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5 Acoustic and statistical analyses

5.1 Introduction

In the present section, the results of the analysis of the data collected in the fieldwork described in Chapter 4 are presented. After a brief description of the methodology (Section 5.1.1) and normalization method (Section 5.1.2), the reduced vowels (Section 5.2) of the penultimate stressed words (Section 5.2.1) of both Carrarese (Section 5.2.1.1) and Pontremolese (Section 5.2.1.2) are discussed. Similarly, the reduced vowels of the antepenultimate stressed words (Section 5.2.2) are presented in Carrarese (Section 5.2.2.1) and Pontremolese (Section 5.2.2.2). A section then follows where the intrusive/epenthetic vowels are described (Section 5.3) for Carrarese (Section 5.3.1) and Pontremolse (Section 5.3.2).

5.1.1 The acoustic analysis

As already mentioned in the previous section, the data were acoustically analysed with PRAAT (Boersma & Weenink 2013). By means of both the (wide-band) spectrogram and the wave-form windows, it was possible to isolate the relevant segments and measure their formant structure and length.

As for the formant structure, the default settings (which identify five formants up to 5,000 Hz) of the built-in LPC algorithm turned out to be sufficiently accurate for most of the data. However, in order to find out the exact frequency values, it was sometimes necessary to increase the number of formants because of both the tendency of F1 and F2 to merge in the back vowels and the coarticulation effects characterizing certain speakers' speech. The accuracy of the frequency values returned by the LPC algorithm was checked by means of a close visual examination of the spectrogram window representation. On the other hand, since the aim of the formant analysis was to measure the first two formants, it was not necessary to increase the frequency span of the spectrogram window beyond the default of 5,000 Hz. Indeed, since Fant (1968), it has been repeatedly shown that F1 frequency corresponds to both the articulatory and perceptual dimensions of vowel height, while F2 frequency corresponds to the front/back dimension, and crucially, that these two formants occur below 2,500 Hz. Together, F1 (roughly 200 to 800 Hz) and F2 (roughly 600 to 2,200 Hz) suffice to determine the quality of the vowels under analysis. Furthermore, the first two formants were found to better resist conditioning due to a low quality recoding (Ferrari Disner 1983) and, in this respect, constitute a significant indication for vowel identification.

As for the selection of the vowel interval to measure the F1 and F2 frequency of, the large amount of coarticulation effects just hinted at, together with the reduced duration (and intensity) of the unstressed vowels under analysis, didn't allow for the selection of the same time interval for every vowel token. Indeed, depending on both the shortness and the consonantal context the analysed vowel occurs in, the formant transitions can be distributed along a fairly large vowel interval in its initial as well as final parts (Harrington 2010). As a consequence, the mean frequency values were calculated of the longer steady state intervals of F1 and F2, which are considered the acoustic by-product of the target configuration the articulators aim at in producing a vowel. The length of the selected steady state intervals shows a great degree of variation, ranging from a maximum of about 200 ms in the longest stressed vowels to the minimum found in some schwa-like unstressed vocoids. In this case, the F1 and F2 frequencies were calculated at the point where F1 displayed the highest frequency value (Harrington 2010).

As for the vowel length measuring, close examination of both the spectrogram and the wave-form representations allowed us to pinpoint the vowel boundaries, which were identified through the co-occurrence of a drastic change in the amplitude of the waveform, in the energy of the formants (particularly of F2) and in the periodicity of the signal (Stevens 2000).

The methodology just described was applied to both unstressed and stressed vocoids. As for the latter, the values were calculated of the cardinal vowels occurring in the forms whose unstressed vocoid values are taken into account for the analysis. This made it possible to define the main acoustic coordinates of Carrarese and Pontremolese vocalic space contours that, in turn, are resorted to to arrange, respectively, the unstressed and intrusive vocoids under concern. Furthermore, the recording of stressed vowel acoustic values allowed us to perform the statistical analyses concerning the ustressed/stress vowel duration ratio (Sections 5.2 and 5.3).

Since the carrier sentences were uttered by every speaker only once, every target form is presented just once per context. Hence, the methodology just described was applied to single tokens, the results displayed in Sections 5.2 and 5.3 being therefore absolute values.

The results of the analyses just described were afterwards organized according to the metrical structure of the word (paroxitones vs. proparoxitones) in which the vowels were analysed, to its phonological context of occurrence (before a consonant-initial word vs. before a pause) and to the dialect where the word comes from. To improve the readability, the data were then integrated in a set of tables. Furthermore, the vocalic tokens under analysis were plotted together with the stressed vowels of the relevant dialect. However, given the lack of homogeneity in speakers' age and gender, the vocalic tokens represented in the plots were first normalized.

5.1.2 The normalization

As stated by Flynn (2011),

> "no two speakers' vowel tracts share the same dimensions. As a consequence, the 'same' phonological vowel uttered by different speakers will show formants at different frequencies due to the different sizes of the speakers' vocal tracts. […] It can be difficult, then, when comparing the positioning of

> vowels within speakers' vowel spaces, to identify whether differences in formant values are due to a linguistic change in the vowel system, or are merely due to the anatomical and physiological differences between speakers. It has been acknowledged that the raw Hertz formant frequencies of different speakers are not directly comparable, and that it is not ideal to plot formant values in Hertz from different speakers on the same formant chart […] The solution is, in principle, to remove as much of the inter-speaker formant value differences due to biological differences as possible. This would leave quantities unaffected by the size of a speaker's vocal tract, and so would be directly comparable." (Flynn 2011: 1)

Since the aim of the present work requires close examination of the distribution within the vowel space of two adjacent vowel clouds ([ɐ] and [ə]), and because of the biological (age and gender) differences of the recorded speakers, the solution Flynn (2011) hints at above turns out to be extremely relevant for the correct comparison of the row frequency values collected by the acoustic analysis of the present data. For this reason, a process of vowel formant normalization has been applied to the Carrarese and Pontremolese data. Among the various normalization methods available on NORM (Thomas & Kendall 2007), both the Lobanov z-score and the Watt & Fabricius modified S-centroid procedures were tested on the recorded data. The former turned out to be preferable because of the 'skewing' problems the latter has with respect to the low vowels (Flynn 2011; Fabricius et al. 2009). Since one of the epenthetic vowels of Pontremolese occupies a low portion of the vowel space, the 'skewing' problem of the Watt & Fabricius modified method turns out to be serious enough to avoid this method and opt instead for the Lobanov z-score procedure, which is generally presented as the best one by the relevant publications about normalization methods (Adank et al. 2004; Flynn 2011; Fabricius et al. 2009). The Lobanov z-score procedure is a vowel-extrinsic, formant-intrinsic and speaker-intrinsic method, which means that in order to normalize a vowel formant, it takes into account (the means and the standard deviations of) the correspondent formant values (formant-intrinsic) of all of the vowels (vowel-extrinsic) that make up the phonological vowel system of a single speaker (speaker-intrinsic).

Thanks to this procedure, it has been possible to correctly compare and plot together the different phonetic realizations of the same phonological segment as uttered by the various speakers of each dialect, thereby nullifying the conditioning of the speakers' biological differences in frequency values of the vocalic segments under concern. The plotting and the statistical analysis of the data were performed by means of the SYSTAT 13 software (Wilkinson 2009). As shown in the following sections, the vowel tokens were clustered together in a set of clouds, according to the (phonological) vowel type they are the realization of. Furthermore, Gaussian bivariate confidence ellipses were drawn for every vowel cloud. These ellipses are centred on the sample means of F1 and F2, their major axes being calculated on the basis of the two formants' standard deviations and their orientation on the covariance between F1 and F2. The size of the ellipses was chosen by setting the probability value to the default value of 0.6837, which means that the probability for a vowel token represented on the plots to occur inside of the ellipses is about 68%.

In the next sections, the Carrarese and Pontremolese data for which the analysis methodology has just been discussed are presented both in their row acoustic (tables) and normalized version (plots). Following the presentation of the data relative to the unstressed vowel reduction processes (Section 5.2), the description of the data concerning the epenthetic/intrusive vowels are displayed (Section 5.3).

5.2 The reduced vowels

As discussed in Chapter 2, Carrarese and Pontremolese are two Gallo Italic dialects belonging to the Western Romance family, namely to the Romance languages that underwent the phonological process which gradually reduced unstressed vowels. The resort to the 'gradualness' concept implies that variation can be found within the relevant geographical domain as far as the degree of unstressed vowel reduction is concerned (Section 3.2). Therefore, in the following sections, the data resulting from the fieldwork and their acoustic and statistical analyses are presented in order to substantiate the diatopic micro-variation observed in this geographical area.

5.2.1 Paroxitones

As reported by relatively recent dialectological literature on the two dialects (Luciani 2002; Maffei Bellucci 1977), both Carrarese and Pontremolese underwent a phonological process that categorically deleted word-final mid vowels[58]. However, it has also been claimed that it is possible to perceive a word-final short vocoid (Restori 1892; Giannarelli 1913; Maffei Bellucci 1977; Savoia 1983), a kind of vowel-like release whose presence can be noticed also in the acoustic representation (Carpitelli 1995). The same authors claim that its phonetic realization is (functionally) conditioned by the need to ease the pronunciation of the otherwise 'difficult' consonant clusters. Indeed, while no trace of it is usually found in the forms ending with a single consonant (It. [ˈtutːo] 'all m.', [ˈnaːzo] 'nose', [ˈkaːne] 'dog', [ˈmuːro] 'wall' vs. Carr. and Pontr. [tut], [naz], [kaŋ], Carr. [mur], Pontr. [myr]), it can occur when the word ends with a primary or secondary consonant cluster, namely as the outcome of both apocope and its interaction with syncope. In any case, when this sound occurs, its acoustic characteristics make it different from the other vowel. Indeed, Restori (1982) explicitly claims that

> "the word-final voiceless -ö is so hardly distinguishable that, not to give it […] the same relevance of the other sounds, I had to resort to a special

[58] An indication of the speakers' awareness of the outcome of this process can also be found in the literary production of both the dialects (Michelotti 2005; Bertocchi 2006; Borgioli 2008), where the etymologically word-final vowels are constantly dropped.

orthographic notation, -^{o}. The quality of this sound is so indistinguishable that, rather than a real sound, I would define it a buccal resonance.”[59] [EC]

In the following sections, the forms are presented which etymologically showed a penultimate stressed syllable, and which therefore display a word-final consonant cluster as a result of apocope.

5.2.1.1 Carrarese

In Tab. 5.1 a selection of Carrarese penultimate stressed forms is presented. As can be noticed, the result of the acoustic analysis is shown for the 5 speakers (AC, BD, ED, MV and AM) whose recording have been taken into account. For each of them, three forms are presented which, after the apocope, show either a decreasing (*colpo* ‘stroke’ and *forno* ‘oven’) or an even (*merlo* ‘blackbird’) sonority contour. Their Italian cognate[60] occurs in the second column and their phonetic (large) transcription in the columns with the ‘Transcr.’ tag. In this last column, the symbol ‘ᵊ’ represents the schwa vocoid in the case that its duration is less than 50% of the stressed vowel’s. The numerical values correspond, from left to right, to the row (namely pre-normalization) F1 and F2 frequency Hertz values, to the absolute duration of the unstressed (‘v ms’) and stressed (‘V ms’) vowels expressed in milliseconds, and to the relative duration (‘v/V’) of the unstressed vowel with respect to the stressed one (when the unstressed vowel does not occur, the relative length column obviously displays a ‘0’). Furthermore, the vowel’s acoustic values were calculated if the words in which they occur are followed either by a consonant initial word (‘ˈσ.CCv] C’) or by a phonological phrase-final boundary (‘ˈσ.CCv] #’). ‘N’ has been inserted in the table whenever the recording of the corresponding word is not good enough to allow for accurate measurement of the acoustic values.

[59] “la finale sorda -*ö* [i.e. [ø], EC] è così a malapena distinguibile che, per non darle […] importanza pari agli altri suoni, m’ha costretto ad una notazione ortografica speciale -^{o}. […] la qualità del suono [-^{o}] è talmente indistinta che più che un vero suono lo direi una risonanza buccale.” (Restori 1982: 7-8)

[60] See Loporcaro (2011a) on the possibility of considering the Standard Italian forms a valid approximation of the etymological ones, at least as far as the presence vs. absence of the etymological vowels is concerned.

Tab. 5.1 Carrarese paroxitones - decreasing/even sonority contour

Forms	ˈσ.CCv] C						ˈσ.CCv] #					
	F1	F2	v ms	V ms	v/V	Transcr.	F1	F2	v ms	V ms	v/V	Transcr.
AC												
colpo	461	1632	69	61	113%	[ˈkolpə]	0	0	0	192	0	[ˈkolp]
forno	369	1664	56	64	88%	[ˈfornə]	0	0	0	189	0	[ˈforn]
merlo	507	1589	57	148	38%	[ˈmɛrl^{ə}]	0	0	0	169	0	[ˈmɛrl]
BD												
colpo	451	1694	38	56	67%	[ˈkolpə]	0	0	0	108	0	[ˈkolp]
forno	508	1700	44	146	30%	[ˈforn^{ə}]	0	0	0	189	0	[ˈforn]
merlo	518	1891	53	155	34%	[ˈmɛrl^{ə}]	0	0	0	185	0	[ˈmɛrl]
ED												
colpo	372	1239	44	63	70%	[ˈkolpə]	0	0	0	131	0	[ˈkolp]
forno	494	1336	74	43	172%	[ˈfornə]	546	1427	94	156	60%	[ˈfornə]
merlo	0	0	0	101	0	[ˈmɛrl]	0	0	0	180	0	[ˈmɛrl]
MV												
colpo	455	1376	54	76	71%	[ˈkolpə]	0	0	0	200	0	[ˈkolp]
forno	510	1536	41	66	62%	[ˈfornə]	0	0	0	176	0	[ˈforn]
merlo	546	1391	39	123	32%	[ˈmɛrl^{ə}]	746	1642	84	188	45%	[ˈmɛrl^{ə}]
AM												
colpo	N	N	N	N	N	N	0	0	0	113	0	[ˈkolp]
forno	N	N	N	N	N	N	0	0	0	162	0	[ˈforn]
merlo	439	1357	73	68	107%	[ˈmɛrlə]	440	1435	120	207	58%	[ˈmɛrlə]

As can be noticed by observing the formant frequency columns of Tab. 5.1, the F1 and F2 values are fairly close to the ones that characterize the 'ideal' schwa (500 Hz and 1,500 Hz; Silverman 2011).

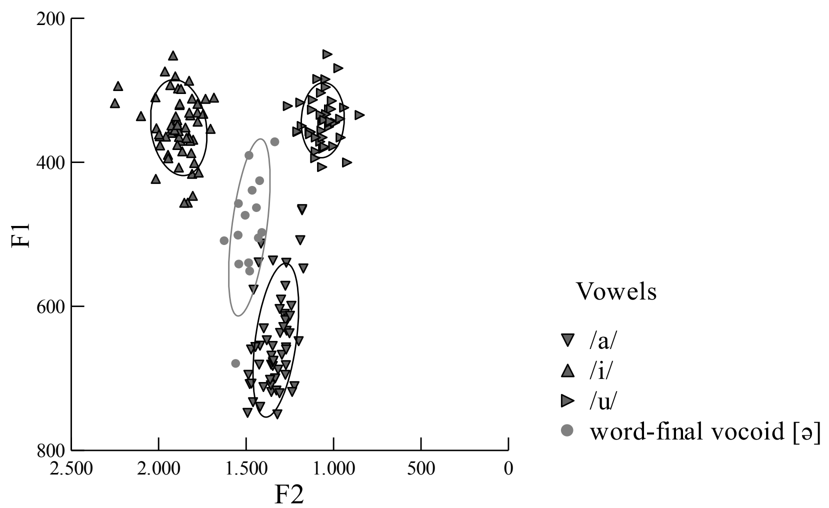
Indeed, as shown in Tab. 5.2, the mean frequency values of the entire set of word-final vocoids are 491 Hz for F1 and 1,527 Hz for F2, with a standard deviation of, respectively, 89 Hz and 179 Hz (displayed in the cells under the 'Total' tag).

Tab. 5.2 Carrarese paroxitones - decreasing/even sonority contour - mean values

Carrarese	F1	F2	v ms	V ms	v/V
ˈσ.CCv] C					
mean	469	1534	54	89	74%
SD	56	194	13	41	42%
ˈσ.CCv] #					
mean	577	1501	99	184	54%
SD	156	122	19	26	8%
Total					
mean	491	1527	63	108	70%
SD	89	179	23	54	38%

Furthermore, no really significant difference between the mean formant values of the vowels belonging to the two phrasal contexts can be found. A departure from the mean frequency values can be found only in the F1 of the word-final vocoid occurring in pre-pausal forms. However, given the low number of the pre-pausal words where this vocoid is realized, the relative mean values are not statistically significant. In Fig. 5.1 the normalized vocoids of Tab. 5.2 have been plotted together with the normalized cardinal vowels.

Fig. 5.1 Carrarese word-final vocoids - paroxitones



It is quite clear from the plot that the word-final vocoids of Carrarese's paroxitones occupy the centre of the vocalic space, namely the one where the schwa typically occurs (Silverman 2011).

As far as the duration parameter is concerned, the mean values summarized on the right side of Tab. 5.2 show that the paroxitone-final vocoid's duration is 70% of the stressed vowel's. Interestingly, a significant difference can be noticed between the pre-pausal and pre-consonantal vocoids: even if the absolute duration of the former is nearly double (99 ms) that of the latter (54 ms), the mean value of the pre-pausal vocoid's relative duration is significantly lower (54%) than that of the pre-consonantal one (74%). The greater absolute duration of the pre-pausal tokens can be easily accounted for by the universal physiologically-based lengthening of the phonological-phrase final part (Scott 1982). Indeed, the stressed vowel that occurs in this phrasal context is significantly longer (184 ms) than its phrase-medial counterpart (89 ms). As has already been said, the low number of pre-pausal vocoid tokens casts some doubt on the statistical significance of these types of mean results. However, while this is true for the formant analysis, in the case of the duration parameter the low number of words displaying the word-final vocoid can be taken into account to interpret the numerical data. Indeed, the relative shortness (which also shows an extremely low standard deviation) of the paroxitone-final vocoids in the phrase-final context, together with the low frequency of their realization (3 cases out of 15, namely 20%)[61], can be interpreted as a clue to the categorical absence of the word-final vowels from the phonological representation of the words (a more detailed discussion of the phonological interpretation of the data will be presented in Chapter 7). Furthermore, Loporcaro (2005-2006) implicitly suggests that in Northern-Italian dialects, the phrase-final and phrase-medial word-final vowels can enter an implicational relationship. It has been observed, indeed, that in the peripheral varieties of the Northern-Italian group, the deletion of word-final vowels occurring in phrase-medial position diachronically precedes that of the word-final vowels occurring instead in phrase-final position, and that this diachronic variation can synchronically be observed in diatopic variation: the dialects that show a word-final vocoid in phrase-final position can realize the same vowel in phrase-medial position or not, but the ones that drop it in phrase-final position delete it phrase-medially as well. In Carrarese the word-final vowel is constantly deleted both in phrase-final and phrase-medial position if the relevant form is followed by another word starting with a vowel[62] (It. [uŋ ˈkolpo o ˈdue] 'one or two strokes' vs. Carr. [uŋ ˈkolp o ˈdo]; It. [um ˈmɛrlo aranˈtʃoːne] 'an orange blackbird' vs. Carr. [um ˈmɛrl aranˈtsoŋ]). Similarly, as can be noticed from the transcription column in Tab. 5.1, the word-final vocoid in phrase-medial position can display an extremely short duration (up to 30% of the stressed vowel's duration), or can be completely deleted[63].

[61] As will be shown later, similar results can be found for the pre-pausal context throughout all the Carrarese data.

[62] In this last phrasal context, no exception has been found in the analysed data: all the etymologically word-final vowels are constantly dropped, and the resulting consonant cluster is resyllabified.

[63] Again, another piece of evidence can be found in the literary production of Carrara's poets (Borgioli 2008), who never write down the word-final vowels.

Hence, considering the implicational relationship just hinted at, it seems to be quite safe to claim that the word-final vowels are categorically absent from the words' phonological representations, with the realization of the vocoid being more likely functionally and articulatorily interpretable as a vowel-like release whose size is increased (and hence perceived as a vocoid) in order to enhance the perception of the consonant's place of articulation in tri-consonantal clusters. Indeed, as stated by Hall (2006),

> "[w]hen two consonant gestures are produced with a low degree of overlap, there is an acoustic release between them, which may be interpreted by the listener as a vowel. If the tongue body is in a fairly neutral position, or this period is short in duration, the perceived vowel will sound like a schwa." (Hall 2006: 388)

As for the relevance of the role of perception, she explicitly claims that

> "the perceptibility of the adjacent consonants is increased if there is a release burst between them. The release burst can carry some articulatory information about the consonant. A burst that is voiced and has vocalic characteristics - i.e. an intrusive vowel – should be particularly suited to convey articulatory information about the adjacent consonant." (Hall 2006: 408)

Leaving an in-depth phonological analysis of these observations to Section 7.2 the next section is devoted to the description of Pontremolese penultimate stressed forms.

5.2.1.2 Pontremolese

Tab. 5.3 presents a selection of Pontremolese penultimate stressed forms. Again, the recordings of 5 speakers were chosen (DP, MM, LB, AS and GB). The selected forms are the same as those of Carrarese: two with an after-apocope decreasing sonority contour (*colpo* 'stroke' and *forno* 'oven') and one with an even one (*merlo* 'blackbird'). In the first column, the corresponding Italian cognate can be found, while the phonetic transcription is shown in the 'Transcr.' column, where the symbol 'ᵊ' represents the schwa vocoid in the case that it is shorter than 50% of the stressed vowel's duration. In the 'F1' and 'F2' columns, the frequency values of the relative formants can be found, and in 'v ms', 'V ms' and 'v/V', the duration of the unstressed and stressed vowels and the proportion between them, respectively, are displayed. As in the preceding tables, the vowels' acoustic values have been calculated in the case that the relevant words are followed by a consonant initial word ('ˈσ.CCv] C') or by a pause ('ˈσ.CCv] #').

Tab. 5.3 Pontremolese paroxitones - decreasing/even sonority contour

Forms	ˈσ.CCv] C						ˈσ.CCv] #					
	F1	F2	v ms	V ms	v/V	Transcr.	F1	F2	v ms	V ms	v/V	Transcr.
DP												
colpo	393	1244	49	87	56%	[ˈkurpə]	0	0	0	167	0	[ˈkurp]
forno	511	1292	135	111	121%	[ˈfurnə]	0	0	0	179	0	[ˈfurn]
merlo	486	1179	94	165	57%	[ˈmørlə]	0	0	0	211	0	[ˈmørl]
MM												
colpo	371	1506	41	37	111%	[ˈkurpə]	369	1450	93	126	74%	[ˈkurpə]
forno	419	1362	70	46	152%	[ˈfurnə]	350	1493	100	143	70%	[ˈfurnə]
merlo	446	1520	58	93	62%	[ˈmørlə]	411	1451	37	80	46%	[ˈmørl^{ə}]
LB												
colpo	356	1392	33	71	47%	[ˈkurp^{ə}]	425	1471	91	125	73%	[ˈkurpə]
forno	357	1457	52	42	125%	[ˈfurnə]	377	1594	59	118	50%	[ˈfurnə]
merlo	429	1945	56	62	90%	[ˈmørlə]	0	0	0	176	0	[ˈmørl]
AS												
colpo	400	1440	51	70	73%	[ˈkurpə]	0	0	0	159	0	[ˈkurp]
forno	477	1575	54	66	82%	[ˈfurnə]	533	1525	71	120	59%	[ˈfurnə]
merlo	425	1390	85	190	45%	[ˈmørl^{ə}]	450	1548	137	131	105%	[ˈmørlə]
GB												
colpo	444	1557	57	46	125%	[ˈkurpə]	472	1392	122	101	121%	[ˈkurpə]
forno	518	1569	68	63	108%	[ˈfurnə]	542	1429	94	122	77%	[ˈfurnə]
merlo	453	1291	69	138	50%	[ˈmørlə]	503	1564	100	143	70%	[ˈmørlə]

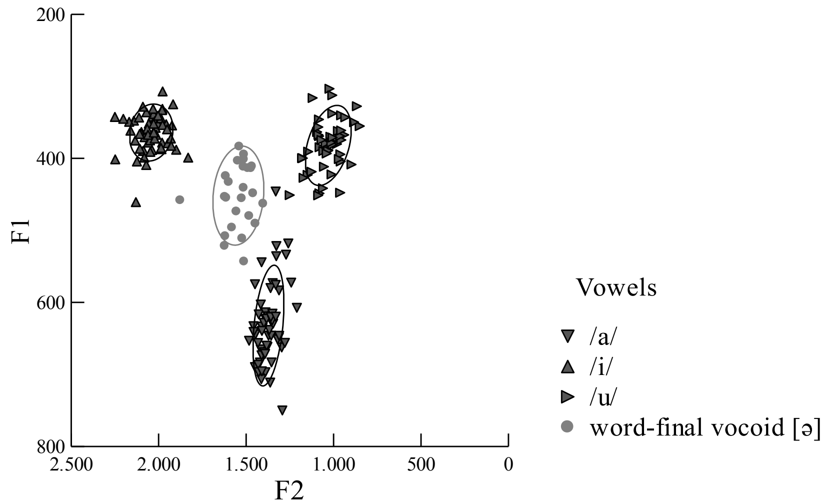
The acoustic mean values of the Pontremolese paroxitones are summarized in Tab. 5.4:

Tab. 5.4 Pontremolese paroxitones - decreasing/even sonority contour - mean values

Pontremol.	F1	F2	v ms	V ms	v/V
ˈσ.CCv] C					
mean	432	1448	65	86	87%
SD	52	184	25	46	35%
ˈσ.CCv] #					
mean	443	1492	90	184	74%
SD	69	65	29	19	23%
Total					
mean	437	1465	75	100	82%
SD	58	148	29	41	31%

Pontremolese word-final vocoids, like their Carrarese counterparts, show the same F1 and F2 frequencies of the schwa: namely 437 Hz for F1 and 1,465 for F2[64]. Furthermore, no significant difference can be found among their realizations in the pre-consonantal and pre-pausal contexts. In contrast to the Carrarese case, the higher number of occurrences of the tokens under consideration suggests that the mean results can be considered statistically significant. The word-final vocoids of Pontremolese can thus be qualitatively considered the same object, namely a schwa, regardless of their context of occurrence. Indeed, as shown in Fig. 5.2, where they have been plotted together with the stressed normalized cardinal vowels, they occupy the centre of the Pontremolese vocalic space.

Fig. 5.2 Pontremolese word-final vocoids - paroxitones



As for the duration parameter, the values summarized in Tab. 5.4 show that the mean relative durations of the word-final vocoids occurring in the two different phrasal contexts are slightly different: 87% of the stressed vowel's duration for the pre-consonantal vocoid and 74% for the pre-pausal one.

Furthermore, similarly to what happens in Carrarese, lengthening of both the word-final vocoid and the stressed vowel also occurs in Pontremolese. While the relevant pre-consonantal mean values are 65 ms (SD 25) and 86 ms (SD 46) for the

[64] As for F3, whose tokens value has been omitted from Tab. 5.3, its mean value is 2,439 Hz (SD 214 Hz), no significant difference having been noticed among the pre-consonantal (mean 2,460 Hz, SD 201 Hz) and the pre-pausal (mean 2,408 Hz, SD 240 Hz) contexts. Carrarese, instead, displays an F3 mean value of 2,670 Hz (SD 143 Hz). Even if the Pontremolese values turn out to be slightly different from the one calculated by Carpitelli (1995), their lower values with respect to the Carrarese values are consistent with the 'more rounded' quality that has been proposed for their Pontremolese realization. Indeed, the rounding of the lips lowers the F3 values (Stevens 2000).

word-final vocoid and the stressed vowel values, respectively, the same objects' durations are 90 ms (SD 29) and 184 ms (SD 19) if they occur in pre-pausal position. This is consistent with the phrase-final lengthening already discussed in Section 5.2.1.1.

Coming back to Tab. 5.3, a difference can be noticed regarding the possibility of omitting the word-final vocoid in the two different phrasal contexts: while it is constantly realized in the pre-consonantal context, it can be optionally (LB and AS speakers) or regularly (DP) dropped in the pre-pausal one. Even if differences in the deletion frequency can be found between Carrarese (which deletes more frequently) and Pontremolese, the Pontremolese data just presented seem to point in the same direction, namely towards a categorical absence of the etymological word-final vowel from the word's phonological representation. Further pieces of evidence in favour of this interpretation can be found in the literature on this dialect (Restori 1982; Giannarelli 1913; Maffei Bellucci 1977), which, as already pointed out in Section 5.2.1, describe the apocope as a regularly applying process. Indeed, no word-final vocoid can be found if the word ends with a single consonant, and it is constantly dropped even in words ending in a consonant cluster if followed by a vowel-initial form[65] (It. [uŋ ˈkolpo o ˈdue] 'one or two strokes' vs. Pontr. [uŋ ˈkurp o ˈdui]; It. [um ˈmɛrlo inˈdjaːno] 'an indian blackbird' vs. Pontr. [um ˈmørl inˈdjaŋ]). Furthermore, similarly again to what happens in Carrarese, the literary production supports the hypothesis of the absence of this object from the mental representations of the Pontremolese speakers[66]. Hence, an explanation can be proposed for word-final vocoid realizations that resorts to the same perceptual/articulatory motivations borrowed from Hall (2006) to account for the Carrarese pattern.

[65] As in Carrarese, the pre-vocalic context admits no exception: all the etymologically word-final vowels are dropped and the consonant (cluster) is resyllabified.

[66] As an example, see the third line of the poem excerpt in the opening of Section 4.1, where the poet writes "[…] *gnanc tant fort*" 'not too loud'. Acknowledging the problems in deriving an underlying representation from the written data, what has been said so far makes the following a fairly likely phonological representation of the line excerpt just quoted: /ˈɲank tant ˈfɔrt/.

5.2.2 Proparoxitones

As in the case of the paroxitones, Carrarese and Pontremolese show some (phonetic) difference in the degree to which this process applies to antepenultimate stressed words. To be more precise, while apocope applies in the two dialects more or less to the same degree, syncope, namely the reduction of the word-medial post-tonic vowels, more drastically changed the prosodic shape of Pontremolese proparoxitones. The Carrarese data are presented first and the Pontremolese in Section 5.2.2.2.

5.2.2.1 Carrarese

In Tab. 5.5 the antepenultimate stressed forms as uttered by the same five speakers of Carrarese are presented. For each of them, seven forms are considered, which, after apocope and syncope, show a decreasing (*stomaco* 'stomach' and *manico* 'handle'), even (*tiepido* 'lukewarm SG.MASC', *selvatico* 'wild SG.MASC') or increasing (*tenero* 'tender SG.MASC', *giovane* 'young SG.MASC' and *libero* 'free SG.MASC') sonority contour. As for the paroxitones, their Italian cognates can be found in the second column and their phonetic transcriptions under 'Transcr.' The symbol 'ᵊ' represents the schwa vocoid in the case that it is less than half the length of the stressed vowel. 'F1', 'F2', 'Duration' and 'v/V' columns respectively display the row F1 and F2 frequency Hertz values, the absolute duration of the unstressed and stressed vowels (in milliseconds) and the relative duration of the unstressed vowels with respect to the stressed ones. All of these values have been calculated for the etymologically word-medial ('v_1') and word-final ('v_2') vowels. In this table the vowel acoustic values have been calculated in the case that the words in which they occur are followed either by a consonant initial word ('ˈσ.Cv_1Cv_2] C') or by a pause ('ˈσ.Cv_1Cv_2] #'). The vocoid's values of the same forms occurring in a pre-vocalic context are presented below in a dedicated table. 'N' means that the recording of the corresponding word is not good enough to accurately measure the acoustic values, and 'Nc' that the relevant value has not been calculated.

Tab. 5.5 Carrarese proparoxitones

Forms	ˈσ.Cv₁Cv₂] C										ˈσ.Cv₁Cv₂] #									
	F1		F2		Duration			v/V		Transcr.	F1		F2		Duration			v/V		Transcr.
	v1	v2	v1	v2	v1	v2	V	v1	v2		v1	v2	v1	v2	v1	v2	V	v1	v2	
AC																				
tiepido	350	453	1827	1627	64	120	153	42%	79%	[ˈtepᵊdə]	464	491	1683	1584	83	85	186	45%	46%	[ˈtepᵊdᵊ]
selvatico	662	404	1691	1490	51	48	76	67%	64%	[səlˈvatəkə]	329	477	1152	1596	46	54	148	31%	36%	[səlˈvatᵊkᵊ]
stomaco	461	424	1127	1380	43	39	57	76%	69%	[ˈstomәkə]	0	0	0	0	0	0	Nc	0	0	[ˈstomk]
manico	599	440	1035	1667	43	50	103	42%	48%	[ˈmanəkᵊ]	0	0	0	0	0	0	Nc	0	0	[ˈmank]
tenero	456	0	1807	0	59	0	92	64%	0	[ˈtenər]	445	0	1663	0	86	0	157	55%	0	[ˈtenər]
giovane	369	0	1477	0	64	0	61	105%	0	[ˈdzovən]	429	359	1552	1653	43	68	193	22%	36%	[ˈdzovᵊnᵊ]
libero	446	0	1545	0	41	0	122	34%	0	[ˈlibər]	490	0	1649	0	32	0	110	29%	0	[ˈlibᵊr]
BD																				
tiepido	0	0	0	0	0	0	Nc	0	0	[ˈtepd]	0	0	0	0	0	0	Nc	0	0	[ˈtepd]
selvatico	665	449	1438	1554	41	39	88	46%	44%	[səlˈvatəkᵊ]	612	0	1691	0	75	0	143	52%	0	[səlˈvatək]
stomaco	N	N	N	N	N	N	N	N	N	N	0	0	0	0	0	0	Nc	0	0	[ˈstomk]
manico	616	565	1948	1671	32	51	81	39%	64%	[ˈmanᵊkə]	490	0	1475	0	32	0	152	21%	0	[ˈmanᵊk]
tenero	494	0	1992	0	47	0	141	33%	0	[ˈtenᵊr]	501	0	2196	0	43	0	144	30%	0	[ˈtenᵊr]
giovane	490	0	1286	0	59	0	122	48%	0	[ˈdzovᵊn]	0	0	0	0	0	0	88	0	0	[ˈdzovn]
libero	0	0	0	0	0	0	N	0	0	[ˈlibr]	0	0	0	0	0	0	Nc	0	0	[ˈlibr]
ED																				
tiepido	413	433	1461	1557	50	67	189	27%	36%	[ˈtepᵊdᵊ]	539	513	1482	1498	39	98	142	27%	68%	[ˈtepᵊdə]
selvatico	349	563	1919	1375	37	44	93	40%	47%	[səlˈvatᵊkᵊ]	0	543	0	1556	0	61	149	0	41%	[səlˈvatkᵊ]
stomaco	492	495	1180	1223	34	62	60	56%	104%	[ˈstomәkə]	504	486	1208	1553	69	43	97	71%	45%	[ˈstomәkᵊ]
manico	406	539	1351	1633	31	42	76	41%	55%	[ˈmanᵊkə]	343	0	1675	0	63	0	130	49%	0	[ˈmanᵊk]
tenero	506	514	1518	1433	49	81	64	77%	128%	[ˈtenərə]	N	N	N	N	N	N	N	N	N	N
giovane	476	0	1266	0	63	0	57	110%	0	[ˈdzovən]	548	466	1396	1396	32	50	173	18%	29%	[ˈdzovᵊnᵊ]
libero	452	0	1455	0	63	0	50	127%	0	[ˈlibər]	440	0	1478	0	44	0	124	35%	0	[ˈlibᵊr]
MV																				
tiepido	452	432	1063	1247	24	22	101	24%	22%	[ˈtepᵊdᵊ]	0	0	0	0	0	0	Nc	0	0	[ˈtepd]
selvatico	320	444	1605	1135	33	39	68	48%	58%	[səlˈvatᵊkə]	442	0	1989	0	50	0	106	47%	0	[səlˈvatᵊk]
stomaco	620	0	1140	0	27	0	31	88%	0	[ˈstomәk]	476	0	1134	0	44	0	97	45%	0	[ˈstomᵊk]
manico	457	464	1451	1315	37	36	66	56%	54%	[ˈmanəkə]	600	494	1476	1450	62	59	155	40%	56%	[ˈmanᵊkə]
tenero	566	0	1444	0	39	0	131	30%	0	[ˈtenᵊr]	550	0	1977	0	151	0	193	78%	0	[ˈtenər]
giovane	0	0	0	0	0	0	Nc	0	0	[ˈdzovn]	514	441	1348	821	57	71	130	44%	55%	[ˈdzovᵊnə]
libero	0	0	0	0	0	0	Nc	0	0	[ˈlibr]	0	0	0	0	0	0	Nc	0	0	[ˈlibr]
AM																				
tiepido	375	436	1310	1322	70	67	81	86%	83%	[ˈtepədə]	433	407	1397	1551	65	87	149	44%	58%	[ˈtepᵊdə]
selvatico	327	393	1450	1411	58	43	100	58%	44%	[səlˈvatəkᵊ]	320	401	1433	1390	81	108	156	52%	69%	[səlˈvatəkə]
stomaco	0	415	0	1077	0	21	56	0	37%	[ˈstomkᵊ]	0	0	0	0	0	0	Nc	0	0	[ˈstomk]
manico	N	N	N	N	N	N	N	N	N	N	320	0	2239	0	57	0	173	33%	0	[ˈmanᵊk]
tenero	440	0	1506	0	89	0	62	143%	0	[ˈtenər]	415	0	1538	0	62	0	187	33%	0	[ˈtenᵊr]
giovane	385	0	1191	0	63	0	95	66%	0	[ˈdzovən]	409	440	1334	1438	69	106	181	38%	59%	[ˈdzovᵊn]
libero	453	407	1327	1338	50	69	166	30%	42%	[ˈlibᵊrᵊ]	421	426	1246	1287	68	89	105	65%	83%	[ˈlibərə]

The acoustic mean values of the Carrarese proparoxitones are summarized in Tab. 5.6:

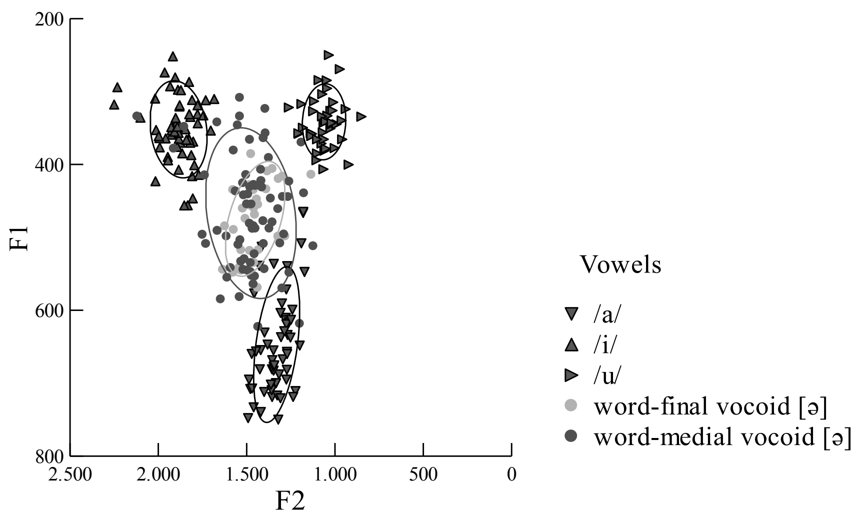
Tab. 5.6 Carrarese proparoxitones - mean values

Carrarese	F1		F2		Duration			v/V	
	v_1	v_2	v_1	v_2	v_1	v_2	V	v_1	v_2
ˈσ.Cv_1Cv_2] C									
mean	468	459	1458	1414	49	52	91	61%	60%
SD	97	54	265	180	15	23	38	31%	26%
ˈσ.Cv_1Cv_2] #									
mean	460	457	1559	1444	61	75	145	42%	52%
SD	81	51	299	213	25	22	31	15%	16%
Total									
mean	464	459	1504	1427	54	62	117	52%	57%
SD	90	52	283	192	21	25	44	27%	22%

As in the case of paroxitones, the F1 and F2 frequency values of the proparoxitone-final vocoids illustrate their schwa quality, with mean values of, respectively, 459 Hz and 1,414 Hz in phrase-medial position and 457 Hz and 1,444 Hz in phrase-final. The same holds for word-medial vocoids, their F1 and F2 mean frequency values being 468 Hz and 1,458 Hz in phrase-medial position and 460 Hz and 1,559 Hz in the phrase-final.

This notwithstanding, F2 shows a considerable standard deviation in every context, with a tendency to be larger in word-medial vocoids. Indeed, while the F1 standard deviation never exceeds 100 Hz, that of F2 ranges between 192 Hz for the word-final vocoid class and 283 Hz for the word-medial class. The difference between the vocoids belonging to the two lexical contexts can be graphically visualized in Fig. 5.3, where they have been plotted together with the normalized stressed cardinal vowels: while the word-final vocoids are concentrated in the very centre of the Carrarese vocalic space, the word-medial ones are still centrally distributed, but they’re also more scattered.

Fig. 5.3 Carrarese word-medial and -final vocoids - proparoxitones



A closer examination of the tokens' values seems to show a tendency for the word-medial F2 to be slightly higher when the etymological vowel is front high and/or when it is adjacent to an alveolar consonant. AC's word-medial vocoids, for example, display an F2 of 1,827 Hz and 1,629 Hz in *tiepido* and *selvatico*, whereas the word-final F2 values of the same forms are 1,627 Hz and 1,490 Hz. At the same time, however, AC's F2 value of the word-medial vocoid of *manico*, namely a form with an etymologically high vowel preceded by an alveolar consonant, is lower than that of the schwa (1,035 Hz). Even if the analysed vocoids do not show a consonantal context of occurrence varied enough to definitively side with one of the two possible sources of F2 variation, it is interesting to point out that tokens can be found in which the F2 of an etymologically non-high vocoid is higher than that of an etymologically high one. Crucially, these tokens are adjacent to an alveolar consonant. This is the case, for example, of the word-medial vocoids of *tenero* as uttered both in phrase-medial and phrase-final position by AC (1,807 Hz and 1,663 Hz), BD (1,992 Hz and 2,196 Hz), MV (1,444 Hz and 1,977 Hz) and AM (1,506 Hz and 1,538 Hz). In all of these cases, the F2 values are higher than those of the schwa and, crucially, as high as (or even higher than) the forms with an etymologically high vowel, uttered by the same speakers. These facts, along with the shortness of these vocoids, seem to suggest that the observed F2 variation is more likely to be due to a coarticulatory effect[67] than to a conditioning of the etymological quality of

[67] Interestingly, Flemming (2007) describe a very similar situation for the English word-medial schwa, which shows greater F2 variation with respect to the word-final one. In his study, the greater F2 variation is due to the articulatory conditioning of the consonantal environment of the word-medial schwa, which in turn is argued to be a consequence of both its lack of contrastive load and, crucially, its shortness. Flemming & Johnson (2007) averaged this schwa duration at 64 ms. Given that the word-medial schwa mean durations of both Carrarese and Pontremolese tend to show about the same length as the English one, and that

which this vocoid is the outcome. Indeed, it is quite plausible to assume that the tongue fronting needed to produce the alveolar consonant has already started (or is coming back to the central/neutral position) when the schwa is pronounced. Since the advanced tongue position is the articulatory correlate of a high F2 frequency, the high F2 values recorded for the vocoid under consideration are possibly explained in this way (Flemming 2007; Flemming & Johnson 2007; Silverman 2011). For all of these reasons, the object under consideration is considered here to be phonetically a schwa, in both word-medial and word-final position.

In Tab. 5.7 the relative and absolute durations of the word-medial and word-final vocoids occurring in both phrase-medial and phrase-final proparoxitones are repeated. As in the preceding tables, the absolute duration of the stressed vowels used to calculate the means are displayed as well.

Tab. 5.7 Carrarese proparoxitone - medial and final vocoid duration

		v_1		v_2		V
		ms	v/V	ms	v/V	ms
$v]_w$ C	mean	49	61%	52	60%	91
	SD	15	31%	23	26%	38
$v]_w$ #	mean	61	42%	75	52%	145
	SD	25	15%	22	16%	31
Total	mean	54	52%	62	57%	117
	SD	21	27%	25	22%	44

The phrase-final lengthening effect is also evident in this case: both the stressed vowels and the word-medial and word-final vocoids occurring in phrase-final forms are longer than the ones occurring phrase-medially, at least as far as the absolute duration is concerned. Indeed, as already noted for the paroxitones, a look at the relative durations suggests that actually, all of the vocoids occurring in phrase-final words are proportionally more reduced than the ones occurring in phrase-medial forms. Tab. 5.7 also suggests that in the phrase-final context the word-final vocoid is longer (52%) than the word-medial one (42%). This statistical observation should, however, be rectified. As can be noticed in Tab. 5.5, even if these word-final vocoids can be longer than the word-medial ones occurring in the same word, they are dropped far more frequently: out of 34 phrase-final forms, 21 tokens (62%) show no word-final vocoid, and only 10 (29%) show no word-medial vocoid.

It is also interesting to observe that, leaving aside one token (i.e. *selvatico* as uttered by ED), whenever the vocoid is absent word-medially, it is absent from word-final position as well, however, the opposite is not true. In other words, deletion of the word-medial vocoid implies deletion of the word-final one.

these segments do not bear any contrastive load, the articulatory explanation of the F2 variation proposed by Flemming (2007) can easily account for the present data.

Summarizing, even if it is frequently unrealized, when the word-final vocoid of a phrase-final form is present, it tends to be slightly longer than the word-medial one. This fact can be interpreted as an optional, maybe emphatically conditioned (Restori 1892; Savoia 1983), lengthening of the release of the (phonologically) word-final plosive[68]. Indeed, comparing the first four forms of every speaker with the last three, i.e. the ones ending with a plosive and the ones ending with a sonorant, it can be noticed that the word-final vocoid is realized 8 times (24%) in the first class and 5 (15%) in the second one. This difference in frequency of post-plosive and post-sonorant vocoid realization is still more drastic in the phrase-medial forms. In these words, the post-plosive is realized 16 times (48%), but only twice (6%) after a word-final sonorant.

Focusing now on the phrase-medial forms, Tab. 5.7 shows that the word-medial and the word-final vocoids share the same length. They are both approximately 60% of the stressed vowels' length. As in the phrase-final words, a preference for word-final vocoid deletion can also be observed phrase-medially. As just noted, however, the difference between the plosive-final and the sonorant-final vocoids is more drastic here: out of 15 tokens where the word-final vocoid is not realized, only two show a plosive in final position. Since the words occurring in phrase-medial position are followed by a consonant-initial word, the general tendency toward a more frequent realization of the word-final vocoid (18 times against 13 times in the phrase-final words), and the specific tendency for it to be realized after a plosive, could be due to the same articulatory and perceptual principles already put forward for the word-final vocoids of the phrase-medial Carrarese paroxitones. Indeed, the high variability of their F2 (see above), the frequency of their realization and their short length suggest that these vocoids can be considered the acoustic by-product of the low degree of overlap of two consonantal gestures: the release of the first consonant is slightly enhanced to convey information about the consonant's place of articulation, and therefore sounds acoustically similar to a short schwa whose F2 value is conditioned by flanking consonants (Hall 2006; Flemming 2007).

As for the word-medial vocoids occurring in phrase-medial position, a preference can be observed for them to be realized more often than the word-final ones in the same phrasal context, and slightly more (28 tokens out of 33: 85%) than the word-medial ones occurring in phrase-final words (24 tokens out of 34: 71%).

In Tab. 5.8 the values are shown of the vocoids occurring in proparoxitones that either end with a vocalic suffix (*-a* and *-e* for the singular and plural feminine forms or *-i* for the plural masculines if not preceded by a nasal consonant) or are followed by a vowel-initial word.

[68] Interestingly, the same 'emphatic conditioning' is reported for French by Schmid (in press), who explicitly claims that in "*merde alors!* [ˈmɛʀd aˈlɔːʀə] 'blimey', […] the paragogic schwa is not part of the underlying representation".

Tab. 5.8 Carrarese pre-vocalic proparoxitones

ˈσ.CvC (]) V						
Forms	F1	F2	Duration		v/V	Transcr.
	v	v	v	V	v	
AC						
tiepido	435	1734	57	157	36%	[ˈtep^{ə}d-]
selvatico	0	0	0	130	0	[səlˈvatk-]
stomaco	0	0	0	Nc	0	[ˈstomk-]
manico	471	1284	50	70	71%	[ˈmanək-]
tenero	0	0	0	Nc	0	[ˈtenr-]
giovane	0	0	0	Nc	0	[ˈdzovn-]
libero	0	0	0	Nc	0	[ˈlibr-]
BD						
tiepido	0	0	0	Nc	0	[ˈtepd-]
selvatico	332	1551	60	120	50%	[səlˈvatək-]
stomaco	0	0	0	Nc	0	[ˈstomk-]
manico	0	0	0	Nc	0	[ˈmank-]
tenero	0	0	0	Nc	0	[ˈtenr-]
giovane	0	0	0	Nc	0	[ˈdzovn-]
libero	0	0	0	Nc	0	[ˈlibr-]
ED						
tiepido	481	1406	25	73	34%	[ˈtep^{ə}d-]
selvatico	378	1997	57	87	66%	[səlˈvatək-]
stomaco	611	1063	57	86	66%	[ˈstomək-]
manico	364	1332	70	49	143%	[ˈmanək-]
tenero	530	1427	75	74	101%	[ˈtenər-]
giovane	543	1141	31	154	20%	[ˈdzov^{ə}n-]
libero	542	1427	57	96	59%	[ˈlibər-]
MV						
tiepido	603	1744	32	72	44%	[ˈtep^{ə}d-]
selvatico	376	1324	32	177	18%	[səlˈvat^{ə}k-]
stomaco	495	1185	46	59	78%	[ˈstomək-]
manico	518	1497	46	62	75%	[ˈmanək-]
tenero	0	0	0	Nc	0	[ˈtenr-]
giovane	0	0	0	Nc	0	[ˈdzovn-]
libero	0	0	0	Nc	0	[ˈlibr-]
AM						
tiepido	435	1424	69	149	46%	[ˈtep^{ə}d-]
selvatico	314	1234	71	116	61%	[səlˈvatək-]
stomaco	0	0	0	Nc	0	[ˈstomk-]
manico	N	N	N	N	N	N
tenero	418	1430	81	107	76%	[ˈtenər-]
giovane	0	0	0	Nc	0	[ˈdzovn-]
libero	441	1240	44	127	35%	[ˈlib^{ə}r-]

In Tab. 5.9 the mean values of the acoustic data presented in Tab. 5.8 are displayed:

Tab. 5.9 Carrarese pre-vocalic proparoxitones - mean values

Carrarese	F1	F2	Duration		v/V
	v	v	v	V	v
ˈσ.CvC (]) V					
mean	460	1413	53	102	60%
SD	88	233	16	38	30%

When these proparoxitones are followed by a vowel, whether it belongs to the same word or to the following one, the word-medial etymological vowel shows, as usual, the same formant frequency values as the schwa: 460 Hz for F1 and 1,413 Hz for F2. As in the vocoids of the words occurring in the other phrasal contexts, a great deal of variation can be observed as far as the F2 values are concerned. Indeed, while the F1 standard deviation is 88 Hz, that of F2 is 233 Hz. It can thus be argued that this variation is also due to the coarticulatory effect. Given the substantial similarity with the vocoids occurring in the other phrasal contexts, the normalized vocoids occurring in the pre-vocalic words have been plotted together with the word-medial ones in Fig. 5.3.

As for the duration parameter, their relative mean value and standard deviation (mean 60%, SD 30%) are similar to those of the same vocoids occurring in the phrase-medial words (61%, SD 31%). The only difference between these two groups concerns the frequency of realization of the vocoid: while in the pre-consonantal words it is realized in 28 of 32 tokens (87%), in the pre-vocalic ones it occurs in 18 of 34 tokens (53%). It has to be noted, however, that seven of these 18 occurrences are found in tokens uttered by the same speaker, namely ED, and they also display the longest durations. For all of the other speakers, there is a preference for the vocoid's absence, and in the case that it is realized, for it to be relatively short.

As suggested in the opening of Section 5.2.2, while syncope applied in a 'milder' way in Carrarese, in Pontremolese the unstressed vowel reduction resulted in its complete deletion. This is shown in the next section.

5.2.2.2 Pontremolese

Tab. 5.10 shows the data of the proparoxitones uttered by five Pontremolese speakers (DP, MM, LB, AS, GB) in the usual pre-consonantal and pre-pausal contexts. In this table, the words have been included which, as a consequence of syncope and apocope, show either a decreasing (*stomaco* 'stomach', *manico* 'handle') or an even (*tiepido* 'lukewarm m.', *selvatico* 'wild m.') sonority contour.

The words that instead show an increasing sonority contour are presented in a dedicated table where Pontremolese forms displaying an epenthetic vowel are described (Section 5.3.2).

Tab. 5.10 Pontremolese proparoxitones - decreasing/even sonority contour

Forms	ˈσ.Cv₁Cv₂] C										ˈσ.Cv₁Cv₂] #									
	F1		F2		Duration			v/V		Transcr.	F1		F2		Duration			v/V		Transcr.
	v_1	v_2	v_1	v_2	v_1	v_2	V	v_1	v_2		v_1	v_2	v_1	v_2	v_1	v_2	V	v_1	v_2	
DP																				
tiepido	297	389	877	1024	94	101	155	60%	65%	[ˈteʋdə]	345	379	920	1514	125	62	151	83%	41%	[ˈteudᵊ]
selvatico	0	391	0	1207	0	74	98	0	76%	[sarˈvadgə]	0	386	0	1878	0	53	176	0	30%	[sarˈvadgᵊ]
stomaco	0	411	0	1227	0	123	81	0	152%	[ˈstumgə]	0	415	0	1566	0	129	109	0	119%	[ˈstumgə]
manico	0	466	0	1469	0	93	105	0	88%	[ˈmankə]	0	416	0	1748	0	79	122	0	65%	[ˈmankə]
MM																				
tiepido	0	412	0	1593	0	88	81	0	108%	[ˈtevdə]	0	413	0	1584	0	85	85	0	100%	[ˈtevdə]
selvatico	0	345	0	1365	0	56	70	0	79%	[sarˈvadgə]	0	364	0	1561	0	47	139	0	34%	[sarˈvadgᵊ]
stomaco	0	364	0	1330	0	48	61	0	78%	[ˈstumgə]	0	347	0	1573	0	101	134	0	75%	[ˈstumgə]
manico	0	380	0	1596	0	61	53	0	116%	[ˈmangə]	0	389	0	1552	0	75	149	0	50%	[ˈmangə]
LB																				
tiepido	0	420	0	1707	0	49	87	0	56%	[ˈtevdə]	0	365	0	1854	0	69	101	0	69%	[ˈtevdə]
selvatico	0	343	0	1457	0	51	81	0	63%	[sarˈvadgə]	0	391	0	1503	0	86	118	0	73%	[sarˈvadgə]
stomaco	0	375	0	1480	0	75	60	0	124%	[ˈstumgə]	0	409	0	1421	0	69	109	0	63%	[ˈstumgə]
manico	0	331	0	1587	0	11	17	0	65%	[ˈmangə]	0	380	0	1540	0	64	119	0	54%	[ˈmangə]
AS																				
tiepido	0	410	0	1707	0	88	112	0	79%	[ˈtevdə]	0	429	0	1600	0	113	88	0	129%	[ˈtevdə]
selvatico	0	381	0	1269	0	62	78	0	80%	[sarˈvadgə]	0	438	0	1547	0	112	159	0	70%	[sarˈvadgə]
stomaco	0	456	0	1399	0	82	104	0	79%	[ˈstumgə]	0	470	0	1360	0	101	111	0	91%	[ˈstumgə]
manico	0	461	0	1732	0	77	83	0	93%	[ˈmangə]	0	448	0	1462	0	190	151	0	126%	[ˈmangə]
GB																				
tiepido	0	440	0	1644	0	82	127	0	64%	[ˈtevdə]	0	468	0	1636	0	76	110	0	69%	[ˈtevdə]
selvatico	0	425	0	1677	0	62	89	0	70%	[sarˈvadgə]	0	467	0	1504	0	101	115	0	88%	[sarˈvadgə]
stomaco	0	437	0	1587	0	83	105	0	79%	[ˈstumgə]	0	499	0	1441	0	77	60	0	128%	[ˈstumgə]
manico	0	480	0	1866	0	68	64	0	105%	[ˈmangə]	0	384	0	1675	0	62	109	0	57%	[ˈmangə]

As already hinted at, syncope changed the Pontremolese prosodic word structure to a greater extent that it did in Carrarese. Indeed, as shown in Tab. 5.10, the etymological word-medial vowels were regularly deleted by all of the speakers. The only exception is DP, who ‘goes a little further’, changing the labio-dental fricative into the corresponding labio-dental approximant [ʋ] (whose frequency values are displayed here).

The regular deletion of the word-medial unstressed vowel obviously applies also in the forms occurring before a vowel. In these cases, the presence of the full vowel, regardless of whether it belongs to the same or to the following word, prevents the creation of a consonant cluster and nullifies any perceptual reason for the schwa-like vocoid to be realized. As already discussed in the previous sections, before a consonant-initial word or a pause, a word-final consonant cluster can display a schwa-like release which can be interpreted both as a means of perceiving the place of articulation of the preceding consonant and as a by-product of the consonantal gesture phasing (Hall 2006). A word such as /sarˈvadg/ ‘wild SG.MASC’, for example, displays a word-final schwa-like vocoid (see Tab. 5.10). On the other hand, in forms such as *selvatica* /sarˈvadga/ ‘wild f.’ and *selvatico o no* /sarˈvadg o no/ ‘wild m. or not’ the formant transitions that help to identify the /g/ place of articulation can be ‘read’ in the formant structure of the vowels that follow it, namely the feminine ending *-a* and the disjunctive conjunction *o*. Therefore, no perceptual reason can be found which could either block the word-medial vowel deletion or favour the presence of the word-final schwa-like vocoid. Since no exception has been found to the absence of this pre-vocalic schwa-like vocoid a dedicated table would be redundant and is hence not presented here.

In Tab. 5.11 the mean values of the acoustic data presented in Tab. 5.10 are displayed:

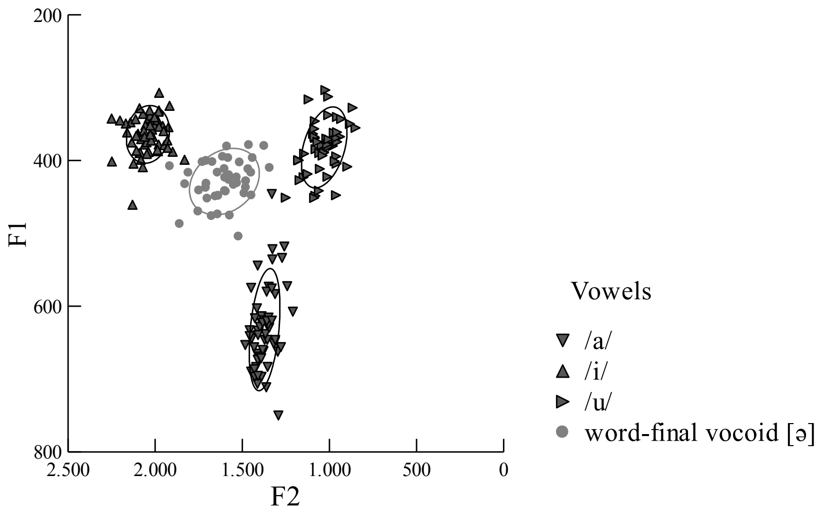
Tab. 5.11 Pontremolese proparoxitones - decreasing/even sonority contour - mean values

Pontremol.	F1		F2		Duration			v/V	
	v_1	v_2	v_1	v_2	v_1	v_2	V	v_1	v_2
ˈσ.Cv_1Cv_2] C									
mean	0	406	0	1496	0	72	86	0	86%
SD	0	43	0	213	0	24	29	0	24%
ˈσ.Cv_1Cv_2] #									
mean	0	413	0	1576	0	88	121	0	76%
SD	0	41	0	132	0	32	28	0	31%
Total									
mean	0	409	0	1536	0	80	103	0	81%
SD	0	42	0	179	0	29	33	0	28%

As for the word-final vocoid, it is realized in all the forms, showing a slightly greater relative duration (mean 86%, SD 24%) in the pre-consonantal context than in the pre-pausal one (mean 76%, SD 31%). The absolute durations of both the word-final vocoids and the stressed vowels again show the phrase-final lengthening effect. In the phrase-medial words, the vocoid and the stressed mean absolute values are, respectively, 72 ms (SD 24 ms) and 86 ms (SD 29 ms), against the 88 ms (SD 32 ms) and 121 ms (SD 28 ms) of the words occurring in the phrase-final forms. Hence, from both the point of view of the frequency of occurrence and of duration, the word-final vocoids occurring in the two phrasal contexts can be considered phonetically the same object.

No significant difference can be found as far as the formant frequency values are concerned either, and the normalized corresponding tokens have hence been plotted in Fig. 5.4 without distinguishing their phrasal context. As can be seen, the word-final vocoids occur in the centre of the Pontremolese vocalic space, nearly perfectly overlapping with the same dialect’s paroxitone-final vocoids plotted in Fig. 5.2.

Fig. 5.4 Pontremolese word-final vocoids - proparoxitones - decreasing/even sonority contour



In both the phrasal contexts, they display similar F1 and F2 mean frequencies, namely 406 Hz (SD 43 Hz) and 1,496 Hz (SD 213 Hz) in the phrase-medial words and 413 Hz (SD 41 Hz) and 1.576 Hz (SD 132 Hz) in the phrase-final. As already observed for the forms discussed in the preceding sections, more variation can be found in F2 values, the standard deviations of F1 being about 40 Hz in the words occurring in both the phrasal contexts, but 213 Hz and 132 Hz in phrase-medial and phrase-final forms. The same articulatory and perceptual explanations already proposed for the greater variation of F2 with respect to F1 can be applied to these vocoids as well. As a consequence, comparing the vocoid F2 standard deviations of the words occurring in the two phrasal contexts, it's not surprising to find a greater variation when the vocoid is followed by a consonant-initial word (213 Hz) than when followed by a pause (132 Hz). Indeed, in the first case the vocoid's F2 can be conditioned by the two flanking consonants. Similarly, given that the word-medial vocoids are regularly absent in the phrase-final words also, the word-final ones can be interpreted as a means of enabling the perception of the (phonologically) word-final consonant.

Now that the description of the fate of the etymologically unstressed vowels in the two dialects has been accomplished, let us turn to the intrusive/epenthetic vowels.

5.3 The intrusive/epenthetic vocoids

In the following sections, a description of the vocoids that can show up as a consequence of the etymologically unstressed vowel deletion is offered. As in the case of the reduced vowels just described, a subtle variation can be observed in the way these vocoids behave in the two dialects. To underline this difference, these vocoids are labelled as ‘intrusive’ (I) in Carrarese and ‘epenthetic’ (E) in Pontremolese (see also Section 1.2).

5.3.1 Carrarese

In Tab. 5.12 the data are presented of the penultimate stressed words that, as a consequence of apocope, show a word final consonant cluster with an increasing sonority contour (*muta cum liquida*).

Tab. 5.12 Carrarese paroxitones - increasing sonority contour

Forms	ˈσ.CIC] C						ˈσ.CIC] #					
	F1	F2	v ms	V ms	v/V	Transcr.	F1	F2	v ms	V ms	v/V	Transcr.
AC												
libro	442	1470	58	49	118%	[ˈlibər]	0	0	0	138	0	[ˈlibr]
magro	467	1767	50	97	52%	[ˈmagər]	0	0	0	189	0	[ˈmagr]
quattro	580	1744	49	99	50%	[ˈkwatər]	0	0	0	165	0	[ˈkwatr]
BD												
libro	524	1444	93	109	85%	[ˈlibər]	0	0	0	174	0	[ˈlibr]
magro	0	0	0	120	0	[ˈmagr]	0	0	0	168	0	[ˈmagr]
quattro	0	0	0	190	0	[ˈkwatr]	0	0	0	94	0	[ˈkwatr]
ED												
libro	471	1251	60	57	104%	[ˈlibər]	0	0	0	114	0	[ˈlibr]
magro	436	1421	53	96	55%	[ˈmagər]	488	1420	59	218	27%	[ˈmag^{ə}r]
quattro	0	0	0	88	0	[ˈkwatr]	423	1463	60	134	45%	[ˈkwat^{ə}r]
MV												
libro	508	1360	54	99	55%	[ˈlibər]	0	0	0	135	0	[ˈlibr]
magro	0	0	0	94	0	[ˈmagr]	0	0	0	171	0	[ˈmagr]
quattro	0	0	0	74	0	[ˈkwatr]	0	0	0	195	0	[ˈkwatr]
AM												
libro	425	1207	143	76	189%	[ˈlibər]	426	1324	75	124	60%	[ˈlibər]
magro	426	1516	54	112	48%	[ˈmag^{ə}r]	427	1481	58	225	26%	[ˈmag^{ə}r]
quattro	444	1402	39	128	31%	[ˈkwat^{ə}r]	426	1359	46	118	39%	[ˈkwat^{ə}r]

These forms are *libro* ‘book’, *magro* ‘thin’ m. and *quattro* ‘four’. The reader should already be familiar with the column tags of the following table, the only difference being that here, the pre-consonantal (ˈσ.CIC] C) and pre-pausal (ˈσ.CIC] #) contexts are the ones in which the word (optionally) displays an intrusive vowel (‘I’).

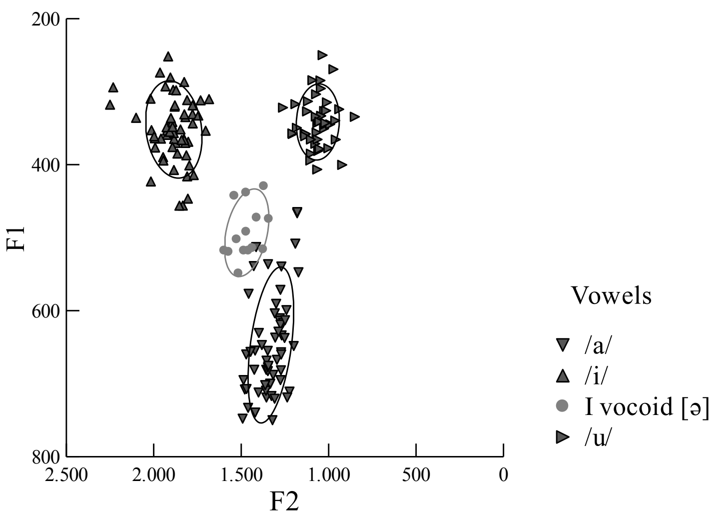
The relative mean values can be found in Tab. 5.13:

Tab. 5.13 Carrarese paroxitones - increasing sonority contour - mean values

Carrarese	F1	F2	v ms	V ms	v/V
ˈσ.CIC] C					
mean	472	1458	65	99	79%
SD	51	183	31	33	48%
ˈσ.CIC] #					
mean	438	1409	60	157	39%
SD	28	67	10	39	14%
Total					
mean	461	1442	63	128	66%
SD	46	153	25	46	43%

It is immediately clear that the intrusive vocoid of Carrarese shows the same mean F1 and F2 frequencies of the schwa in both phrasal contexts, namely 472 Hz (SD 51 Hz) and 1,458 Hz (SD 183 Hz) in the pre-consonantal word and 438 Hz (SD 28 Hz) and 1,409 Hz (SD 67 Hz) in the pre-pausal one. It can also be noticed that, as far as F2 and F1 are concerned, the variation observed in the intrusive vocoid is lower than the one characterizing the vocoid occurring in the contexts described in the previous sections. However, since the F2 frequency values of schwa-like vocoids are assumed to be conditioned by the quality of the adjacent consonants (Flemming 2007; Flemming & Johnson 2007 and Silverman 2011), and given that the intrusive vocoids acoustically analysed occur in very similar consonantal contexts, the I vocoids of Carrarese should be considered qualitatively similar to the other vocoids analysed so far. Indeed, as shown in Fig. 5.5, they occupy the same central area of the Carrarese vocalic space.

Fig. 5.5 Carrarese I vocoids - paroxitones



As for the duration parameter, the data summarized in Tab. 5.13 show that the phrase-final lengthening applies also in this case, but interestingly only to the stressed vowels. While in the previously examined vocoids, the absolute duration augments proportionally to that of the stressed vowel, the I vocoid goes in the opposite direction, its duration being shorter in phrase-final words than in phrase-medial ones. Indeed, as shown by the table, in phrase-medial forms, the mean durations of the I vocoid and the stressed vowel are, respectively, 65 ms (SD 31 ms) and 99 ms (SD 33), against the 60 ms (SD 10 ms) and 157 ms (SD 39 ms) of phrase-final forms. Furthermore, while phrase-finally the I vocoid is realized in only in five tokens out of 15, phrase-medially it occurs in 10 out of 15. These data seem to suggest that the I vocoid is transparent to the phrase-final lengthening, and that Carrarese speakers 'easily' pronounce word-final bi-consonantal clusters with both an even (Section 5.2.2.1) and an increasing sonority contour[69]. To be more precise, they also seem to 'prefer' the word-final increasing sonority contours to the even ones. Indeed, as shown in Tab. 5.12, while they produce only five tokens out of 34 (15%) showing an even sonority contour (namely the forms in Tab. 5.5 where both apocope and syncope are 'drastically' applied), they produce 10 out of 15 (67%) tokens showing an increasing sonority contour. However, from the acoustic/perceptual point of view, this is hardly surprising as it has been argued that the monovibrant rhotics[70] contain "two vocalic elements, one on each side of [the]

[69] It is also interesting to note that cases can be found where the vowel reduction processes neutralize some opposition, such as the one between *libero* 'free' and *libro* 'book', both pronounced as [ˈlibr] (see for example the relevant pre-consonantal and pre-pausal forms as pronounced by BD and MV in Tab. 5.5 and the pre-pausal ones produced by the same speakers in Tab. 5.12).

[70] The spectrographic analysis of Carrarese and Pontremolese rhotics shows that, similarly to those of Northern Italian varieties (Romano 2013), they are phonetically flaps.

constricted interval" (Savu 2013: 145). As a consequence, the need for a formantic structure conveying the articulatory information of the preceding stop is fulfilled by the 'vocalic elements' of the following rhotic. The phonetic considerations just discussed call for a description of the I vocoid as a kind of enhancement of the first 'vocalic element' of the post-consonantal rhotic.

In the next section, the differences between the intrusive vocoid just described and the epenthetic vocoid of Pontremolese will be phonetically substantiated by the presentation of the latter's data.

5.3.2 Pontremolese

In Tab. 5.14 the acoustic data are presented of the Pontremolese penultimate stressed words showing an increasing sonority contour after the application of apocope. The tags in the table are the same as those already described for Tab. 5.12, the only difference being the use of 'E' to indicate the epenthetic vocoid instead of the 'I' used for the Carrarese intrusive vocoid.

Tab. 5.14 Pontremolese paroxitones - increasing sonority contour

Forms	ˈσ.CEC] C						ˈσ.CEC] #					
	F1	F2	v ms	V ms	v/V	Transcr.	F1	F2	v ms	V ms	v/V	Transcr.
DP												
libro	564	880	91	160	57%	[ˈlibɐr]	571	1033	105	137	77%	[ˈlibɐr]
magro	616	1253	95	123	77%	[ˈmagɐr]	628	1429	153	170	90%	[ˈmagɐr]
quattro	541	1375	45	102	44%	[ˈkwat^{ɐ}r]	581	1390	83	154	54%	[ˈkwatɐr]
MM												
libro	522	1412	72	75	96%	[ˈlibɐr]	576	1294	83	111	75%	[ˈlibɐr]
magro	548	1496	69	96	72%	[ˈmagɐr]	552	1355	71	132	54%	[ˈmagɐr]
quattro	501	1441	40	77	52%	[ˈkwatɐr]	430	1591	55	145	38%	[ˈkwat^{ɐ}r]
LB												
libro	489	1291	57	57	101%	[ˈlibɐr]	545	1381	106	118	90%	[ˈlibɐr]
magro	476	1355	65	100	65%	[ˈmagɐr]	554	1468	81	119	68%	[ˈmagɐr]
quattro	494	1335	45	76	59%	[ˈkwatɐr]	579	1487	64	149	43%	[ˈkwat^{ɐ}r]
AS												
libro	591	1346	86	68	126%	[ˈlibɐr]	615	1401	142	118	120%	[ˈlibɐr]
magro	622	1692	69	88	79%	[ˈmagɐr]	622	1576	108	162	67%	[ˈmagɐr]
quattro	596	1529	50	62	81%	[ˈkwatɐr]	607	1418	124	170	73%	[ˈkwatɐr]
GB												
libro	601	1331	88	101	87%	[ˈlibɐr]	592	1412	65	100	65%	[ˈlibɐr]
magro	490	1642	76	93	82%	[ˈmagɐr]	500	1534	84	126	67%	[ˈmagɐr]
quattro	584	1415	59	78	76%	[ˈkwatɐr]	504	1450	50	122	41%	[ˈkwat^{ɐ}r]

In Tab. 5.15 the mean values are presented of the Pontremolese epenthetic vocoid acoustic data:

Tab. 5.15 Pontremolese paroxitones - increasing sonority contour - mean values

Pontremol.	F1	F2	v ms	V ms	v/V
ˈσ.CEC] C					
mean	549	1386	67	90	77%
SD	51	187	18	26	21%
ˈσ.CEC] #					
mean	564	1415	92	184	68%
SD	53	133	31	22	22%
Total					
mean	556	1400	79	113	72%
SD	52	160	28	33	21%

To facilitate comparison between the intrusive/epenthetic vocoids, in Tab. 5.16 the frequency and length mean values of the Carrarese intrusive vocoid are illustrated here.

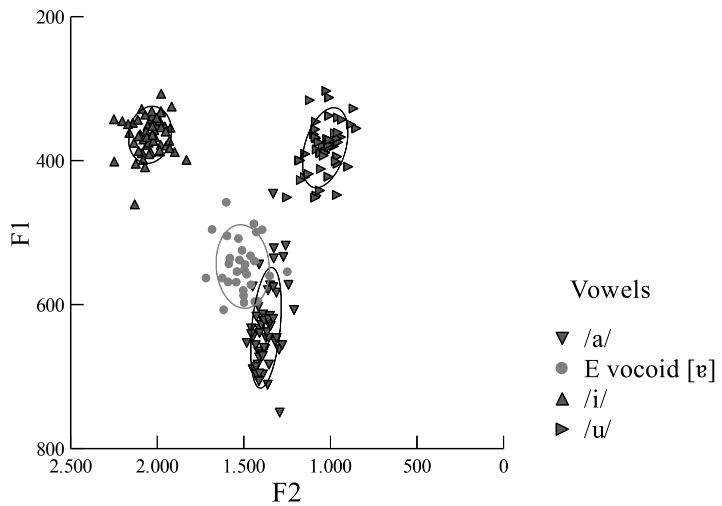
Tab. 5.16 Carrarese intrusive vocoids mean values

Carrarese	F1	F2	v ms	V ms	v/V
ˈσ.CIC] C					
mean	472	1458	65	99	79%
SD	51	183	31	33	48%
ˈσ.CIC] #					
mean	438	1409	60	157	39%
SD	28	67	10	39	14%
Total					
mean	461	1442	63	128	66%
SD	46	153	25	46	43%

As can be noticed by having a look at the means from the two dialects presented in Tab. 5.15 and Tab. 5.16, while the Carrarese I vocoid shows an F1 mean value similar to that of the schwa, the Pontremolese E vocoid F1 displays higher frequency values in the forms occurring in both phrasal contexts. Since the F1 frequency value is inversely correlated with the height of the vowel, the Pontremolese E vocoid turns out to be lower than the Carrarese I vocoid. As for the F2, the mean values of the two vocoids occurring in the phrase-final words are pretty similar (1,409 Hz for I vs.

1,415 for E), but show a significant difference as far as the standard deviation is concerned: the Pontremolese E vocoid shows a higher value (67 Hz for I vs. 133 Hz for E). On the other hand, in the phrase-medial words, the Pontremolese E vocoid displays a lower F2 mean value (1,386 Hz) than the Carrarese I vocoid (1,458 Hz), the standard deviations being, in this case, quite similar (187 Hz for E vs. 183 Hz for I). While F1 is related to the vowel height, the F2 frequency value is related to the vowel frontness: the lower the F2, the more back the vowel is. Hence, the F2 values of the Pontremolese E vocoid suggest that it is less central than the Carrarese I vocoid (as shown by the E mean value of the phrase-medial forms) and that it can be produced with a greater amount of variation along the front-back dimension (as indicated by the higher E SD value of the phrase-final forms). Summarizing, the mean F1 and F2 E frequency values characterize a vocoid which is slightly more low and back than a schwa, which has hence been transcribed as [ɐ] and plotted in Fig. 5.6 together with the normalized stressed cardinal vowels.

Fig. 5.6 Pontremolese E vocoid ([ɐ]) - paroxitones



Another difference between I and E vocoids can be found both in their mean durations and in their frequency of realization in the phrase-final forms. Indeed, while I vocoids of Carrarese average at 60 ms, 39% of the stressed vowel length, Pontremolese E vocoids average at 92 ms, that is, 68% of the stressed vowel length. Furthermore, while the phrase-final I is far shorter than the phrase-medial one (which is 79% of the stressed vowel length), the relative lengths of the phrase-final and phrase-medial Pontremolese E are very similar (68% vs. 77%). Hence, while Carrarese I seems to be transparent to the phrase-final lengthening (Section 5.3.1), the same cannot be argued for the Pontremolese E vocoid, which behaves as every other vowel.

Furthermore, while Carrarese I is frequently dropped (10 times phrase-finally and five phrase-medially out of 15), Pontremolese E is always realized in both of the phrasal contexts.

The acoustic, durational and distributional differences just described suggest a phonological difference between I and E. However, before going through it (Chapter 7), Pontremolese proparoxitones showing a post-syncope/apocope increasing sonority contour need to be described. Indeed, as shown in Tab. 5.17, proparoxitones are interesting not only because they confirm the distributional difference between I and E, but also because they display the back E vocoid. In order to display the acoustic differences between the two E vocoids, the usual *tenero*, *libero* and *giovane* are presented together with *asino* 'donkey'. As can be noticed in the table, while *tenero* and *libero* show the low E, *giovane* and *asino* show the back one (henceforth respectively aE and uE).

Tab. 5.17 Pontremolese proparoxitones - increasing sonority contour

	ˈσ.CEC] C										ˈσ.CEC] #									
Forms	F1		F2		Duration			v/V		Transcr.	F1		F2		Duration			v/V		Transcr.
	v1	v2	v1	v2	v1	v2	V	v1	v2		v1	v2	v1	v2	v1	v2	V	v1	v2	
DP																				
tenero	567	0	1219	0	56	0	87	64%	0	[ˈtenɐr]	660	0	1286	0	69	0	140	49%	0	[ˈtenɐr]
libero	547	0	1062	0	109	0	148	74%	0	[ˈlibɐr]	624	0	1225	0	107	0	121	88%	0	[ˈlibɐr]
giovane	423	0	690	0	140	0	171	82%	0	[ˈzuʊŋ]	420	0	692	0	166	0	145	115%	0	[ˈzuʊŋ]
asino	303	0	629	0	105	0	139	76%	0	[ˈazʊŋ]	345	0	745	0	81	0	178	45%	0	[ˈaz^{ʊ}ŋ]
MM																				
tenero	N	N	N	N	N	N	N	N	N	N	530	0	1487	0	70	0	145	48%	0	[ˈtenɐr]
libero	542	0	1383	0	50	0	88	57%	0	[ˈlibɐr]	524	0	1278	0	93	0	97	96%	0	[ˈlibɐr]
giovane	308	0	690	0	63	0	90	70%	0	[ˈzuʊŋ]	377	0	843	0	57	0	94	60%	0	[ˈzuʊŋ]
asino	397	0	637	0	109	0	168	65%	0	[ˈazʊŋ]	338	0	736	0	90	0	188	48%	0	[ˈaz^{ʊ}ŋ]
LB																				
tenero	695	0	1593	0	51	0	72	71%	0	[ˈtenɐr]	706	0	1555	0	93	0	112	83%	0	[ˈtenɐr]
libero	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
giovane	N	N	N	N	N	N	N	N	N	N	283	365	702	1368	102	95	81	126%	117%	[ˈzuʊŋə]
asino	297	0	733	0	106	0	113	94%	0	[ˈazʊŋ]	301	0	837	0	87	0	184	47%	0	[ˈaz^{ʊ}ŋ]
AS																				
tenero	619	0	1513	0	68	0	100	68%	0	[ˈtenɐr]	716	0	1541	0	134	0	137	98%	0	[ˈtenɐr]
libero	594	0	1302	0	81	0	75	108%	0	[ˈlibɐr]	602	0	1357	0	117	0	87	135%	0	[ˈlibɐr]
giovane	442	0	904	0	40	0	87	46%	0	[ˈzu^{ʊ}ŋ]	288	0	706	0	209	0	143	146%	0	[ˈzuʊŋ]
asino	344	0	740	0	77	0	154	50%	0	[ˈazʊŋ]	282	0	1169	0	94	0	184	51%	0	[ˈazʊŋ]
GB																				
tenero	532	438	1571	1608	44	53	81	54%	65%	[ˈtenɐrə]	569	0	1610	0	91	0	105	86%	0	[ˈtenɐr]
libero	613	0	1329	0	108	0	118	91%	0	[ˈlibɐr]	513	0	1391	0	65	0	90	72%	0	[ˈlibɐr]
giovane	269	0	813	0	84	0	95	89%	0	[ˈzuʊŋ]	347	0	780	0	111	0	102	109%	0	[ˈzuʊŋ]
asino	349	0	1020	0	67	0	120	56%	0	[ˈazʊŋ]	217	0	632	0	93	0	157	59%	0	[ˈazʊŋ]

Tab. 5.17 shows that, while the Pontremolese proparoxitones with an even or decreasing sonority contour resulting from the combination of syncope and apocope do not display any cluster-breaking vocalic segment, if the word-final cluster is a *muta cum liquida* then an aE vocoid appears. The only thing that can be observed in the even/decreasing sonority contour cases (see Tab. 5.10) is the regular realization of a schwa-like vocoid after the last consonant of the cluster, both phrase-medially and phrase-finally. This word-final vocoid is instead unrealized in Pontremolese increasing sonority contour proparoxitones. It should be noted that it actually

appears in two cases: in *tenero* as pronounced by GB in phrase-medial position and in *giovane* as pronounced by LB in phrase-final position. In both of these cases, the F1 and F2 values indicate that this vocoid is qualitatively a schwa. The fact that GB produces the same form without this vocoid in the other phrasal context and that all of the other forms produced by LB lack this vocoid render these two tokens exceptions to a fairly regular generalization.

In Tab. 5.18 the mean values are displayed of the acoustic data just presented. The table shows the mean values of the low epenthetic vocoid (aE) on the left and those of the back epenthetic vocoid (uE) on the right.

Tab. 5.18 Pontremolese proparoxitones - increasing sonority contour - mean values

Pontremol.	aE									uE								
	F1		F2		Duration			v/V		F1		F2		Duration			v/V	
	aE	v_2	aE	v_2	aE	v_2	V	aE	v_2	uE	v_2	uE	v_2	uE	v_2	V	uE	v_2
	ˈσ.CEC] C									ˈσ.CEC] C								
mean	589	0	1371	0	71	0	96	73%	0	348	0	762	0	88	0	126	70%	0
SD	54	0	183	0	26	0	26	18%	0	61	0	130	0	30	0	33	17%	0
	ˈσ.CEC] #									ˈσ.CEC] #								
mean	605	0	1414	0	93	0	115	84%	0	320	0	784	0	109	0	146	81%	0
SD	77	0	139	0	23	0	22	26%	0	57	0	150	0	45	0	40	39%	0
	Total									Total								
mean	597	0	1394	0	83	0	106	79%	0	333	0	774	0	99	0	137	75%	0
SD	66	0	157	0	26	0	25	23%	0	59	0	137	0	39	0	37	30%	0

As for the F1 and F2 frequencies, the proparoxitonic aE vocoids display pretty much the same mean values as their paroxitonic equivalents: in the phrase-medial forms, the F1 and F2 mean values are, respectively, 589 Hz and 1,371 Hz (versus 549 Hz and 1,386 Hz in the paroxitones), and 605 Hz and 1,414 Hz in the phrase-final ones (versus 564 Hz and 1,415 Hz in the paroxitones). The similarity between the paroxitonic and proparoxitonic aE formant values is confirmed by the similarity of the relative standard deviations, which, as usual, show the highest values for F2 in both phrasal contexts. The paroxitones' and proparoxitones' aE vocoids must hence be phonetically considered the same object.

A substantial difference can instead be found when the word-final consonant of a cluster is a nasal (as in the outcome of *giovane* and *asino*). In this phonological context, the Pontremolese speakers realize an epenthetic vocoid that displays the formant frequency values of a high back vowel. It has, as shown in Tab. 5.18, an F1 mean of 333 Hz (SD 59 Hz) and an F2 mean of 774 Hz (SD 137 Hz). It is interesting to note that its quality can be argued to be conditioned by the following consonantal articulation. Indeed, uE occurs before a word-final nasal that, crucially, in Pontremolese is always velar[71]. In other words, the uE shares some articulatory

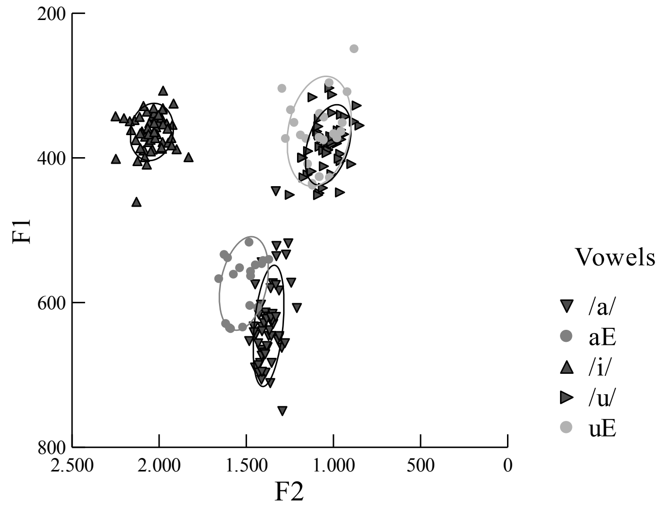
[71] Interestingly, even if Carrarese word-final nasals are velar, they do not spread their acoustic (or phonological) features toward the preceding vocoid, which in Carrarese keeps its own schwa-like quality (Pontr. [ˈazʊŋ] vs. Carr. [ˈazəŋ] 'donkey').

configuration with the following consonant, namely the backness of the tongue body of the velar nasal.

As for the duration parameter, the back and the low epenthetic vocoids do not show any difference: they are both slightly less than the 80% of the stressed vowel duration.

In order to better visualize the numerical data presented so far about the formant frequencies of these vocoids, aE and uE have been plotted in Fig. 5.7 together with the Pontremolese stressed cardinal vowels.

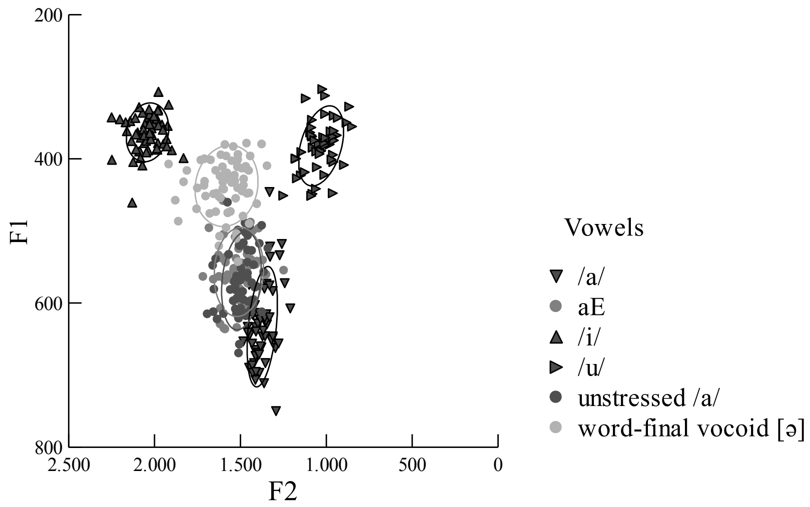
Fig. 5.7 Pontremolese aE and uE vocoids - proparoxitones



As already shown by the numerical data, the aE cloud is a little more low and back with respect to that of the schwa-like vocoid realized in word-final position, which occupies a more central and high position. This can be visually checked in Fig. 5.8, where aE[72] has been plotted together with the stressed cardinal vowels and, crucially, with the unstressed /a/ (which occurs word-finally to mark the singular feminine) and the schwa-like vocoid, which can be realized word-finally.

[72] Given their phonetic and phonological similarity, the paroxitonic and proparoxitonic aE vocoids have been collapsed together here.

Fig. 5.8 Pontremolese aE, unstressed /a/ and schwa-like word-final vocoids



As can be noticed in the figure above, the aE probability ellipsis almost perfectly overlaps with that of the unstressed /a/. This means that the two objects share the same frequency values, which in turn means that they are perceived as the same by Pontremolese speakers as well. As for the other epenthetic vocoid, the uE cloud overlaps considerably with the stressed high-back vowels (Fig. 5.7), showing just a little more dispersion. As claimed for aE, this means that the Pontremolese speakers may interpret uE and /u/ as the same object. Furthermore, as pointed out above, the fact that, differently from the Carrarese I, the Pontremolese E undergoes the phrase-final lengthening, can be considered another clue to the phonetic and phonological identity of aE and uE with respect to /a/ and /u/. Namely, from both the phonetic and phonological points of view, there seems to be no difference between the Pontremolese epenthetic vocoids and full vowels.

Therefore, even if what is written down by the poets can be considered neither a phonetic nor a phonological transcription of their strophe, it might be no coincidence that they use the <a> and <u> graphemes for the aE and uE vocoids just described.