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Journal

Proceedings of the Annual Meeting of the Berkeley Linguistics Society, 37(37)

ISSN

2377-1666

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Publication Date

2013

Peer reviewed

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Proceedings of the 37th Annual Meeting of the Berkeley Linguistics Society: Special Session on Languages of the Caucasus (2013),

pp. 3-17

Editors: Chundra Cathcart, Shinae Kang, and Clare S. Sandy

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A Comparative Phonetic Study of the Circassian Languages¹

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Introduction

This paper presents results of a phonetic study of Circassian languages. Three phonetic properties were targeted for investigation: voice-onset time for stop consonants, spectral properties of the coronal fricatives, and formant values for vowels.

Circassian is a branch of the Northwest Caucasian language family, which also includes Abhaz-Abaza and Ubykh. Circassian is divided into two dialectal subgroups: West Circassian (commonly known as Adyghe), and East Circassian (also known as Kabardian). The West Circassian subgroup includes Temirgoy, Abzekh, Hatkoy, Shapsugh, and Bzhedugh. East Circassian comprises Kabardian and Besleney. The Circassian languages are indigenous to the area between the Caspian and Black Seas but, since the Russian invasion of the Caucasus region in the middle of the 19th century, the majority of Circassians now live in diaspora communities, most prevalently in Turkey but also in smaller outposts throughout the Middle East and the United States.

1 Methodology

Results presented here are drawn from a total of 33 speakers. Of the 33, 26 hailed from Turkey, 4 from the Russian Federation, 1 from Syria, and 2 from Jordan. Nineteen consultants spoke Adyghe (18 from Turkey, 1 from Russia), 13 spoke Kabardian (7 from Turkey, 3 from Russia, 1 from Syria, 2 from Jordan), and 1 (from Turkey) spoke Besleney. The Adyghe speaker from Russia spoke the

¹ Thanks to the audience at the 37th meeting of BLS for feedback on this research. A special thanks to the many Circassian speakers without whose generosity and time this study would have been impossible. The research presented here was funded by an ELDP grant from the Hans Rausing Foundation to the first author and by NSF grant BCS0553771 to the second author.

literary (Temirgoy) variety, while the Adyghe consultants from Turkey self-reported as speaking the following dialects: Abzekh (4 speakers), Hatkoy (7 speakers), Shapsugh (5 speakers), Bzhedugh (2 speakers). Most of the recordings were made in Ankara, Turkey during a series of trips conducted between 2007-2010 with some additional recordings made in Orange County, California and, in the case of one Adyghe speaker, in Leipzig, Germany.

A corpus of 196 words designed to illustrate the principle phonetic contrasts of the targeted languages was elicited from the East Circassian (Kabardian and Besleney) speakers, while a corpus of 256 words was recorded from the West Circassian (Adyghe) speakers. The list included all the phonemic contrasts reconstructed for proto-Circassian (Kuipers 1963, 1975). Each word was repeated twice by each speaker after being prompted with the Turkish equivalent for speakers living in Turkey, the English equivalent for speakers living in Orange county, and Kabardian for the Adyghe speaker from the Adyghe Republic of Russian Federation. Targeted consonants appeared in word-initial, intervocalic and word-final contexts, while vowels appeared in stressed syllables of mono- or di-syllabic words. Data were recorded as .wav files at 44.1 kHz onto a solidstate recorder (either a Marantz PMD660 or an Edirol R09) via a Shure SM10 headworn unidirectional microphone. Digital recordings were transferred to computer in preparation for acoustic analysis using Praat (Boersma & Weenink 2010).

2 Results

2.1 Voice-onset-time (VOT)

Proto-Circassian is reconstructed as having a four way laryngeal contrast in the stop series between voiced, voiceless unaspirated, voiceless aspirated, and ejective (Kuipers 1963, 1975). Most varieties of modern Circassian, including the East Circassian languages Kabardian and Besleney and most varieties of Adyghe have neutralized the contrast between voiceless unaspirated and voiceless aspirated stops while preserving the original ejectives. Most Shapsugh dialects of Adyghe, however, are reported by Kuipers (1963, 1975) and Smeets (1984) to preserve a four-way laryngeal contrast. Most speakers of the Hatkoy dialect of Adyghe recorded by us also appear to maintain the original contrasts.

For the present study, voice-onset-time was measured in two contexts: word-initially and intervocalically. Word-medial exemplars appeared in disyllabic words between stressed /a:/ and unstressed /ə/. Virtually all word-initial tokens appeared in the first (stressed) syllable of disyllabic words before the vowel /a:/, although for certain speakers monosyllabic words had to be substituted. Places of articulation for which the data were best controlled for were measured: bilabials

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for the initial tokens and denti-alveolars for the medial ones. Voice-onset-time was measured from a waveform in conjunction with a time-aligned spectrogram.

Figure 1 contains bar graphs showing the mean VOT values (in seconds) averaged across speakers for the measured stops as produced by speakers of the two Circassian varieties, Shapsugh and Hatkoy, that maintain a four-way laryngeal contrast. Ejectives are included as well since voice-onset-time is potentially used as a cue to their identity. Note that the whiskers delimit the range of values one standard deviation from the mean.

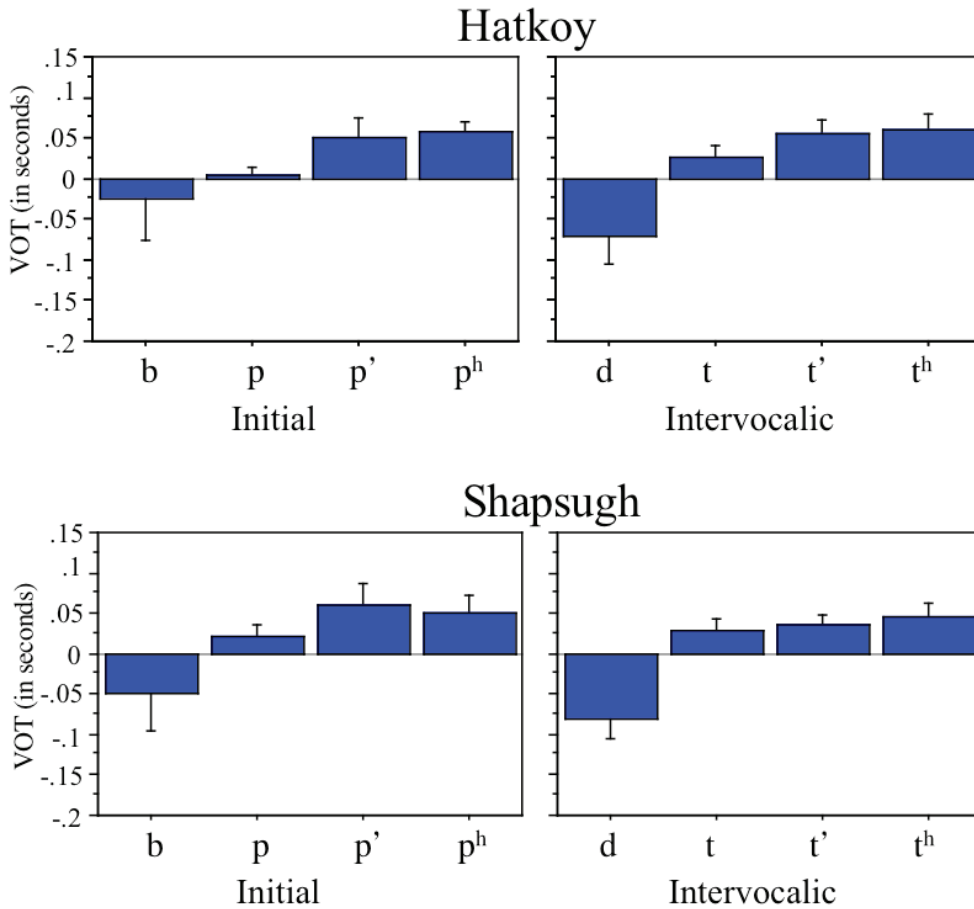


Figure 1. Voice-onset-time values (in seconds) for voiced, unaspirated, ejective, and aspirated stops in two contexts averaged over 7 Hatkoy and 5 Shapsugh speakers.

As figure 1 shows, the contrast between voiced, voiceless unaspirated and voiceless aspirated stops is preserved in both Hatkoy and Shapsugh, though the difference in VOT between the unaspirated and aspirated stops in both varieties is

considerably smaller in intervocalic position, where the unaspirated stops have longer VOT values than in initial position.

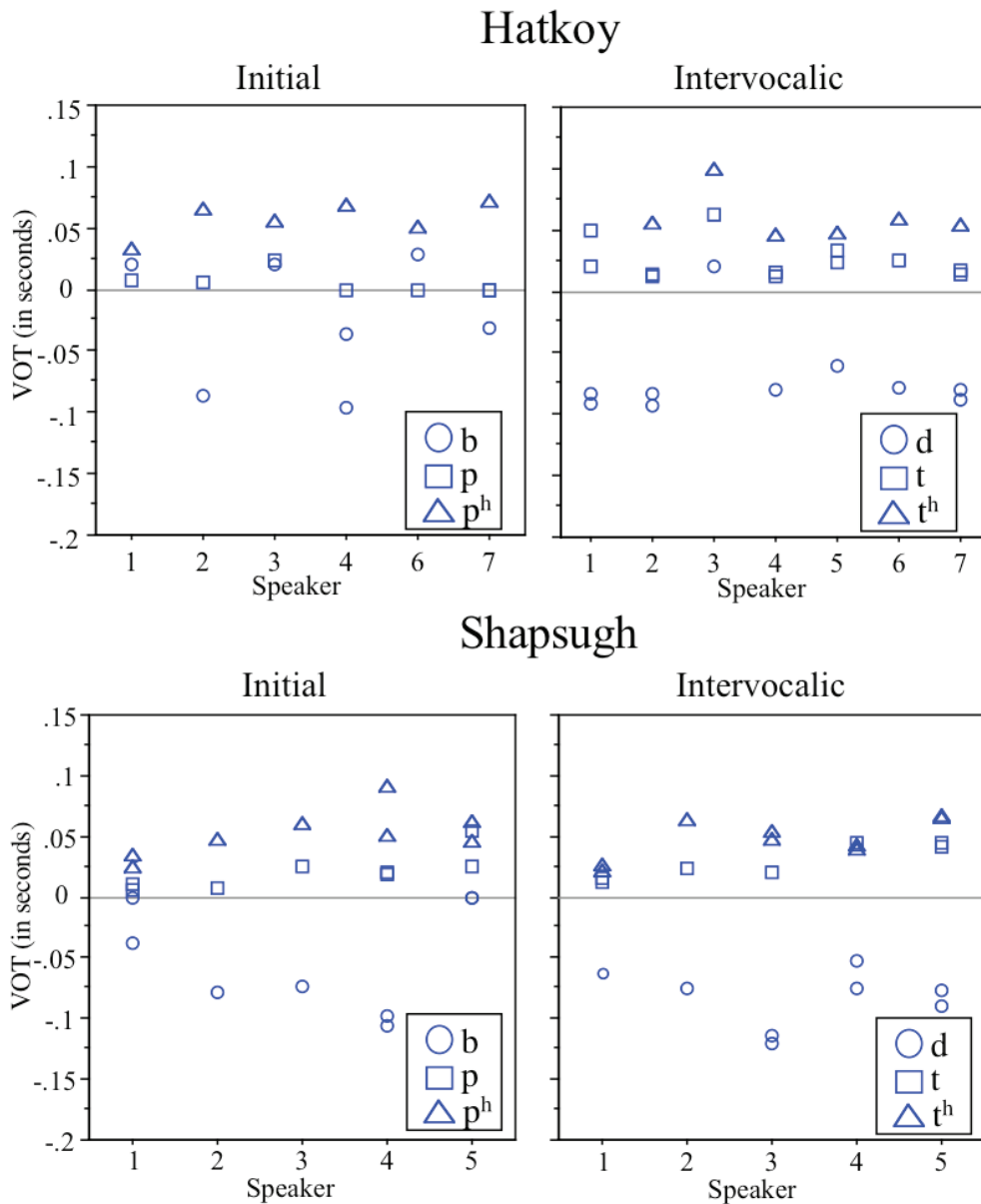


Figure 2. VOT values (in seconds) for tokens of voiced, unaspirated, and aspirated stops in two contexts for 7 Hatkoy and 5 Shapsugh speakers.

The situation is actually more complex than the across speaker means in figure 1 suggest, as certain speakers in both Hatkoy and Shapsugh appear to be collapsing at least two of the three non-ejective series. Figure 2 plots VOT for separate tokens of the voiced, unaspirated, and aspirated stops as produced by individual speakers of Hatkoy and Shapsugh. The three-way contrast is particularly vulnerable in initial position, where three of the seven Hatkoy

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speakers and two of the Shapsugh speakers produce the phonemic voiced stops without consistent prevoicing during the closure. This mode of realization infringes on the VOT space of the voiceless stops resulting in neutralization or near-neutralization word-initially. It is, in fact, unclear whether Hatkoy speaker 1 or Shapsugh speaker 1 contrast any of the non-ejective stops word-initially. (Note that Hatkoy speaker 1 did not produce the target word containing aspirated stops word-medially.) Word-medially Hatkoy speaker 5 and Shapsugh speakers 1, 4, and possibly 5 appear to have lost the VOT difference between aspirated and unaspirated stops.

Figure 3 confirms that the Bzhedugh and Abzekh varieties of Adyghe have neutralized the distinction between unaspirated and aspirated stops both initially and medially. Neutralization results in a stop with virtually no aspiration word-initially in Bzhedugh and one with some aspiration word-medially in Bzhedugh and both initially and medially in Abzekh.

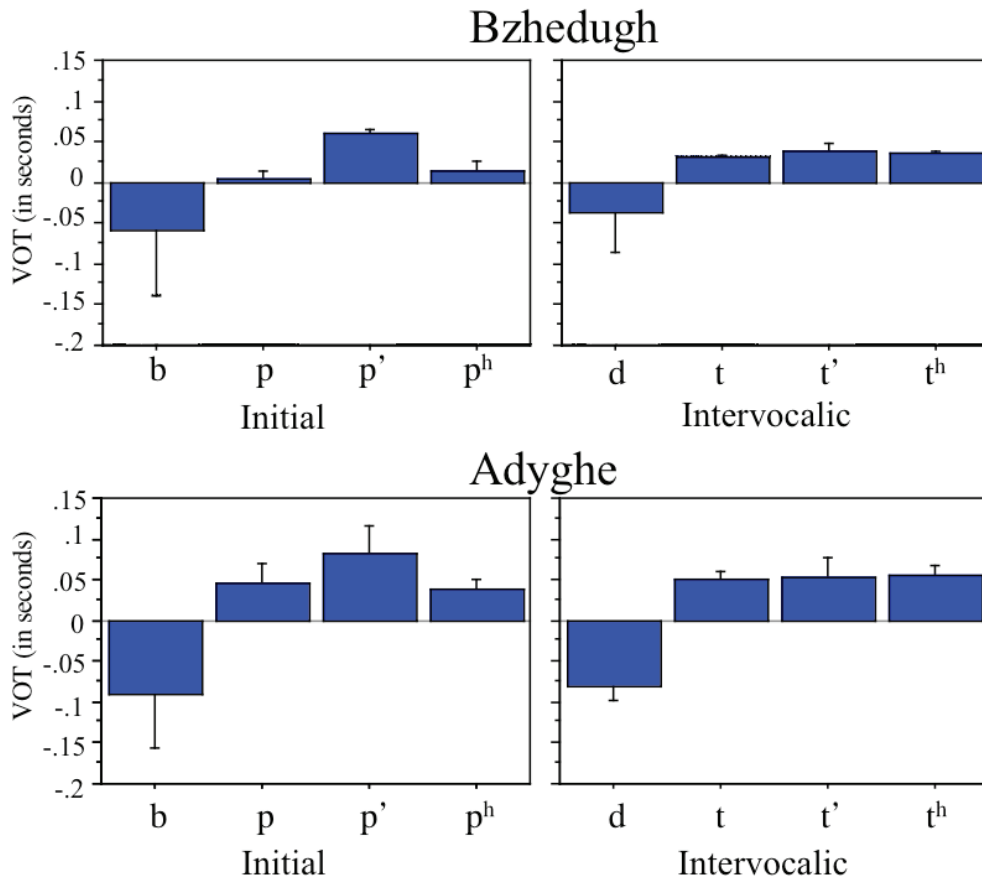


Figure 3. VOT values (in seconds) for voiced, unaspirated, ejective, and aspirated stops averaged over 2 Bzhedugh and 4 Abzekh speakers.

The proto-Circassian four-way contrast has also been lost in East Circassian (Kabardian and Besleney), which has collapsed the etymologically unaspirated and aspirated series word-initially (e.g. *pa:nə ‘thorn’ and *p^ha:sə ‘early’ both begin with /p/ in East Circassian) and the etymologically unaspirated and voiced series intervocalically (e.g. *sa:pə ‘dust’ and *x^wa:bə ‘hot’ both have /b/ in East Circassian). In both positions, as figure 4 shows, the contrast has been neutralized in favor of aspiration, plausibly to enhance the contrast with the phonemic voiced series. (Note that there is only word-initial stop data from Besleney and only from a single speaker.)

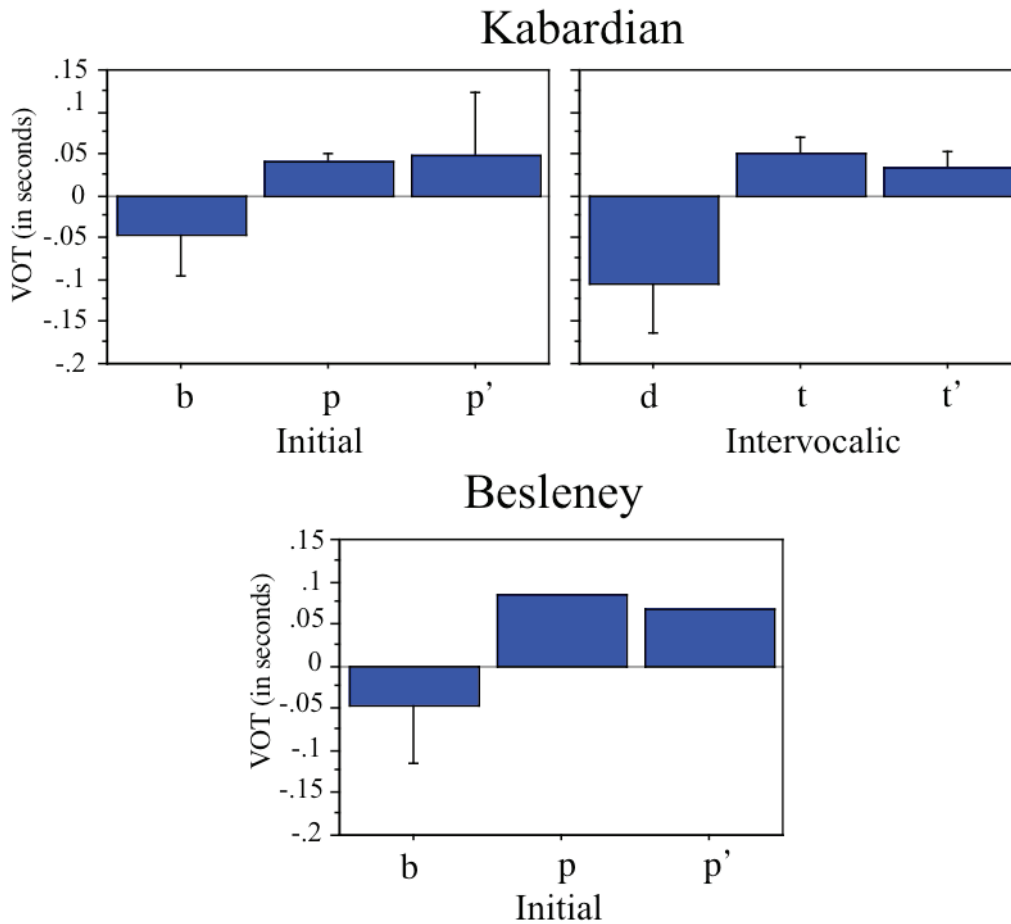


Figure 4. Voice-onset-time values (in seconds) for voiced, voiceless, and ejective stops in two contexts (one for Besleney) averaged over 13 Kabardian and one Besleney speaker.

2.2 Spectral Properties of Fricatives

Proto-Circassian is reconstructed by Kuipers (1963, 1975) as having 14 coronal fricatives in addition to fricatives at the bilabial, velar, uvular, pharyngeal and glottal places of articulation. Four laryngeal settings are reconstructed for the coronals by Kuipers: voiceless unaspirated, voiceless aspirated, ejective, and voiced. In addition, four places of articulation contrasted in the proto-language and in certain modern West Circassian varieties: denti-alveolar, alveopalatal, and two postalveolar series. There is disagreement about the phonetic nature of the contrast between the two postalveolars. Kuipers (1963, 1975) describes it as a contrast between plain palatals and palatalized palatals, whereas Smeets (1984) characterizes it as a contrast between plain (Kuipers' palatalized palatals) and velarized (Kuipers' plain palatals). The latter series, i.e. Kuipers' plain palatals and Smeets' velarized palatals, is characteristically, though not exclusively, realized, as far as we can tell from acoustic data and observations about the articulation, as a domed postalveolar (palato-alveolar) fricative, i.e. /ʃ/, whereas the second series, i.e. Kuipers' palatalized palatals and Smeets plain palatals, varies in its realization across individuals and varieties. The most typical realization seems to be as a laminal closed postalveolar as described for the related Northwest Caucasian language Ubykh by Ladefoged & Maddieson (1996). Catford (ms cited in Ladefoged & Maddieson 1996:161) describes its production as follows: "acoustically and physiologically between a typical s and a typical ʃ: In its production the tip of the tongue rests against the lower teeth (as for a laminal s), but the main articulatory channel is at the back of the alveolar ridge (as for a lamino-post-alveolar ʃ)" Catford (and Ladefoged & Maddieson 1996) transcribe it as \hat{s} , a transcription which we adopt here, and refer to it as a "closed laminal postalveolar fricative". It is "laminal" because the contact between the tongue and the upper surface of the mouth is relatively broad in the front-back dimension and "closed" because it is not produced with the sublingual cavity that often characterizes postalveolar fricatives cross-linguistically. The 14 coronal fricatives reconstructed for proto-Circassian by Kuipers (1963, 1975) are thus shown in table 1, using the transcriptions of /ʃ/ and / \hat{s} / for the two postalveolars.

Table 1. The 14 coronal fricatives of proto-Circassian (Kuipers 1975) transcribed to approximate articulatory characteristics of their modern reflexes

	Dental	Alveolo-palatal	Post-alveolar ¹	Post-alveolar ²
Voiceless	s	ϵ ϵ^w	ʃ	\hat{s}
Voiceless aspirated			ʃ ^h	\hat{s}^h
Ejective		ϵ' $\epsilon^{w'}$		
Voiced	z	z z^w	ʒ	\hat{z}

In our data, all 14 coronal fricatives are found only for one of the Shapsugh speakers and not for any speakers of the other Circassian varieties. Elsewhere, a subset of contrasts is found with the phonetic nature of this contrast and the number of contrasts varying from variety to variety and often from speaker to speaker.

One of the typologically rare features of the Circassian fricative inventory is the aspirated postalveolar fricative, which is synchronically preserved only for certain Shapsugh speakers in our data.² Even for those speakers maintaining a contrast between aspirated and unaspirated fricatives, aspiration is limited to certain lexical items and has been lost in many words that are etymologically expected to contain an aspirated fricative. The word for ‘horse’, /ʃʰə/, is the lexical item most reliably associated with aspiration, perhaps because it is a high-frequency word that differs minimally through its aspiration from another high-frequency lexeme, the word for ‘three’, /ʃə/. Aspiration is often associated with nasalization as Colarusso (1988) observes for Bzhedugh (although our Bzhedugh speakers do not have aspirated fricatives). Figure 5 shows the contrast between an aspirated fricative in /ʃʰə/ ‘horse’ and an unaspirated fricative in /ʃədə/ ‘donkey’ as produced by a female Shapsugh speaker.

Languages vary in how many of the 14 coronal fricatives from proto-Circassian are preserved synchronically. If we take the voiceless series as representative, all languages have /s/ but varieties differ in whether they have one, two, or three additional coronal places of articulation represented. A common theme is for Diaspora speakers outside of Russia to have fewer contrasts. At the extreme end of simplicity, Besleney and Turkish Kabardian (and the Baksan Russian Kabardian speaker) neutralize /ɕ/, /ʃ/ and /ʂ/ to /ʃ/. Russian Kabardian (and the Kabardian speaker from Syria), Hatkoy, Bzhedugh, and Diaspora Adyghe occupy middle ground possessing two coronal places posterior to /s/. These two places vary depending on speaker: /ɕ/ vs. /ʃ/ or /ʂ/ vs. /ʃ/ or /ʂ/ vs. /ʃ/. At the extreme end of complexity, Shapsugh and Temirgoy Adyghe preserve a 3-way posterior coronal contrast, where the phonetic nature of the contrast shows considerable interspeaker and interdialectal variation. Figure 6 shows a spectrogram (top) and FFT spectra (bottom) of fricatives involved in the four-way contrast between /s/, /ʂʰ/, /ʃ/ and /ʂ/ as produced by a speaker of Shapsugh from Turkey. For this speaker of Shapsugh, the four coronals are distinguished relatively clearly through the distribution of their noise in the frequency domain. The denti-alveolar /s/ is associated with the highest frequency energy, much of which is above the 8000Hz upper limit of the spectrogram. Proceeding from the retroflex fricative /ʂʰ/ in ‘horse’ to the domed postalveolar /ʃ/ in ‘milk’ to the laminal closed postalveolar /ʂ/ in ‘hundred’, the lower limit of the primary locus

² Colarusso (1988) mentions a uvular aspirated fricative in Bzhedugh found only in the plural morpheme /χʰa/ but our Bzhedugh speakers have a simple unaspirated uvular fricative in this morpheme.

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of energy progressively increases in frequency. Note that the word for ‘hundred’ begins with a sound that is phonetically quite similar to the sound in ‘horse’ for some speakers.

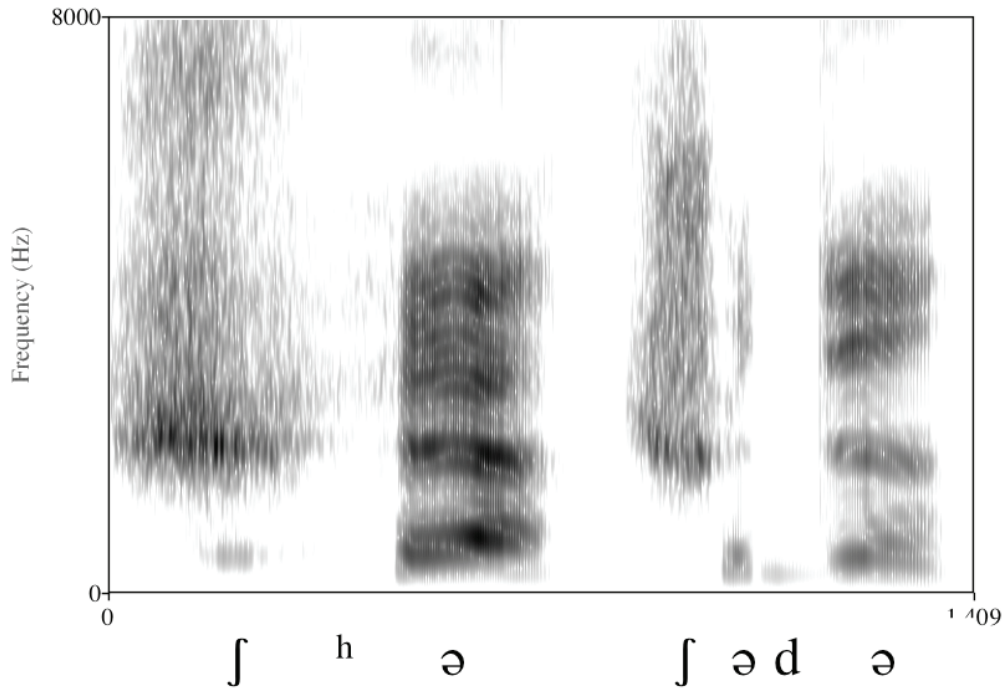


Figure 5. The aspirated fricative in /ʃʰə/ ‘horse’ vs. the unaspirated fricative in /ʃədə/ ‘donkey’ as produced by a female Shapsugh speaker.

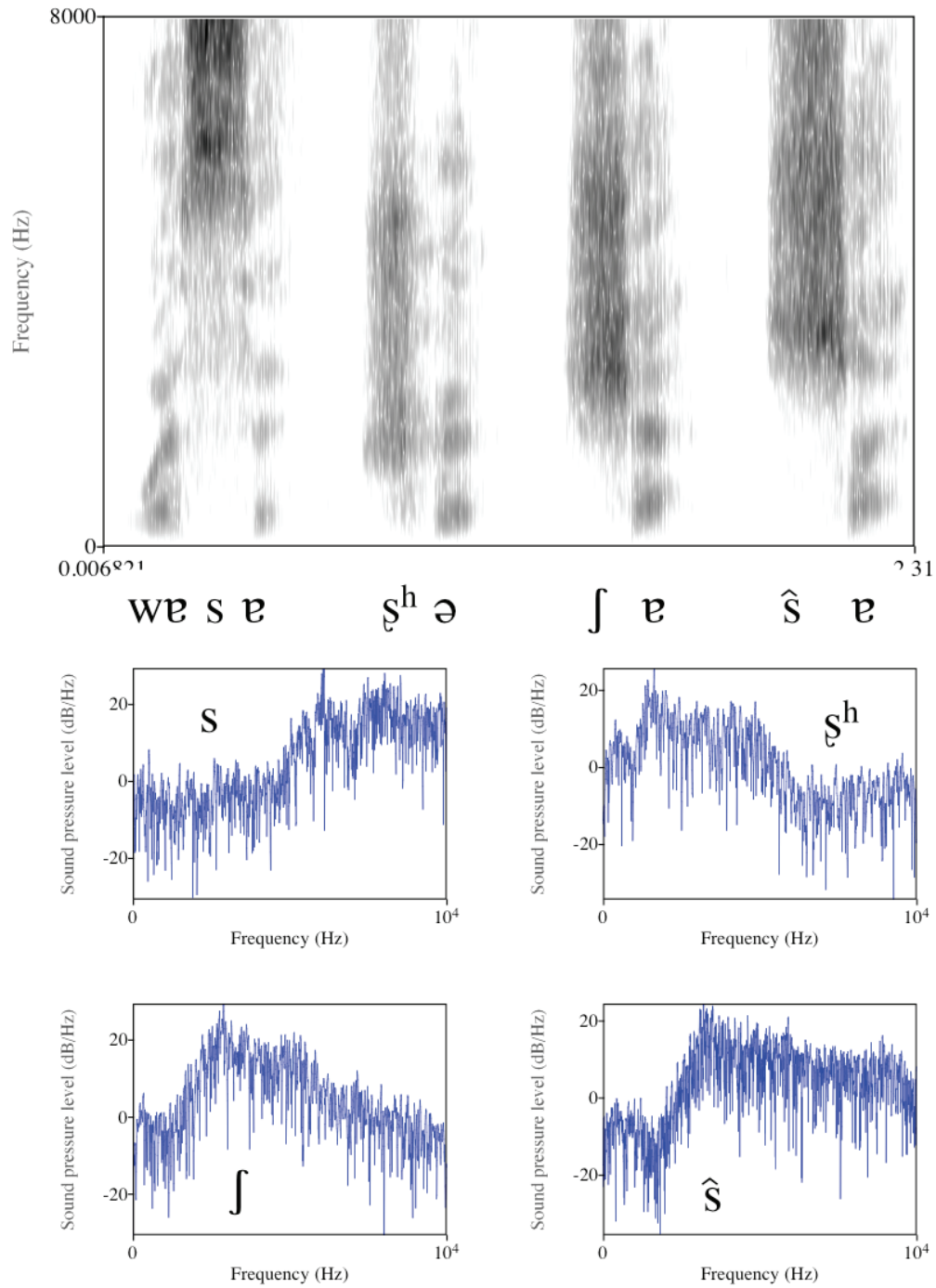


Figure 6. Spectrogram (top) and FFT spectra (bottom) of the four coronal fricatives in the words /wɛs/ ‘snow’, /sʰə/ ‘horse’, /ʃɛ/ ‘milk’, and /ʃ̂ɛ/ ‘hundred’ uttered by a Shapsugh speaker.

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Figure 7 shows representative FFT spectra from an Adyghe speaker who also distinguishes four coronal places of articulation. A similar increase in energy going from retroflex to domed postalveolar to closed postalveolar is observed here as well.

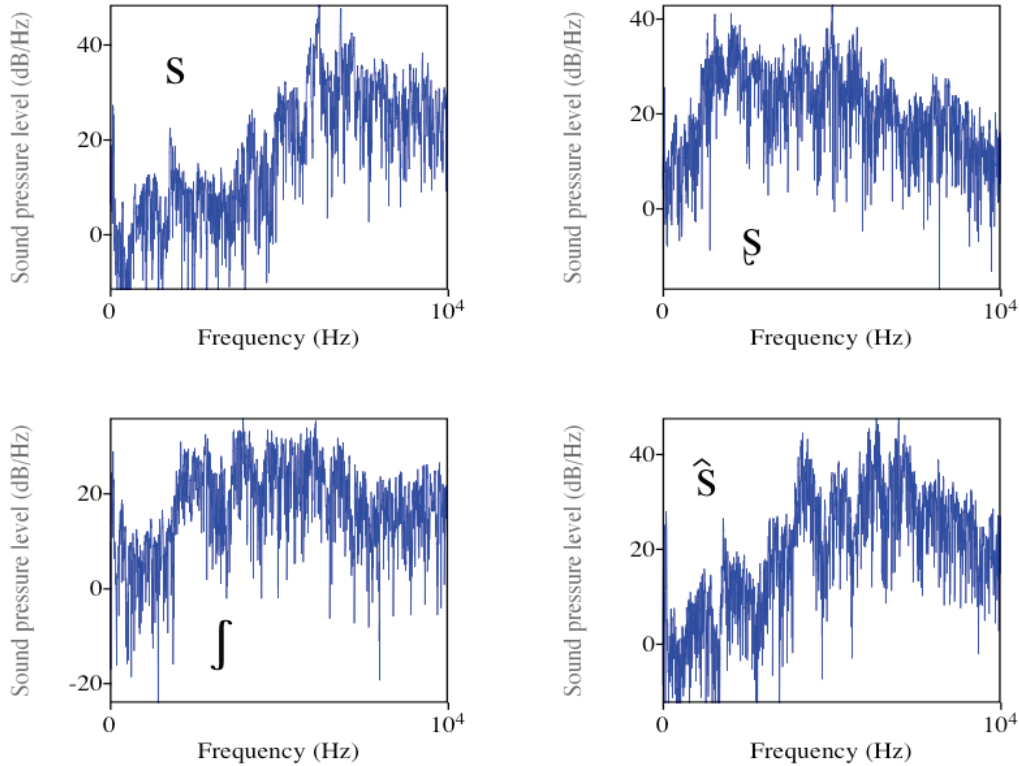


Figure 7. FFT spectra for the four coronal fricatives in the words /p^ha:sɛ/ ‘early’, /ʃə/ ‘horse’, /g^wa:fɐ/ ‘princess’, and /məʂɐ/ ‘bear’ uttered by a Temirgoy Adyghe speaker.

To summarize the fricatives, Circassian varieties range from preserving all the relatively subtle coronal contrasts to having only a two-way distinction between denti-alveolars and postalveolars. There is considerable variation in the direction of neutralization. The fricative (the one in ‘horse’) labeled (depending on the source) either as a velarized palatal or a plain non-palatalized palatal is particularly prone to neutralizing with another series, though the direction of this merger varies. It may collapse with the alveolopalatal (e.g. in ‘hundred’) or with the domed postalveolar (e.g. in ‘milk’). The direction of the merger is likely attributed to variation in its production. The retroflex realization is acoustically similar to the domed postalveolar, whereas the closed laminal postalveolar realization is more like the alveolopalatal. In any case, the close proximity of the alveolopalatal, the domed postalveolar, and the third postalveolar (the

velarized/non-palatalized one in ‘horse’) makes the three-way contrast unstable and prone to neutralization. Even the two-way contrast between alveolopalatal and postalveolar is neutralized in Turkish Kabardian.

2.3 Vowels

Most analyses of Circassian languages (e.g. Yakovlev 1948, Turchaninov & Tsagov 1940, Apazhev et al. 1957, Abitov et al. 1957, Bagov et al. 1970) assume three underlying vowels (2 short and one long) and four additional surface long vowels that are underlyingly short vowel + glide sequences, as shown in table 2.

Table 2. A representative vowel inventory for Circassian languages.

	Front	Central	Back
High	i: /əj/		u: /əw/
Mid	e: /ej/	ə ɐ	o: /əw/
Low		a:	

There are very few differences in vowel quality that can reliably be attributed to dialect as opposed to idiolect. One of the interesting issues is the spacing of the vowels in the height dimension since Circassian languages have “vertical” vowel systems. Figure 8 plots the three phonemic central vowels in the height (first formant) and backness/frontness (second formant) dimensions for the Turkish Kabardian speakers, for whom the data set is largest and whose vowel spacing is representative of other Circassian varieties.

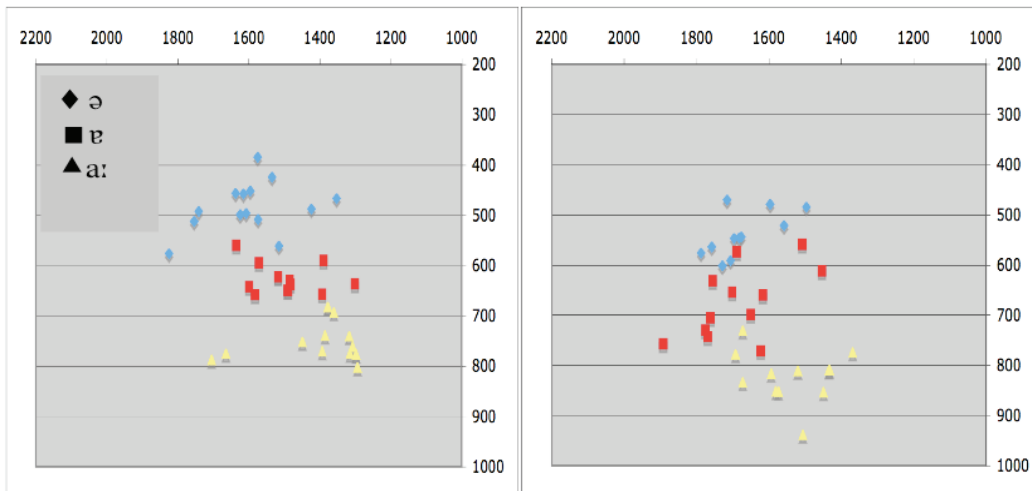


Figure 8. First vs. second formant plots (in Hertz) for male (left) and female (right) speakers of Turkish Kabardian.

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The three vowels are fairly well differentiated in the vertical dimension and are consistent with the transcription of them as /ə/, /e/, and /a:/. Figure 9 plots the vowel space for four male Adyghe speakers (three from Turkey and one from Russia).

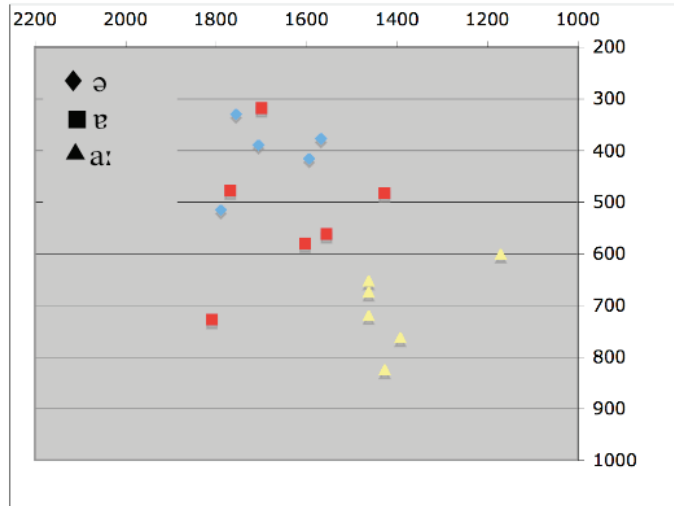


Figure 9. First vs. second formant plots (in Hertz) for four male speakers of Adyghe.

The two higher central vowels are shifted slightly upward in height relative to the male Turkish Kabardian data suggesting a transcription of these vowels as /i/ and /ə/. The lowest vowel is also slightly retracted relative to the other two in figure 10. Note also the outlier data point for the mid vowel in the middle of the highest vowel's space.

It is interesting to note that Catford (1984) and Choi's (1991) studies of Kabardian show first formant values for the two higher central vowels in the Terek variety of Russian Kabardian that are similar to those in our Adyghe data and lower than those found in our Turkish Kabardian data. On the other hand, Wood's (1994) study of vowels in the Kuban dialect of Russian Kabardian produced results that are compatible with our Turkish Kabardian results.

3 Conclusions

Circassian languages are typologically unusual in the complexity of the fricative inventories, particularly in the coronal subspace. This phonetic complexity, however, has led to instability in the realization of the contrasts. Many dialects and idiolects collapse certain of the original contrasts with the direction of neutralization varying considerably. A similar phonetic complexity is observed in the laryngeal contrasts of proto-Circassian with a similar result synchronically:

instability and neutralization. The neutralization of phonetically subtle contrasts has likely been further aided by the gradual erosion of the native speaker populations of these languages, many of which are seriously endangered, in the face of pervasive contact with other socially, economically, and politically dominant languages. Contact between different Circassian dialects has also likely led to cross-dialect influence on the production of certain phonemic contrasts. The vowel systems, which stand in sharp contrast to the fricative and stop inventories in their phonetic simplicity, have been preserved throughout the Circassian family.

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