal vowels 1 through 8

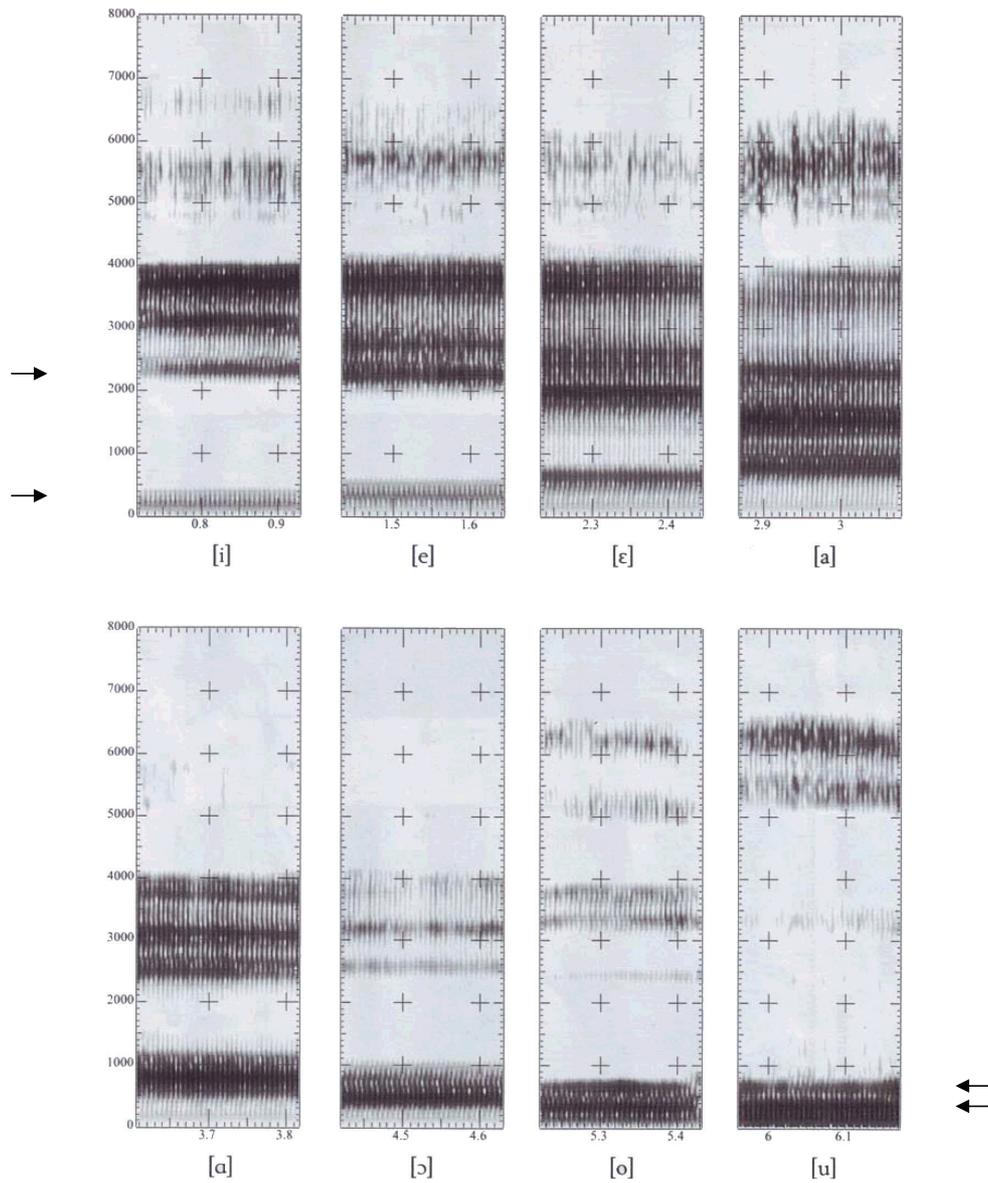


Fig. 1: Spectrograms of cardinal vowels⁵

⁵ Reproduced from a handout for a Phonetics Workshop in Uppsala, 13-16 August, 2007. Sincere thanks to Pétur Helgason for allowing us to publish these spectrograms.

Fig. 2–4 show the spectrograms of [ʊ] and [ɤ] for comparison.⁶

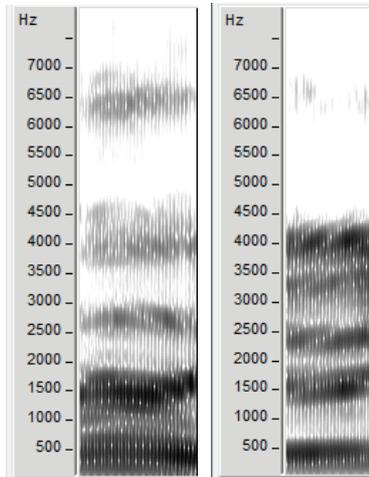


Fig. 2: [ʊ] [ɤ]
(scale of 7000)

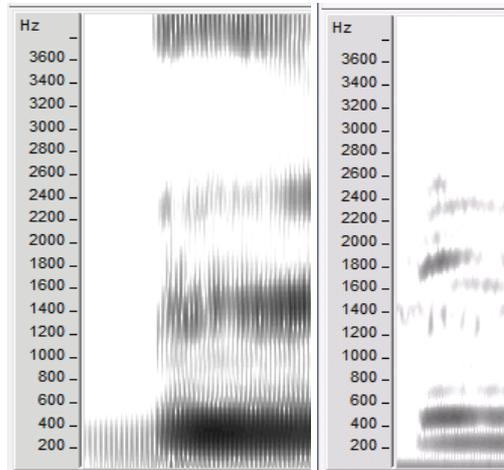


Fig. 3: [ʊ] [ɤ]
(scale of 3600)

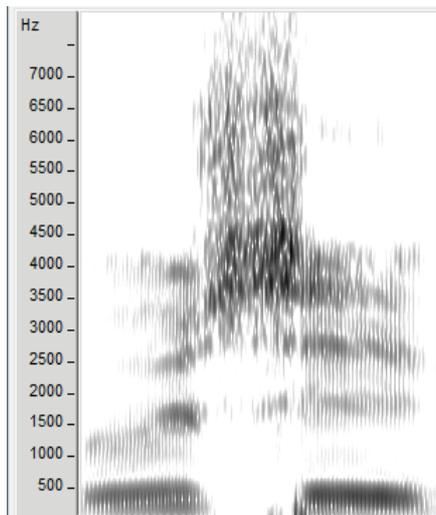


Fig. 4: ʊ:ɤY [ʊ:ɤY] “that direction”

⁶ Fig. 2a and 3b are from female speakers, the others from males. There seems to be no gender related difference in the pronunciation of [ʊ] and [ɤ] in Iranian Sistani. Both scalings of 3600 and 7000 are represented to allow comparison with the sample words in Section 4.3.

4.2 Analysis

First of all, an auditory analysis of the data was carried out. To complement this analysis, an acoustic analysis by means of the software WaveSurfer⁷ was also used, in order to obtain more accurate judgements. This program shows the spectrogram of audio input that is fed into it. By means of these spectrograms the sounds in question can be identified. We have thus carried out both auditory and acoustic analyses of the data.

For the analysis of the sound under investigation, the same words spoken by both male and female informants were analysed, and their spectrograms were tested to see whether the pronunciation of this sound is [ɤ] or [ʏ], or rather [u] or [ʊ]. Some of these spectrograms will be shown in Section 4.3.

As mentioned in Section 4.1, the first and the second formants merge at about 500 Hz in the back rounded vowel /u/. So if /u/ has moved towards the centre in Sistani, i.e. away from the back rounded articulation, the formants should not be in this position. The spectrograms of the analysed words (demonstrated in Section 4.3) show that F1 and F2 are not merged as a fat formant around 500 Hz, but that F2 is higher than 500 Hz. (F2 is even higher when [ɤ] moves further to [ʏ].) The height of the formants in the back vowel [u] obviously implies an absence of energy above 1000 Hz, but since these spectrograms indicate a formant in this area, they indicate the presence of a central vowel [ɤ] rather than a back vowel [u]. This supports the hypothesis that a process of *u*-fronting has happened in Iranian Sistani (OKATI 2008: 70, 133). In fact, the auditory analysis also confirms that the vowel under study is a central vowel *#* in this dialect.

Depending on the phonological environment, *#* undergoes further changes:

- It moves further towards the front and becomes [ʏ] when it is adjacent to, and especially preceded by, coronals, e.g. [ʃʏl] “basket”, [tʰʏjk] (a certain bird), [tʰʏ] “inside”, [dʏzʔzi] “theft”, [lʏlʔlak] “insect”, [rʏnmɑːʔi] “gift”. This can be described as an allophonic variation [ʏ] ~ [ɤ].
- As a result of vowel harmony, the pronunciation of *#* in certain environments is sometimes different from what has just been stated, e.g. [bɤʔrʏ] ~ [bɤʔrɤ] “out”, [kʰɤʔrʏ] ~ [kʰɤʔrɤ] “puppy”. In both examples, although [ʏ] occurs after a coronal, it moves back towards the centre to the same place of articulation as the first vowel in the word. The assimilation is sometimes progressive and sometimes regressive. This process may also cause variants of one and the same word. For instance, in words like /arɤʔsi/ ~ /ariʔsi/ “wedding”, /ʔiːsɤ/ ~ /ʔiːsi/ “this direction”, /biʔrɤ/ ~ /bɤʔrɤ/ “out”, /sɤʔzi/ ~ /sɤʔzɤ/ “needle”, there is a tendency to harmonize the two vowels, but the non-harmonic variant is also heard.⁸
- *#* may be pronounced somewhat towards the back of the mouth (but not as far back as to the positions of [ʊ] or [u]) when it is preceded by velars, especially in an open syllable, in the speech of some younger informants who are educated or live in more

⁷ WaveSurfer is an Open Source program, see <http://www.speech.kth.se/wavesurfer/>.

⁸ Vowel harmony also occurs for vowels other than *#* in Sistani. However, our discussion is limited to describing it where it occurs in connection with the issue of fronting.

urbanized areas. This suggests that the phenomenon should be analysed as a slight backing of $\#$ (towards its original position, if one assumes an underlying phoneme /u/), rather than as an absence of the fronting process.

In all other environments (i.e., except when an additional fronting to [ɣ] occurs, and except for a more general backing by some educated speakers), the pronunciation is [ɰ], e.g., [p^hɰ] “money”, [bɰ'da] “has been”, [mɰf] “mouse”.

Syllable patterns and stress apparently do not play any role for the two phonetic realizations, for both [ɰ] and [ɣ] can occur in different syllabic patterns with or without stress. Table 1 shows $\#$ in different environments and syllable patterns.

Table 1. Sistani $\#$ in various environments and syllable patterns.

example		syllable pattern	conditioning feature
[t ^h ɣ]	“inside”	CV	[+coronal]
[xɰ]	“blood”	CV	[-coronal]
[ʃɣ]	“basket”	CVC	[+coronal]
[dɣzz]	“thief”	CVC	[+coronal]
[xɰk]	“pig”	CVC	[-coronal]
[gɰ]	“fire”	CVC	[-coronal]
[p ^h ɰ]	“to fly”	CVC	[-coronal]
[ɣɰp]	“sound of falling”	CVC	[-coronal]
[p ^h a:ɣ]	“beside”	CV.CV	[+coronal]
[sɣ'zɣ]	“needle”	CV.CV	[+coronal]
[bɰ'ɣ]~[bɰ'rɰ]	“out”	CV.CV	[+coronal]~harmony
[a:dʒ'ɣɰ]	“bishop’s weed”	VC.CV	[-coronal]
[ɰn'dɣ]	“Hindu”	VC.CV	[+coronal], initial position
[ɰ'ɣɰɣ]	“salary”	V.CVC	[-coronal], initial position
[t ^h ɣ]k]	(a kind of bird)	CVCC	[+coronal]
[ɰ]p ^h ɰ]	“whistle”	VC.CVC	[-coronal], initial position
[la:m'p ^h ɰ]	“a ring pierced into the nose of animals”	CVC.CV	[-coronal]
[k ^h ɰ'rɣ]~[k ^h ɰ'rɰ]	“poppy”	CVC.CV	[+coronal]~harmony
[ɣɣ'lak]	“insect”	CVC.CVC	[+coronal]
[rɣnma:i]	“gift”	CVC.CV.V	[+coronal]

4.3 Sample spectrograms

In this section, examples of different words (from male and female informants, and from all five regions of Iranian Sistan) containing [ɰ] and [ɣ] are represented in the form of spectrograms (Fig. 5–15).⁹ All these words show fronting of /u/ (> $\#$), and also the further fronting discussed in Section 4.2.

The duration of the long vowels in comparison with the short ones can be seen in the “time axis”. The formants of short and long forms of a vowel are the same, i.e. the only difference between them is their duration.

⁹ Owing to the different methods of recording employed, some of these are in the scaling of 3600 Hz while others use 7000 Hz. For comparison of the formants, see Fig. 2–3.

Fig. 5–15: Spectrograms of $\#$ and its allophone [y] in some sample words

Fig. 5–12, female speakers

(The part of the lexical item which is not included in the spectrogram is placed in brackets.)

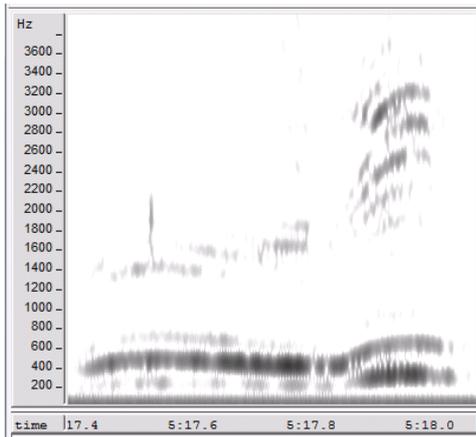


Fig. 5: *bæ:'rʌ* [bæ:'rʌ] “out”

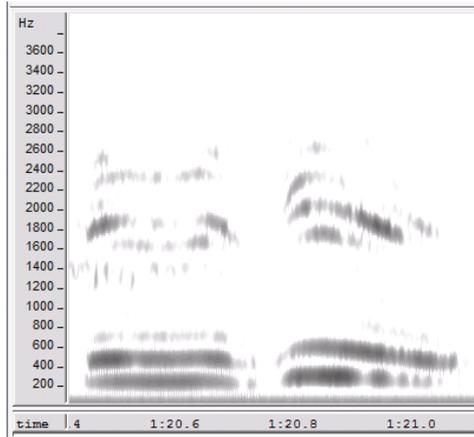


Fig. 6: *sɪ:'zɪ* [sɪ:'zɪ] “needle”

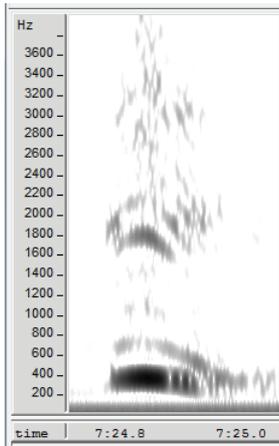


Fig. 7: *dɪz* [dɪz] “thief”

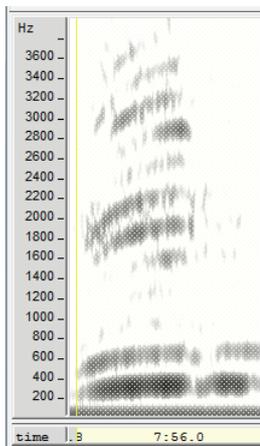


Fig. 8: *zɪl* [zɪl] “wood”

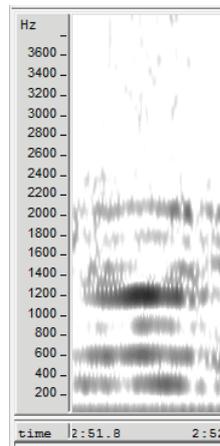


Fig. 9: *dɜː* [dɜː] “far”

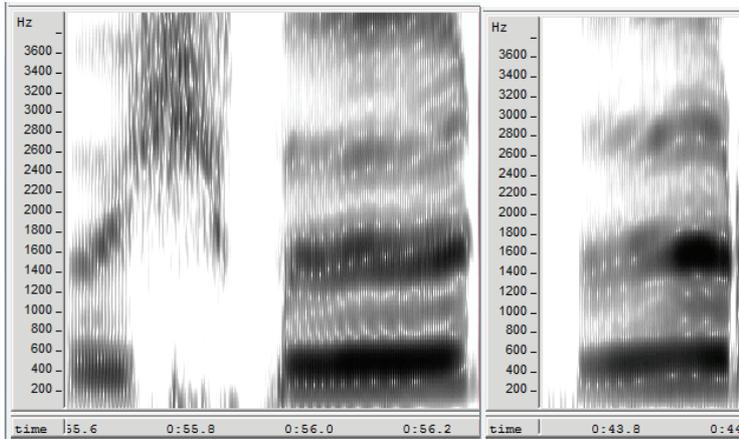


Fig. 10: #/p#l “whistle”

Fig. 11: #r “fairy”

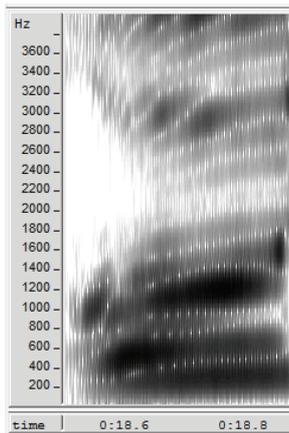
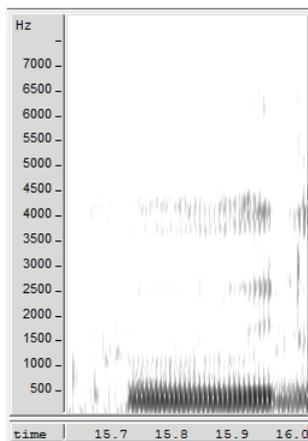
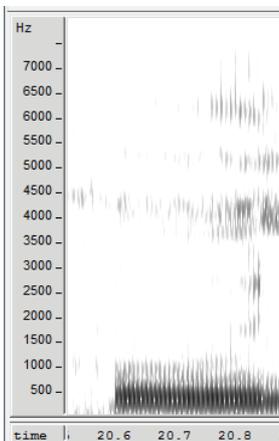
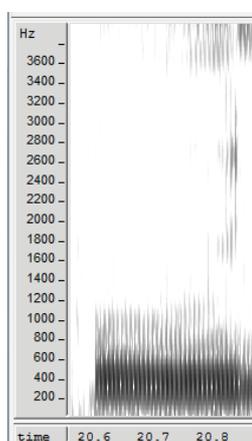


Fig. 12: #u:(t) “food”

Spectrograms of slightly backed

Fig. 13–15, male speakers

The following spectrograms show the pronunciation of # towards the back of the oral cavity that occurs in the speech of some educated people. There is a fat formant almost around 500 Hz and weak formants above 1000 Hz. These features are close to the characteristics of a back [u].

Fig. 13: *kʰ:(la)* “small house”Fig. 14: *xʰ:(ni)* “bloody”Fig. 15: *xʰ:(ni)* “bloody”

5. Conclusion

The auditory pretest and the technical analysis resulted in support for the hypothesis that the position of the vowel under investigation is central in the Iranian Sistani dialect, namely [ʊ]. Comparison with other Iranian languages, and the fact that fronting seems to be a common phenomenon in the area where Sistani is spoken, makes us conclude that we are dealing with fronting of /u/. Due to the lack of sources for the pronunciation of Sistani older than about 50 years, it is, however, impossible to determine when and under what circumstances this fronting took place, and if it is to be seen as a language-internal or a contact-induced phenomenon.

The analysis further shows that different environments can cause further fronting of the central *ʰ*. Coronal consonants, e.g. dentals, alveolars, and post-alveolars, make it move more towards the front of the oral cavity ([ʏ]). The fronted variant [ʏ] is analysed as an allophone of *ʰ*.

A vowel rather near to the close back cardinal vowel [u] is sometimes heard in the pronunciation of younger educated language informants living in towns, a phenomenon that can hardly be attributed to anything but influence from Standard Persian.

Vowel harmony is another phenomenon observed in Sistani. A deeper investigation of vowel harmony would be an interesting subject for a future study.

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