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The Beginning of an Important Change in Polish Phonotactics

1. Introduction

Polish phonotactics is constantly evolving. At present, the speakers of Polish take care to articulate individual speech sounds with precision. This results in a reduction in the frequency of some assimilations (cfr. Osowicka-Kondratowicz, Serowik 2007, Madejowa 1981) and in the emergence of unnatural (and sometimes even incorrect) realisations (reconstruction of gemination, stronger nasalisation of the second part of the diphthong in the pronunciation of the letters *ę* and *ą*). Overall, we observe a more 'orthographic' pronunciation, pronunciation informed by the written form – the rules of continuous pronunciation of the segments are not implemented. In our opinion, this is primarily the effect of many years of inadequate education and the fact that teachers of Polish are ignorant of the rules of Polish phonotactics.

1.1. Some time ago we started to look more closely at the tendency to the syllabic pronunciation of *r* in the final position after a consonant. This tendency was noticed earlier by Osowicka-Kondratowicz (2011). This change is expected from the point of view of the historical development of Slavic languages, and taking into account natural preferences in pronunciation. Its effect is to smooth out the falling line of sonority in the syllable coda which had already taken place in all Slavic languages. We included the first observations in several conference papers and in two articles (Sawicka, Zinowjewa 2020, 2023). We are preparing for a detailed examination of the phenomenon. The examination will involve the pronunciation of all sonorants in one of the contexts in which the Sonority Principle is violated: namely, the word-final position after a consonant, with particular focus on the pronunciation of *r*.

1.2. Several hundred sentences have been recorded, containing the contexts under examination, pronounced by the so-called model speaker. It is our intention to compare this pronunciation with the pronunciation of 'regular' speakers of the language and with the pronunciation of older speakers. The model speaker is a public figure, a weather presenter and an actress¹, who has often been observed to pronounce *r* syllabically. Her pro-

¹ Everyone can hear her pronunciation on TVP programs. This is Aleksandra Kostka – we reveal her name with her consent.

nunciation is correct and precise. She has been chosen because she regularly pronounces *r* in a ‘new’ way, while for most Poles this pronunciation is still rare. The recording was made in studio conditions, with professional equipment used in television productions. The present article discusses the material obtained from the model speaker. She uses the north-eastern variant of the Polish pronunciation. For comparison, the same material was also recorded by an older woman, about eighty years old (INS), who uses an older variant of pronunciation. Her pronunciation also represents the north-eastern variety of Polish phonetics.

1.2.1. The material containing the examined contexts of *r* included 87 sentences. The following contexts were considered: segmental environment (after a voiced or voiceless obstruent; before a voiced or voiceless obstruent or a resonant in the onset of the next word, or before a pause), and various positions with the phrase. Various types of prosodic endings of phrases constituted also an important context. Each context was represented in two or three sentences. We were unable to investigate certain factors because *r* in the position examined occurs mainly after stops – there are too few examples with a fricative consonant and these are only labiodental obstruents [v] and [f] (as in *manewr* ‘maneuver’, *szyfr* ‘cipher’).

1.2.2. The position at the end of the word was chosen for the study, not the position in which the sonorant is between two obstruents. Both positions promote syllabification to a greater extent than the position of the sonorant before the obstruent at the beginning of the word. However, it is difficult to assess which of these positions promotes syllabification to a greater extent. On the one hand, there are few words in which the sonorant occurs between two obstruents: they are less numerous than 100~150 years ago, e.g. Russian *днепровский* ‘related to the Dnieper river’, previously *днепрский*, *заднестровский* ‘the region located east of the Dniester river’, previously *заднестрский*; similarly *приступивший* ‘one who joined’, previously *приступльший*, *преставившийся* ‘one who died’, previously *преставльшийся*, Czech *zemdlelý* ‘fainted’, previously *zmdlelý*, Slovak *zomdliet* ‘to faint’, previously *zmdliet*. On the other hand, in some Slavic languages syllabic *r* occurs inside words between two obstruents, but does not occur at the end of words, e.g. Slovak *prst* ‘finger’, *krv* ‘blood’ but *vietor* ‘wind’, *vepor* ‘hog’, Serbian *prst* ‘finger’, *trg* ‘market’, *krv* ‘blood’ but *vetar*, *litar*, *makabar*, more rarely *makabr* ‘macabre’; similarly *ansambal* ‘ensemble’, previously *ansambl*, etc. The word-final position was selected because the number of words with the final cluster ‘obstruent + *r*’ is significantly greater than the number of words with ‘obstruent + *r* + obstruent’ clusters.

1.3. The material was assessed visually on the basis of the spectrograms made with the use of PRAAT, version 6.2.14, 2022 (Boersma, Weenink 1992-2016).

In an earlier study (Sawicka, Zinowjewa 2020), the position that favoured the syllabic realisation was determined on the basis of recordings of weather forecasts and reports from ski jumping competitions. It is the position at the end of the so-called unfinished phrase, i.e. a sentence in which a pause was made for breath, after which a continuation is expected.

2. *Auditory and visual assessment*

The persons that carried out the auditory assessment are capable of distinguishing syllabic pronunciation from non-syllabic pronunciation. They were two Polish women who also speak the languages in which *r* is pronounced syllabically, and a number of native speakers of these languages: four Croats, three Macedonians and one Russian. Our model speaker pronounced the final *r* very carefully in all the contexts examined. As a rule, voicing was preserved, and the *r* itself had a multi-element character, usually from two to four noise segments (occlusions) and as many or more vocalic segments. The speaker did not assimilate the obstruents despite the sonorant that separates them, which is allowed by the Polish language norm (cfr. Dukiewicz, Sawicka 1995, Steffen-Batogowa 1996).

The pronunciation of *r* lasted a long time; its duration was comparable to the duration of vowels in a word, including stressed vowels. F₀ was subordinated to the F₀ contour throughout the sentence.

The auditory assessment did not yield consistent assessments of syllabicity / non-syllabicity of the pronunciation of *r* (see below).

3. *Voicing*

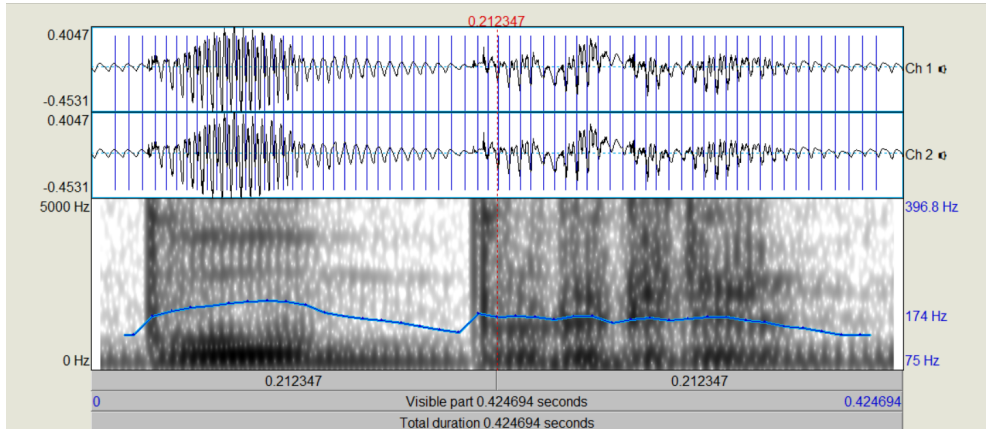
Voicing was well recognizable in auditory assessment, but was not always discernible in the spectrograms. Its presence or absence was determined on the basis of the 'pitch' function.

The final *r* was completely voiceless in only four out of the 87 samples. It should be noted that the speaker did not make any pauses. In these four samples, *r* followed a voiceless stop (*amfiteatr* 'amphitheatre', *metr* 'metre', *wiatr* 'wind', *lotr* 'rascal'). It seems that the type of sound in the onset of the next word was not significant. In one case, it was a voiced obstruent (*Amfiteatr zamknięto na okres zimowy* 'The amphitheatre was closed for the winter'), and in another, a resonant (*Kup jeszcze metr jedwabiu na wykończenia* 'Buy another metre of silk for the trimmings'). In two samples, it was at the end of a sentence with the final fall (*Cały dzień wiał straszny wiatr* 'A terrible wind blew all day', *To był straszny lotr* 'He was a terrible villain').

There were 14 samples in which *r* was partially voiced. In five samples, *r* occurred after a voiced stop, in the remaining samples, it followed a voiceless stop. A voiceless onset (one or two initial stops and the same number of vocalic elements) occurred in 9 samples – in all of them, *r* occurred after a voiceless stop. After a voiced stop, in five samples, the beginning of the articulation of *r* was voiced while the final part was voiceless. In total, in 9 samples there was a partial progressive assimilation of voicing.

It seems that the shift to the morphonological value (i.e. from the voiceless beginning to the voiced ending) does not depend on the context that follows. In two samples, a voiced obstruent occurred at the beginning of the next word; a voiceless obstruent occurred in two samples; a resonant also occurred in two samples; in one sample, the examined word occurred at the end of a finished phrase. Devoicing after a voiced beginning may or may

FIGURE 1.
Bóbr [bubr] (*gryzie korę*) ‘The beaver chews bark.’



not depend on the context that follows – in one sample, the next word began with a voiceless consonant, and in four samples it marked the end of a phrase. However, there were too few samples for a realistic assessment. Besides, it should be remembered that partial progressive devoicing of any sonorant is a characteristic feature of Polish pronunciation.

All in all, it can be said that the voicing in the initial phase of articulation was influenced by the position after a voiced or voiceless stop. It should be reiterated here that our model speaker articulated all the speech sounds very carefully and usually the voicing of the sonorant was preserved even in the sentence-final position – the position most conducive to devoicing in Polish, such as in the sentence *Idź i kup cydr!* ‘Go and buy cider!’.

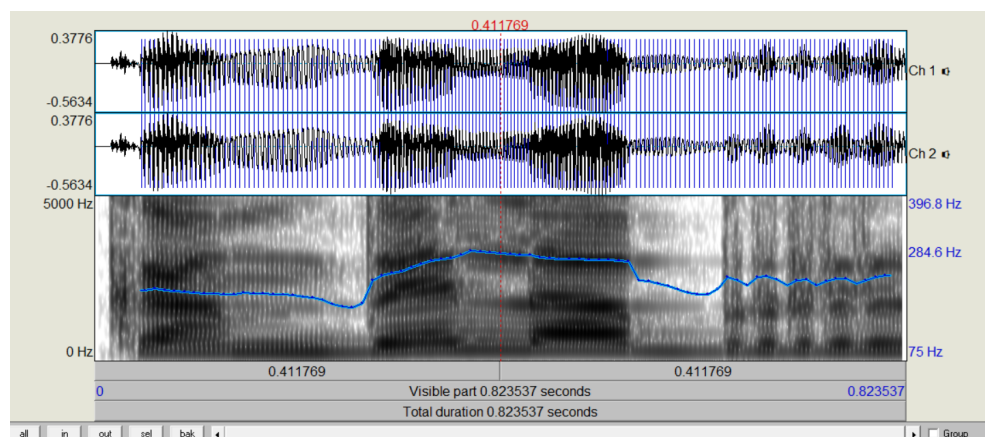
4. *Duration*

It should be mentioned that in almost all samples, the duration of the articulation of *r* in the examined consonant clusters was comparable to the duration of vowels in a word, often including stressed vowels. See, for instance, the word *bóbr* (in the sentence *Bóbr gryzie korę* ‘The beaver chews bark’) in **FIGURE 1**, where the stressed [u] lasts 0.075 sec., and [r] as much as 0.155 sec.

In the word *kandelabr* ‘candelabra’ (**FIGURE 2**), the vowel [a] lasted 0.076 sec, the stressed [e] – 0.074 sec, the second [a] – 0.095 sec, and [r] lasted about 0.170 sec. Additionally, the last two consonantal elements seem to lose their closure.

In Polish, duration seems to be most closely related to the opposition syllabic (or almost syllabic) (trill) vs. non-syllabic (tap). In Polish, in the position next to a vowel, *r* is most often pronounced with a single tap, rarely with two, and it is shorter. In the position

FIGURE 2
Kandelabr (zajmował cały blat stolika)
 ‘The candelabra (took up the entire top of the table)’.



examined (i.e. word-finally after an obstruent), our model speaker usually pronounced *r* much longer – with three, four, and even five occlusions. This is best illustrated with words in which *r* occurs in different positions (cfr. FIGURES 3, 4, 5).

FIGURE 3
(W konkursie uczestniczyło nie pięć orkiestr, (ale) dziesięć)
 ‘(Ten, not five) orchestras (participated in the competition)’.

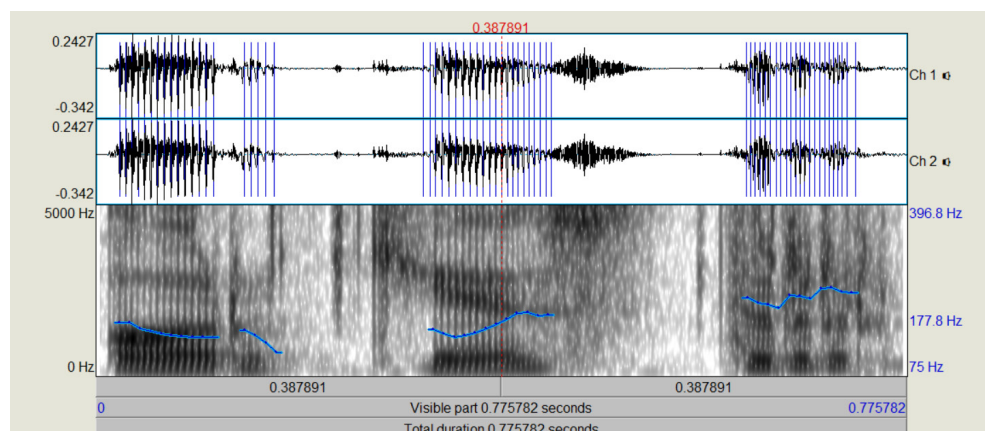


FIGURE 4
Barometr (zaczyna iść w górę) ‘Barometer (is starting to rise)’.

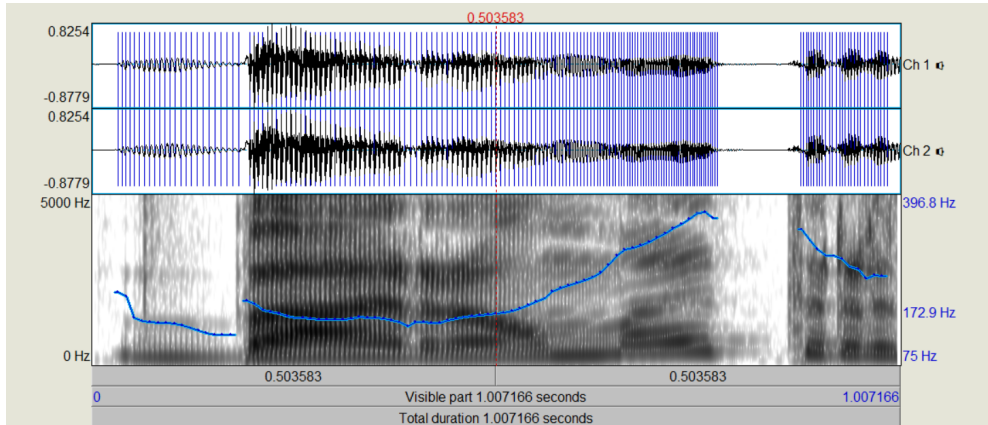
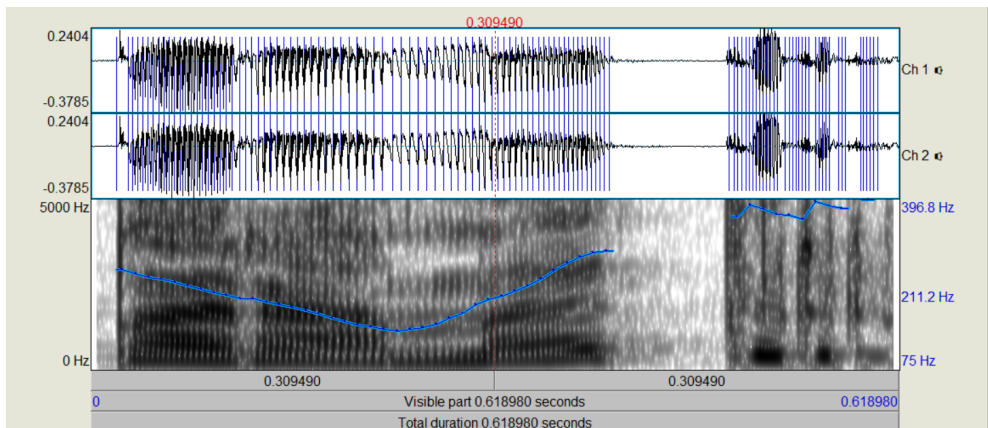


FIGURE 5
(Czy to właściwy) parametr? ‘(Is this an adequate) parameter?’



The difference in the articulation of *r* in the compared positions could mark the beginning of the syllabification of *r*, especially considering that in the older type of pronunciation, the articulation of *r* in the same position is shorter and is often voiceless. See FIGURES 6 and 7.

FIGURE 6

Cydr (przyjemnie chłodził) ‘The cider (was pleasantly cool)’.
Older (quasi-affricative) pronunciation of a woman (INS) in her eighties [tsitr].

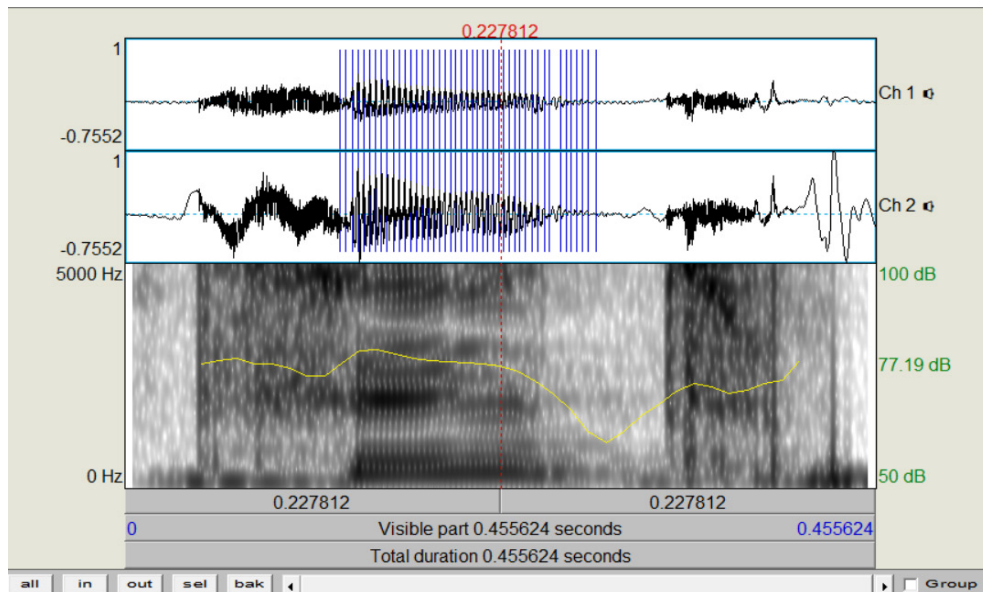
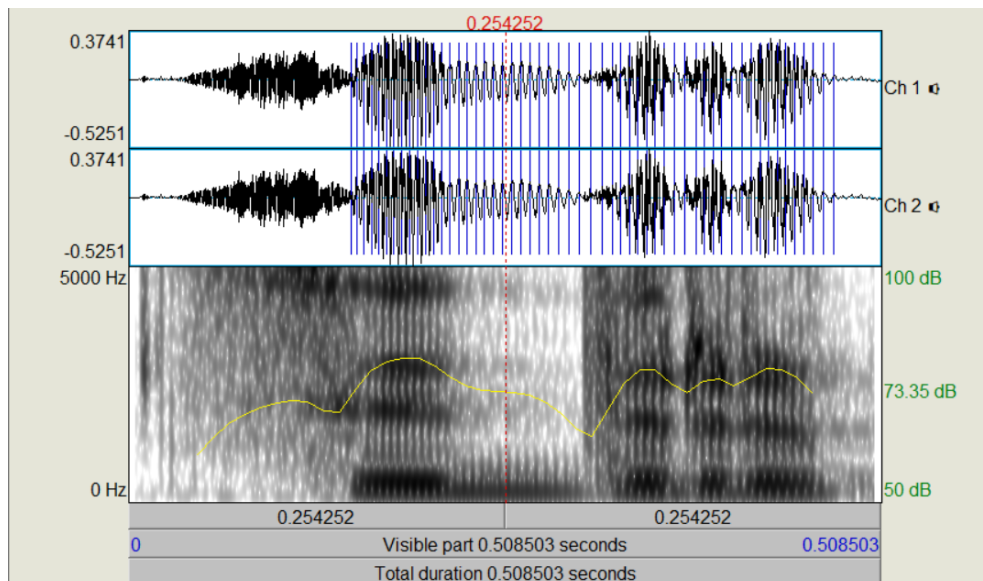


FIGURE 7

Cydr (przyjemnie chłodził) ‘The cider (was pleasantly cool)’.
More recent pronunciation of our model speaker [tsidr] (polysegmental pronunciation of *r*).



It could be argued that the articulation lengthens (slows down) at the end of a word, and that therefore *r* in the position under examination lasts longer than within the word. Consequently, we compared the pronunciation of *r* in the position examined with the pronunciation of the word-final *r* after a vowel in our model speaker's pronunciation, cfr. FIGURES 8 and 9.

FIGURE 8

(*Nie mówi się Tyber, (ale Tybr)* '(One does not say) [tiber], (but [tibr])'

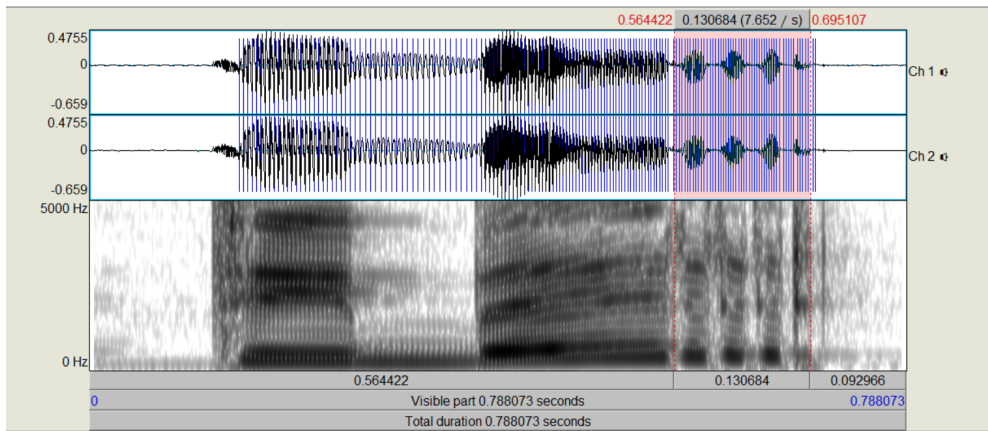
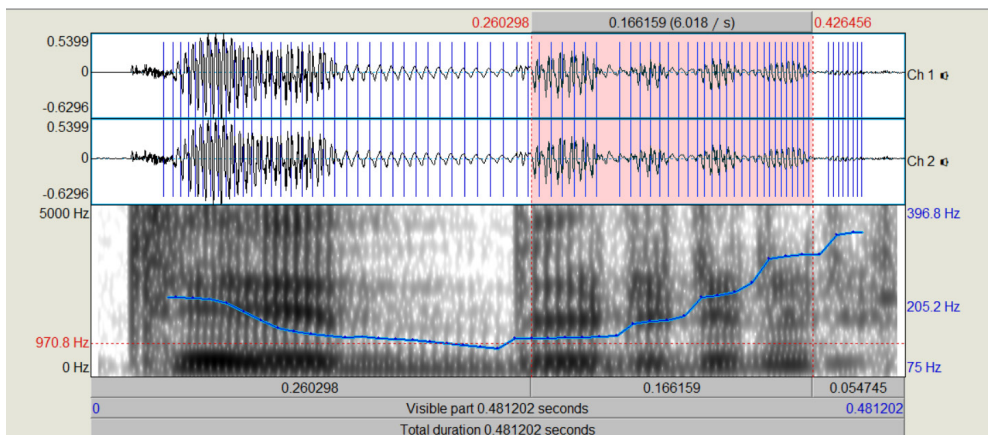


FIGURE 9

(*Nie mówi się Tyber, (ale) Tybr* '(One does not say) [tiber], (but [tibr])'



Indeed, our model speaker also pronounced a strong and long polysegmental *r* at the end of the word after a vowel, though it was shorter in *Tyber* by more than 0.030 sec. However, it cannot be concluded that the duration of articulation is the only key parameter.

The duration of *r* in the context examined does not exhibit any dependence on the contextual conditions, either segmental or prosodic. We only found the lengthening of articulation at the end of the word in this one sample. Examination of a large number of samples is needed.

Moreover, it seems that longer or shorter duration of the articulation of *r* may be related to isochronism. Our test included 40 samples that were longer than one syllable. In these words, *r* was generally pronounced shorter than in one-syllable words. Since the duration of articulation is also affected by other factors, especially the position in the phrase, we compared the duration of the articulation of *r* only in the words that occur at the beginning of the sentence. In 16 one-syllable words², the average was 0.135 sec. (in the samples from 0.085 to 0.194 sec.); in 13 two-, three- and four-syllable words, the average was 0.097 sec. (for the five two-syllable words – 0.103 sec., for the seven three-syllable words – 0.132 sec.). And in one four-syllable word, *r* lasted 0.058 second. In this group, the values differed significantly, especially for the two-syllable words: from 0.066 to 0.128 sec. It is characteristic that the shortest articulation of *r* occurred in the longest word (*amfiteatr* ‘amphitheatre’) is 0.058 sec., and the longest, in one of the one-syllable words (*żubr* ‘wisent’) is 0.194 sec.

5. Intensity

The intensity distribution does not show any relationship with the contexts considered in our study. Just like the duration of the speech sound, the intensity of the sound *r* is comparable to the intensity of the vowels in the word. In as many as 13 samples, *r* was stronger than the vowels in the sample, but the differences amounted to 1-2 dB. The difference was greater only in two samples and it amounted to 5 dB (*Potężny Dniepr atakuje strome brzegi* ‘The mighty Dnieper attacks the steep banks’) and 7 dB (*Czy to zwierzę to żubr?* ‘Is this animal a wisent?’).

The only generalisation we can make is that in most samples, the intensity is highest in the initial syllables of a word and decreases towards the end of the word. These differences are not significant.

In four out of the 43 one-syllable words, the final *r* was stronger than the vowel by 1 dB, in one word it was stronger by 2 dB, in another by 5 dB and in one by as much as 7 dB. This last sample was at the end of a yes / no question (*Czy to zwierzę to żubr?* ‘Is this animal a wisent?’), but other samples were not characterised by the same intensity distribution in the same prosodic position.

In six out of the 21 two-syllable words, the intensity of *r* was higher (but only by 1-2 dB) than that of the vowels. In the remaining samples, the level of intensity was lower than

² The number of syllables in a word is counted in a ‘traditional’ way, i.e. assuming that the final *r* is non-syllabic.

in the vowels, including the stressed vowel. In 12 three-syllable words, *r* was slightly (1-2 dB) weaker than all vowels in a word and in 8 words it was weaker than a stressed vowel. In two four-syllable words, *r* was weaker than the vowels.

The intensity level of *r* does not depend on the position in the phrase, nor on the prosodic type of the phrase, nor even on the voicing of *r* and the adjacent speech sounds. However, it is comparable to the level of intensity of the vowels in the word.

The intensity distribution confirms that a slight strengthening is characteristic of the beginning of the unit. The first syllable in the word was the strongest in most of the words examined. In 25 words, the initial syllable had the same intensity as the other strongest syllable in the word or was weaker than the strongest syllable by 1-2 decibels³.

6. Syllabicity

There are opinions on the structure of the Polish syllable that differ significantly from the received views on the issue (for instance, Bogusławski 1985, 1990, Gladney 2004, Szpyra 1998). These scholars decided that the division into syllables must be consistent with the scale of sonority. According to this approach, the word *metr* should be considered a two-syllable word (*me-tr*), not monosyllabic. They relied on the scale of sonority, defined for the values of speech sounds produced in isolation (without contexts). This approach is completely inconsistent with the syllabic rhythm of the Polish language, where the degree of sonority of sonorants is significantly influenced by context.

6.1. We assume that the so-called strong position, i.e. the non-contextual level of sonority of sonorants, is the position next to a vowel (after a consonant and before a vowel, after a vowel and before a consonant, at the end of a word, or between vowels). Thus, at the cost of simplification⁴, this degree of sonority can be said to be an intermediate level between obstruents and vocoids, but closer to vowels. Consequently, if a sonorant occurs in a different position (at the end of a word after an obstruent, at the beginning of a word before an obstruent, or between consonants), its 'inherent' degree of sonority must be adjusted to the rhythm of production: it is either weakened, smoothing out the line of increasing/decreasing sonority in a syllable, or strengthened, resulting in the creation of a new syllable. At present, at least in the pronunciation of our model speaker, the degree of sonority of *r* in the examined position does not seem to undergo modification. It has not been weakened so far, but it has not been strengthened either to the degree that would make it possible for us to determine whether we are dealing with a separate syllable or not. Until recently, however, the first solution was

³ We took the opportunity to examine whether intensity contributes to word stress. All one-syllable and two-syllable samples were rejected because the stressed syllable was the first syllable in those words. In 11 out of the 21 samples, the stressed syllable was the strongest syllable in the word, but the differences amounted to one or two decibels.

⁴ Differences in the degree of sonority within particular speech sound classes should also be taken into consideration.

applied in Polish – the weakening of the sonorant. It should be noted that the smoothing of the slopes of a syllable by the weakening of the sonorant is not complete and that this is a rare solution in the languages of the world. This solution is rare because it is usually transient. Such combinations of segments usually arise as a result of vowel reduction and (because the rhythm is disturbed) they are usually eliminated after some time⁵. Such a process is reconstructed in the history of Slavic languages, and the authors have observed it as an ongoing process in Russian (cfr. Zinowjewa 2018) and in Albanian (Sawicka 2015, 2018). The situation in Polish allowed us to expect the same development.

6.2. This issue has attracted considerable attention from researchers. It was studied by, for instance, Frank Gladney (2004) who investigated several aspects of the issue (the origin of the contexts discussed, the problem of syllabicity, voicing assimilations). Most authors agree that in the Polish language, at the phonological level, consonant groups of the type we are discussing have a value consistent with the sonority scale, and therefore, the syllable model at the phonological level is more universal. Differences arise at the level of realisation. Rubach and Booij state that Polish “seems to indulge in violating the Sonority Sequencing Generalisation” (1990: 121). Similarly, Szpyra-Kozłowska states that “this principle is notoriously violated on the surface” (Szpyra-Kozłowska 1998: 65). This means that in the underlying representation we divide words into syllables according to a non-contextual sonority scale. We cannot comment on this because we believe that the model of the syllable that we realise in the surface structure belongs to the linguistic code. This is evidenced by the fact that sonorants are realised automatically in the contexts in question: they are realised syllabically by Serbs or Czechs when they try to speak Polish and, conversely, non-syllabically by Poles in Czech or Serbian words. Furthermore, it is not the speech sounds that create the language rhythm, but the rhythm itself is the overarching phenomenon. This aligns well with the concept of cognitive rhythm and the theories that relate to this concept, such as autosegmental phonology and metrical phonology.

6.3. Another issue related to the topic is voicing assimilation. Researchers often refer to the publication *Phonetics and phonology of the Polish language* (see Dukiewicz, Sawicka 1995) and to the studies of Steffen-Batogowa (1996), according to which sonorants that separate obstruents do not interfere with assimilation of voice in contexts such as *metr bawełny* ‘a metre of cotton’ [mɛdr bawɛwni], or in *kadr filmu* ‘film frame’ [katr fɨlmu] in about 10% of utterances. Sonorants are considered transparent in this position (Rubach, Booij 1990: 445, in the same vein as Bethin 1992: 171). Gladney (2004) is of the opposite opinion because, according to him, sonorants are also involved in regressive assimilation. We cannot agree with this, because sonorants in Polish undergo regular partial progressive devoicing, which the author himself demonstrates in other examples.

⁵ These relationships confirm the fact that it is not configurations of speech sounds that create a specific rhythm, but that rhythm is the superior factor to which realisation adapts.

What is important in this discussion is that some researchers (Gladney 2004, Szpyra 1998) claim that if the sonorant retains voicing, it is, by this virtue, syllabic. According to Gladney, a devoiced sonorant automatically becomes an obstruent:

It is their vowel-like (+sonorant) feature that enables them positionally to be syllabic. Devoiced, they lose this ability (Gladney 2004: 126).

Gladney summarises his considerations as follows:

the claims for the exceptionality of consonant clusters containing sonorants in Polish appear to be unfounded. On the one hand, sonorants, when they are voiced and ‘trapped’ between less sonorous segments or a less sonorous segment and word boundary, constitute syllable peaks and do not enter into consonant clusters. On the other hand, sonorants (other than /l/) when devoiced cease being sonorants and become obstruents, entering into consonant clusters which do not violate the Sonority Principle (*ibidem*: 130).

If so, almost all present realisations of *r* would be syllabic, which is certainly not the case.

6.4. These considerations confirm that sonority is a variable value that depends on the context, with which, of course, one should agree. However, we do not agree with such a simplistic conception of syllabicity, in particular with the claim that voiceless speech sounds cannot be syllabic (cfr., for instance, whispered speech or some languages of Northwest America). In our opinion, each speech sound can be syllabic (in all contexts, or only in some), depending on the particular language code. Manipulations of sonority also depend on this code. Thus, whether a segment is syllabic in a given context or not is decided by native speakers of a given language. At the same time, however, syllabicity is an objective phenomenon and it depends on the amount of energy (sonority, intensity, duration) that we put into the articulation of a segment in relation to the amount of energy of the neighbouring segments and on the amount of energy that a native speaker considers sufficient to create a nucleus. These rules are quite firmly established in the speaker’s subconscious, which makes him or her hear syllabicity where it is expected according to these rules, and not where it is objectively realised.

6.4.1. The search for one specific physical correlate of sonority has yielded no results⁶. In our opinion, the physical correlate of the degrees of sonority is the overall energy used to produce a given segment. Most important in this area is Stephen Parker’s work (2002), which reports on the measurements of five acoustic and aerodynamic correlates of sonority in English and Spanish: intensity, frequency of the first formant, total segmental duration, peak of intraoral air pressure, and combined oral plus nasal air flow. According to Parker, sonority is best defined in terms of a linear regression equation derived from the observed intensity

⁶ ‘Sonority’, just like ‘lenition’, is a very useful but not sufficiently defined term. Ohala (1992) stated that it should not be used at all because it had not been empirically validated. According to him, specific physical features of sounds should be studied instead. In a sense, however, sonority is confirmed empirically, because in most languages of the world, the distribution of sounds within a syllable is motivated by the deduced differences in the degree of sonority of sounds. On this basis, we can quite precisely determine the physical correlates of the degrees of sonority.

results. There was also an attempt to measure the overall energy of speech sounds (Nagarajan *et al.* 2003), where the primary role was also attributed to intensity. The authors proposed a method for segmenting the acoustic signal into syllable-like units, in which they derive a minimum phase signal from the short term energy function as if it were a magnitude spectrum. However, the authors themselves see a problem with this approach, which concerns the contexts that may produce results contrary to the actual role of a speech sound in a syllable (this concerns especially approximants and sibilants):

The semivowels are very similar to vowels in that they have periodic, intense waveforms with most energy in the low formants. Even though they are slightly weaker than vowels, if they come in the middle of a word in the continuous speech, in many places, there may not be a visible energy reduction (Nagarajan *et al.* 2003: 2895).

Better results, it seems, are obtained in articulatory studies, e.g. Beňuš, Pouplier 2011, who examined jaw movements in syllabic and non-syllabic realisations of liquids and vowels. Also the Praat script used to detect syllable nuclei and measure speech rate automatically is not particularly helpful for our purposes (cfr. De Jong, Wempe 2009). The algorithm for syllable detection proposed by Pfitzinger, Burger and Heid (1996) also produces unsatisfactory results, especially in the case of spontaneous speech.

The syllable-forming segment should be characterised by energy comparable to the energy of vowels and this energy level should distinguish it from the surrounding segments. The total energy is comprised of the periodic structure, duration, and intensity. In the samples we examined, the values of these factors for *r* did not differ from the values they achieved in vowels in most realisations; the values of these factors did not differ from the values characteristic of syllabic *r* in other Slavic languages, either. Yet, we were unable to decide whether the *r* in our samples was syllabic or not.

Syllabic *r* is identified by ear (aurally) in various ways – either as longer, with a greater number of occlusions (most Serbian and Croatian realisations), or as a consonant preceded by an unclear short vocalic element. This is how *r* is articulated in Macedonian and Russian, and in Russian this optional vocalic element can already be identified with the unstressed vowel /o/. In the speech of our model speaker, we heard rather the first type of articulation, although vocalic parts showed clearly in spectrograms.

6.5. According to our research hypothesis, the Polish language is at a turning point, a point at which the existing rules of syllabification are changing. The sonorant /r/ in the position examined is strengthened, the pronunciation clearly differs from the previous pronunciation, but the difference is not marked enough for us to decide whether a new nucleus has arisen or not. In this situation, the best test seemed to be listening to the recordings of our model speaker by speakers of the languages which have syllabic /r/ in their phonetic systems. In this case, too, there was a possibility that their interpretation of the value of /r/ would be influenced by the distribution rules of their native languages. Our listeners were professional phoneticians and were aware of the problem.

Only one utterance was considered to be syllabic by each of the two Polish listeners who listened to the recordings. In the spectrogram, the utterance considered as syllabic did not differ from the other samples. Each listener selected a different word. All other words were considered ‘rather’ non-syllabic, but a question mark was placed next to each. One listener (Russian) heard non-syllabic pronunciation in all samples. Four Croats decided that *r* was non-syllabic in seven samples, they were unable to make a decision about six other samples, and they considered the remaining samples as syllabic. Macedonians, on the other hand, identified syllabicity in 53 samples, and in six of them, they heard a schwa following /r/. None of these interpretations could be linked to specific features of the acoustic image or to a specific context.

The Russians expected more distinct vocalism⁷ to recognise that an extra syllable occurs in a sample. The Croats were satisfied with a stronger and longer articulation of /r/, and the Macedonians expected to hear a weak schwa, but articulated before rather than after the segment. In addition, the Macedonians described the pronunciation of *r* as ‘strange’. The authors of the article also found this type of pronunciation unusual, admitting at the same time that it is heard more and more often. However, we hear it primarily in situations in which accurate, careful pronunciation is expected – on the radio or television, in theatrical performances and in formal communicative situations such as lectures or speeches.

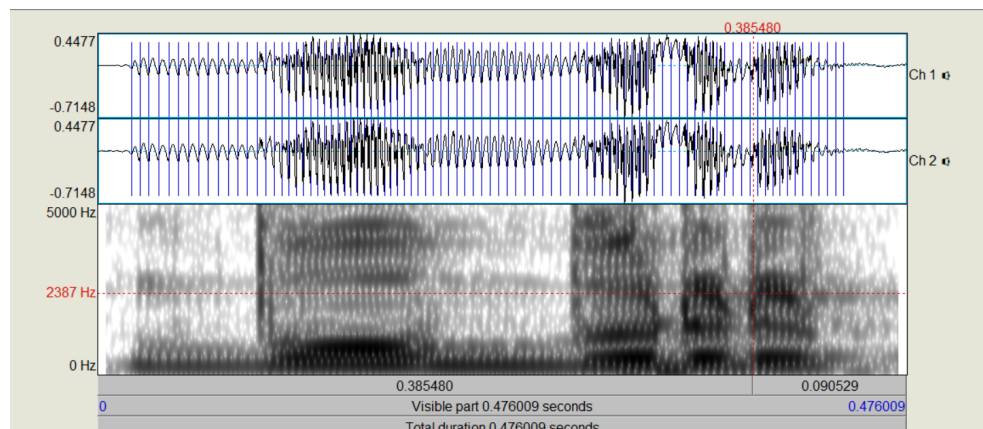
6.6. In the historical development of sonorants in Slavic languages, the emergence of schwa played an important role. It is mainly connected with the contexts created after the loss of the weak jers. It was at that time that the combinations were created which violated the Sonority Sequencing Principle in the syllable. Such contexts have been gradually eliminated from Slavic languages, so that in modern Slavic languages we observe all phases of this process: syllabification (e.g. Serbian *krvav* ‘bloody’), the emergence of schwa (e.g. Bulgarian *кръвав* ‘bloody’)⁸, further development of schwa into a full vowel (Russian *кровавый* ‘bloody’), while in Polish, this context has not yet been modified (*krwawy* [krɔfavi] ‘bloody’). In the word-final position, the changes were slightly different: in Bulgarian, the secondary schwa has been preserved everywhere, because it has been identified with a similar segment originating from the jer in the strong position (**dobrǝ* → **dobr* → *добър* ‘good’). In Serbian and Croatian, there is *dobar*, despite the existence of syllabic *r* in these languages – evidently, a syllabic pronunciation of *r* was also used in the past instead of *ar*, which led to the emergence of schwa. This secondary vocalism, similar to the jer in the strong position, developed further into /a/ and the given morphono-

⁷ The vowel segment in the pronunciation of the Russian *метр* ‘metre’ [mʲetər] is phonetically identical with the unstressed /o/ and this fact is starting to gradually influence the morphology of the language, which is confirmed by mistakes found on the Internet of the type: *визит у педиатрора* ‘a visit to the pediatrician’, *пора к психиатропу* ‘time to go to the psychiatrist’, instead of *визит у педиатра*, *пора к психиатру*, because *педиатр* is pronounced as [pʲedʲiatər] and *психиатр* as [psʲiɕiatər].

⁸ The consolidation of this phase was determined by the the presence of the same segment with a different origin in Bulgarian.

FIGURE 10

Bóbr [bubr] (*przybrał i wkrótce wyleje*) ‘The river Bóbr (has risen and will pour out soon)’.



logical context became fixed in the endings (cfr. *metar* ‘metre’, *Petar* ‘Peter’, *litar* ‘litre’; in more recent borrowings, there are also doublets, e.g. *makabr* / *makabar* ‘macabre’). In Russian, the process of syllabification and the emergence of schwa in the final position ended only in the middle of the 20th century.

The schwa which occurs in the syllabic pronunciation is most often heard before a sonorant, but there are also samples with schwa after a sonorant, e.g. Bulgarian and Macedonian dialectal morphological alternations of the type *bǝrdo* and *brǝdo* ‘hill’ (cfr. Duma 1999, map 31) – also with a kind of pleophony *čǝrn*, *črǝn*, *čǝrǝn*, *črǝn* ‘black’ (*ibid.*: map 20); the author also records forms with a syllabic sonorant and a schwa, i.e. with two additional syllables as *b^ɣǝdo*, *b^ɣǝ^ɣdo*, or *čǝrka* ‘an Orthodox church’, *č^ɣǝka*, *č^ɣǝka^ɣ*, *č^ɣǝka* apart from the forms with a full vowel (*ibid.*: map 28a)¹⁰.

6.7. Our model speaker pronounced *r* very carefully, with several occlusions (from two to as many as six). So we checked F1 and F2 in the clearest (longest) vocalic parts. The parts after or before the first occlusion were usually the longest, but there were also longer articulations in other vocalic elements. In the word [bubr] (FIGURE 10), the first vocalic fragment in [r] lasts 0.043 sec (the subsequent vocalic parts 0.026 and 0.033 sec), and the average values of the first two formants are: F1 – 426 Hz F2 – 1229 Hz.

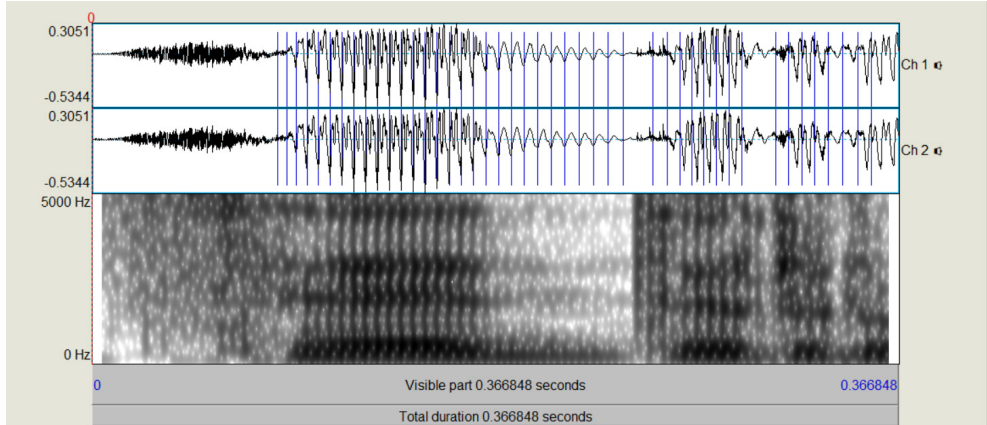
In the next sample (FIGURE 11), the values of the formants indicate a higher articulation.

⁹ In this transcription, *r* represents the syllabic sonorant.

¹⁰ Literary *κρǝθ* ‘blood’ – *κǝρθαθ* ‘bloody’ result from the different origins of *ǝ* (jer in the strong position vs. syllabic sonorant).

FIGURE 11

Cedr (*łagodnie szumił za oknem*) ‘Cedar (gently rustled outside the window)’.

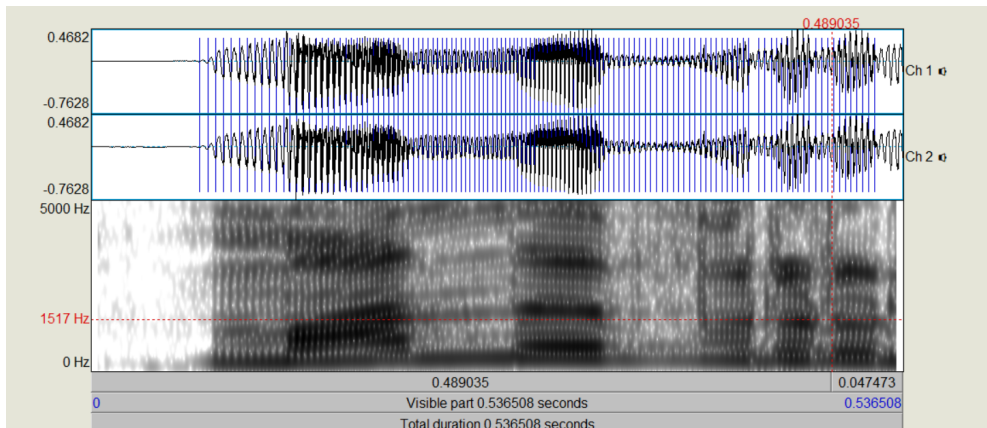


The first vocalic part in *cedr* (FIGURE 11) lasted 0.031 sec. (the second – 0.023 sec.), F_1 – 382 Hz, F_2 – 1658 Hz.

In the word *manewr* ‘maneuver’ (FIGURE 12), the successive vocalic elements in *r* lasted 0.031 sec., 0.025 and 0.031 sec.; F_1 amounted to 495 Hz, 451 Hz and 461 Hz, and the frequency of F_2 was 1379 Hz, 1395 Hz and 1372 Hz.

FIGURE 12

Manewr (*Ludwika był skuteczny*) ‘(Ludwik’s) maneuver (was successful)’.



In the word *bóbr* ‘beaver’ (FIGURE 13), the first vocal element is long (0.052 sec.), F1 is 376 Hz and F2 is 1341 Hz. Similarly, in the word *kadr* ‘frame’ (FIGURE 14) the first vocal element lasts 0.061 sec., F1 amounts to 400 Hz, and the frequency of F2 is 1723 Hz. In the second utterance of the same word (FIGURE 15), the first, longer vocalic element lasted 0.038 sec., F1 was 479 Hz, and F2 amounted to 1649 Hz.

FIGURE 13

(*Każdy*) *bóbr* (*gryzie korę*) ‘(Every) beaver (chews bark)’.

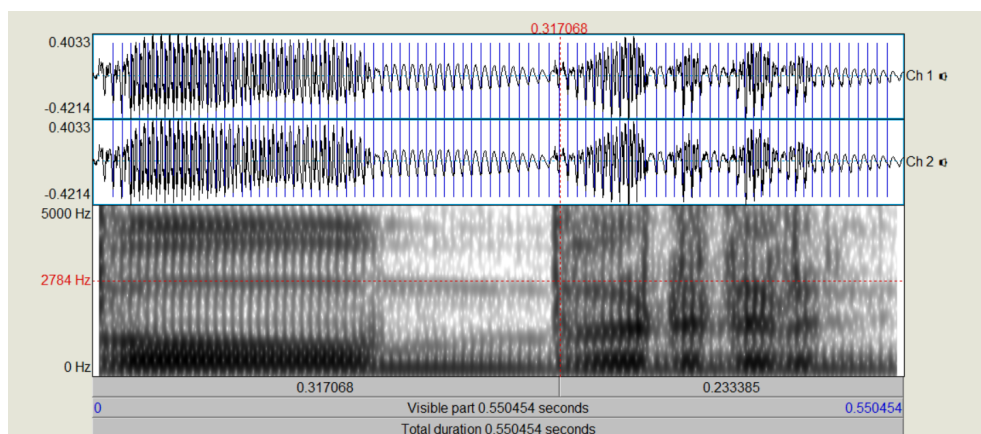


FIGURE 14

(*Każdy*) *kadr* (*był arcydziełem*) ‘(Each) frame (was a masterpiece)’.

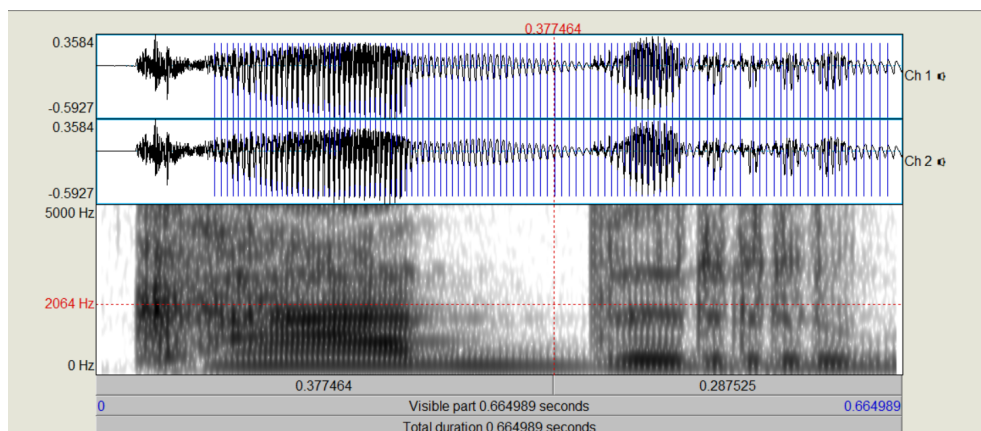


FIGURE 15
(Jan poszedł do kadr (na drugie piętro))
 '(Jan went to) the human resources department (to the second floor).'

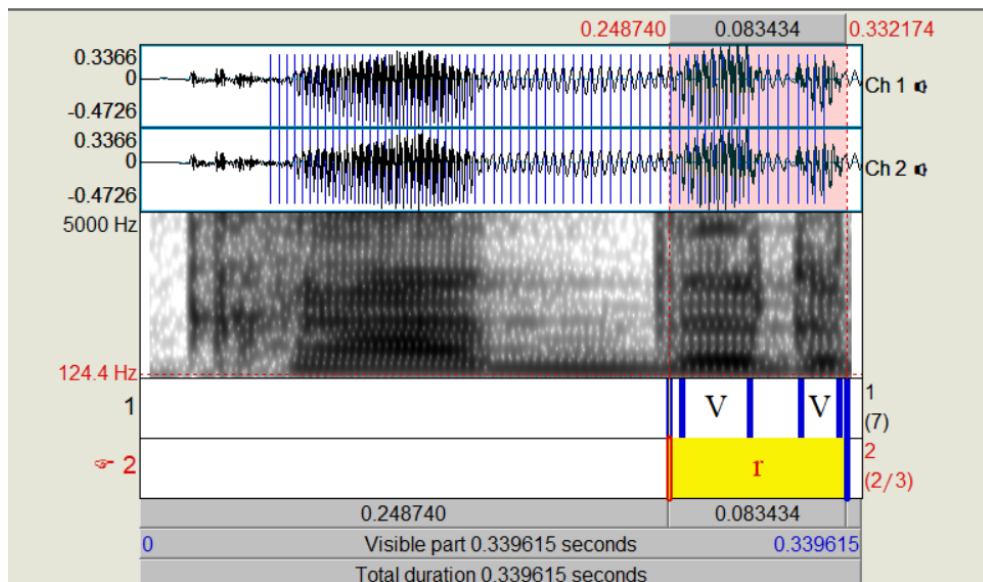
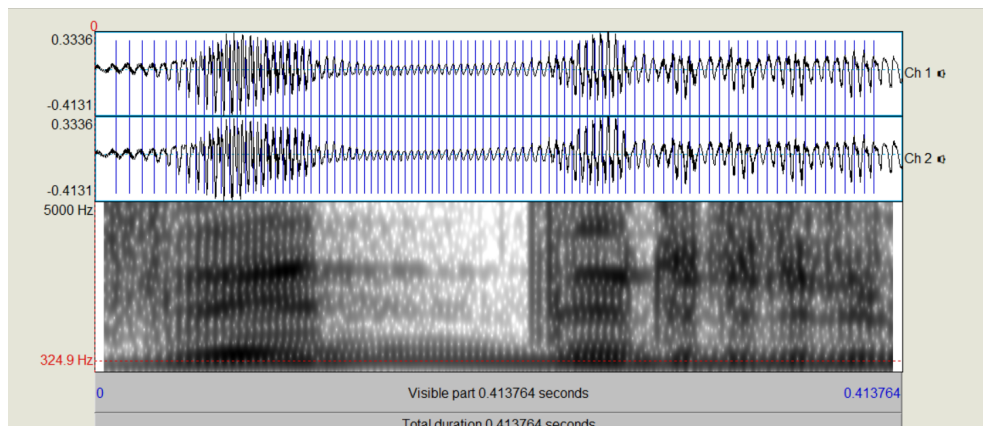


FIGURE 16
(Kilka wydr (mignęło między krzewami))
 '(A few) otters (were briefly visible among the bushes).'



In the word *wydr* ‘otters’ (FIGURE 16), the first vocalic element lasted 0.030 sec. F₁ was 400 Hz, and F₂ was 1801 Hz.

The values of the first two formants correspond to centralised speech sounds, roughly mid-front and mid-high. The values of F₁ approximate the value of F₁ of the Polish vowel /ɛ/ (according to Gonet 1993, F₁ for /ɛ/ is 494 Hz), while F₂ is lower than in Polish /ɛ/ (which, according to Gonet, is 1807 Hz). The values of the formants of Macedonian schwa (the so-called dark phone)¹¹ oscillate between 300 Hz and 500 Hz for F₁, and between 1500 and 1800 Hz for F₂ (on the basis of the female voice according to Sawicka *et al.* 2022). Our vocalic insertions seem to correspond more to Polish [ɛ] than to Macedonian [ə]. In turn, the formants of the Polish centralised vowel /i/ correspond to a slightly higher and more front vowel and amount, according to Gonet (1993), to 380 Hz for F₁ and 1799 for F₂, and according to Klešta (1998), the values for men are: F₁ – 388 Hz, F₂ – 1742 Hz, and for women: F₁ – 484 Hz, F₂ – 2077 Hz.

6.8. None of the factors examined here can be unequivocally related to syllabicity. The changes in the articulation of *r* in Polish (voicing, duration, multiple occlusions) undoubtedly bring the pronunciation of this sound closer to syllabic pronunciation, but they are not unambiguous. In the articulations produced by our model speaker that we examined, syllabicity was not identified aurally, however, a colossal difference in pronunciation was observed in comparison to previous articulation habits. Vocalic elements were not identified aurally. On the other hand, the acoustic image (duration and characteristics of vocalic elements) allows us to consider these articulations as syllabic. In fact, in most of the samples analysed, the characteristics of the first two formants make it possible for us to identify a very short [ɛ] preceding the realisation of the trill. However, the temporal characteristics of the vocalic element preclude us from considering it a full vowel. The shortest vowels in our material lasted almost twice as long as the first vocalic elements that make up the articulation of *r* – besides, they were not identified by hearing. On the other hand, the temporal values for *r* were comparable to the duration of the vowels.

The test consisted of separate read sentences. Consequently, it was not a completely natural pronunciation, but rather a kind of recitation. In an earlier pilot study (Sawicka, Zinowjewa 2020), which consisted of about 30 sentences extracted from weather forecasts (spontaneous, not read, delivered by our model speaker and other weather-presenters) and ski jumping reports delivered by a sports commentator, several syllabic pronunciations were unequivocally identified at the end of the so-called unfinished phrases.

6.8.1. This study made it possible to confirm a clear difference in pronunciation in comparison to the articulation habits followed more or less 50 years ago, cfr. selected samples from the recordings of our model speaker (new pronunciation) and the INS speaker of about 80 years old (old pronunciation): FIGURE 17a-23b.

¹¹ This speech sound occurs in regional pronunciation in borrowings from Turkish, but it is also part of the syllabic articulation of /r/.

FIGURE 17a
Kandelabr (zajmował cały blat stolika)
 ‘The candelabra (occupied the entire top of the table)’

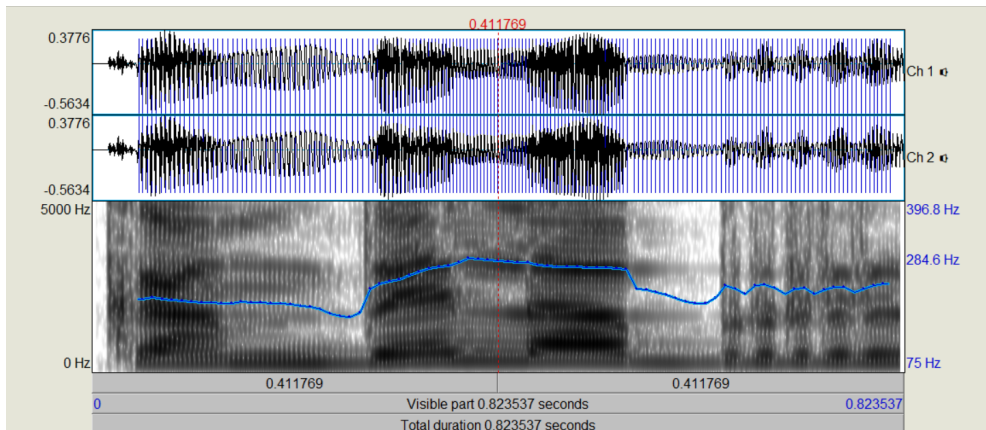


FIGURE 17b
Kandelabr (zajmował cały blat stolika) (INS)
 ‘The candelabra (occupied the entire top of the table)’

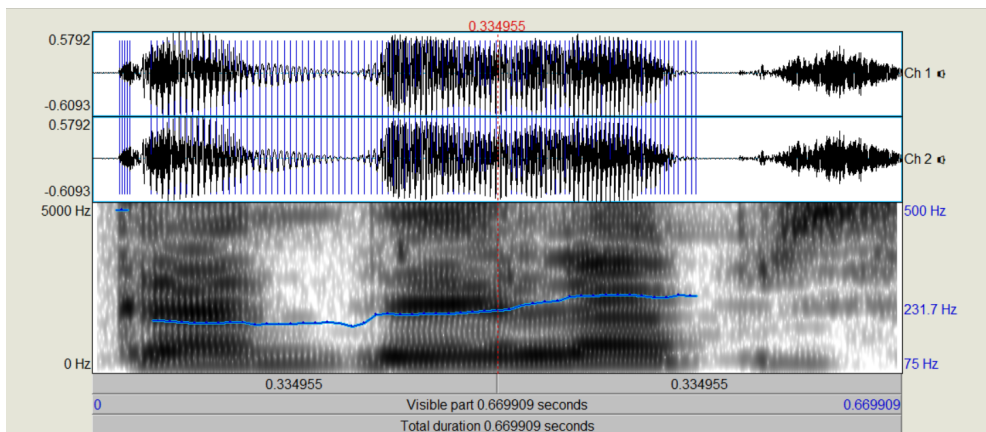


FIGURE 18a
Amfiteatr (zamknięto na okres zimowy)
 'The amphitheatre (closed for the winter)':

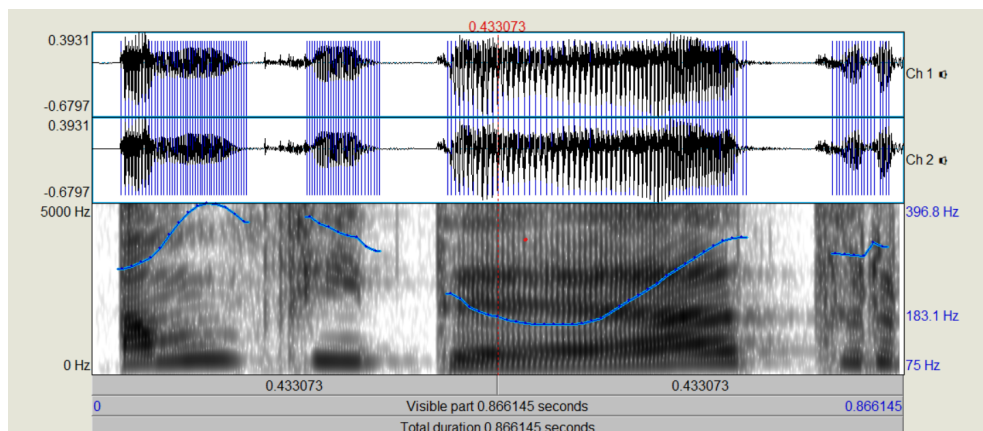


FIGURE 18b
Amfiteatr (zamknięto na okres zimowy) (INS)
 'The amphitheatre (closed for the winter)':

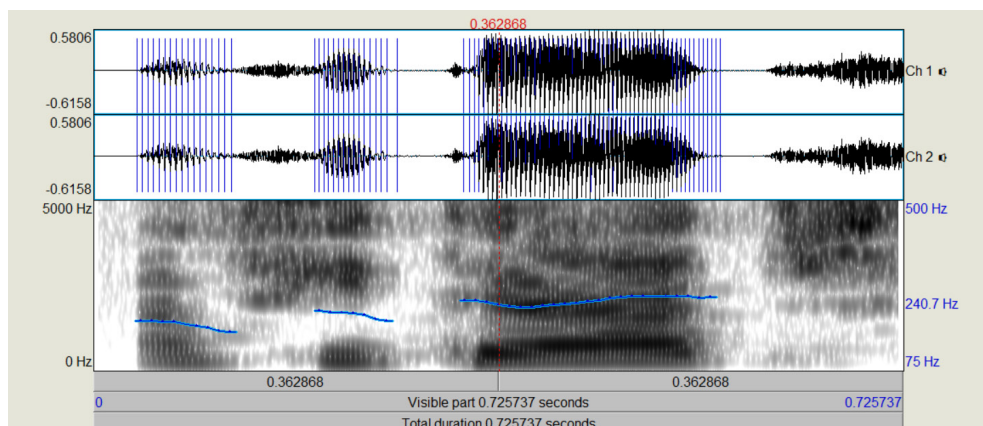


FIGURE 19a
Kandelabr (postawiono na serwantce)
 ‘The candelabra (was placed on the cabinet)’

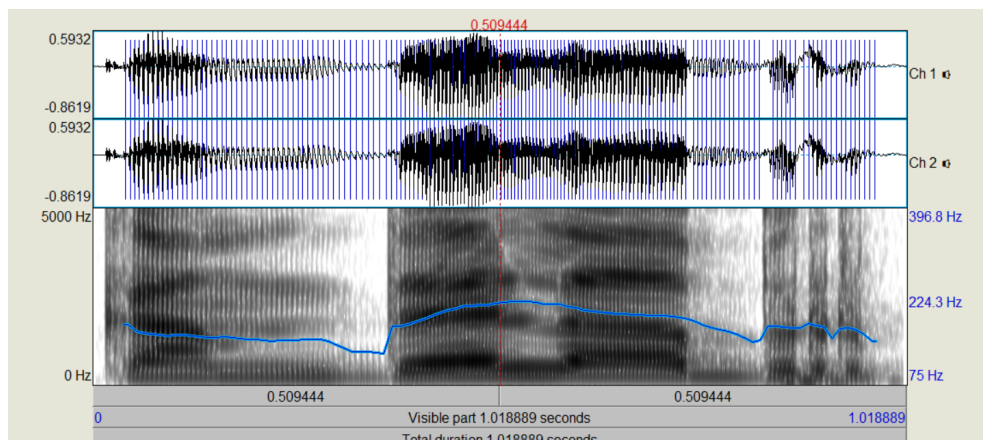


FIGURE 19b
Kandelabr (postawiono na serwantce) (INS)
 ‘The candelabra (was placed on the cabinet)’

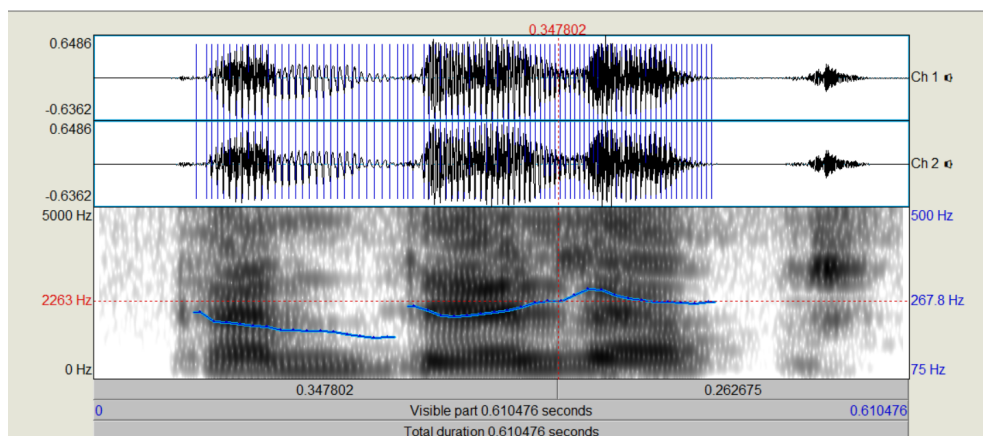


FIGURE 20a
Teatr (przestaje działać w okresie letnim)
 ‘The theatre (stops operating during the summer)’

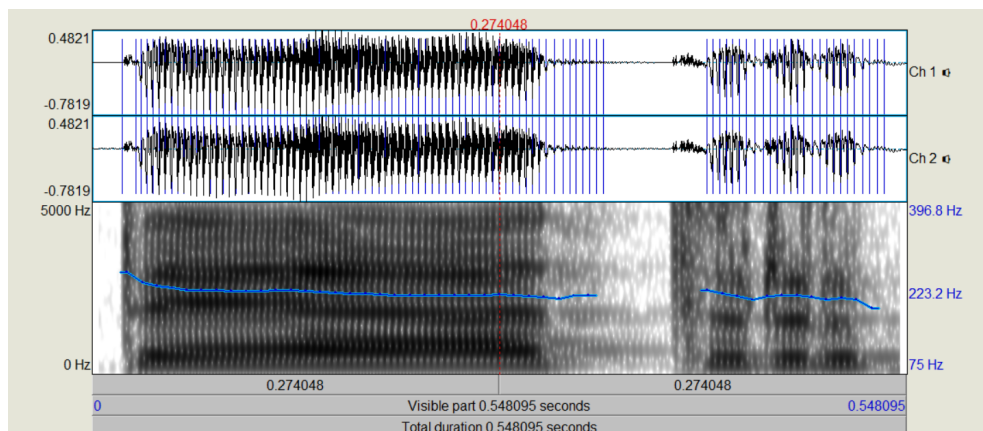


FIGURE 20b
Teatr (przestaje działać w okresie letnim) (INS)
 ‘The theatre (stops operating during the summer)’

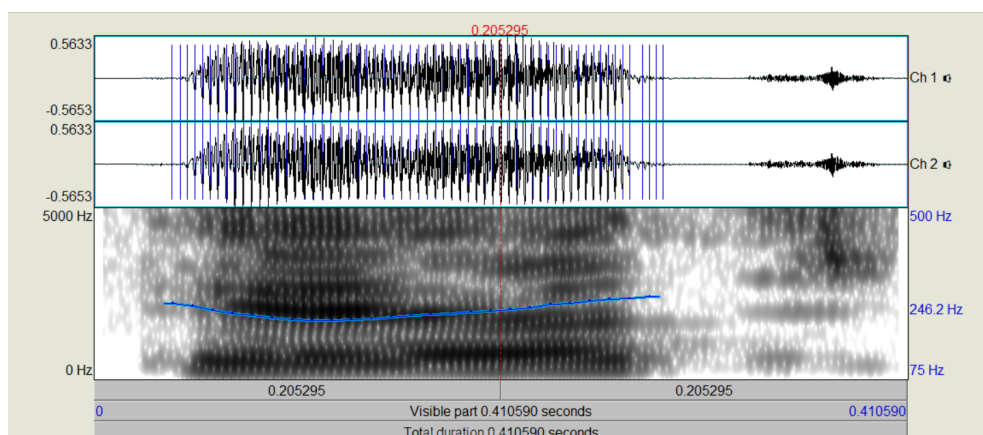


FIGURE 21a
Dniepr (uchodzi do limanu dniewprowskiego)
 'The Dnieper (flows into the Dnieper liman)':

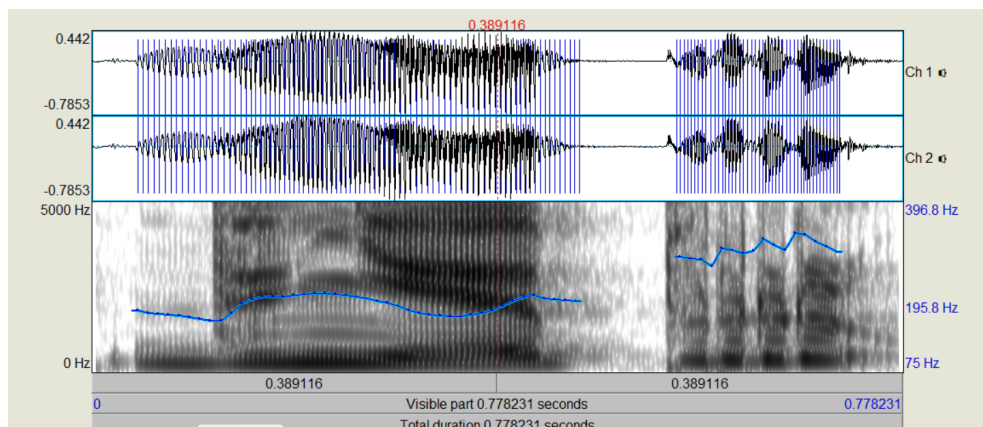


FIGURE 21b
Dniepr (uchodzi do limanu dniewprowskiego) (INS)
 'The Dnieper (flows into the Dnieper liman)':

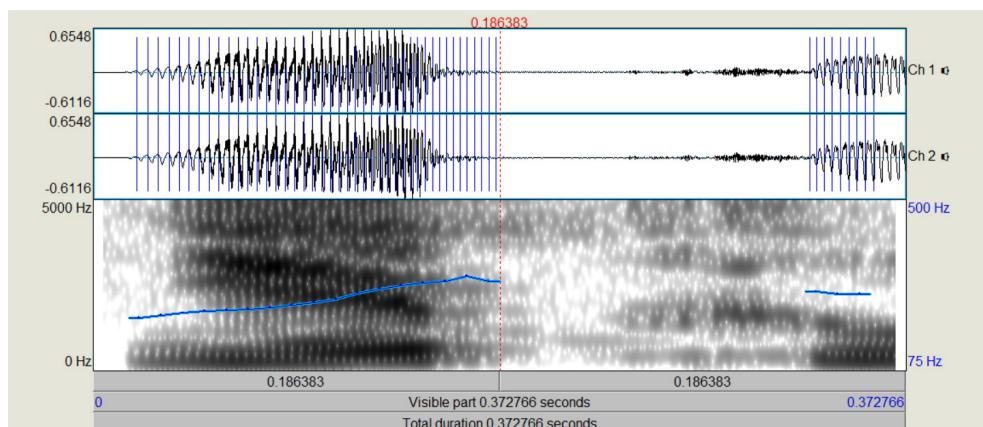


FIGURE 22a
Cypr (ma piękne kurorty)
 ‘Cyprus (has beautiful resorts)’.

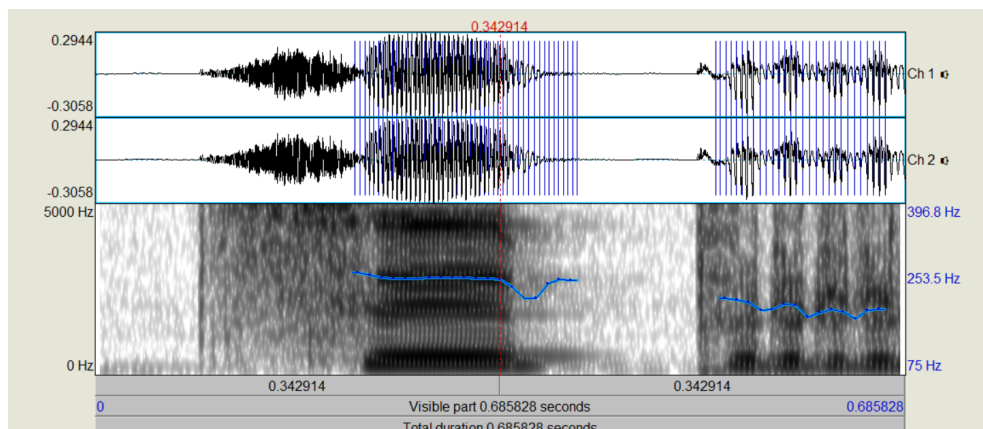


FIGURE 22b
Cypr (ma piękne kurorty) (INS)
 ‘Cyprus (has beautiful resorts)’.

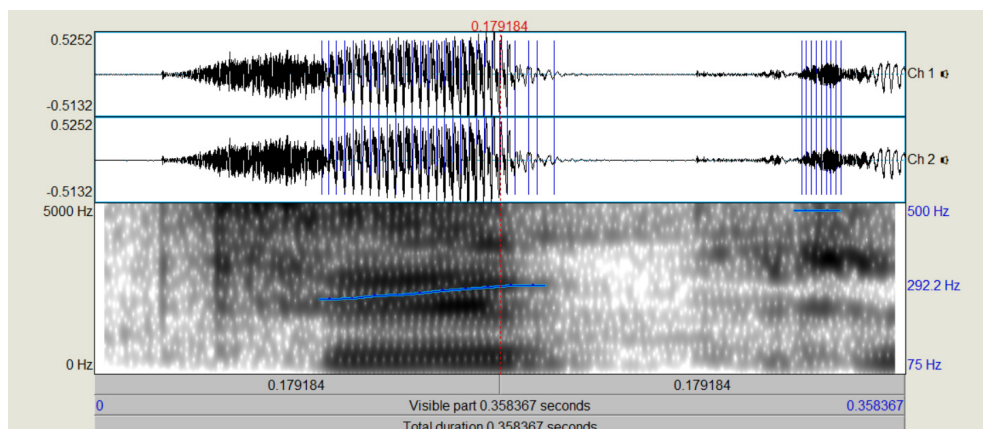


FIGURE 23a
(Tylko sześć) eskadr (ukończyło manewry)
'(Only six) squadrons (completed the maneuvers).'

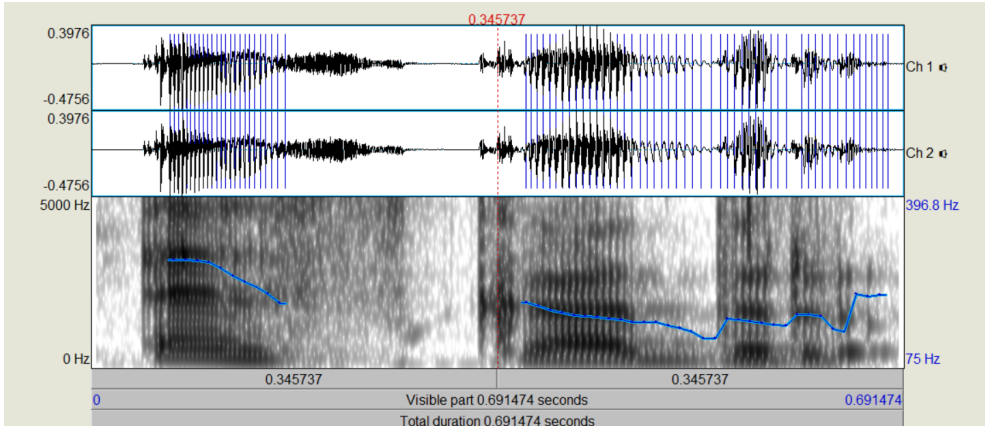
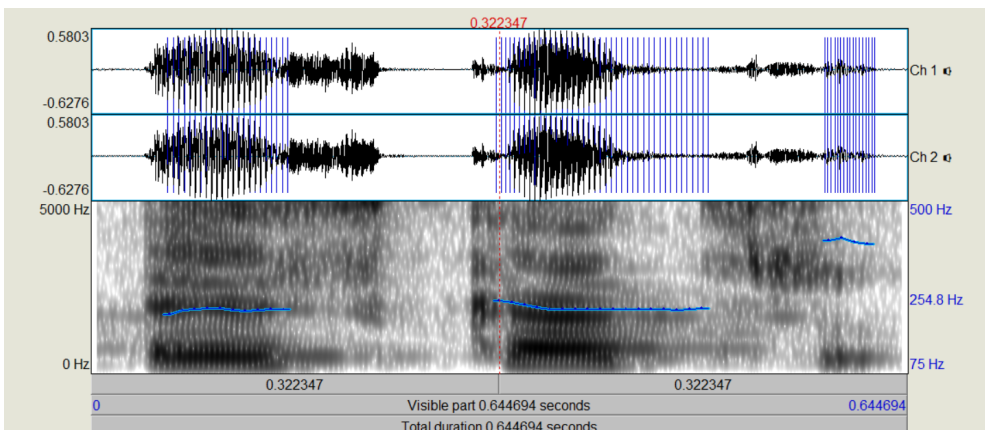


FIGURE 23b
(Tylko sześć) eskadr (ukończyło manewry) (INS)
'(Only six) squadrons (completed the maneuvers).'



7. Conclusions

Neither on the basis of the listeners' assessment nor on the basis of acoustic images can we state unequivocally whether *r* has undergone syllabification or whether a vocalic segment has emerged. The listeners' assessments were divergent and clearly influenced by the rules of their native languages, which made Macedonians and Croats hear syllabicity where it is predicted by the rules, and which precluded Poles from hearing syllabicity. In acoustic images *r* lasts a long time and mini vocal segments usually emerge in the articulation of *r*, the first of which is usually the longest, although much shorter than any other vowel. This is what the acoustic image of syllabic *r* looks like in Serbian or Macedonian.

7.1. This pronunciation is radically different from the previous pronunciation. However, this can hardly be an argument for syllabicity, because the pronunciation of *r* in other contexts has also changed and it is not always related to the context¹². The only thing that can be said is that the new type of pronunciation of *r* in the context examined is always multi-segmental, and that next to a vowel, tap realisations sometimes occur. In any case, changes in articulation concern all speech sounds: pronunciation becomes more precise and informed by the orthographic form, e.g. the previously common pronunciation of the word *jabłko* 'apple' as [japko] has been replaced by [jabwko]. However, based on the above observations, we can conclude that the expected process of the syllabification of sonorants in contexts with irregular sonority sequencing in the syllable has finally begun in Polish. It started with the strengthening of the articulation of *r* at the end of words after a consonant.

7.1.1. The first stage can be considered the lack of the devoicing of sonorants, which used to be frequent in this position, especially after a voiceless consonant, before a pause, or before a voiceless sound beginning of the next word (this is also observed by other researchers, e.g. Strycharczuk 2012), as well as the lack of regressive voicing assimilation of obstruents that takes place despite the sonorant that separates them (as in *Cydr chłodzi* 'Cider cools' [tsitɕ xwoɖzi]). The next stage is a significant lengthening of the articulation, which finally also becomes stronger. This stage was observed in the material examined here.

7.1.2. If the process continues, unequivocal syllabification is expected. If it also involves other sonorants, the frequency of such contexts will increase to the extent that systemic consequences can be expected. They may concern, firstly, the emergence of a new schwa-type segment. If such a segment is ever identified with one of the vowel phonemes of the Polish language (/i/ or /ɛ/), it will affect the morphonology of words: additional allomorphs will be created, e.g. the morpheme *wiatr* 'wind' will occur in the following forms: 1. /vjatr/ (e.g. in the gen.sg form *wiatru*), 2. /wjetʃ/ (e.g. in the form *wietrzny* 'windy'), and 3. /vjater/ (in the nom.sg. form *wiatr* – this is, actually, a common pronunciation in most Polish dialects). Secondly, the increase in the number of syllables in the word will lead to

¹² In languages with syllabic *r*, spectrograms of syllabic and non-syllabic pronunciation do not differ in a regular way either, see Sawicka *et al.* 2022, where appropriate spectrograms are provided.

an increase in the number of exceptions to the penultimate stress rule in Polish. We do not expect stress to shift to the penultimate syllable (which at present is the last syllable)¹³.

7.2. Next, we plan to examine the problem in a similar way in utterances produced by non-professional language users, and then we will analyse spoken (non-read) texts, as well as the pronunciation of sonorants between two obstruents within words.

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¹³ In Polish, stress no longer shifts if additional syllables in the form of clitics are added to a prosodic word. If additional morphemes are added (in derivation), stress placement is regulated on the basis of the general pattern.

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Abstract

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The Beginning of an Important Change in Polish Phonotactics

A change has been observed in the pronunciation of sonorants in Polish in positions where their occurrence does not conform with the sonority principle. We decided to take a closer look at this process and begin research on this phenomenon. First, we plan to examine the pronunciation of sonorants in word-final positions after an obstruent, next we will examine them in the position between two obstruents, and finally in the word-initial position before an obstruent. So far, a short pilot study has been published (Sawicka, Zinowjewa 2020), and the pronunciation of /w/ has been examined in sentences read by a selected speaker (Sawicka, Zinowjewa 2023). The present study discusses the pronunciation of *r* in sentences read by the same speaker. The project will also include an examination of the same material read by a greater number of 'average' speakers of Polish, and an examination of continuous material – longer texts, read and spoken.

Keywords

Syllable Structure; Polish Language; Sonorants.