The phonology of calls in Ladin:

Towards a unified account of chanted vocatives in Romance

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1. Introduction

Several languages of different families use a characteristic melody for calls that is known as *stylized intonation*, *chanted call* or *vocative chant*. This tune generally displays a rise to a high F0 level, followed by a sustained level pitch in the middle of the speaker's range. Additionally, the call has a longer duration in comparison with the corresponding statement. This tune is documented, among others, in Portuguese (Frota et al. 2015), Spanish (Hualde/Prieto 2015), Catalan (Prieto et al. 2015), Occitan (Sichel-Bazin/Meisenburg/Prieto 2015), Sardinian (Vanrell et al. 2015), Romanian (Jitcă et al. 2015), German (Grice/Baumann/Benzmüller 2005), English (Liberman 1975, Pierrehumbert 1980, Gussenhoven 2004), Dutch (Gussenhoven 2005), Greek (Arvaniti/Baltazani 2005), Serbo-Croatian (Godjevac 2005), Czech (Pešková 2019), Hungarian (Varga 2008) and Arabic (Chahal/Hellmuth 2014). Similar melodies have also been described for Friulian (Roseano/Vanrell/Prieto 2015), Italian (Gili-Fivela 2015), French (Delais-Roussarie 2015), and Polish (Arvaniti/Żygis/Jaskuła 2016). For Ladin, there is no detailed description of vocative intonation: the only information available in the literature is found in Roseano/Finco (2021), that mentions only briefly the existence of a tune similar to the one found in Friulian and in Italian.

In spite of the phonetic similarity between the chanted calls across languages, the phonological accounts are rather different. For example, the chant is interpreted as H* !H-L% in English, L+H* H-% in German, H*!H* % in Dutch, L*+H !H% in Czech, H* !H-0% in Hungarian, L+H* H-L% in Arabic and L*+H !H- !H% in Greek. For Romance languages, with the exception of French where the tune is interpreted as H+!H* !H%, two representations have been put forward: L+H* !H% for Catalan, Spanish, Romanian, Sardinian, Portuguese and Occitan, while L+H* H!H% has been suggested for Friulian and Italian. Such differences are in part unavoidable due to the typological dissimilarities between languages, but there might be some space for a more unified account of the vocative chant.

The objectives of this article are, therefore, two. First of all, we aim at providing a phonetic description of vocative chant in Ladin Badiot. Secondly, we will put forward a phonological representation of this contour (this will include both a representation of its tune, as well as a tentative representation of its durational aspects). When doing so, we will take into account the phonological representations of similar tunes in other languages, especially the Romance ones, in order to provide a more unified account of the stylized intonation in these varieties.

In order to achieve these objectives, we will first present the theoretical model we have chosen for our analysis (§ 2) and we will summarize previous studies about the intonation of chanted vocatives in Ladin and in Romance (§ 3). In § 4 we will give details about the methods we have used to collect and analyse materials. The phonetic results are presented in § 5, while § 6 discusses the issue of the phonological representation. Finally, in § 7 we provide some final crosslinguistic remarks.

2. Theoretical framework

The theoretical framework we adopt for the phonological analysis developed in § 6 is the Autosegmental-Metrical model (AM) (Goldsmith 1979, 1990, Pierrehumbert 1980, Ladd 2008) (henceforth AM). In § 2.1 we are going to summarize some aspects of AM that are relevant for our analysis: tonal target, interpolation, spreading and tonal crowding. For this paper, one has to bear in mind that AM was created to account for tonal phenomena, while durational phenomena are not taken into consideration in the classical version of the model. As we will see in § 2.2, we argue that integrating duration into the AM model can help to deal with some unsolved issues in the phonological representation of prosody.

2.1 The AM model and the tune

In the AM model the F0 contour of an utterance can be thought of as a sequence of points united by a line. For example, the F0 contour of the Italian vocative in Figure 1 can be thought of as the sequence of F0 movements between the turning points marked in red.

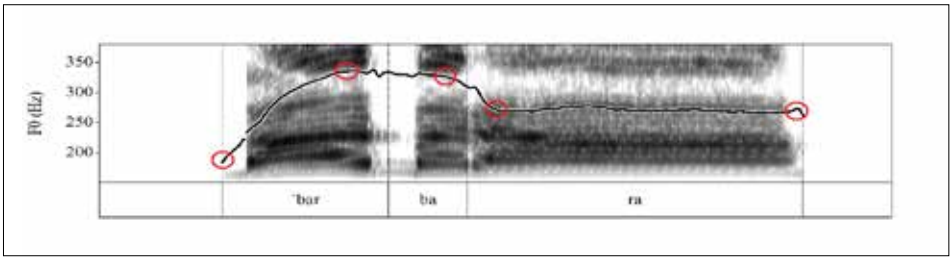

Fig. 1: Spectrogram, F0 contour (in black), tonal landmarks (in red) and broad phonetic transcription of the Vocative *"Barbara"* uttered by a speaker of Italian from Biella.

If we further simplify the representation, we get Figure 2, where each rectangle represents a syllable (the dark grey rectangle being the stressed one), while the superposed black line is a stylization of the F0 contour and the red circles signal the tonal turning points.

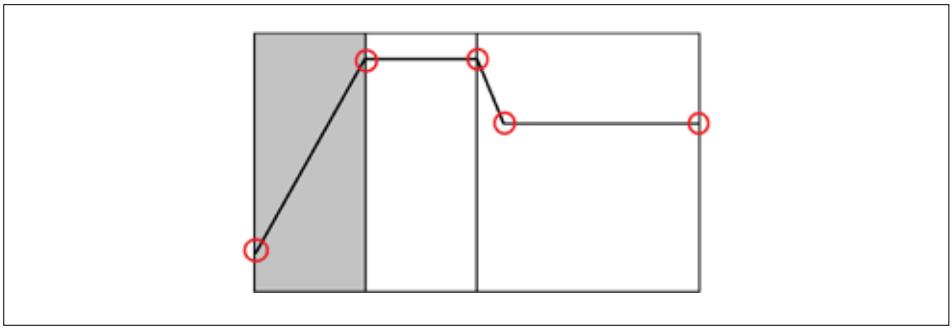

Fig. 2: Simplified representation of the Italian vocative *"Barbara"*, with F0 contour (in black) and tonal landmarks (in red).

The turning points of the F0 contour are usually called "tonal targets" and the fact that they are united by straight lines is known as interpolation. Interpolation means that the F0 contour between two tonal targets is just smoothly going from the first tonal value to the second one, across all segments in-between that are not associated with any tone (cf. Féry 2016; for a discussion of the different types of interpolation see Ladd/Schepman 2003).

The AM model assumes that tonal targets do not occur in random locations within the utterance but are aligned with two main kinds of positions: the tones that are aligned with the stressed syllables are called pitch accents (and are marked with the symbol * after the letter that indicates the tone), and the tones that are associated with the edge of a prosodic constituent are called boundary tones[1] (and are marked with the symbol % after the letter that indicates the tone). The main labels that will be used in this paper are three: L+H* than stands for a rising pitch accent, !H% that corresponds to a mid final boundary tone, and H!H% that represents a final high-falling tone (see § 1.1.3 for some examples).

Another AM concept that will be used in our analysis is spreading. The description of tonal languages often resorts to spreading, while it is used less often for intonational languages. In Romance, for example, it has been documented solely in French, Occitan, Catalan and Portuguese, and only for few specific boundary tones (Jun/Fougeron 2000, 2002, Sichel-Bazin/Meisenburg/Prieto 2015, Frota 2014, 2015, Prieto et al. 2015); in addition, it has been described for the H tone of pitch accents in some varieties of Italian (Gili-Fivela 2015). The basic idea behind spreading is that not all F0 turning points are the result of the surfacing of tones defined underlyingly at the phonological level: while some of them are, others are the result of phonological processes. Spreading is the process that causes a phonological tone to propagate from the position it is phonologically aligned with to one or more neighbouring positions and expands, thus, its temporal span. Portuguese offers an example of tonal spreading that, crucially for this paper, is observed in vocatives (cf. Frota 2014). As we can see in Figure 3, the phonetic F0 contour of the call *Marina!* in Portuguese has five turning points, but only three of them are phonological: the low (L) point at the beginning of the stressed syllable, the high (H) point at the end of the same syllable, and the mid (!H%) point at the end of the utterance. The initial low point is not phonological because, as in other languages (see, for example, Arvaniti/Żygis/Jaskuła 2016 for Polish), low F0 at the beginning of utterances is a default. The mid point at the beginning of the F0 plateau in the last syllable is not phonological either, but is the result of the left-spreading of the final mid tone.

[1] In addition to pitch accents and boundary tones, there is another type of edge-related tone – the phrase accent – which is used systematically to account for the intonation of certain languages (like English German) and, more limitedly, also of Romance languages (Grice/Ladd/Arvaniti 2000 contains a well-known discussion of the phonological status of phrase accents, while Gili-Fivela 2015, 162, 172, 185, 193 provide some examples of phrase accents in Italian). As far as Ladin is concerned, although Hack (2012, 2015) postulated the existence of phrase accents in *some* (though not all) sentence-types, there is no evidence in our data that supports the idea that phrase accents may exist in vocatives. Typologically speaking, this is coherent with the fact that phrase accents have not been proposed for vocatives in any other Romance language.

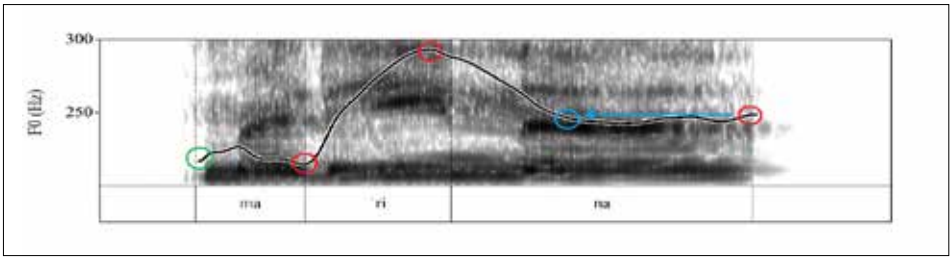

Fig. 3: Spectrogram, F0 contour (in black), tonal turning points resulting from underlyingly phonological tones (in red), tonal turning points resulting from spreading (in blue), default low starting point (in green), and broad phonetic transcription of the vocative *"Marina!"* uttered by a speaker of European Portuguese from Porto (source of the audio: Prieto/Borràs-Comes/Roseano 2010–2014).

One needs also to observe the different phonetic results of interpolation and spreading. If we consider again the case of the Portuguese call *Marina*, the underlying L+H* !H% contour can surface with a final mid plateau only if spreading is present (Figure 4, left panel), while if the H point at the end of the stressed syllable and the final !H point are united by interpolation, the shape of the F0 contour would be different (Figure 4, right panel).

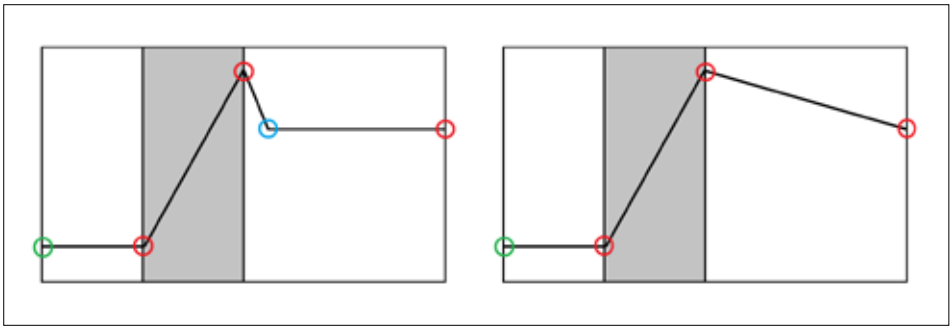

Fig. 4: Simplified representation of the Portuguese vocative *"Marina!"* with left-spreading of the final mid tone (left panel) and hypothetical representation of the same vocative without left-spreading of the final mid tone (right panel).

The last AM concept that is relevant to our analysis is tonal crowding. Tonal crowding is "the situation in which the composition of a melody is such that there are more tonal elements than tone-bearing units (typically vowels) on which the tonal elements may be realized" (Arvaniti/Żygis/Jaskuła 2016, 341). In general, tonal crowding occurs when more than two different tonal targets are associated with a single tone-bearing unit (cf. Gordon 2001, Gussenhoven/Jacobs 2013, Rodriquez 2020, 2021, Roseano/Fernández Planas 2018, Yip 2002, Zhang 2002). In intonation studies, crowding is interesting because it can

be used as a diagnostic of the status of specific parts of a melody: it can be used to determine whether a particular pitch event is always retained or can be omitted under certain circumstances. The assumption is that retained elements are more likely to be phonological (Arvaniti/Żygis/Jaskuła 2016, 341). As we will see later, in our corpus we have included words with different numbers of syllables and accentual positions in order to assess the effects both of the scarcity of tone-bearing units (tonal crowding) and the abundance of unstressed postaccentual material on the appearance of certain tonal turning points.

2.2 The AM model and duration

Since its origins, the AM model has been concerned almost exclusively with one aspect of prosody, which is intonation. This is due to the fact that the F0 modulation is one of the main strategies to encode postlexical information about sentence type, while in most languages duration does not play this role. Nevertheless, some studies show that duration can transmit information about the sentence type, although only in a limited number of languages and often to a minor extent in comparison with intonation.

Duration is known to be the only prosodic feature that expresses certain sentence type contrasts in some non-Indo-European languages (see, among others, Rischel's (1974) classical account for West-Greenlandic Eskimo). The Romance languages spoken in the Iberian Peninsula also provide clear examples of how duration can be the sole prosodic cue of sentence-type. In Mieres Asturian (López Bobo et al. 2005, Díaz Gómez et al. 2007) and in Don Benito Extremaduran Spanish (Congosto 2007a, 2007b, Congosto-Martín et al. 2010), the prosodic difference between a broad focus statement and a yes-no question does not lie in the nuclear configuration of the F0 contour (which is the same in both sentence-types) but in duration: while statements show only short vowels, the last vowel of questions is considerably lengthened. Even more importantly for this paper, something similar has also been reported for Central Catalan (cf. Prieto et al. 2009; Borràs-Comes/Sichel-Bazin/Prieto 2015, Prieto/Roseano 2021), where uncertainty statements and vocatives are distinguished by duration. Figure 5 shows the uncertainty statement *"La Marina"* (left panel) and the call *"Marina!"* (right panel) uttered by a speaker of Central Catalan. One can observe that both contours show a rise within the stressed syllable and a fall to mid in the final unstressed syllable. Nevertheless, in addition to differences in scaling, there are two more intonational features that differ between the two contours. On one hand, the vocative displays left-spreading of the final !H% tone, like in Portuguese. On

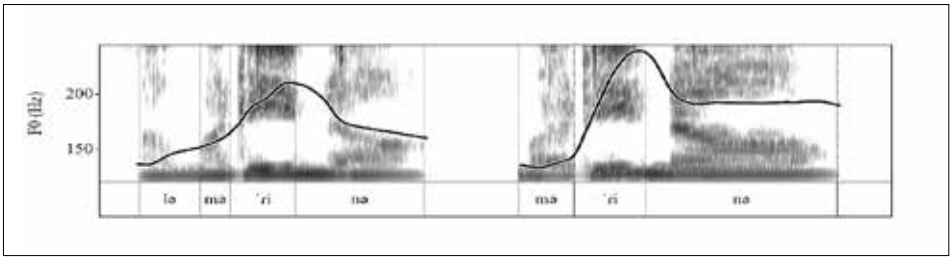

Fig. 5: Spectrogram, F0 contour, and broad phonetic transcription of the uncertainty statement *"La Marina"* (left) and of the vocative *"Marina!"* (right) uttered by a speaker of Central Catalan.

the other hand, which is relevant for this section of the paper, the final syllable in the call is considerably lengthened. Hayes and Lahiri (1991) argued for the phonological nature of this lengthening of the calling contour.

The fact that in the above-mentioned cases of Spanish, Asturian and Catalan duration is distinctive at the sentence level (as opposed to the well-known cases in which duration is distinctive on the lexical level) leads to conclude that it should be represented phonologically. The question is "what kind of formal representation should be attributed to durationally-specified contours to distinguish them from ordinary intonation contours?" (Hayes/Lahiri 1991, 78). To the best of our knowledge, there have been very few attempts to answer this question (for a review see Muñiz-Cachón/Roseano 2021). Our hypothesis is that the best way to account for the lengthening of calls in Romance (as well as for the distinctive lengthening in yes-no questions of Mieres Asturian and Don Benito Extremaduran Spanish) is assuming that the prosody of an utterance is not the result of the interplay between *two* tiers only (a segmental one and a tonal one), but among *three*: a segmental tier that contains vowels and consonants and *two* suprasegmental strings (one that contains tones, and another that contains what we tentatively call "durational phonemes"). As we will see in § 6.2, we suggest that such durational phonemes can be thought of as prosodic moras (μ^{P}) that, in certain sentence-types, are aligned with certain positions of the prosodic hierarchy.

3. The prosody of stylized calls in Romance languages

Since one of the objectives of this paper is comparing the intonation of Ladin vocatives with the intonation of calls in other Romance languages, in this section we provide a summary of the studies about stylized calls in these languages. Chanted vocative tunes have been documented in Portuguese (Frota et al. 2015), Spanish (Hualde/Prieto 2015, Roseano et al. 2021), Catalan (Prieto

et al. 2015), the Aranese and Cisalpine dialects of Occitan (Sichel-Bazin/Meisenburg/Prieto 2015), Sardinian (Cabré/Vanrell 2013, Vanrell 2015), Romanian (Jitcă et al. 2015), Friulian (Roseano/Vanrell/Prieto 2015), Italian (Gili-Fivela 2015), and French (Delais-Roussarie et al. 2015). For Ladin, the existence of chanted vocatives is briefly mentioned in Roseano/Finco (2021). Although the phonetic shape of this melody is similar in all these languages, three different phonological interpretations have been provided. In the following part of this section, we will first discuss the phonological representations of intonation, and at the end we will deal with the issue of the representation of the durational aspects.

3.1 The intonation of stylized calls Romance languages

The first phonological representation of the chant is – at least apparently – the most widespread: the tune interpreted as L+H* !H% is documented in Portuguese, Spanish, Catalan, Occitan, Sardinian, and Romanian. As an example of this tune, we can take the Catalan vocative in Figures 6 and 7. The first two turning points of the contour are the result of the surfacing of the L+H* pitch accent. As far as the other two turning points are concerned, following Prieto et al. (2015, 39) we assume that final one (in red in Figures 6 and 7) is the outcome of the underlying phonological !H% boundary tone, while the penultimate turning point (in blue) is the effect of the spreading of the final mid tone, which left-spreads till the beginning of the postaccentual stretch.

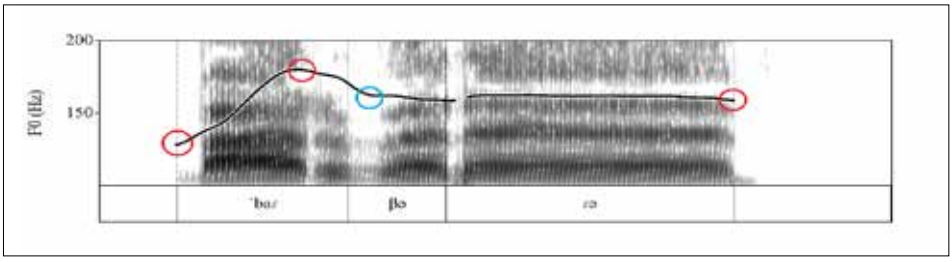

Fig. 6: Spectrogram, F0 contour (in black), tonal turning points resulting from underlyingly phonological tones (in red), tonal turning points resulting from spreading (in blue), and broad phonetic transcription of the vocative *"Bàrbara!"* uttered by a speaker of Balearic Catalan (source of the audio: Aguilar/De-La-Mota/Prieto 2009–2011).

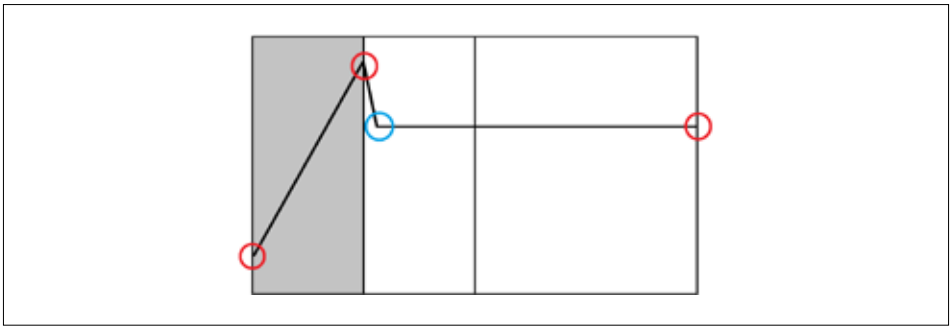

Fig. 7: Simplified representation of the L+H* !H% Catalan vocative *"Bàrbara!"* with left-spreading of the final mid tone.

For Italian, Friulian and Ladin, a slightly different version of the chant has been documented. As one can see in Figures 8 and 9, the difference lies in that there are two tonal plateaus in proparoxytone words: a high one in the penultimate syllable, and a mid one in the last syllable. In order to represent phonologically this characteristic, the contour has been transcribed as L+H* H!H%. This means that the final boundary tone has been interpreted as bitonal. The high plateau in the penultimate syllable would be then the result of the interpolation between the H target of the pitch accent and the H target of the boundary tone. Nevertheless, this explanation does not account for the presence of the penultimate tonal turning point (in blue in Figure 8), which is needed to describe the existence of a final mid plateau (as we will see later, one can easily argue that it can be motivated by the spreading of the final !H% tone, like in Portuguese and Catalan).

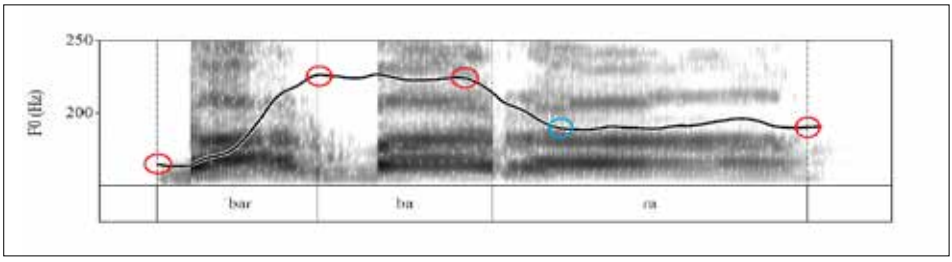

Fig. 8: Spectrogram, F0 contour (in black), tonal turning points resulting from underlyingly phonological tones (in red), tonal turning points possibly resulting from spreading (in blue), and broad phonetic transcription of the vocative *"Barbara!"* uttered by a speaker of Northern Friulian.

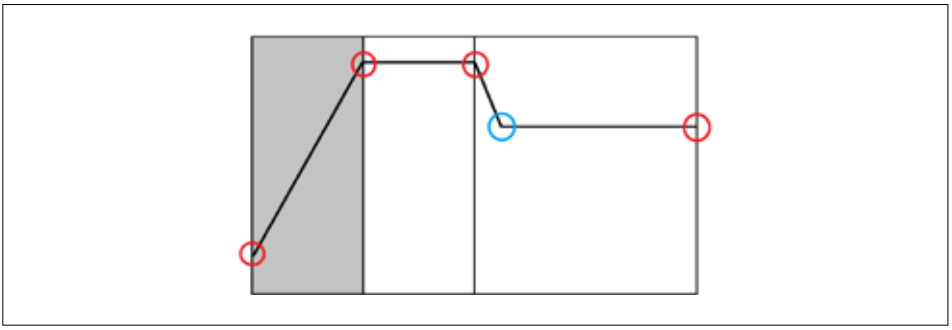

Fig. 9: Simplified representation of the L+H* H!H% Friulian vocative "*Barbara!*" with left-spreading of the final mid tone.

The third chanted contour found in Romance has been described only for French (Figure 10) and, although it is very similar in shape to the contour documented in Spanish or Catalan, it differs from it for a few important phonological reasons that have to do with two typological differences between French and the other languages of the same family:

1. First of all, "unlike other Romance languages, French has no lexical stress. […There are] two distinct stress types that are assigned at the phrasal level: an obligatory phrase-final, primary, stress, and an optional phrase-initial, secondary, stress" (Delais-Roussarie et al. 2015, 65).

2. Secondly, French displays a non-obligatory low boundary tone that is associated with the left edge of an Accentual Phrase[2] and that is transcribed with aL (cf. op. cit., 70). The tonal target corresponding to the initial low boundary tone surfaces close to the beginning of the phrase.

These two features of French require a quite different phonological analysis of the chanted contour. Phonetically speaking, the tune in Figures 10 and 11 is characterized by a rise followed by a mid-plateau, like in other Romance languages. Nevertheless, these pitch movements need to be accounted for differently. Whereas in other Romance languages the rising movement is associated with the accented syllable (and is, therefore, interpreted as a L+H* pitch accent), in French it occurs in the pre-accented stretch and therefore cannot be a pitch accent. Something similar occurs with the final plateau, that in Romance languages

[2] For the purposes of this article one does not need to describe in detail the prosodic status and intonational features of Accentual Phrases. It is enough to bear in mind that the French vocatives we analyse in this paper form an Accentual Phrase, and, therefore, can display the initial low boundary tone.

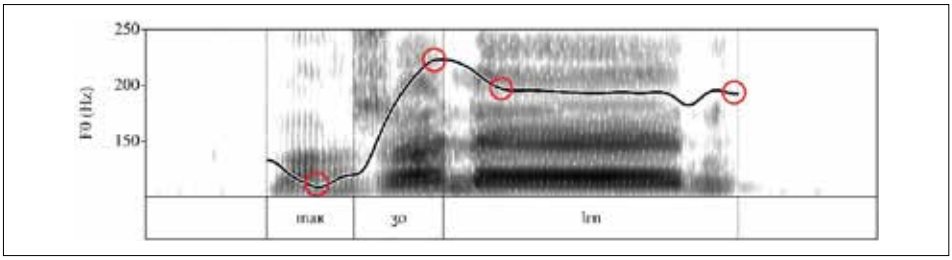

Fig. 10: Spectrogram, F0 contour (in black), tonal turning points resulting from underlyingly phonological tones (in red), and broad phonetic transcription of the vocative *"Marjolène!"* uttered by a speaker of French from Brussels (source of the audio: Prieto/Borràs-Comes/Roseano 2010–2014).

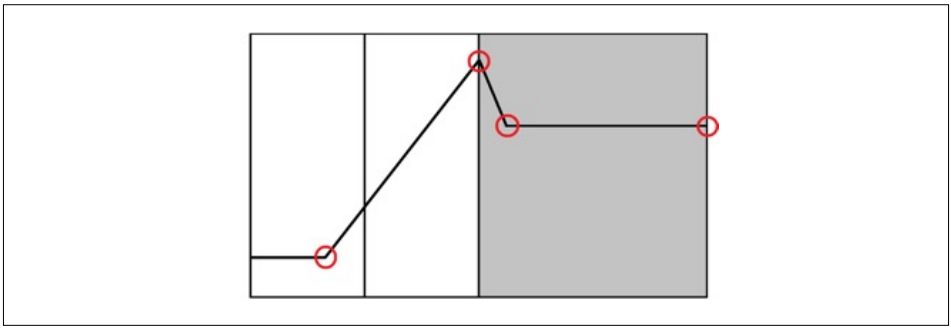

Fig. 11: Simplified representation of the aL H+!H* !H% French vocative *"Marjolène!"*.

occurs in the posttonic syllables and is therefore interpreted as the result of the existence of a mid boundary tone (!H%). In French, the final plateau corresponds to the last accented syllable and, for this reason, must be explained (also) by means of a primary accent. The tune of French chanted calls has been describes as follows: aL H+!H* !H%. This means that the analysis of the vocative in Figure 10 is the following: the first tonal target (that surfaces in the syllable [maʁ]) is an initial low boundary tone (aL); the final mid target at the end of the last syllable [lɛn] is a !H% boundary tone; the rising pitch movement in the syllable [ʒo] is the effect of interpolation between the initial aL and the trailing tone of the H+!H* nuclear accent, and the plateau in the accented final syllable [lɛn] is the result of the interpolation between the !H* tone and the !H% boundary (cf. Delais-Roussarie et al. 2015, 94–95). In short, the only phonological element in common between French calls and chanted vocative in other languages seems to be the existence of a final !H%, despite of their similarity in F0 curve shape.

As a final remark to this subsection, one has to point out that the description of the vocative chants in Romance relies on data collected with a small but impor-

tant methodological difference. While for Catalan, Spanish, Sardinian, Italian, Friulian and Ladin the description is based on the scrutiny of proparoxytone names, for other languages (Portuguese, Romanian, and Occitan) paroxytone words have been analysed. As we will see in § 7, in some cases this has consequences on the phonological analysis.

3.2 The durational aspects of stylized calls in Romance languages

While the intonation of stylized calls in Romance languages has been discussed in several previous works, the durational aspects of this sentence-type have been dealt with less in depth.

As far as the acoustic aspects of the lengthening detected in calls are concerned, to the best of our knowledge there is no detailed phonetic analysis of this phenomenon in Romance. The authors that deal with this subject seem to share the idea that the final syllable is always lengthened, while only some of them suggest that in some languages there is a certain degree of lengthening also in the stressed syllable. Among the authors that report lengthening of both the stressed and the final syllable we can mention Frota (2014, 34) for Portuguese ("In the greeting call, the nuclear syllable and most particularly the boundary syllable are lengthened"). Similarly, Frota et al. (2015, 274–275) state that "A further common trait of the greeting call in Portuguese is syllable lengthening: the nuclear syllable and particularly the boundary syllable are lengthened". Although Gili-Fivela (2015) do not develop in depth the issue of lengthening in Italian vocatives, their data show that the final syllable is lengthened. These authors mention also that the stressed nuclear syllable can also be lengthened, but only when the vocative chant is used as an insistent vocative (cf. Gili-Fivela et al. 2015, 186). Vanrell et al. (2015, 344) do not address the question of duration in Sardinian vocatives explicitly either, but from the phonetic segmental transcriptions provided in the pictures of the calls that they analyse one can infer that the authors assume that lengthening can be present in both the stressed and the final unstressed syllable. For other languages, the lengthening has been described only for the final syllable. For French, Fagyal (1997, 85) refers to the "the final syllable surfacing as the lengthened". Prieto et al. (2015) for Catalan mention "the extreme final lengthening". For Friulian, Roseano/Vanrell/Prieto (2015, 133) mention "the last post-tonic syllable (which is lengthened)". Jitcă et al. (2015) do not explicitly talk about length in Romanian vocatives, but when they refer to the "*long* [emphasis is ours], moderately high, constant pitch movement during the last unaccented syllable" (311) it seems quite clear

that they consider lengthening to affect only the last syllable. Last but not least, Hualde/Prieto (2015, 386) for Spanish argue that "What all calls appear to have in common is the extraordinary lengthening of the (stressed or unstressed) final syllable."

Although – as we have seen above – some phonetic information is available on lengthening, the question of its phonological status is hardly been addressed in Romance languages. The issue is raised by Frota et al. (2015, 274–275):

> It is unclear whether this extended duration is a phonetic property associated with the realization of the contour, or a phonological feature. Interestingly, in the case of EP it has been shown to block posttonic phonetic vowel reduction and vowel deletion, which otherwise occur in posttonic position (Frota 2014). […] Future research examining the perception of calling contours should clarify the status of duration in the prosodic representation of this utterance type.

The same author (2014, 36) also mentions the fact that "Hayes & Lahiri [1991] have argued for phonological lengthening as a feature of the calling contour, as it neutralizes the distinction between long and short vowels in the languages analysed".

In our analysis of Ladin calls we will try to improve the knowledge of lengthening of vocatives in this Romance variety by providing, first of all, a detailed phonetic analysis of duration in order to establish which elements of the segmental chain get lengthened in calls (§ 5.1). In addition, we will put forward a (tentative) phonological representation of this lengthening (§ 6.2).

4. Methodology

4.1 Materials

In order to collect the data, a *Discourse Completion Task* (DCT) (cf. Vanrell/Felhausen/Astruc 2018) was designed. The DCT contained 18 situations: nine of them were intended to elicit broad focus statements (like in (1) below) and nine of them were designed to elicit vocatives (like in (2) below). While vocatives are the objective of this study, statements were recorded in order to collect durational data that could be used as reference values to check whether vocatives displayed lengthening. When preparing the situation for eliciting vocatives, we controlled for several pragmatic and communicational factors that are described as relevant in the literature. Namely, we first of all controlled for social distance between parties, insofar as we established a symmetric familiar relation (cf.

Brown/Levinson 1987). Secondly, the conversational context implies two conditions that, according to previous studies (see Ladd 1978 for a review), trigger the use of the stylized intonation: the fact that the speaker does not see the addressee, and the fact that the addressee is not near the speaker.

1. Interviewer: Your sister's name is Berbora. A person who does not know her asks you what her name is. Answer to his/her question saying only the name "Berbora".
   Speaker: *Berbora.*

2. Interviewer: You go to your sister Berbora's. When you get there, you find the front door open. You stand on the threshold and you look inside the house, but you do not see her. Call her.
   Speaker: *Berbora!*

The nine traditional Badiot names used in the DCT were chosen based on a set of features that we considered that could possibly have effects on prosody (Table 1). The first of these features is accentual position: the questionnaire contains one name with the stress on the antepenultimate syllable (*Berbora* "Barbara"), two with the stress on the penultimate syllable (*Madalena* "Magdalene" and *Fridl* "Frederick"), and six with the stress on the last syllable (*Matî* "Matthew", *Martin* "Martin", *Michil* "Michael", *Tomèsc* "Thomas", *Ujöp* "Joseph" and *Micurá* "Nicholas"). The second feature we took into consideration was the nature of the syllable nucleus: the nucleus of unstressed final syllables in Badiot can be either a vowel (like in the case of *Madalena* [ma.da.ˈle.na]) or a sonorant (like in the case of *Fridl* [ˈfri.dl̩]). For words with the stress on the last syllable, we also took into consideration vowel quantity, which can be short like in *Micurá* [mi.ku.ˈra] or long like in *Matî* [ma.ˈti:]. For oxytone words we also controlled for the presence and nature of codas in the stressed syllable: in addition to names with no coda (*Matî* [ma.ˈti:] and *Micurá* [mi.ku.ˈra]), we included in the DCT words ending with sonorants (either a nasal like in *Martin* [mar.ˈtiŋ] or a liquid like in *Michil* [mi.ˈkil]) and obstruents (either a fricative like in *Tomèsc* [to.ˈmeʃ] or a stop like in *Ujöp* [u.ˈʒøp]). The reason why we decided to include names with different characteristics is the assumption is that tonal elements that are not retained in all conditions are less likely to be phonologically specified (cf. Arvaniti/Żygis/Jaskuła 2016, 341). In other words, if in our data we find tonal elements that are elided, such elements are less likely to be the result of underlying tones.

Name	Phonetic transcription	Stressed syllable	Last syllable	
			Nucleus	Coda
Berbora	[ˈber.bo.ra]	antepenultimate	vowel	none
Madalena	[ma.da.ˈle.na]	penultimate	vowel	none
Fridl	[ˈfri.dl̩]	penultimate	sonorant	none
Matî	[ma.ˈti:]	last	vowel	none
Micurá	[mi.ku.ˈra]	last	vowel	none
Martin	[mar.ˈtiŋ]	last	vowel	nasal
Michil	[mi.ˈkil]	last	vowel	liquid
Tomèsc	[to.ˈmeʃ]	last	vowel	fricative
Ujöp	[u.ˈʒøp]	last	vowel	stop

Tab. 1: Names used in the DCT and their characteristics.

Before starting data collection, the questionnaire was tested with one of the speakers in January 2021. In February 2021 we recorded six native speakers of Badiot (three males and three females). Due to the ongoing Covid-19 pandemic, recordings were made remotely. A native speaker of Badiot gave the speakers the instructions according to the questionnaire described in § 2.1. The speakers recorded the utterances by means of their mobile phones and sent the recordings to the researchers. The audio files were then converted from the compressed .ogg format to .wav format in order to process them. On the whole, for this research we collected 108 recordings (i.e. nine names * two sentence-types * six speakers).

4.2 Annotation

The audio files were annotated in *Praat* textgrids (cf. Boersma/Weenink 2021) containing three tiers (Figure 12). In the first tier we marked the syllables, in the second tier we annotated the segments, and in the third we marked the position of tonal targets of vocatives (while no intonational analysis of declaratives was carried out).

In order to demarcate segments and syllables, we followed the same criteria used by Gabriel/Kireva (2014), namely: a) boundaries between vowels and adjacent consonants were determined on the basis of formant structure, b) for unvoiced

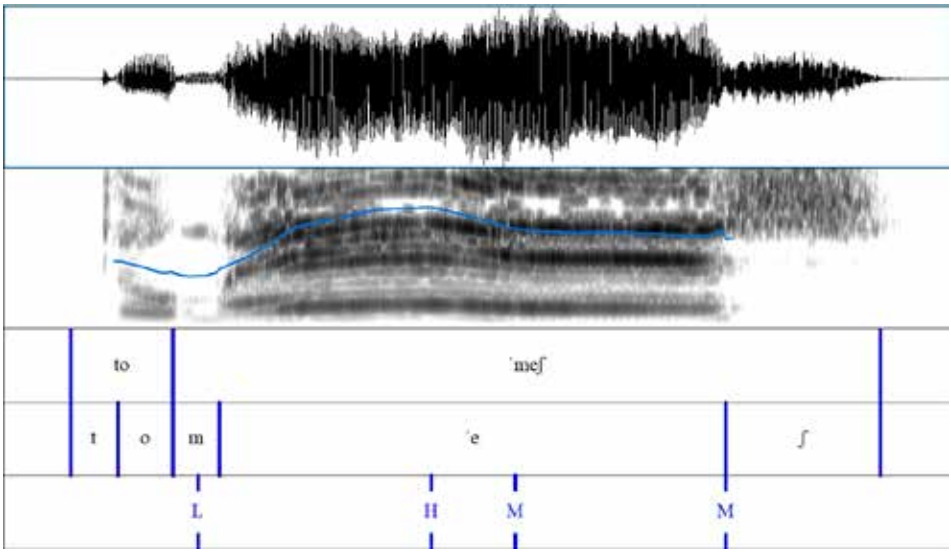

Fig. 12: Example of annotation with *Praat* of the .wav file of the vocative *"Tomèsc!"*.

plosives in word-initial position, the beginning was placed at 50 ms prior to the burst, given that their boundaries can hardly be determined on the basis of other criteria, c) the end of vowels in word-final position was established based on format structure and intensity.

In order to establish the position of the low (L) and high (H) turning points, we selected a ~300 ms interval around each point and we used the *Praat* functions "Move cursor to minimum pitch" and "Move cursor to maximum pitch", respectively. When we detected the presence of microprosodic perturbations in the area where the low/high turning point was placed, we checked the result of this automatic procedure and, if needed, we corrected it manually. For the two mid (M) targets that appear in all vocatives, we placed the first one at the turning point where the final F0 plateau begins, and the second one at the end of the same plateau.

4.3 Prosodic data

Durational and intonational data were exported in a database in .xls format. As we explain in detail in the following subsections, the data that were exported included duration values (§ 4.3.1), F0 values (§ 4.3.2), and information about the position of the tonal targets (§ 4.3.3).

4.3.1 Duration values

In order to check whether calls display lengthening in comparison with statements, we measured the duration (in ms) of a set of intervals:

a) whole name (ω)
b) stressed syllable (ˈσ)
c) final unstressed syllable (σ)
d) rest of unstressed syllables (r)
e) nucleus of the stressed syllable (ˈn)
f) nucleus of the final unstressed syllable (n)
g) onset of the final syllable (o)
h) coda of the final syllable (c)
i) sum of the onset and coda (if present) of the stressed syllable (ˈoc)

Since the durational measures from a) to i) will be applied to both statements and calls, we will use the subindexes $_c$ (calls) and $_s$ (statements). For example, ω_s refers to the length of the whole name uttered as a statement, while ω_c indicates the duration of the whole name uttered as a call.

Since every speaker uttered pairs of utterances (i.e. a statement and a call with the same name), we used paired tests to check for the significance of the differences in duration between statements and calls. Items were paired so that each vocative uttered by a single speaker was compared with the corresponding statement produced by the same person. Since the distribution of data is not normal we used the Wilcoxon signed-rank test, which we run by means of *Social Science Statistics* (cf. Stangroom 2021).

Although our research hypothesis is directional, insofar as we generally expect to observe lengthening, this is not the case for the statistical hypothesis, since the literature about the durational aspects of stylized calls in Romance languages (§ 3.2) does not provide a clear picture of which of the intervals from a) to i) can be expected to be lengthened in Badiot. Therefore, we used the two-tailed version of the test, which has also the following additional advantages: 1) the two-tailed version of the test is more restrictive than the one-tailed version. This is because by dividing the significance level between both ends of the distribution, one avoids the risk of overestimating the presence of correlations in one direction, which is an advisable precautionary measure when the number of

cases is limited. 2) By applying the two-tailed version of the test we are equally testing for effects in both the expected and unexpected direction, which also is a precautionary measure since we do not know beforehand which of the chosen measures from a) to i) will be affected in stylized chanted calls.

When implementing this test, we calculated W when the number of cases was below 20 and Z when it was above 20 (cf. von Sperling/Verbyla/Oliveira 2020, 367).

In order to measure the difference in duration between calls and statements, based on the above-mentioned values in ms we calculated the ratios from (3) to (11) for each speaker.

3) $\Omega = \frac{\omega_c}{\omega_s}$

4) $'\Sigma = \frac{'\sigma_c}{'\sigma_s}$

5) $\Sigma = \frac{\sigma_s}{\sigma_c}$

6) $R = \frac{r_c}{r_s}$

7) $'N = \frac{'n_c}{'n_s}$

8) $N = \frac{n_c}{n_s}$

9) $'OC = \frac{'oc_c}{'oc_s}$

10) $O = \frac{o_c}{o_s}$

11) $C = \frac{c_c}{c_s}$

In order to assess whether the differences in duration measured by means of the ratios from (3) to (11) are linguistically relevant, we followed Pamies/Fernández Planas (2004) who determined that any difference in length below the threshold of 1/3 of the duration of the shortest interval is not perceivable by speakers and, therefore, is not linguistically relevant. Taking up the threshold of 1/3 implies that if our ratios are below 1.33 the difference in length is not perceivable.

4.3.2 F0 values

In order to describe accurately the contours of the calls, we measured F0 values of the following elements:

a) L target
b) first H target
c) second H target, if present
d) mean F0 value of the M plateau

We then proceeded to calculate the value in semitones for two F0 movements of each vocative: the rise from the L target to the first H target, and the fall from the last H target to the mean F0 value of the M plateau.

We deliberately omitted the initial L because in Ladin a low F0 at the beginning of utterances is a default (see Hack 2012, 2015). In other words, it is part of the phonetic realization of intonation and does not reflect the presence of a phonological tone, exactly like Arvaniti/Żygis/Jaskuła (2016) argue for Polish chanted calls. For this reason, we also decided not to annotate it in the phonological analysis we carry out in § 6.

4.3.3 Position of tonal targets

We included in the database information about the position of the tonal targets on the time (horizontal) axis in comparison with the adjacent landmarks in the signal:

a) Position of the L target in comparison with the left edge of the stressed syllable
b) Position of the first H target in comparison with the right edge of the stressed syllable
c) Position of the second H target (if present) in comparison with the right edge of the unstressed pre-final syllable
d) Position of the first M target in comparison with the left edge of the final syllable
e) Position of the second M target in comparison with the right edge of the final syllable

5. Phonetic results

In this section we are presenting the results of the phonetic analysis of the contours that are contained in our corpus. We will present first the data about duration (§ 5.1) and then those of F0 (§ 5.2 and § 5.3). In some subsections, we will provide first the data of proparoxytone and paroxytone words, where the prosodic features surface in a more transparent way, and only later will we discuss oxytone words, that display more complex features.

5.1 Duration

5.1.1 Proparoxytone and paroxytone words

The analysis of the duration of proparoxytone (['ber.bo.ra]) and paroxytone ([ma.da.'le.na] and ['fri.dl̩]) names revealed that calls are, overall, longer than the corresponding statements. A two-tailed Wilcoxon signed-rank test showed that the difference in length between calls and statements is statistically significant ($W = 10, p < .01$). From a perceptual point of view, the Ω ratio suggests that the difference is on the edge of perceivability (mean $\Omega = 1.27$, $SD = 0.29$). A more detailed analysis of duration can shed more light on where exactly lengthening takes place, as well as on its statistical and perceptual significance. In the following, we will analyse separately the duration of unstressed non-final syllables, of the stressed syllable and of the final unstressed syllable.

As far as the duration of unstressed non-final syllables of ['ber.bo.ra] and of [ma.da.'le.na] (that is, [bo] and [ma.da])[3] is concerned, a two-tailed Wilcoxon signed-rank test showed that there is no statistically significant difference between statements and calls ($p > .05$). In addition, the *R* ratio shows that the difference in length is below the threshold of perceivability (mean $R = 0.95$, $SD = 0.21$). We have to conclude that the duration of unstressed non-final syllables does not differ between statements and calls or, in other words, that unstressed non-final syllables are not lengthened in calls.

The analysis of the duration of the stressed syllables of ['ber.bo.ra], [ma.da.'le.na] and ['fri.dl̩] gave similar results. On one hand, a two-tailed Wilcoxon signed-rank test showed that there is no statistically significant difference

[3] The name ['fri.dl̩] was excluded from this analysis because it does not have any non-final unstressed syllable.

between statements and calls ($p > .05$). On the other hand, the 'Σ ratio shows that the difference in length is below the threshold of perceivability (mean 'Σ = 1.07, SD = 0.22). The same holds if we analyse only the nucleus of the syllable ($p > .05$; mean '*N* = 1.10, SD = 0.25) or the onset+coda part of the syllable ($p > .05$; mean '*OC* = 1.11, SD = 0.69). The conclusion we have to draw, thus, is that the duration of stressed non-final syllables does not differ between statements and calls or, in other terms, that stressed non-final syllables are not lengthened in calls.

If we take into consideration final unstressed syllables, the situation is different. A two-tailed Wilcoxon signed-rank test showed that the difference between calls and statements is statistically significant (W = 1, $p < .01$). In addition, the Σ ratio shows that the difference in length is well above the threshold of perceivability (mean Σ = 1.70, SD = 0.52). If we analyse separately the nucleus of the syllable and the onset, we can be more precise about the elements that get lengthened. In fact, while the duration of the onset does not differ between statements and calls ($p > .05$; mean *O* = 1.08, SD = 0.27), the duration of the nucleus does (W = 1, $p < .01$; mean *N* = 1.92, SD = 0.69). One has to infer, therefore, that the final unstressed syllables are lengthened in calls and that such lengthening takes place in the nucleus, be it a vowel like in ['ber.bo.ra] and [ma.da.'le.na] or a sonorant like in ['fri.dl̩].

5.1.2 Oxytone words

The analysis of the duration of oxytone names ([ma.'ti:], [mi.ku.'ra], [mar.'tiŋ], [mi.'kil], [to.'meʃ], [u.'ʒøp]) shows that calls are, on the whole, longer than the corresponding statements. A two-tailed Wilcoxon signed-rank test showed that the difference in length between calls and statements is statistically significant (Z = -5.2316, $p < .01$). This result is confirmed by the Ω ratio, which shows that the difference is above the threshold of perceivability (mean Ω = 1.45, SD = 0.24). In order to get a more precise idea of where lengthening takes place, we analysed separately non-final unstressed syllables and the stressed final syllable.

As far as non-final unstressed syllables are concerned (i.e. [ma] in [ma.'ti:], [mi.ku] in [mi.ku.'ra], [mar] in [mar.'tiŋ], [mi] in [mi.'kil], [to] in [to.'meʃ], and [u] in [u.'ʒøp]), a two-tailed Wilcoxon signed-rank test showed that the difference in length between calls and statements is not statistically significant ($p > .05$). Furthermore, the *R* ratio shows that the difference in length is below the threshold of perceivability (mean *R* = 0.97, SD = 0.20). Like for paroxytone and proparoxytone

words, we have to conclude that the duration of unstressed non-final syllables does not differ between statements and calls or, in other words, that non-final unstressed syllables are not lengthened in calls.

As far as the final syllable is concerned (which in this case is also the stressed one), the results show that it is consistently longer in calls than in statements. From a statistical point of view, according to a two-tailed Wilcoxon signed-rank test, the difference in length is significant ($Z = -5.2316$, $p < .01$). In addition, the difference in question is definitely above the threshold of perceivability (mean $\Sigma = 1.73$, SD = 0.46). If we separate the nucleus form the onset (in [ma.ˈtiː], [mi.ku.ˈra], [mar.ˈtiŋ], [mi.ˈkil], [to.ˈmeʃ], and [u.ˈʒøp]) and from the coda (only in [mar.ˈtiŋ], [mi.ˈkil], [to.ˈmeʃ], [u.ˈʒøp]), we observe first of all that the duration of the syllable nucleus differs. In fact, a two-tailed Wilcoxon signed-rank test revealed that the difference is statistically significant ($Z = -5.2316$, $p < .01$). Furthermore, the *N* ratio shows that the lengthening is above the threshold of perceivability (mean $N = 2.51$, SD = 0.86). On the other hand, the onset does not differ ($p > .05$; mean $O = 0.96$, SD = 0.21), nor does the coda ($p > .05$; mean $C = 1.09$, SD = 0.30). The conclusion we have to draw is that, once again, the lengthening of the final syllable is due to the increased duration of its nucleus.

In addition to the comparative analysis of duration between statements and calls, our data allow another kind of analysis that is of some relevance and that will be recalled in § 6.2. Hayes/Lahiri (1991) noticed that the lengthening in calls in British English overrides any distinctions of segmental length defined at the segmental level. For this reason, the authors argue that lengthening in calls is part of the phonological representation of the contour. The same can be observed in our data. In declaratives the phonologically long /iː/ of [ma.ˈtiː] is significantly longer than the /i/ of [mar.ˈtiŋ] and [mi.ˈkil]: while the first one has an average duration of 291 ms (SD = 43), the second has an average duration of 189 ms (SD = 58), which means that the difference between them is 54%, that is above the threshold of 1/3 (cf. Pamies/Fernández Planas 2004). On the other hand, in vocatives there is no significant difference between the /iː/ of [ma.ˈtiː] and the /i/ of [mar.ˈtiŋ] and [mi.ˈkil]: the first one has an average duration of 551 ms (SD = 128), while the second has an average duration of 453 ms (SD = 135); the difference between the two is 22%, that is below the threshold of 1/3 (cf. op. cit.). This means that in Badiot vocatives the lengthening due to prosody overrides distinctions of vocalic length defined at the segmental level.

5.1.3 Interim discussion: duration

The durational data show a) that calls are longer than statements and b) that the lengthening takes place in the nucleus of the final syllable. If the final syllable is unstressed, in calls its nucleus is twice as long as in statements. If the last syllable of a call is stressed, its nucleus is even longer, i.e. approximately 2.5 times longer than in statements.

5.2 Pitch movements

As far as intonation is concerned, we calculated the value in semitones for two F0 movements of each vocative: the rise from the low target to the first high target, and the fall from the last high target to the mean F0 value of the final mid plateau. The average value of the raise is 8.5 st (SD = 2.2), while the fall to the mid plateau is, on average, of 3.2 st (with a SD of 0.7). The fall of 3.2 st corresponds pretty well to a minor third interval (3 st), which has often been described as typical in calls (see, i.a., Liberman 1975, Gibbon 1976, Ladd 1978, Day-O'Connell 2010).

5.3 Position of F0 turning points

The number and position of turning points of the F0 contour varies across words depending on the position of the stress within the word and on the characteristics of the segments that form the last syllable. For this reason, in this subsection we will discuss first proparoxytone words (§ 5.3.1), then paroxytones (§ 5.3.2) and, eventually, oxytones (§ 5.3.3).

5.3.1 Position of F0 turning points in proparoxytones

In proparoxytone calls one can detect five turning points of the F0 contour. The first of them is a low one (labelled L in Figure 13) and appears at the beginning of the syllable, in its onset. After the initial L point, the F0 contour rises till it reaches a high (H_1) turning point which is placed at the end of the stressed syllable. After that, F0 draws a high plateau till a second high turning point (H_2) at the end of the pre-final unstressed syllable. The contour falls then quickly to a mid point marked with M_1 (at the beginning of the nucleus of the final lengthened syllable). From that point onwards the F0 draws a mid plateau that stretches till the end of the last voiced element of the word (in this case, the vowel [a]), where the final M_2 point lies.

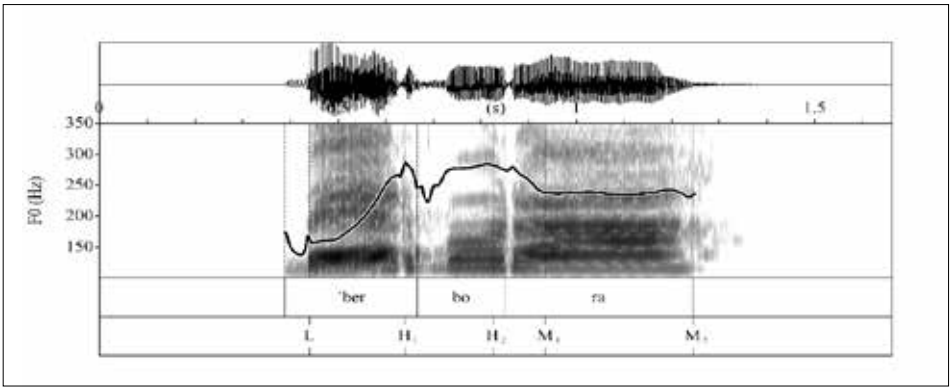

Fig. 13: Oscillogram, spectrogram, F0 contour, broad phonetic transcription and annotation of the F0 turning points of the vocative *"Berbora!"*.

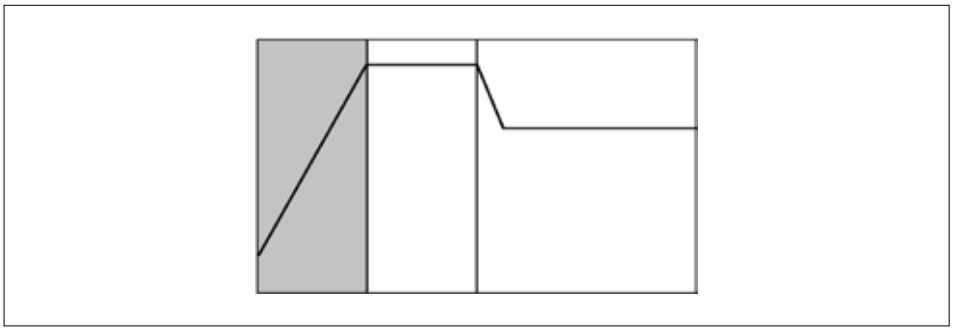

Fig. 14: Schematic representation of the vocative *"Berbora!"*.

If we had to represent the call schematically, we could do it as in Figure 14, where each rectangle represents a syllable (the dark grey rectangle being the stressed one and the wider rectangle the final lengthened one), while the superposed thick black line is a stylization of the F0 contour.

5.3.2 Position of F0 turning points in paroxytones

Differently from what we have observed in proparoxytone calls, in paroxytone names we detect only four turning points instead of five. As we will wee in § 6.1, this feature has to be considered when reconstructing the phonological representation of the calling contour in Badiot. As we can see in Figure 15, the first turning point is a low one (L) and appears near the beginning of the stressed syllable, usually in its onset. The second turning point is high (H) and is placed at the end of the stressed syllable. From there, F0 falls to a mid level, which is

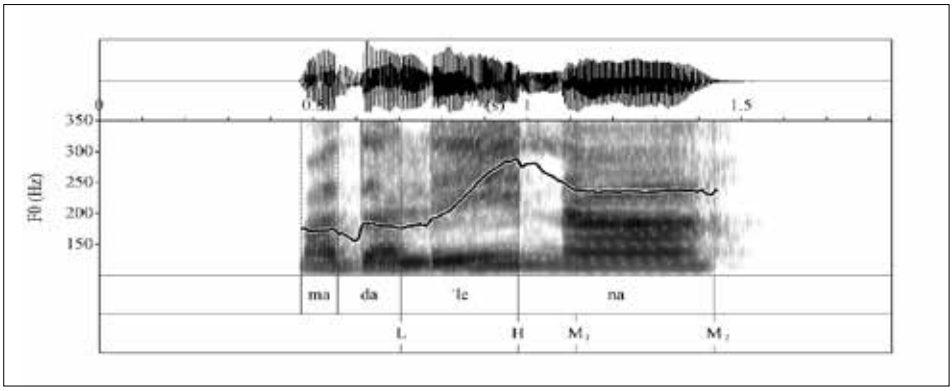

Fig. 15: Oscillogram, spectrogram, F0 contour, broad phonetic transcription and annotation of the F0 turning points of the call *"Madalena!"*.

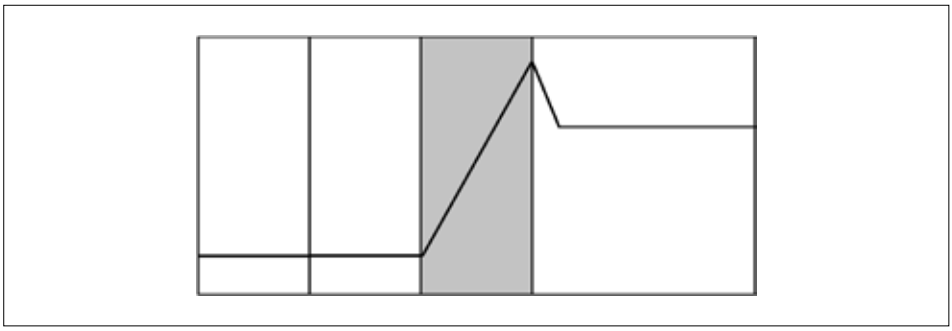

Fig. 16: Schematic representation of the call *"Madalena!"*.

reached at point M_1 at the beginning of the final lengthened syllable. After that, F0 remains stable and draws a plateau till the end of the last voiced element of the utterance, where the contour reaches its final point (M_2). Figure 16 offers a schematic representation of this contour.

The distribution of F0 turning points is the same also when de final unstressed syllable has a consonantic nucleus, like in ['fri.dl̩] (Figure 17). As one can see, F0 rises form a L point that is located as close as possible to the beginning of the stressed syllable and reaches its maximum (H) at the end of the same syllable. From the H point, F0 falls to a mid point M_1, which lies at the beginning of the final lengthened syllable. F0 remains then at the same level till the end of the last voiced element of the word, which in this case is the utterance-final [l̩]. A stylization of this contour is provided in Figure 18.

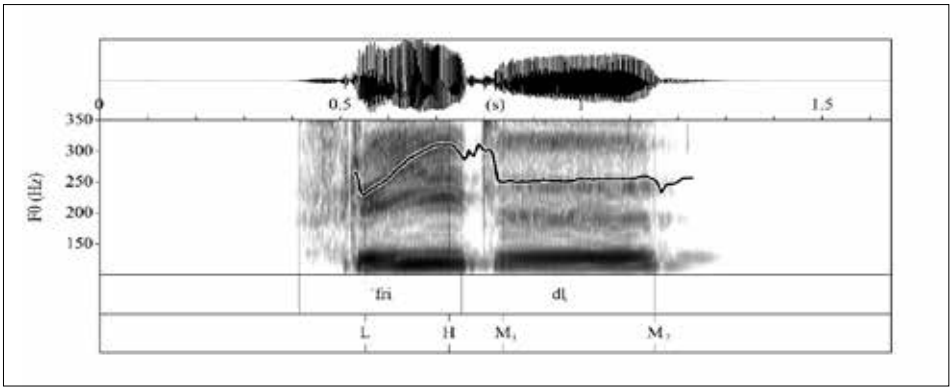

Fig. 17: Oscillogram, spectrogram, F0 contour, broad phonetic transcription and annotation of the F0 turning points of the call *"Fridl!"*.

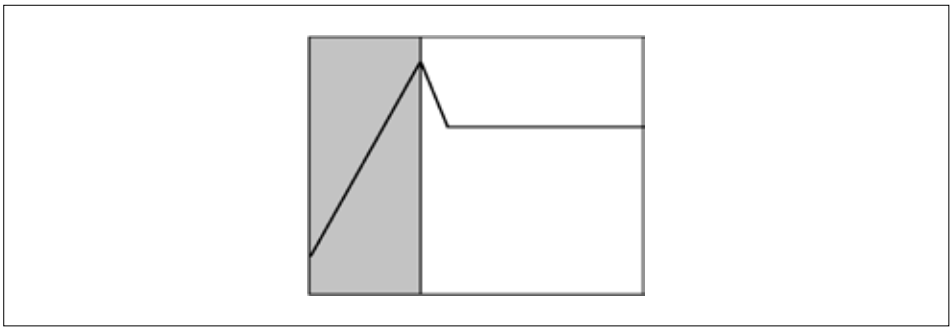

Fig. 18: Schematic representation of the call *"Fridl!"*.

5.3.3 Position of F0 turning points in oxytones

The analysis of the position of F0 turning points in oxytones provides similar results, although –as we will see later in this section– some differences are found when the name ends with an unvoiced consonant.

If the name ends with an open syllable (like [ma.ˈti:] in Figure 19 or [mi.ku.ˈra] in Figure 20), the L turning point appears close to the beginning of the stressed syllable. The H turning point is located in the first part of the syllable (usually in the first third of the vocalic nucleus). From the high point, F0 falls to a mid level (M_1) that is reached in the first half of the lengthened vowel. Then F0 is maintained at the same level until the final mid point (M_2), which appears at the end of the last voiced element of the utterance, which is a vowel ([i:] and [a], respectively). In Figure 21 we provide a schematic representation of this contour.

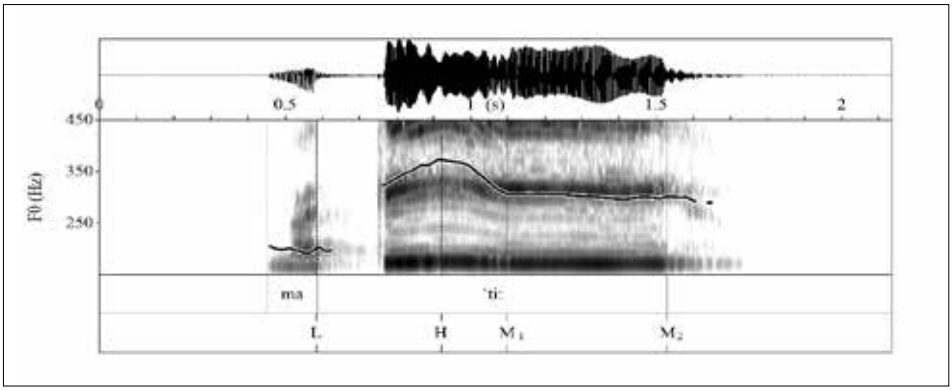

Fig. 19: Oscillogram, spectrogram, F0 contour, broad phonetic transcription and annotation of the F0 turning points of the call *"Matí!"*.

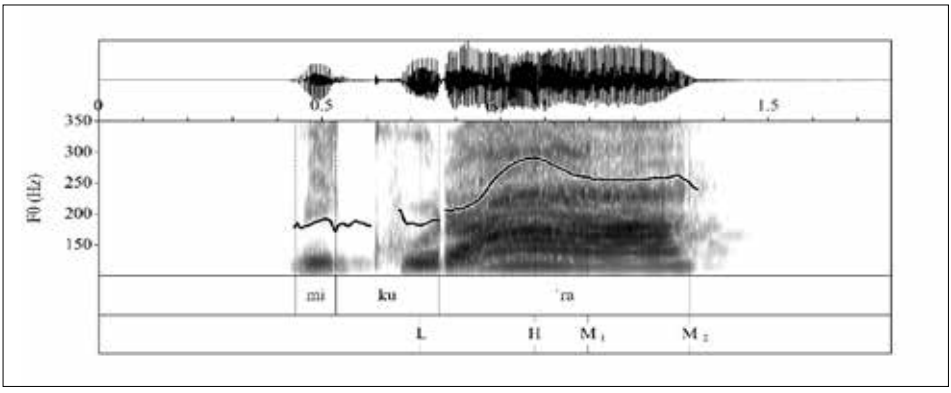

Fig. 20: Oscillogram, spectrogram, F0 contour, broad phonetic transcription and annotation of the F0 turning points of the call *"Micurá!"*.

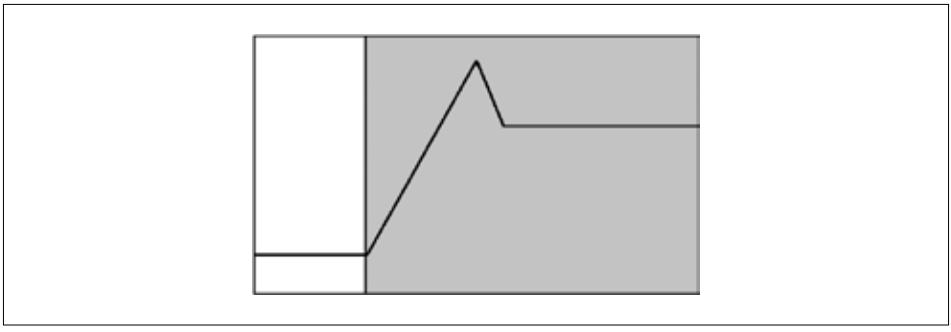

Fig. 21: Schematic representation of the call *"Matí!"*.

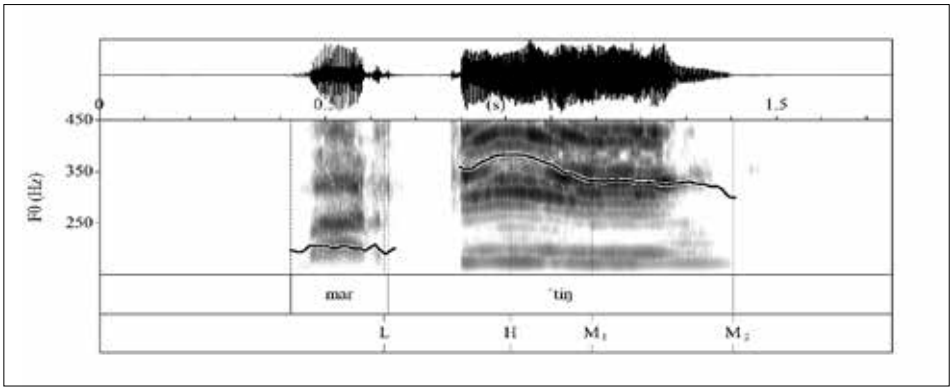

Fig. 22: Oscillogram, spectrogram, F0 contour, broad phonetic transcription and annotation of the F0 turning points of the call *"Martin!"*.

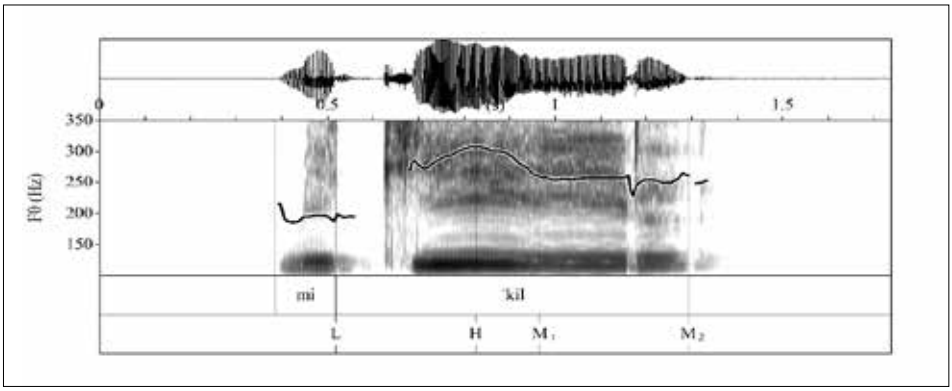

Fig. 23: Oscillogram, spectrogram, F0 contour, broad phonetic transcription and annotation of the F0 turning points of the call *"Michil!"*.

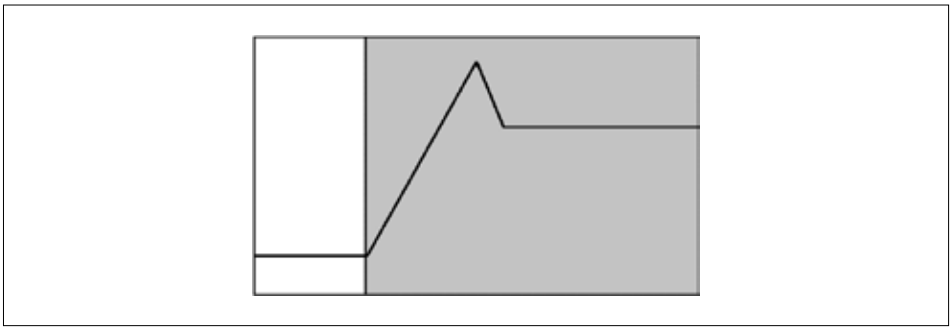

Fig. 24: Schematic representation of the call *"Michil!"*.

If the last syllable has a sonorant coda (like [mar.ˈtiŋ] in Figure 22 or [mi.ˈkil] in Figure 23), the situation is similar to the previous one: the L turning point is close to the beginning of the stressed syllable, the H turning point is in the first third of the vocalic nucleus of the stressed syllable, and the mid level (M_1) is reached in the first half of the lengthened vowel. Like in the previous cases, F0 is then maintained at the same level until the final mid point. Nevertheless, in this case the final mid point (M_2) is not reached within a vowel but at the end of the final sonorant consonant ([ŋ] and [l], respectively). Figure 24 contains a stylized representation of the contour.

The situation is slightly different when the oxytone name ends with an unvoiced consonant (like in [to.ˈmeʃ] in Figure 25 or in [u.ˈʒøp] in Figure 26). In that case, the position of F0 turning points in the first part of the contour is the same as above (i.e., the L point is at beginning of the stressed syllable, the H point is reached in the first third of the syllable and the fall to M_1 is usually completed in the first half of it). The main difference has to do with the final M_2 point, which appears at the end of the last voiced element of the syllable (i.e., the vowels [e] and [ø], respectively). Differently from the cases described above, M_2 does not appear in utterance-final position but, due to the fact that the last segment is unvoiced, it appears before. Figure 27 contains a schematic representation of this situation.

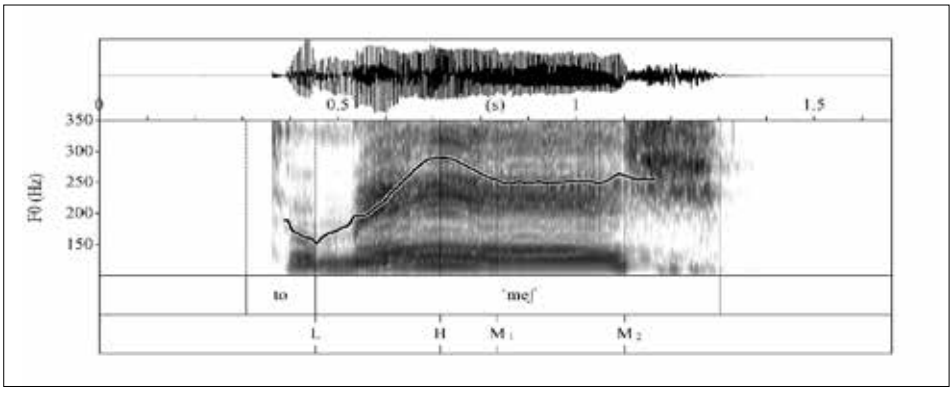

Fig. 25: Oscillogram, spectrogram, F0 contour, broad phonetic transcription and annotation of the F0 turning points of the call *"Tomèsc!"*.

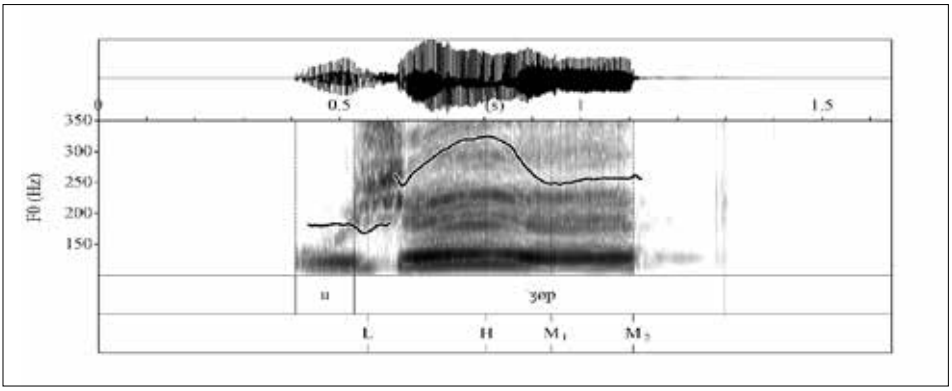

Fig. 26: Oscillogram, spectrogram, F0 contour, broad phonetic transcription and annotation of the F0 turning points of the call *"Ujöp!"*.

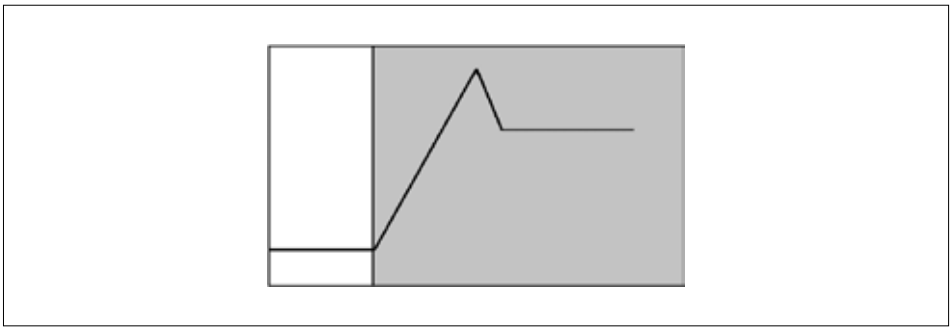

Fig. 27: Schematic representation of the call *"Tomèsc!"*.

5.3.4 Interim discussion: position of F0 turning points

The analysis of F0 turning points showed first of all that the number of such points is different between proparoxytone words (which have five) and the rest of words (that have four). As we will see more clearly in § 6.1, this difference has to do with the fact that in proparoxytone words there are unstressed syllables between the stressed one and the final unstressed one.

On the other hand the position of F0 turning points is regular: L is placed at the beginning of the stressed syllable; the first high point (H_1) appears, as a general rule (i.e. except in oxytones), at the end of the stressed syllable; the second high point (H_2), if it exists, is located at the end of the last pre-final unstressed syllable; the mid level is reached at (M_1) that, as a general rule (i.e. except in oxytones), appears at the beginning of the last unstressed syllable; the final mid plateau usually reaches the end of the utterance, except when the name ends with unvoiced segments and M_2 appears at the end of the last voiced segment.

6. Phonological representation

6.1 Phonological representation of the tune

A phonological representation of the vocative tune in Ladin needs to account for two equally important things: 1) for the presence of all tonal turning points detected in our data, but also 2) for the absence of some of them. The starting point for achieving such a representation is the comparison between the tunes of proparoxytone, paroxytone and oxytone words (Figure 28). We will first discuss the elements of such tunes that can be easily explained, and later we shall deal with the problematic one.

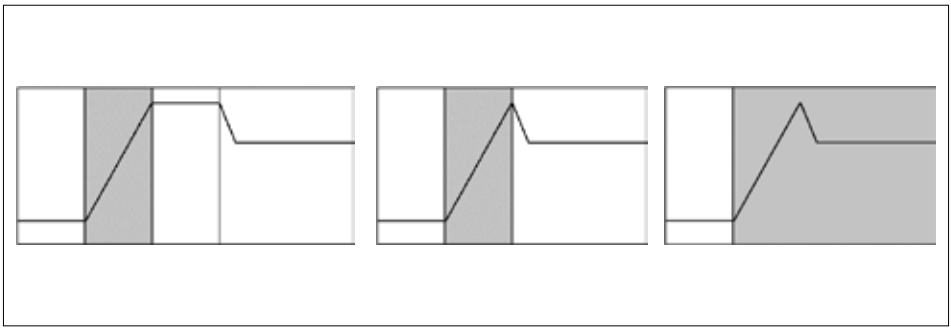

Fig. 28: Schematic representation of the proparoxytone (left), paroxytone calls (centre) and oxytone calls (right) in Ladin.

Like it has been argued for Polish (Arvaniti/Żygis/Jaskuła 2016), the initial low plateau is not phonological, but it is the result of the interpolation between a non-phonological default low F0 value and the low target that, as we are going to see in the next paragraph, belongs to the pitch accent. Since the initial low value is not phonological, it does not need to be labelled.

The rising F0 movement within the stressed syllable is quite obviously the result of the surfacing of a phonological bitonal pitch accent that, like in all other Romance languages but French, can be labelled as L+H* (cf. Frota et al. 2015, Hualde/Prieto 2015, Prieto et al. 2015, Sichel-Bazin/Meisenburg/Prieto 2015, Vanrell et al. 2015, Jitcă et al. 2015).

The final mid plateau can be explained, like for Portuguese and Catalan (cf. Frota et al. 2015, Prieto et al. 2015), as the result of the surfacing of a phonological IP-final mid tone (labelled as !H%), which spreads leftwards till the beginning of

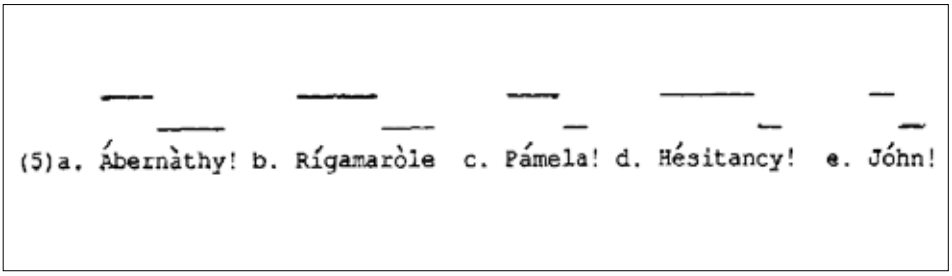

Fig. 29: Schematic representation of the calling contour with right-spreading of the H tone in different words in British English according to Hayes/Lahiri (1991, 80).

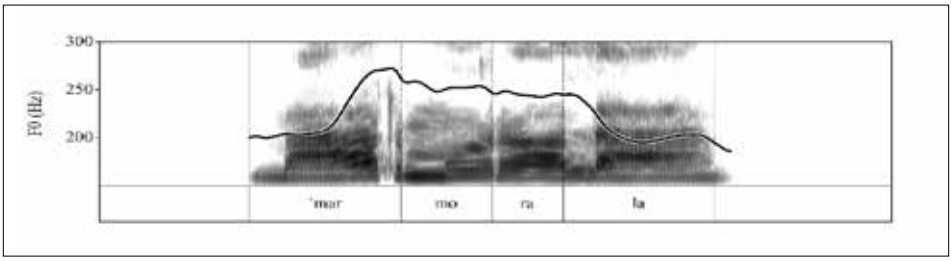

Fig. 30: Oscillogram, spectrogram, F0 contour and broad phonetic transcription of the vocative of the pseudoword ['mar.mo.ra.la].

the final syllable (in proparoxytones and paroxytones) or till the point where the L+H* ends (in oxytones).

While the rising pitch accent (L+H*), the final mid tone (!H%) and the left-spreading phenomenon are present in all of our recordings, the high plateau is observed only in proparoxytones. In other words, the H_2 turning point is elided in paroxytones and oxytones. According to the assumption that "tonal elements that are not retained in all conditions are less likely to be phonologically specified" (Arvaniti/Żygis/Jaskuła 2016, 341), our hypothesis is that H_2 does not need to be explained by postulating the existence of a phonological H tone (like it has been done for Friulian and Italian in the works that label the call as L+H* H!H%). Following Hayes and Lahiri's influential paper on chanted vocatives (1991, 80, see Figure 29), we think that the presence of high plateau is the result of the right-spreading of the H* tone.

In order to provide a full picture of the intonational grammar of Ladin vocatives, we have to determine the domains of each of the two spreading processes. Based on the data we have gathered with the DCT, it seems that the left-spreading of !H% is limited to the last syllable and the right-spreading of H* affects the

unstressed non-final syllables. In order to check for this hypothesis, one should record calls with more than one non-final unstressed syllable. Unfortunately, Ladin does not have names with such feature. For this reason, we asked one speaker to record a call with the pseudoword [ˈmar.mo.ra.la]. The contour obtained (Figure 30) confirms our hypothesis, insofar as !H% only spreads within the final syllable, while in the rest of posttonic syllables we observe a high plateau which is the effect of the right-spreading of the H* tone.

In sum, the intonation of Ladin chanted calls can be thought of as the result of three elements: an underlying L+H* !H% tune, the obligatory left-spreading of the !H% tone within the final syllable, and the right-spreading of the H* to the non-final unstressed syllables (if any).

6.2 Phonological representation of duration

In § 3.2 and § 5.1 we have seen that the last syllable of stylized calls is lengthened in all Romance varieties; in Ladin, specifically, it is approximately twice as long as the final syllable of statements. The question which has been raised a few times by phonologists (see, among others, Frota et al. 2015, 274–275) is whether such lengthening is merely phonetic or is phonological. If it is phonological, a formal representation needs to be provided.

The answers to the question of the phonological status of the final lengthening can be provided based on different criteria:

a) *Distinctiveness at the postlexical level.* As we mentioned in § 2.2, duration seems to be a prosodic feature that, in some languages like Catalan, can distinguish between the chanted vocative and other sentence-types. In order to check whether postlexical duration is distinctive in those languages, one should run perception tests that, to the best of our knowledge, have not been carried out yet and that would provide evidence in favour of the phonological status of postlexical lengthening. As far as Ladin is concerned, running perception tests of this kind is problematic because in this language there is no "unlengthened" L+H* !H% contour that constitutes a minimal pair with the "lengthened" L+H* !H% the we find in chanted calls. The absence of such minimal pair makes discrimination, identification and adequacy tests hard to devise and raises questions about the reliability of their results. For the future, a more adequate methodology for perception experiments in Ladin needs thus to be developed on the basis

of experiments carried out in languages where the lengthened contour has an unlengthened minimal contrast pair (e.g., Catalan and Spanish).

b) *Blocking of segmental phonological processes*. Frota et al. (2015) argue that an element in favour of the phonological status of lengthening in vocatives can be provided by phonological processes. In European Portuguese, for example this lengthening "has been shown to block posttonic phonetic vowel reduction and vowel deletion, which otherwise occur in posttonic position" (op. cit., 274). In other words, if lengthening overrides otherwise obligatory phonological processes, it cannot be merely phonetic. Unfortunately, this criterion is not useful for the Ladin case-study because we are not aware of any phonological process blocked by lengthening.

c) *Neutralization of segmental contrasts defined at the lexical level*. As Frota (2014, 36) mentions, "Hayes & Lahiri [1991] have argued for phonological lengthening as a feature of the calling contour, as it neutralizes the distinction between long and short vowels in the languages analysed". The rationale behind this consideration is that if prosodic lengthening overrides phonological length differences defined at the lexical level, it cannot be merely phonetic. As we have seen in § 5.1.2, this is true also for Ladin, where phonological differences in vowel length are neutralised in vocatives. For this reason, we believe that there is a reason to argue that vocative lengthening in Ladin can be phonological.

If we accept – although only tentatively – that postlexically defined duration is phonological in Ladin, we have to ask ourselves how it should be represented. As we mentioned in § 2.2, we think that an elegant way to account for the lengthening of calls in Ladin (as well as for the distinctive lengthening in yes-no questions of Mieres Asturian and Don Benito Spanish) is postulating that the prosody of an utterance is not the result of the interplay between *two* tiers only (a segmental one and a tonal one), but among *three*: a segmental tier that contains vowels and consonants and *two* suprasegmental strings (one that contains tones, and another that contains what we tentatively call "durational phonemes"). We suggest that such durational phonemes can be thought of as prosodic moras (μ^p) that, in certain sentence-types like vocatives, are aligned with certain positions of the prosodic hierarchy. A similar approach was adopted for focalized constituents in certain varieties of Italian by Prieto (2005, 391), who "hypothesize that accented syllables in focalized constituents become bimoraic, acquiring a mora through phonetic lengthening".

For the lengthening observed in Ladin vocatives, we argue that it is due to the surfacing of a μ^p that is included in the underlying representation of the prosody

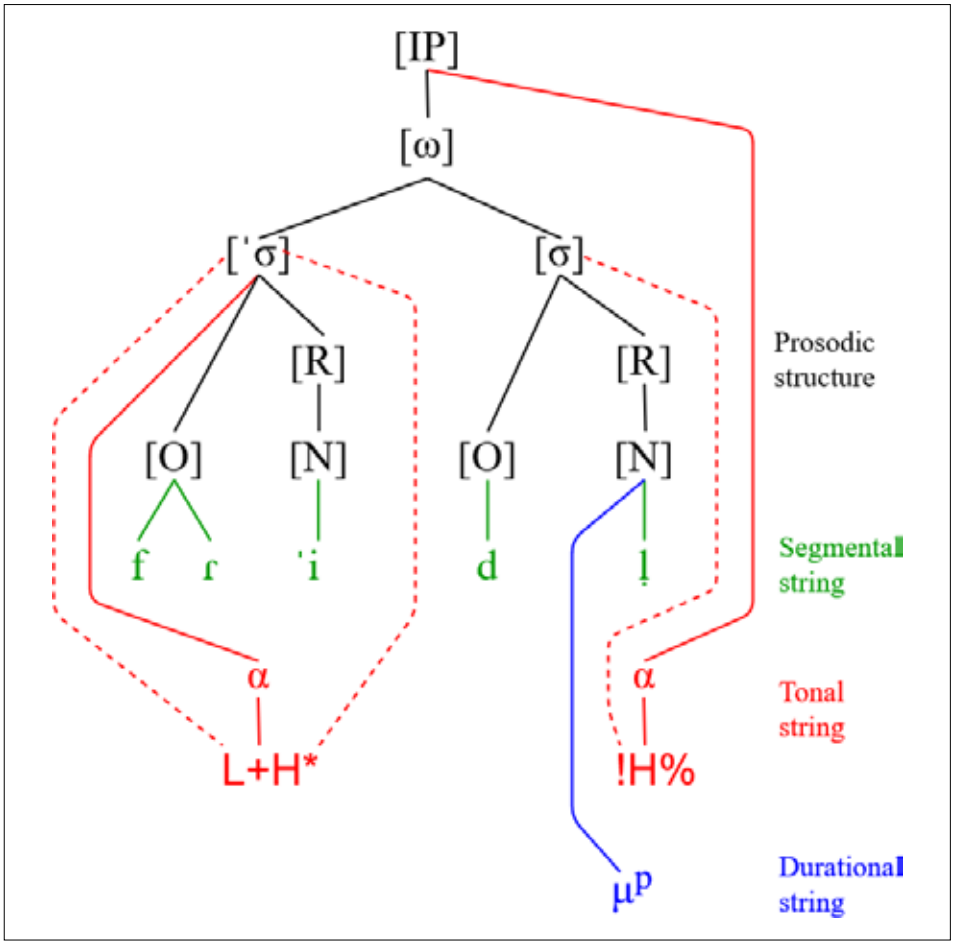

Fig. 31: Schematic representation of the Ladin vocative *"Fridl!"*. The prosodic structure is represented in black (IP = intonational phrase, ω = prosodic word, σ = syllable, O = syllable onset, R = syllable rhyme, N = syllable nucleus, [= left edge of a constituent,] = right edge of a constituent). Three strings are linked to the prosodic tree: the segmental string (in green), the tonal string (in red), and the durational string (in blue).

of the call and that is aligned with the nucleus of the last syllable. When this μ^p gets associated with the nucleus of the last syllable of the utterance, which already contains a mora defined at the segmental level, it causes the segment that occupies the nucleus (be it a vowel like in [ma.da.ˈle.na] or a consonant like in [ˈfri.dl̩]) to surface as bimoraic, that is, as lengthened.

Figure 31 provides a tentative representation of the prosodic structure and of the three strings (the segmental one, the durational one and the tonal one) that interact to give way to a Ladin vocative. Although the representation in Figure 31

is bidimensional, one has to imagine that the three above-mentioned strings are on different levels or planes (see Pierrehumbert/Beckmann 1988, 117). More specifically, the durational string is situated at a phonologically intermediate level, i.e., the level where association lines between the tonal string and the metrical structure have already been drawn but spreading has not taken place yet. Following Pierrehumbert/Beckmann (1988), Prieto/D'imperio/Gili-Fivela (2005) and Ladd (2008), we assume that both pitch accents and boundary tones have a primary association (marked with a solid line) and secondary associations (marked with dashed lines). The L+H* pitch accent is primarily associated as a unit (α) to the stressed syllable, while its component tones secondarily associate separately to the edges of the same syllable: the secondary association of L is with the left edge, and the secondary association of H* is with the right edge. In the case of the !H% boundary tone, the primary association is with the intonational phrase (IP), while the secondary association is with the right edge of the last syllable of the IP. For the prosodic mora, our data only allow us to postulate an association with the nucleus of the final syllable. If durational phonemes, analogous to phonological tones, also form dual associations, then it could be possible that the primary and secondary association coincide at that structural position, or maybe –like in the case of boundary tones– the primary association is with the IP and the secondary with the nucleus.

7. Remarks on the intonation of calls in Romance

As a conclusion to this paper, we would like to present some considerations about what Ladin can tell us about the intonational phonology of stylized calls in Romance. Before doing so, we need to remember that – as we mentioned in § 3.1 – the available descriptions of the vocative chants in Romance rely on data collected with different methods. While for Catalan, Spanish, Italian, Friulian and Ladin proparoxytone names have been analysed, for other languages (Portuguese, Romanian, Sardinian, and Occitan) the analyses published so far are based on paroxytone words[4]. In order to fill this gap, we collected recordings of proparoxytone and paroxytone vocatives in several Romance varieties[5], which are displayed in the Appendix.

[4] The majority of varieties of Occitan do not have any proparoxytone name, therefore recording proparoxytones would not be possible. For Sardinian, proparoxytone names have been recorded (cf. Vanrell et al. 2015, 2020), but have not been discussed.

[5] As we mentioned in Section 3.1, since French has no lexical accent and has phrase-initial boundary tones, its vocatives cannot be analysed phonologically like the rest of the languages of the same family.

These data show that there is no important crosslinguistic difference in the tune of paroxytone calls, while for proparoxytones two intonational patterns emerge (Figure 32): some languages display a tune with five turning points (like Ladin), while others have a contour with four turning points (like Catalan).

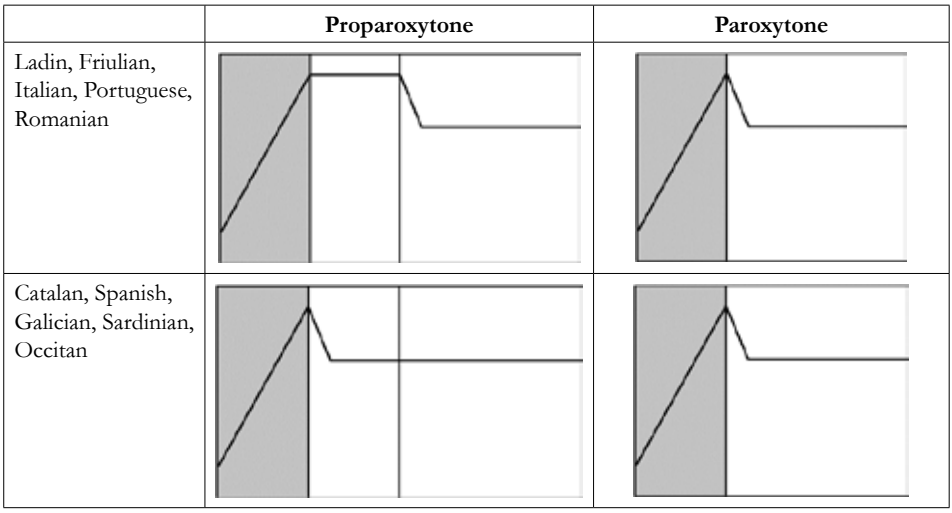

Fig. 32: Schematic representation of the proparoxytone and paroxytone calls in different Romance varieties.

Our hypothesis is that all the above-mentioned Romance languages share the same underlying configuration (i.e. L+H* !H%) and that the differences observed in proparoxytones are due to distinct intonational grammars: while in languages like Catalan only one spreading phenomenon is active (namely the left-spreading of !H%), in languages like Ladin an additional spreading process is operating (that is, the right-spreading of H*).

We think that this account can represent an improvement in comparison to previous works in two ways. Its first advantage is that it represents a step forward in the direction of a unified account of stylized calls in Romance. In fact, it postulates the existence of a single underlying configuration for all Romance varieties but French, while previous researches proposed two: L+H* !H and L+H* H!H% (for a review see Frota/Prieto 2015b, 407–409). The second advantage of this approach is that it is able to account for all tonal targets in all the above-mentioned varieties, while not all previous approaches –as we mentioned in § 3.1– provided explicitly an explanation of the turning point at the beginning of the final mid plateau. We hope that future research on other Romance varieties will establish whether our overall approach is correct.

8. Acknowledgements

We would like to thank first of all the six speakers of Ladin who took part in data collection, and in particular Ulrike Frenademez for her pivotal role in the whole process. We are also very grateful to several colleagues and friends who provided data and valuable pieces of advice: Adina Hradtzky, Adrian Turculeţ, Anca Bibiri, Chiara Meluzzi, Corina Catarau-Cotutiu, Cristina Belorţu, Doina Jitcă, Iuliana Marcoci, Maria del Mar Vanrell, Marisa Sousa Cruz, Pedro Guedes de Olivei-ra, Pilar Prieto, Rafèu Sichel-Bazin, Rosalía Rodríguez Vázquez, Simón Perera, Victor Peña Irles, and Wendy Elvira-García. We also thank the two anonymous reviewers for their careful reading of our manuscript and their insightful com-ments and constructive suggestions.

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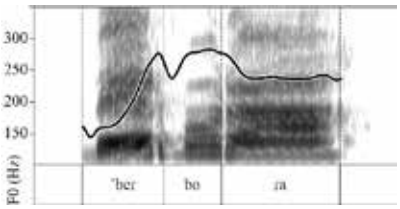
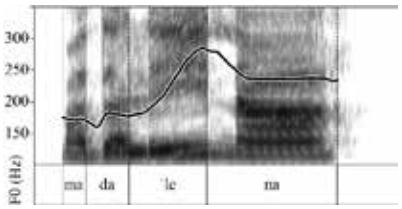
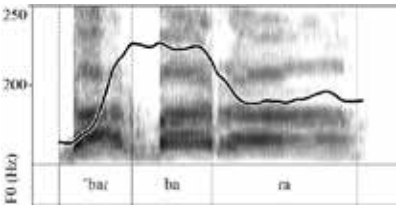
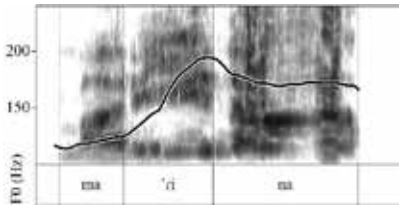
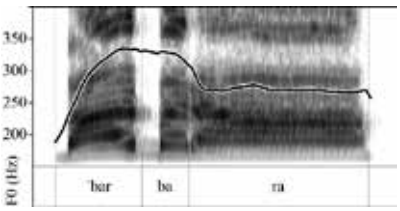
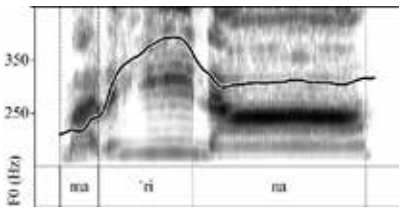
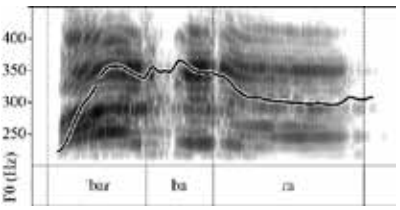
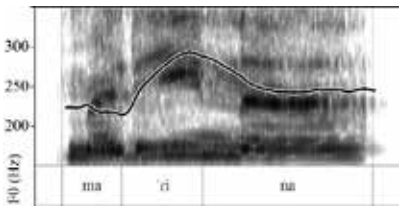
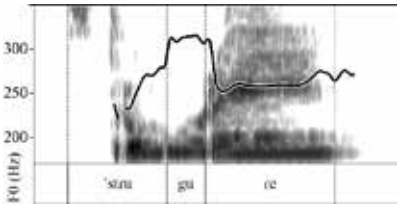
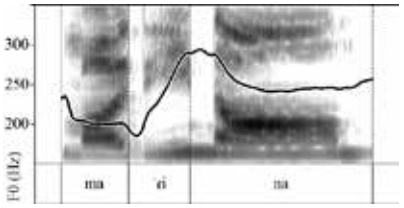
Appendix

	Proparoxytone	Paroxytone
Ladin		
	Call *"Berbora!"* uttered by a speaker of Badiot Ladin.	Call *"Madalena!"* uttered by a speaker of Badiot Ladin.
Friulian		
	Call *"Barbara!"* uttered by a speaker of Friulian from Agrons.	Call *"Marina!"* uttered by a speaker of Friulian from Agrons.
Italian		
	Call *"Barbara!"* uttered by a speaker of Italian from Biella.	Call *"Marina!"* uttered by a speaker of Italian from Biella.
Portuguese		
	Call *"Bárbara!"* uttered by a speaker of Portuguese from Lisbon.	Call *"Marina!"* uttered by a speaker of Portuguese from Porto (source of the audio: Prieto/Borràs-Comes/Roseano 2010–2014).

Romanian

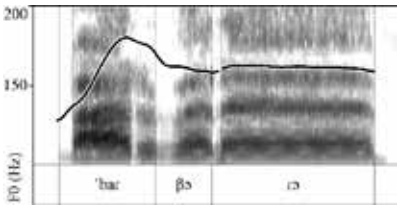


Call *"Strugure!"* uttered by a speaker of Romanian from Bacău.

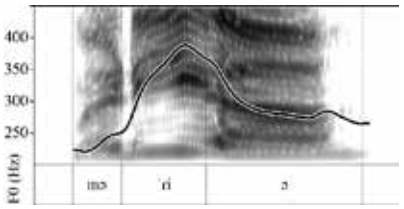


Call *"Marina!"* uttered by a speaker of Romanian from Bistrița (source of the audio: Prieto/Borràs-Comes/Roseano 2010–2014).

Catalan

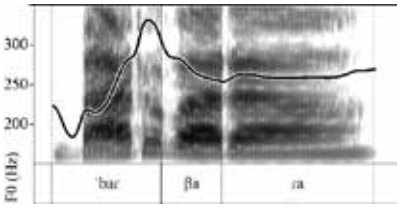


Call *"Bàrbara!"* uttered by a speaker of Catalan from Eivissa (source of the audio: Aguilar/De-La-Mota/Prieto 2009–2011).

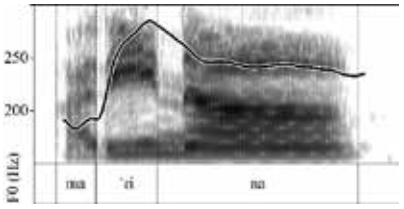


Call *"Maria!"* uttered by a speaker of Catalan from Vic (source of the audio: Prieto/Borràs-Comes/Roseano 2010–2014).

Spanish

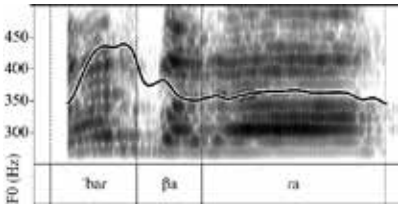


Call "¡Bárbara!" uttered by a speaker of Spanish from Torrelavega.

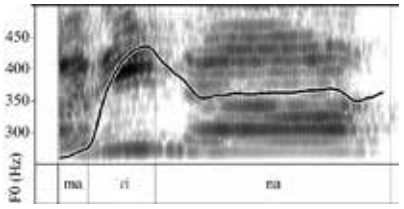


Call "¡Marina!" uttered by a speaker of Spanish from Madrid (source of the audio: Prieto/Borràs-Comes/Roseano 2010–2014).

Galician

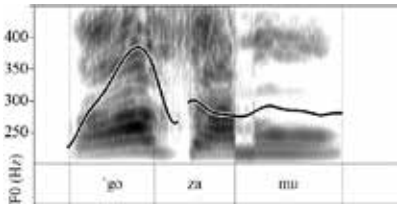


Call *"Bárbara!"* uttered by a speaker of Galician from Vigo.

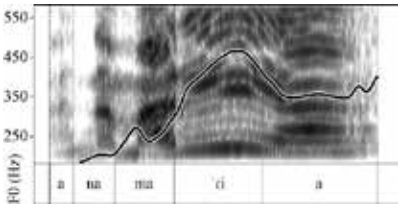


Call *"Marina!"* uttered by a speaker of Galician from Vigo.

Sardinian

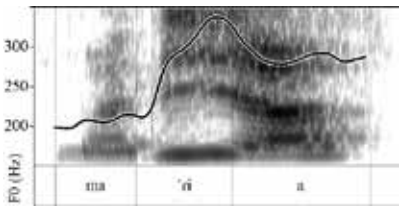


Call *"Gosamu!"* uttered by a speaker of Sardinian from Ìttiri (audio kindly provided by M.M. Vanrelli).



Call *"Annamaria!"* uttered by a speaker of Sardinian from Sinnia (source of the audio: Prieto/Borràs-Comes/Roseano 2010–2014).

Occitan



Call *"Maria!"* uttered by a speaker of Occitan from Les (source of the audio: Prieto/Borràs-Comes/Roseano 2010–2014).

Abstract:

This paper investigates the prosody of stylized calls of Badiot Ladin, a Rhaeto-Romance variety spoken in the Badia Valley (Eastern Alps). A Discourse Completion Task was used to elicit 108 utterances from six native speakers of Badiot. The results show that, from a phonetic point of view, the calling melody consists of a low F0 stretch, followed by a rise to high in the stressed syllable, a high plateau in pre-final unstressed syllables (in proparoxytones names only), and a mid-plateau in the final unstressed syllable, whose nucleus is considerably lengthened. After comparing the stylized intonation of Ladin with the same contour in other Romance languages, we argue that this contour can be represented phonologically as L+H* !H%, while the presence of the two plateaus can be explained by means of tonal spreading. We tentatively suggest that the final lengthening can be interpreted as the result of the presence of a prosodic mora aligned with the nucleus of the final syllable.

Keywords: prosody, intonation, stylized intonation, chanted call, vocative chant.