

An Acoustic Approach to Galician *Gheada*

Sabela Labraña-Barrero and Carlos van Oosterzee

Laboratori de Fonètica. Universitat de Barcelona, Spain.

E-mail: barrero@fil.ub.es, carlosvanoosterzee@hotmail.com

ABSTRACT

This study is a first attempt at providing an acoustic description of the dialectal phonetic phenomenon called *gheada* ([h̥e'aða]) in Galician, which covers a wide range of back fricative consonants. After making recordings in the areas of Galicia where *gheada* is used, we performed acoustic and perceptual analyses to describe the phonetic realizations of the consonant. We noted some regularity in the distribution of the variants. Our results indicate that this regularity seems to depend on the geographical area from which the recordings were obtained. We also observed a further distribution according to the surrounding vowels of the sounds dealt with.

1. INTRODUCTION

Gheada is a phonetic phenomenon that occurs in Galician. What in the non-*gheada* territory is a voiced velar approximant or stop, in the *gheada* territory it is a more retracted fricative. It is considered to be a dialectal characteristic, found in a large part of Galicia.

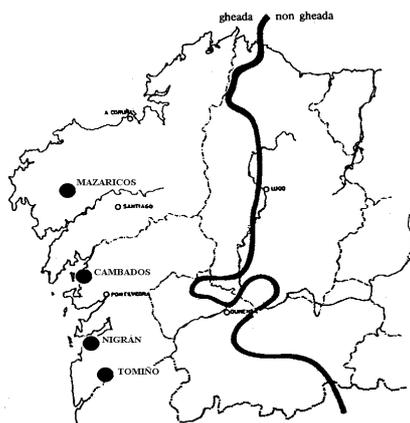


Figure 1: Geographical localization of *gheada* in Galicia, left of the isogloss (map obtained from [1]).

Despite the fact that it has official status in the standard language, this dialectal feature is receding because of its negative social status – traditionally, it has been considered as a grotesque adaptation to Galician phonetics of the Castilian Spanish unvoiced velar fricative. In contrast with this view, there is also a theory that defends

the *gheada* as an innovation peculiar to Galician.

According to [1], the commonest realizations of this phoneme are all fricative, being articulated as pharyngeal, glottal or voiced uvular. He also points out that on the coast, instead of the pharyngeal or glottal realizations, an unvoiced velar fricative can be heard. [2], on the other hand, remarks the voiceless realizations of these sounds. [3] maintains that there are voiced or unvoiced pharyngeal fricatives, voiced or unvoiced glottal fricatives, unvoiced velar fricatives, voiced or unvoiced uvular fricatives and uvular approximants, of which the unvoiced pharyngeal fricative is the commonest realization. Finally, [4] talk about a fricative or approximant phoneme with voiced or unvoiced realizations ranging from velar to glottal.

In view of this diversity of description, our aim is to study this phenomenon acoustically and perceptually and to verify the realizations, their geographical distribution and the extent of their variability within each speaker.

2. METHOD

The corpus we have analyzed consists of words with the *gheada* sound in the following stressed syllable positions (where [h̥] represents any realization of the *gheada*): [h̥ (a,ɛ,i,ɔ,u)], [a'h̥a], [e'h̥ɛ], [e'h̥i]. The words were non-local terms, prompted to informants through pictures. This procedure, essential for eliciting spontaneous speech, was detrimental to the whole set of intervocalic contexts. The tokens were obtained from eight informants from four different villages in Galicia inside the *gheada* territory: two coastal villages, Cambados and Nigrán, and two inland villages not far from the coast, Mazaricos and Tomiño (see Figure 1), a man and a woman from each village. The age range was 50 to 60 years old, in order to reflect the features of *gheada* in this particular generation. All informants have Galician as their mother tongue and it is their everyday language. All of them are aware of the velar sounds of Spanish ([ɣ, g, x]) although none of them has secondary studies. As for the villages of origin of the informants, all are situated in western Galicia, two of them on the coast and the other two away from the coast. The recordings were made with a Marantz CP430 recorder and they took place in the houses of the informants.

Acoustic analyses were carried out with a CSL 4300B analyzer, through which we obtained the waveform, the spectrogram, and the LPC. The frequency of the data was sampled at a 25.600 Hz rate. LPC was obtained with a length of 30 msec and filter 6.

3. RESULTS

After the acoustic analyses, we found realizations that range from the palatal order to the glottal, these being: unvoiced palatal fricatives ([ç]), unvoiced velar fricatives ([x]), voiced and unvoiced uvular fricatives ([ʁ],[χ]), voiced and unvoiced pharyngeal fricatives ([ʕ],[ħ]), voiced and unvoiced glottal fricatives ([h],[ɦ]), and even uvular approximants ([ʁ]). This diversity is distributed according to place of articulation as follows: unvoiced palatal fricatives 3.3%, unvoiced velar fricatives 23%, uvular fricatives 19.8% (unvoiced uvular fricatives 8.3% and voiced uvular fricatives 11.5%), pharyngeal fricatives 29.4% (unvoiced pharyngeal fricatives 27.8% and voiced pharyngeal fricatives 1.6%), glottal fricatives 24.5% (unvoiced glottal fricatives 18% and voiced glottal fricatives 6.5%):

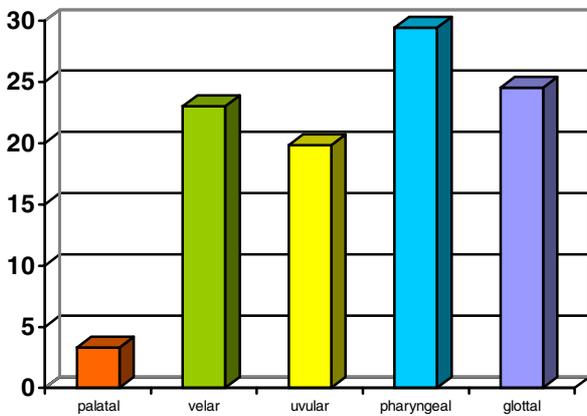


Figure 2: Percentage of occurrences according to place of articulation in both coastal and inland areas.

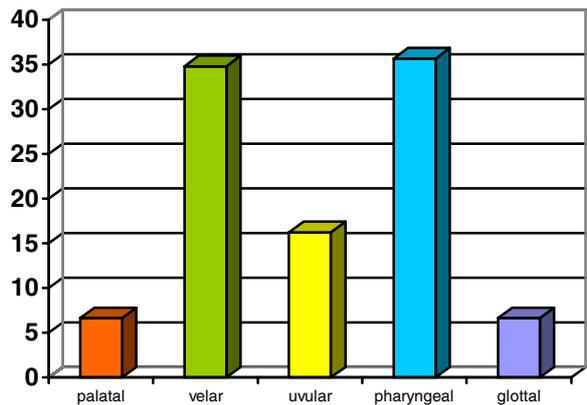


Figure 3: Percentage of occurrences according to place of articulation in the coastal area.

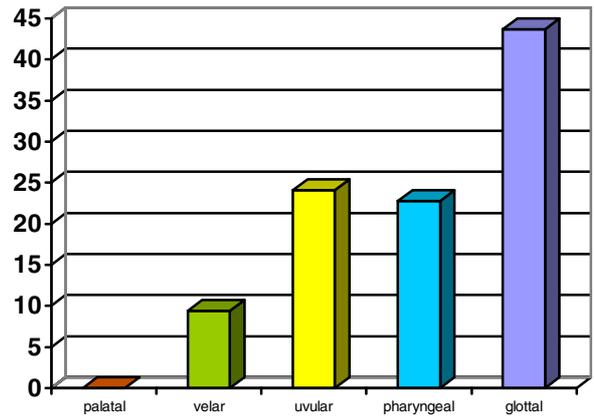


Figure 4: Percentage of occurrences according to place of articulation in the inland area.

In order to determine some of the places of articulation, we considered the following approximate acoustic parameters, taking [5] and [6] as starting points: in [ç] we find a peak of high energy between 3000 and 4000 Hz. Energy diminishes at medial frequencies and it is recovered again at high frequencies. [x] shows a peak between 2000 and 3500 Hz. Energy is maintained in a central peak between 4500 and 6000 Hz and diminishes at high frequencies. In general, for [χ] all values are lower than for the velar fricative.

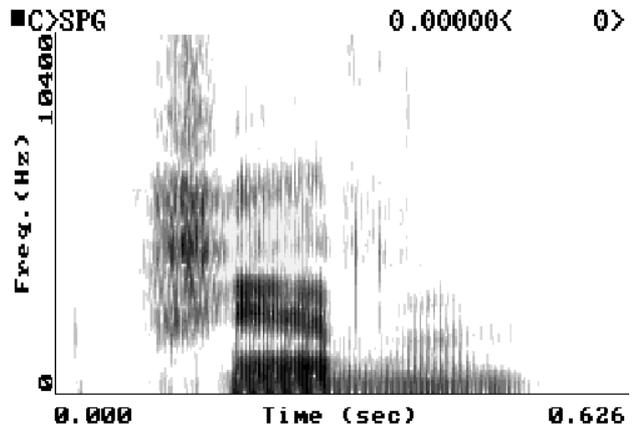


Figure 5: Spectrogram of the word guerra ['xɛra] 'war' as pronounced by one female informant from Cambados (coastal area). The first sound is the gheada realization [x].

In accordance with [6], [ʁ] appears always with a formant-like structure proper of an approximant. We find an initial peak between 800 and 2500 Hz. The second peak is found between 5000 and 6000 Hz. All peaks show a very low intensity. We have noticed that the presence of this sound also modifies the formants of the contextual vowels: raising F1 and lowering F2 of central and back vowels, values that imply uvularization. In [ħ], resonance noise starts around 1600 Hz. An isolated band tends to appear at around 800 Hz, as [6] states. There is a peak of

energy between 1500 and 2500 Hz and a second one between 4000 and 6000 Hz. At high frequencies, energy tends to diminish. In general, contrasted with the other back fricative consonants, the intensity of peaks is lower. We also coincide with [6] in observing that both F1 and F2 are raised in central and back vowels in contact with this sound.

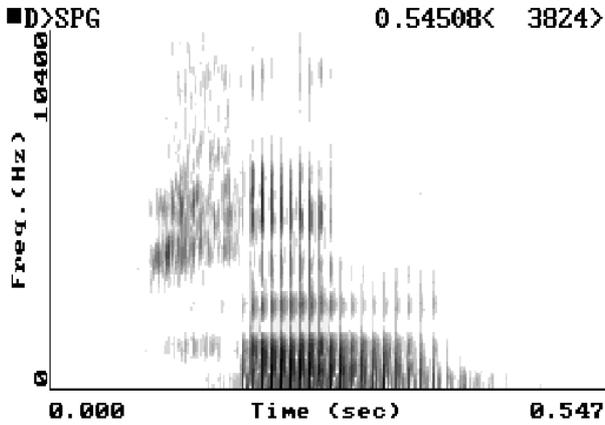


Figure 6: Spectrogram of the word *gol* [hɔl] ‘goal’ as pronounced by one male informant from Cambados (coastal area). The first sound is the *gheada* realization [h]. Notice the isolated noise band at around 800 Hz.

As for [h], the literature is misleading. [5] states that it tends to have a very low lower limit of frequency, a major peak around 1000 Hz and one around 1700 Hz. [7] identifies a peak below 3000 Hz although he says that this sound is not really a voiceless fricative – the noise source is the glottis itself. We have certainly found a very low lower limit of frequency, a peak around 3000 Hz, and another peak of much lower intensity from 5000 to 6000 Hz.

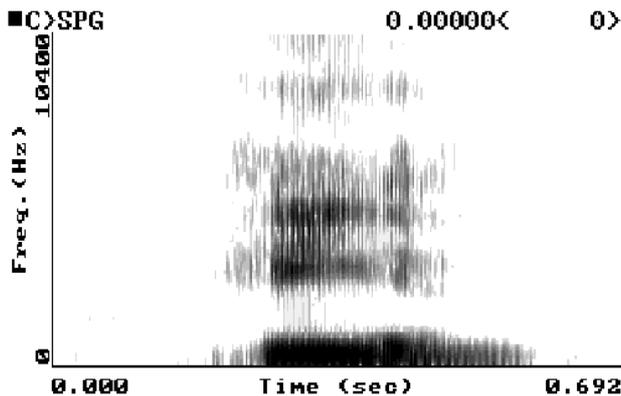


Figure 7: Spectrogram of the word *guía* [h̥ia] ‘guide’, as pronounced by one female informant from Mazaricos (inland area). The first sound is the *gheada* realization [h̥].

We have not found any particular spectral parameters by other authors for [h̥]. We obtained all the instances in intervocalic position from informants of the inland area. In the clearest cases we could appreciate a lowering of the intensity and some noise between the glottal pulses.

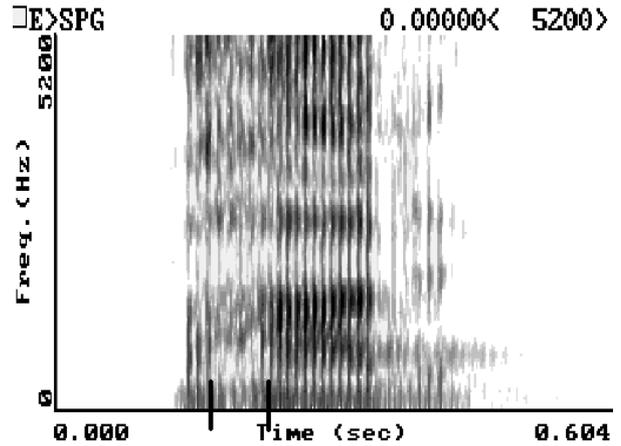


Figure 8: Spectrogram of the word *pagar* [páˈɦar̥] ‘to pay’, as pronounced by one male informant from Tomiño (inland area). The sound marked is the voiced glottal fricative.

In some other cases it was difficult to segment the vowel and the consonant, although the consonant was clearly perceptible. Contrasting the data with those offered by other authors who illustrated breathy voice, [7,8], we inferred a change of voice modality could be taking place: breathy voice.

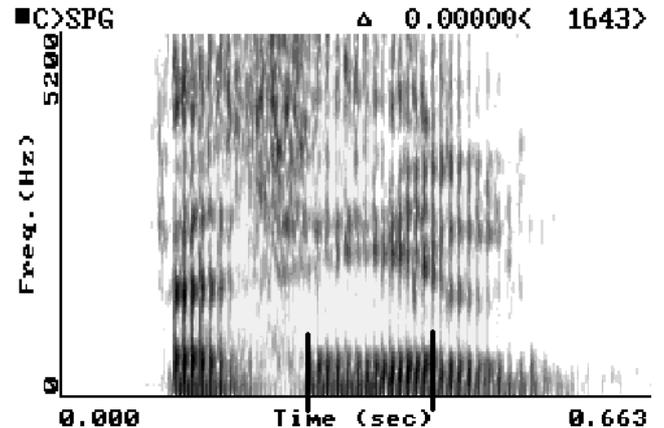


Figure 9: Spectrogram of the word *perseguilo* [pers̥iːl̥u] “to pursue it”, as pronounced by the male informant from Tomiño. The marked section ([r̥iː]) shows a possible instance of breathy voice.

4. CONCLUSIONS

Our research confirms the existence of a wide range of realizations, as reported by other researchers, like [3]. However, we must point out that from our informants, we have also obtained results that have led us to observe other realizations, such as unvoiced palatal fricatives, although these constitute a minority. Furthermore, according to [1,2,3,4], the sound that appeared most is the unvoiced pharyngeal fricative. Next to this, the ranking of places of articulation in order of occurrences is the following: pharyngeal, glottal, velar, uvular, palatal (see Figure 2).

It seems, however, that the distribution is not homogeneous, but responds to a geographical distribution: coastal villages (Cambados and Nigrán) on the one hand and inland villages (Mazaricos and Tomiño) on the other. We can elicit this from the sound range that each area covers, these ranges being the following: for the coastal villages we observe a tendency to an “upper” articulation, with fricative sounds ranging from velar to pharyngeal ([x,χ,ɣ,ħ]), and for the inland villages we observe a “lower” tendency, with sounds ranging from uvular to glottal ([χ,ɣ,ħ,ʕ,ɦ,ʁ]). In both areas we have found “peripheral” realizations to a limited extent, which we consider as non-significant: in the coastal area, the palatal and the glottal fricatives ([ç,h]) and in the inland area, the velar fricative ([x]). We must remark, firstly, that the palatal realizations of the coastal area could be replacing the velar realization ([x]) as they only occur in one of the informants, only before [i], and it is the only realization that appears before the uvular type. Secondly, the only velar realizations in the inland area occur in one informant and all of them seem to be retracted ([x̠]). Unlike [1]’s proposal, we suggest that the velar and the pharyngeal realizations are not exclusive, considering the fact that both appear in the “upper”-tendency group.

The place of articulation of these sounds can be modified according to their vocalic context. In the coastal area, the velar fricative tends to be realized in front vowel contexts and back vowels tend to attract the pharyngeal fricative. In the inland area, on the other hand, the distribution is less homogeneous as regards vowel context. We observe a tendency to realize pharyngeal and glottal fricatives in any contexts.

As far as voicing is concerned, these consonants are only voiced in intervocalic position, and surprisingly enough, these voicing patterns match the geographical distribution that we stated above: voicing only occurs in the inland area (in the coastal area only one occurrence of a voiced fricative appears).

This, as the first acoustic study of the *gheada*, is intended to provide the basis for further research into this complex phonetic phenomenon of Galician.

5. ACKNOWLEDGMENTS

The authors would like to thank Prof. Eugenio Martínez-Celdrán and Dr. Anna Ma. Fernández-Planas for their constant support and their valuable advice. We also wish to thank Dr. Omar Ouakrim for his help in the classification of the back fricative consonants and Dr. Brian Mott for revising and correcting the English text.

REFERENCES

[1] F. Fernández Rei, *Dialectoloxía da lingua galega*, Vigo: Edicións Xerais de Galicia, 1990.

[2] X. L. Regueira, “Galician,” in *Handbook of the International Phonetic Association*, IPA, pp. 82-85, Cambridge: Cambridge University Press, 1999.

[3] X. R. Freixeiro Mato, *Gramática da lingua galega, I, Fonética e fonoloxía*, Vigo: Edicións A Nosa Terra, 1998.

[4] R. Álvarez and X. Xove, *Gramática da lingua galega*, Vigo: Editorial Galaxia, 2002.

[5] P. Stevens, “Spectra of Fricative Noise in Human Speech,” in *Language and Speech* 3, pp. 32-49, London : Kingston Press Services, 1960.

[6] O. Ouakrim, *Fonética y fonología del bereber*, Bellaterra: Universitat Autònoma de Barcelona, 1995.

[7] P. Ladefoged, *Vowels and Consonants*, Malden, Massachusetts: Blackwell Publisher Inc., 2001.

[8] P. Ladefoged, I. Maddieson and M. Jackson, “Investigating Phonation Types in Different Languages,” in *Vocal Fold Physiology*, 2, pp. 297-317, New York, Raven Press, 1988.