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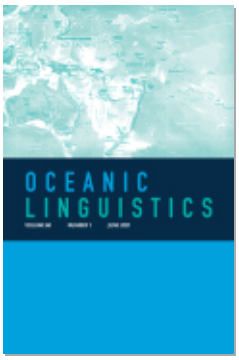

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Cristoph Bracks

UNIVERSITÄT ZU KÖLN

This study analyzes intonational patterns at the right edge of the intonation unit (IU) in Totoli. Based on a corpus of (semi)spontaneous discourse, I present a model of the IU. I have identified a set of three tonal patterns marking the right-edge boundary. These three patterns, in combination with the rarely occurring discourse markers, suffice to describe the tonal events at the right edge of the IU in Totoli. By analyzing the phonetic realization of the boundary-tone complexes, segmental content was revealed not to influence the alignment but only the shape of the tonal contours. The two main exceptions responsible for alternation are the presence of long vowels and the variability in syllabification. Regarding distributional evidence, tail–head linkage constructions provide evidence for the boundary-tone complexes, as tails and heads differ systematically in their prosodic realization. With evidence from tail–head linkage, I also show that the functions of two of the three intonational patterns pertain to signaling finality, while the third is specialized for nonfinal elements of lists.

Keywords: Prosody; Intonation; Intonation Unit; Austronesian

1. INTRODUCTION.[1] This article describes the intonational structure of intonation units (IUs) in Totoli in general and tonal events at the right edge of IUs in particular. Totoli is an endangered Austronesian language of Indonesia spoken in the Tolitoli regency in Central Sulawesi by about 7,500 speakers (Himmelmann 2001:18). Previous works on Totoli include a wordlist of the Tomini–Tolitoli languages with sociolinguistic data and information about phonology (Himmelmann 2001), Himmelmann (1991) on a variety of topics related to phonetics and phonology of the Tomini–Tolitoli languages, Himmelmann and Riesberg (2013) and Riesberg (2014) on the complex voice system, Kadjia et al. (2001) on morphosyntax in general, and Kangiden and Nardiati (1994) on oral literature. On the topic of intonation, Himmelmann (2018) and Himmelmann and Kaufman (2020) propose an account of the basic structure of Totoli intonation.

The more thorough phonetic studies that have been conducted on Austronesian languages of Indonesia in recent years suggest that many

1. This study was funded by the Deutsche Forschungsgemeinschaft (DFG) through the Collaborative Research Center 1252 Prominence in Language.
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languages in the area may lack word-level prominence and that tonal targets are primarily assigned at the phrase level. Indonesian/Malay as one of the major languages in the region has stirred debate about "stress" placement (for a summary, see Goedemans and van Zanten [2007:38f]). For Indonesian, as well as for many other Austronesian languages, the position of word stress is often claimed to be the penultimate syllable of a word. Goedemans and van Zanten (2007:42) analyzed this claim on the assumption that speakers of Indonesian as a second language show a strong L1 influence and compared Indonesian spoken by Toba Batak speakers with that of Javanese speakers. They found that Toba Batak speakers produce the penultimate syllable of IU-final words in focus condition with higher intensity, longer duration, and a rise in F0. Speakers of Indonesian with Javanese as first language, however, produce the words in the same condition only with a rise in F0, while duration and intensity are not affected. They conclude that Indonesian spoken by Toba Batak speakers exhibits prominence on the level of the word as well as the phrase. For speakers with a Javanese background, however, they "only found evidence for prominence at the phrase level (in the form of pitch movements)" (Goedemans and van Zanten 2007:45). The results found for Indonesian of Javanese L1 speakers are, in fact, similar to what has been reported about the Indonesian/Malay variety Ambon Malay, spoken in Eastern Indonesia on the Maluku Islands. Analyzing IU-final F0 movements in Ambon Malay, Maskikit-Essed and Gussenhoven (2016:382) found no association of the timing of IU-final boundary-tone complexes with any syllable, nor did focus condition reveal any systematic effect on range and shape of pitch on IU-final words. Hence, they opt for analyzing IU-final tone complexes as floating boundary tones, since such an analysis assumes neither word stress nor pitch accents, whether associated lexically or postlexically (Maskikit-Essed and Gussenhoven 2016:356). They conclude that IU-final boundary-tone complexes may instead signal the function of sentences.

The absence of word prosody and the assignment of tone-complexes to boundaries of prosodic domains fit the characteristics of what Féry (2017) labels *Phrase Languages*:

> Phrase languages resemble intonation languages in that their tonal specifications are mostly assigned at the level of ɸ-phrases and ɪ-phrases. But contrary to intonation languages, specifications at the level of the word are sparse, absent or only weakly implemented. Phrase languages do not automatically associate pitch accents with stressed syllables, most tones are nonlexical (or 'postlexical'). (Féry 2017:270)

In fact, many Austronesian languages may fall under the category Phrase Languages, following Himmelmann and Kaufman's (2020:376) assertion that "in many [Austronesian] languages the tones aligned with the edges of phrases and utterances are the only tonal targets that surface with any consistency."

Besides studies of phonetic correlates of stress in Austronesian languages, only a small number of analyses of the intonation of Austronesian languages exist: Himmelmann (2010) presents a description of the intonation of Waima'a, spoken in East Timor; Maskikit-Essed and Gussenhoven (2016) describe the two most common IU-final pitch melodies of Ambon Malay; Stoel (2006) proposes a concise description of the intonation of Banyumas Javanese. These studies are based on a set of target phrases or question–answer pairs, the realization of which has been taken as generalizable over the intonational system of the language as a whole. Such an approach may be suitable to describe the major aspects of the intonation of a language. However, the distribution of patterns over the corpus, as well as less frequently used intonation patterns, may only be observed in a corpus study covering different communicative events. Possibly the only study conducted on the intonation of an Indonesian language which is based on a corpus of spoken spontaneous discourse is that on Manado Malay, reported in Stoel (2005, 2007).

In this article, I propose a first model of the intonation of Totoli. Based on a corpus of two hours of spoken (semi)spontaneous discourse, it is the second corpus-based analysis of a language in the region (after Stoel [2005, 2007]). The analysis aims to provide further insights into the intonation of Austronesian languages of Indonesia.

2. MATERIAL. I collected the recordings during a trip to the administrative region of Tolitoli (Central Sulawesi, Indonesia) in October–November, 2017. The corpus builds on an earlier corpus resulting from a documentation project on Totoli.[2] In the course of this first documentation project, an initial dataset for the analysis of the prosodic system of Totoli was collected by Claudia Leto. This data consist exclusively of elicited utterances and have been used by Himmelmann in his writings on Austronesian prosody (Himmelmann 2018; Himmelmann and Kaufman 2020). The current analysis, while of course informed by previous work, is exclusively based on the more recently collected discourse data and differs in many details from the preliminary unpublished analyses proposed by Leto and Himmelmann. All data collected in the first phase of the documentation project are accessible through the website of The Language Archive (formerly DoBeS archive).

The corpus that forms the basis of the analysis presented here consists of two hours three minutes of recordings of (semi)spontaneous speech and was recorded with sixteen different consultants (thirteen males and three females) of age forty-five and older (with one exception who was twenty-five years old). Video and audio were recorded with a Zoom Q8 audio/video recorder with two external AKG C520 head-mounted condenser microphones at a sampling rate of 48 kHz.

The recordings that constitute the corpus divide nearly equally into monological and conversational data. These represent the two major types of

2. Leto, Claudia, Winarno S. Alamudi, Nikolaus P. Himmelmann, Jani Kuhnt-Saptodewo, Sonja Riesberg, and Hasan Basri, 2005–2010, DoBeS Totoli Documentation, DoBeS Archive MPI Nijmegen, https://hdl.handle.net/1839/da11addf-bef3-4742-9c00-d85a446f2cdb.

communicative events in the classification of spontaneity and interactivity proposed by Himmelmann (1998:180f). He asserts that the degree of spontaneity correlates with linguistic aspects; hence, I aimed for a balance of these in the corpus.

In order to allow for further phonetic and prosodic analyses, all recordings were made using head-mounted microphones worn by the consultants, with an additional recording on the built-in camera microphone. Stimuli were used to overcome the hurdle of obtaining natural data despite the intrusive nature of head-mounted microphones. For conversational data, two stimuli were used: the Animal Game stimulus tools for broad/narrow focus (Skopeteas et al. 2006:111) and the Man and Tree and Space Games stimulus tool (Levinson et al. 1992). For monological data, retellings of the Pear Film (Chafe 1980) as well as recorded narratives of folk tales and descriptions of local traditions were used. Table 1 gives an overview of the composition of the corpus, indicating the type of communicative event as well as the recording type or stimulus used.

I made the recordings in collaboration with Datra Hasan, a local team member of the Totoli documentation project and native speaker of Totoli, who then segmented the recordings into IUs, transcribed the Totoli data, and finally translated the transcriptions into Indonesian using the annotation software ELAN of the Max Planck Institute for Psycholinguistics (Wittenburg et al. 2006). In the next step, I segmented the data on the word and syllable levels using the Praat software (Boersma 2002). Figure 1 gives an example of the annotation and segmentation of the corpus data, with the tiers (from top to bottom): syllable, word, IU, free translation to Indonesian, and free translation to English.

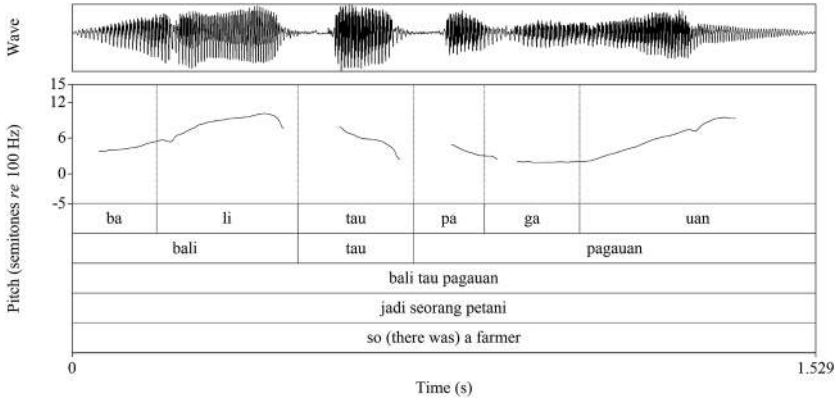
The IU has been discussed under a variety of names such as the Tone Group (Halliday 1968), the Tone Unit (Crystal 1969), the Intonation/Intonational Phrase (Pierrehumbert 1980; Nespor and Vogel 1986; Selkirk 1986; Ladd 2008), and the Breath Group (Lieberman 1966; Lieberman et al. 1970). Whether or not these terms are interchangeable is subject to some debate. Yet, underlying the discussion here is a definition of an IU that is based on pitch, rhythm, and voice quality, but also on nonprosodic features, such as change of speaker, inhalation, and lexical boundary markers (Du Bois et al. 1992, 1993; Schuetze-Coburn 1995: 93–155; Cruttenden 1997:29–39; Himmelmann 2006:260–70).

Chafe (1994) introduces a coarse-grained, general categorization of IUs into *substantive intonation units*, *regulatory intonation units*, and *fragmentary*

TABLE 1. CORPUS DESCRIPTION.

Type of communicative event	Recording type	Length	IUs
Monological	Pear Story retellings	0:25:28	662
	Folk tales	0:12:00	354
	Descriptions	0:30:37	745
Conversational	Animal Game	0:18:54	284
	Space Game	0:37:00	1300
	Total	2:03:59	3345

FIGURE 1. PRAAT ANNOTATION STRUCTURE OF TOTOLI CORPUS.

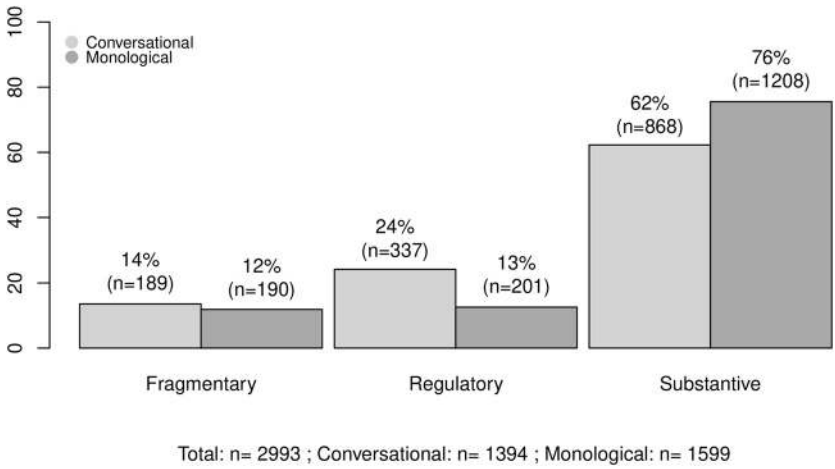


intonation units. Fragmentary IUs are truncated or in other ways incomplete. Complete, or successful, IUs are divided by their function in discourse. Regulatory IUs are "regulating interaction or information flow," whereas substantive IUs convey "ideas of events, states, or referents" (Chafe 1994:63).

Monological communicative events are controlled almost exclusively by one speaker. Conversely, in conversational settings, the communicative event "is constructed interactionally by the participants" (Himmelmann 1998:197). This has an effect on the distribution of regulatory, fragmentary and substantive IUs within the two different communicative settings. The distribution of the types of IUs in the corpus is given in figure 2.

In both conditions, the majority of IUs are of the substantive type. The internal distribution of IU types within each type of communicative event differs

FIGURE 2. DISTRIBUTION OF IU-TYPES BY GENRE.



slightly; the proportion of regulatory IUs is eleven percentage points larger in conversational data than in monological data, and the proportion of substantive IUs is fourteen percentage points smaller. In the following section, I will turn to an analysis of the intonation of substantive IUs.

3. TONAL MARKING OF SUBSTANTIVE IUS. The analysis is presented in the autosegmental-metrical framework (Beckman and Pierrehumbert 1986; Ladd 2008) and builds on Himmelmann's (2018:360) model of the basic structure of IUs in Austronesian languages of Indonesia. An adapted version of this model to the findings of Totoli is given in figure 3.

According to this hypothesis, the right-edge boundary of the IU is marked with a tonal complex consisting of an IU-level phrase tone (represented by T-) and an IU-final boundary tone (T%). The analysis presented here focuses only on IU-final pitch events which are always bitonal. IU-internally, pitch events may occur, marking the right-edge boundary of an intonational phrase below the IU. Himmelmann (2018) calls these intermediate phrases (ips), represented in figure 3 by $. In his preliminary model, IU-final segments are not contained in a separate ip as the *Strict Layer Hypothesis* would demand (Selkirk 1986). This is done on the assumption that IU-final tonal targets are much more varied than ip-final ones, which he analyses as strictly monotonal, consisting of simple rises only. Further evidence from an analysis of ip-final tonal targets and how they compare to IU-final ones is need in order to determine the relation between tonal targets. For the analysis presented here, I cautiously followed Himmelmann's model which does not include the IU-final segments in an own ip (see Bracks [2020] for an alternative model).

The edge of an ip mostly corresponds to the edge of a syntactic constituent. As also noted in Himmelmann (2018:359), there appears to be considerable variability as to the chunking of IUs into ips, allowing syntactically complex IUs to be uttered either without being chunked into smaller ips, or with every constituent forming an ip of its own. The analysis of ips, however, is not further pursued in this article (see Bracks [2020] for an in-depth investigation).

The analysis presented here focuses only on the tonal patterns occurring at the right-edge boundary of an IU, as it is the major pitch event which obligatorily

FIGURE 3. BASIC STRUCTURE OF THE IU IN TOTOLI (ADAPTED FROM HIMMELMANN 2018:360).

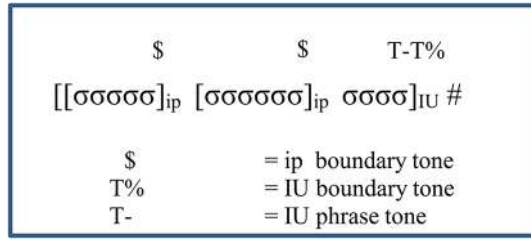


TABLE 2. SUMMARY OF IU-FINAL TONAL PATTERNS.

IU-final tonal pattern
(L)H-L%
L-H%
LH-H%

occurs in every IU. I propose a small set of three tonal patterns which are used to mark the right edge of the IU. The tonal patterns consist of a phrase tone and a boundary tone. The phrase tone can consist of a low tone L-, a high tone H-, or a rising tone LH-. The final boundary tone can be H% or L%. However, phrase tones and boundary tones do not freely combine; the possibilities are restricted to exactly three combinations, as summarized in table 2. In the following, the main formal and functional features of each pattern are briefly reviewed and illustrated. Section 4 provides more details regarding the tune–text alignment.

In section 4, I argue that combinations of an LH- or H- phrase tone with the boundary tone L% are, in fact, variations of the same tonal complex, referred to here as (L)H-L%. Examples of the (L)H-L% and L-H% boundary-tone complexes are given in (1).[3] Here, the same segmental material is produced in two consecutive IUs, in the first instance bearing the (L)H-L% boundary-tone complex and in the repeated instance bearing the L-H% boundary-tone complex (cf. the F0 contour given in figure 4).

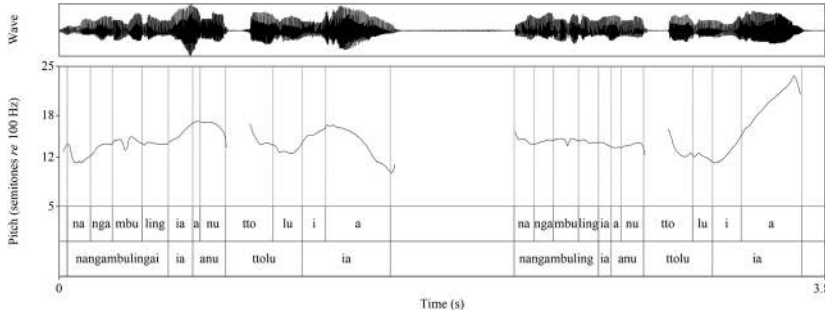
In the first IU, the high target of the LH- phrase tone is located at the boundary between the penultimate syllable [i.] and the ultimate syllable [.a]. On the ultimate syllable, F0 drops toward the low boundary tone L%. In the repeated IU, the low target of the L- phrase tone is located at the beginning of the penultimate syllable [i.]. F0 then rises toward the high target of the H% boundary tone, with the main rise occurring on the ultimate syllable [.a]. Note also the difference in IU-internal chunking into ips. The first instance of the IU is chunked into two ips, marked through an ip boundary tone on the last syllable of *nangambulingai* 'return'. The second instance lacks such chunking.

(1) nangambulingai anu ttolu ia
noN- kambuling =ai anu ttolu ia
AV.RLS- return =VEN REL three PRX
'(they) came back the three of them' [pearstory_32_MIN]

In terms of function, (L)H-L% and L-H% clearly differ in that (L)H-L% signals finality and L-H% continuation. This is nicely illustrated by (1), which is a tail–head linkage (THL) construction.

3. The following abbreviations are used: 3, third person; AMOT, autonomous motion; AND, andative; APPL, applicative; AV, actor voice; COLL, collective; CPL, completive; EMPH, emphasizer; FILL, filler; DIST, distal; GEN, genitive; INCPL, incompletive; INTJ, interjection; LK, linker; LOC, locative; NEG, negative; NMLZ, nominalizer; PRX, proximative; RCP, reciprocal; RDP, CV-reduplication; RDP1, C-reduplication; RDP2, CV:-reduplication; REL, relative pronoun; RLS, realis; SG, singular; ST, stative; UV, undergoer voice; VEN, venitive.

FIGURE 4. IU-FINAL LH-L% AND SECOND L-H%, FEMALE SPEAKER MIN.



De Vries (2005:262) defines THL as "a way to connect clause chains in which the last clause of a chain is partially or completely repeated in the first clause of the next chain." In Totoli, instances of THL occur mostly in unplanned narratives. THL constructions primarily contribute to what de Vries (2005:378) calls processing ease, as it links paragraphs and maintains event coherence. At the same time, they serve as a planning device, allowing speakers more time to plan the next paragraph. In the corpus, recordings of retellings of the Pear Film yield a considerable number of instances of THL constructions, as speakers are given the task to extemporize a coherent account of the storyline of a previously unknown story.

In the Pear Story retellings, IUs are usually grouped into higher-level units above the IU which may be termed "paragraphs" (Himmelmann and Ladd 2008:251). A paragraph consists of a series of IUs ending on L-H% and concludes with a final IU marked by the (L)H-L% pattern. The excerpt of a Pear Film retelling in (2)–(4) provides an illustration.

(2) a. bali tau pagauan L-H%
'so a gardener'

b. kononipu alpukatna L-H%
'is picking avocados'

c. nipenekanna dei batangna L-H%
'is climbing up the trunk'

d. niambinnamai uliai babo L-H%
'is carrying from the top'

e. sagaat nadabuai dei buta L-H%
'half of it fell to the ground'

f. bai injan nakaalamai L-H%
'so after getting it'

g. ninauna poniai <moi> nitauna dei karanjang L-H%
'being brought down by him to the basket'

h. dei llengget L-H%
'to the basket'

i. kaddaan tau L-H%
'there was a
person'

j. notumalibko L-H%
'passing by'

k. biibindas toolang H-L%
'pulling a goat'

(3) **a. biibindas toolang L-H%**
'pulling a goat'

b. tapi ganega tumalibko H-L%
'but only passing by'

(4) a. ingga daan noosa kaddanmai mangngana saasapeda L-H%
'Not long after that, there came a child, cycling'

Example (2a–j) are uttered with the IU-final L-H% boundary-tone complex. The final IU—the tail—of paragraph (2) is (2k) *biibindas toolang* 'pulling a goat', which is uttered with the paragraph final H-L% boundary-tone complex. This IU is repeated as a whole as the head of the subsequent paragraph, again illustrating a THL. The F0 contour of the two IUs of the THL construction in (2k)–(3a) are displayed in figure 5.

These examples should suffice to give some plausibility to the hypothesis that (L)H-L% signals finality, while L-H% serves as "continuer," signaling nonfinality of an IU with regard to a higher-level discourse unit. Note that both contours occur in interrogative and declarative sentences.

Turning to the LH-H% contour, we can observe that its function is more specialized as it is used for nonfinal elements of lists and enumerations, such

FIGURE 5. F0 CONTOUR OF THL CONSTRUCTION IN (2k)–(3a), MALE SPEAKER SP.

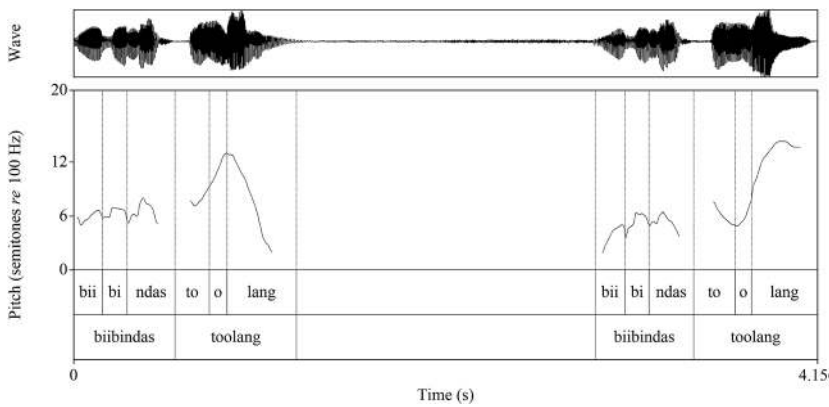
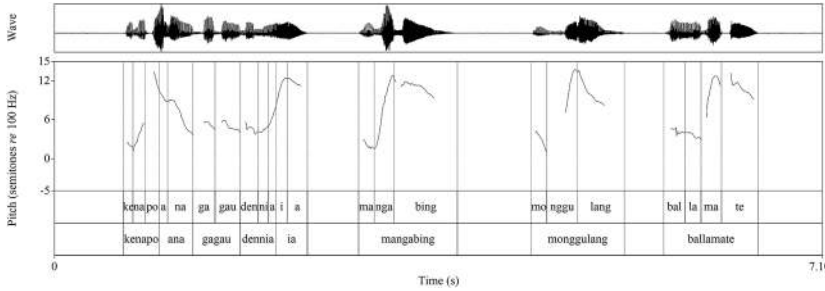


FIGURE 6. F0 CONTOUR OF (5), ENUMERATION FINAL LH-H%, MALE SPEAKER ZBR.



as in (5), where the speaker enumerates Totoli festivities and traditions. The F0 contour of (5) in figure 6 shows four IUs, each uttered with the LH-H% list intonation. F0 rises on the penultimate syllable to the high target of the LH- phrase tone. F0 then remains (near) level over the ultimate syllable, toward the high target of the H% boundary tone. Notice that there is no additive effect of the high targets LH- and H%, and the label here describes a pitch plateau on the final syllable.

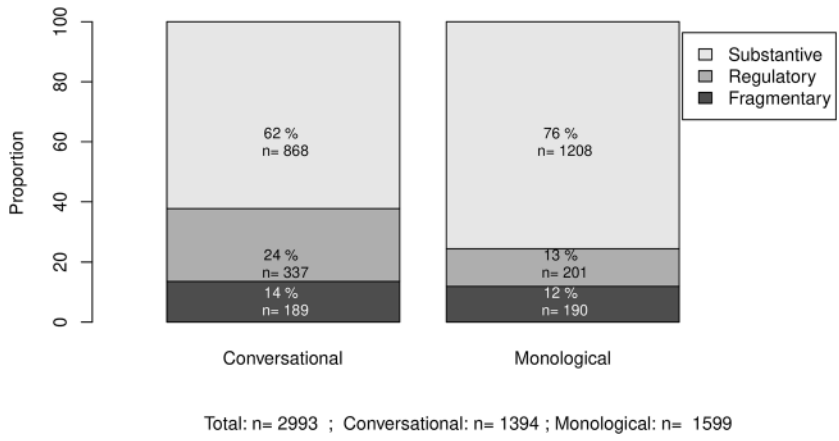
(5) kenapo ana gagau dennia ia; mangabing, monggulang, ballamate
kena =po ana ga- gau dennia ia moN- kabing mo- nggulang ballamate
don't =INCPL if RDP- work like.this PRX AV- marry AV- swing funeral
'Not to mention work like this; to marry, cradling ceremony, funerals'
[explanation-wedding-tradition_ZBR]

The three patterns—L-H%, (L)H-L%, and LH-H%—suffice to describe the tonal events at the right edge of 97% of the 2076 substantive IUs in Totoli. No IUs ending on a simple L% or H% occur in the corpus. The remaining IUs are uttered with a final discourse marker that occurs after one of the boundary-tone complexes (section 5). This confirms Himmelmann's (2018:360) hypothesis that the right edge of Totoli IUs is obligatorily marked by an edge-tone complex.

Some support for the proposed functions of the three contours is provided by their distribution across monologues and dialogues, as shown in figure 7. The general trend of their distribution is similar for both conversational and monological data. In both genres, the highest proportion are IUs with final (L)H-L% pattern—60% for conversations and 53% for monologues. The IU-final L-H% pattern occurs in 30% of IUs in conversations and 38% of IUs in monologues. In both genres, the LH-H% pattern is only rarely attested—a proportion of 5% for conversations and 8% for monologues.

The distributional differences between the boundary-tone complexes observed in figure 7 support the proposed functions in the following way. The higher proportion of IUs with final (L)H-L% in conversations as compared

FIGURE 7. DISTRIBUTION OF IU-FINAL PATTERNS BY GENRE.



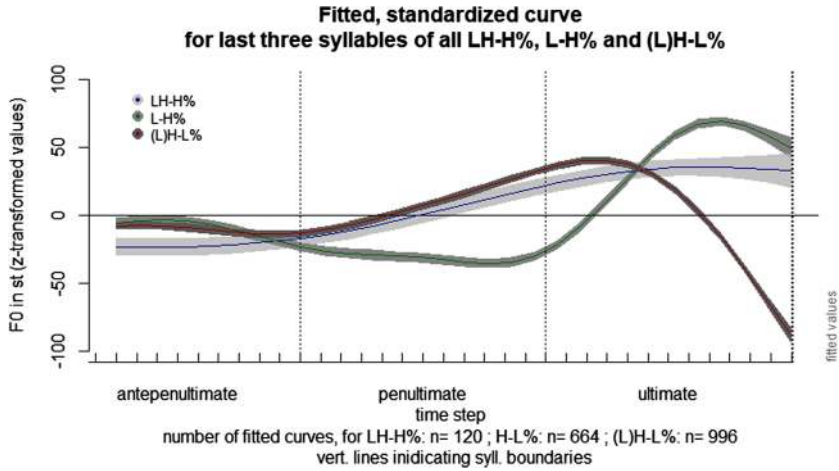
to monologues probably reflects the fact that in conversations a paragraph may consist of a question and an answer only, while in monologues narrations are organized into longer paragraphs, containing several IUs (as exemplified in the excerpt in examples (2)–(4)). Furthermore, monologues yield a higher proportion of IUs with the LH-H% pattern, as speakers frequently enumerate referents, events, or entities in descriptive texts (cf. (5)). As an aside, we may note that, unsurprisingly, discourse markers are much more frequent in conversations than in monologues.

In order to show the general trend of the three IU-final tonal patterns identified, I fitted a generalized additive mixed models (GAMMs) over the pitch values of the final three syllables of all IUs in the corpus (following Sóskuthy [2017] and Winter and Wieling [2016]).[4] I took z-transformed pitch values in semitones at twelve time steps of each of the final three syllables of every IU in the corpus. Vertical lines indicate syllable boundaries. For reasons discussed in section 4, I excluded syllables with long vowels (section 5). The resulting fitted curves are displayed in figure 8.

Figure 8 shows a generalized estimation of the trend of the pitch contours of each boundary-tone complex. While the model is not employed for statistical inference, it clearly indicates some important features of the pitch contours. In the next section, I will discuss each of the three boundary-tone complexes, provide details of their phonetic realization and the variability thereof, and discuss the text–tune alignment.

4. Curves were fit using the bam() command of R pack-age "mgcv" (Version 1.8-17) with smoothing parameter ML (Wood 2011).

FIGURE 8. FITTED, STANDARDIZED F0 CONTOUR FOR FINAL THREE SYLLABLES OF LH-H%, L-H%, AND (L)H-L% IN THE CORPUS.

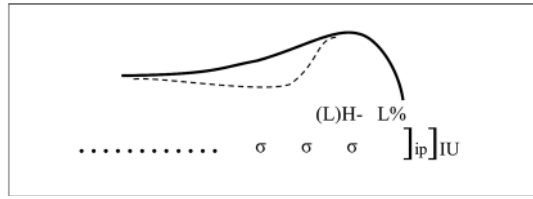


4. PHONETIC IMPLEMENTATION OF TONAL PATTERNS. The realization of the boundary-tone complexes is influenced by the segmental content. However, only the shape of the pitch contour is influenced, for example, by the sonority of segmental material; the alignment of tones remains unaffected. Syllables with long vowels in IU-final position, however, alter the text–tune alignment. In this section, I will first discuss the three boundary-tone complexes as they prototypically occur on syllables with short vowels, before turning to a discussion of the phonetic variability of their realization, with special reference to the influence of long vowels.

4.1. (L)H-L%. The (L)H-L% boundary-tone complex consists of a rise in F0 within the speaker's current range to a high target at the beginning of the vowel of the final syllable and a following major drop in F0. In the analysis proposed here, this intonational pattern consists of a high target of the IU phrase tone and a low target of the IU-final boundary tone.

With respect to the shape of the F0 rise to the high target, two variants of the boundary-tone complex are attested. The rise to the high target can occur smoothly over the preceding syllables. The phrase tone is then labeled with a simple H-. In the second variant, the rise to the high target of the phrase tone is realized exclusively on the penultimate syllable. To account for the fact that the rise is limited to about one syllable only, the phrase tone is then labeled as LH-. The two variants of the IU phrase tone LH- and H-, in combination with IU-final boundary tone L%, are labeled as (L)H-L%. Figure 9 depicts a schematic version of the two variants of this tonal pattern, where the solid line represents the F0 contour with a simple H- phrase tone and the broken line represents the variant with an LH- phrase tone.

FIGURE 9. BASIC STRUCTURE OF IU-FINAL (L)H-L% EDGE-TONE COMPLEX.



Instances of these two variants are given in figures 10 and 11. Both are taken from Pear Film retellings. Figure 10 shows the F0 contour of the realization of the one-word IU of (6) with the IU-final H-L% boundary-tone complex.

(6) kambulinganna
kambuling -an =na
return -UV =3SG.GEN
'(it was) returned by him' [pearstory_11_SP]

F0 begins mid-level of the speaker's current range. F0 rises gradually about 5 st (semitones) over the initial three syllables, beginning in the preantepenultimate syllable of the IU [.mbu.]. The F0 peak of the IU phrase tone H- is reached at the beginning of the vowel of the ultimate syllable. F0 then falls 12 st to the bottom of the current range. Given that the rise in F0 gradually extends over three syllables and no other F0 target before the peak on the ultimate syllable can be identified, the phrase tone is labeled here with a simple H-.

The variant with an LH- phrase tone is illustrated by the F0 contour of (7) in figure 11.

FIGURE 10. F0 CONTOUR OF (6) WITH IU-FINAL H-L%, MALE SPEAKER SP.

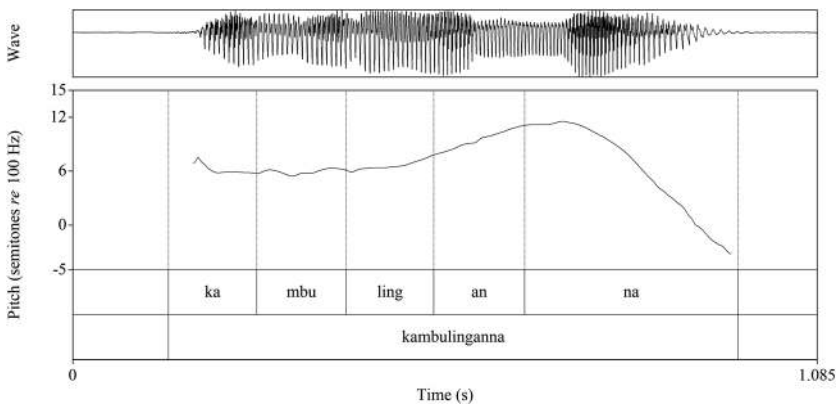
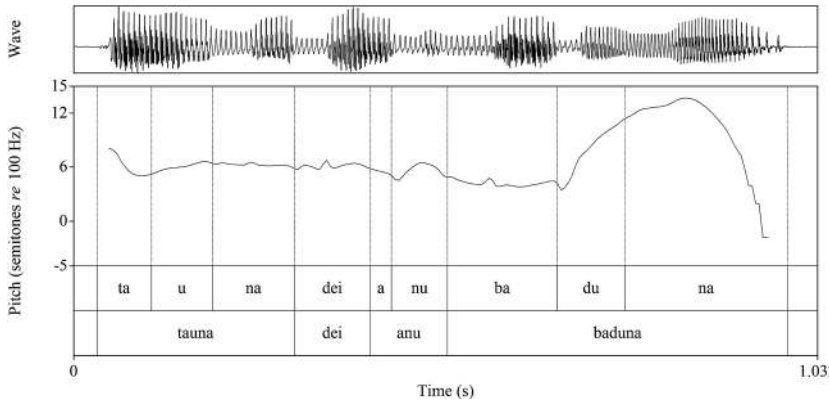


FIGURE 11. F0 CONTOUR OF (7) WITH IU-FINAL H-L%, MALE SPEAKER RSTM.



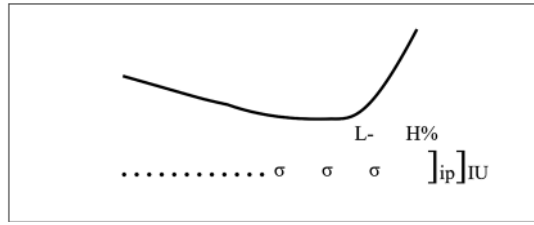
(7) tauna dei anu baduna
tau -Ø =na dei anu badu =na
put -APPL =3SG.GEN LOC FILL shirt =3SG.GEN
'he puts them in his whatchamacallit shirt' [pearstory_12_RSTM]

F0 begins mid-level of the speaker's current range and remains nearly flat over the first seven syllables of the IU. Starting at the beginning of the penultimate syllable, F0 rises 10 st to the H- phrase tone at the beginning of the vowel of the last syllable. F0 then drops 12 st to the low target L% of the IU boundary tone. Contrasting with figure 10, in figure 11 the domain for the rise in F0 is limited to the penultimate and the beginning of the ultimate syllable of the IU only; hence, the phrase tone is labeled LH-.

That the two boundary-tone complexes are, in fact, variations of the same category becomes evident from their distribution. Both variants occur in a tail of a THL. The functional or perceptual difference between the two is a topic for further research. However, the LH-L% variant seems to be more frequent in emphatic as well as in careful speech. Notice also that the high target of this pattern always occurs at the beginning of the vowel of the ultimate syllable of the last word of the IU, independent of whether this syllable is a morphological clitic, a suffix, or part of the lexical root (cf. figures 10 and 11).

4.2. L-H%. The L-H% boundary-tone complex is a combination of a low target at the boundary between the penultimate and ultimate syllables and a subsequent major F0 rise to the top of the speaker's current range. In the autosegmental framework used here, this tonal complex is analyzed as an L- phrase tone at the boundary between the penultimate and ultimate syllables and a subsequent H% boundary tone. Figure 12 shows a schematization of the F0 contour of the L-H% boundary-tone complex.

FIGURE 12. BASIC STRUCTURE OF THE IU-FINAL L-H% EDGE-TONE COMPLEX.



The F0 contour of the realization of example (8) is given in figure 13.

(8) niambinnamai uliai babo

ni	ambin	-Ø	=na	=mo	=ai	uli	=ai	babo
RLS-	carry	-UV1	=3SG.GEN	=CPL	=VEN	from	=VEN	top

'carried from the top' [pearstory_11_SP]

The F0 contour begins at the lower mid-range of the speaker's current range. F0 remains level over the first eight syllables of the IU until the low target of the L- phrase tone, located at the boundary of the penultimate and ultimate syllables. The final syllable bears the major F0 rise of 12.5 st toward the high target of the H% boundary tone.

The question arises whether the F0 contour can be described by a simple H% boundary tone only, rather than assuming an L-H% boundary-tone complex. However, such an analysis would not explain the fact that the F0 rise occurs exclusively on the last syllable. Hence, we must assume a low target before the final major rise in F0. This will become even more evident when considering (9).

FIGURE 13. F0 CONTOUR OF (8) WITH IU-FINAL L-H%, MALE SPEAKER SP.

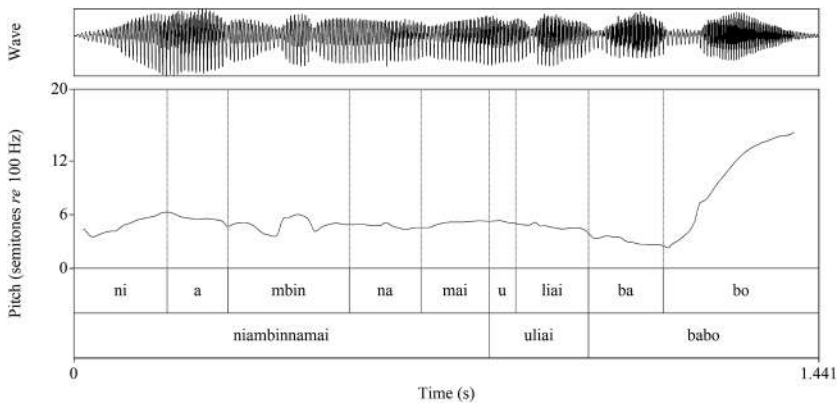
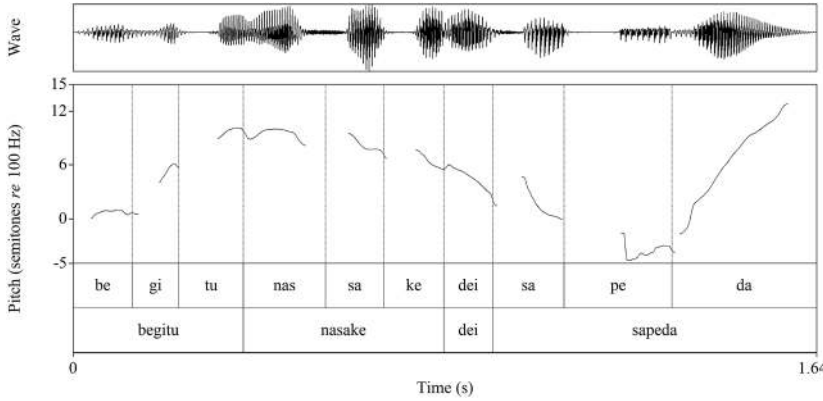


FIGURE 14. F0 CONTOUR OF (9) WITH IU-FINAL L-H%, MALE SPEAKER IRN.



An F0 contour as flat as in figure 13 is not regularly the case; more frequently, other high targets occur IU-internally. This is depicted in the F0 contour of (9), given in figure 14.

(9) begitu nasake dei sapeda
begitu no- sake dei sapeda
like.that AV.RLS- get.on LOC bicycle
'so s/he was riding his bicycle' [pearstory_15_IRN]

After an IU-internal high target on the last syllable of the first word of the IU, F0 does not remain high but drops about 15 st toward the low target of the L- phrase tone, located between the penultimate and ultimate syllables. Parallel to figure 13, the major rise in F0 occurs exclusively on the last syllable. Analyzing the IU-final rise as an H% boundary tone only would not explain why the F0 contour in figure 14 does not remain high after the initial high target toward the end of the first word and the high target of the H% boundary tone. In considering these two examples, it becomes evident that we must assume an L- phrase tone to accommodate for the drop in F0 before the final rise on the ultimate syllable.

4.3. LH-H%. The third and last boundary-tone complex consists of a rise to a high target located between the penultimate and antepenultimate syllables. The penultimate syllable is the domain of the F0 rise. F0 then remains level over the ultimate syllable. This boundary-tone complex is analyzed here as consisting of an LH- phrase tone, located at the boundary between the antepenultimate and penultimate syllables in combination with an IU-final H% boundary tone. Figure 15 depicts the schematized pitch contour of this pattern.

Note the similarity between the (L)H-L% and the LH-H% boundary-tone complexes. The major difference is the pitch plateau on the last syllable, with F0 in the latter complex remaining high in the speaker's current range. The

FIGURE 15. BASIC STRUCTURE OF THE LH-H% EDGE-TONE COMPLEX.

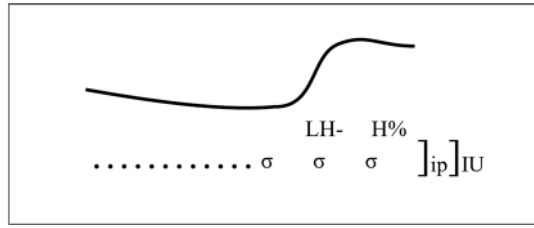
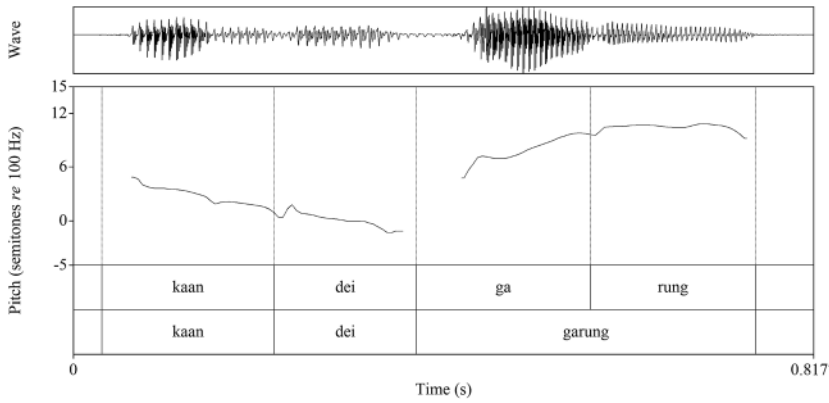


FIGURE 16. F0 CONTOUR OF (10) WITH IU-FINAL LH-H%, MALE SPEAKER IRN.



phrase tone is labeled as LH- rather than a simply L- tone to account for the fact that the rise in F0 does not proceed smoothly until the final H% boundary tone. Rather we see a rise in F0, occurring on the penultimate syllable, and a subsequent level pitch on the ultimate syllable. Figure 16 shows the F0 contour of (10) with a final LH-H% boundary-tone complex.

(10) kaan dei garung
kaan dei garung
perhaps LOC wet.rice.field
'maybe at the rice field' [pearstory_15_IRN]

The F0 contour in figure 16 of (10) shows that F0 drops smoothly until the boundary of the antepenultimate and penultimate syllables, rises 6.5 st on the penultimate syllable, and remains level on the ultimate syllable.

5. EFFECTS OF SEGMENTAL CONTENT. In the following, I will discuss three salient cases: open syllables with a long vowel in IU-final position,

IU-final vowel clusters of unlike vowels, and plosives in the onset of the ultimate syllable.

In Totoli, open syllables with a long vowel occur in IU-final position CV:#. Some word bases inherently end in a long vowel. In addition, word-final long vowels occur due to two different processes: Through affixation of a like vowel, which is phonetically realized as a single long vowel, CV_{α}-V_{α}# → CV_{α}:#, or through a phonological process of compensatory lengthening, by which word-final lateral [l] is dropped and the preceding vowel is lengthened CV[l]# → CV:#. All processes result in a phonetically single long vowel. Orthographically, long vowels are represented by doubling the corresponding grapheme, for example [o:] → <oo>.

The discussion so far has only taken into account the shape of tonal contours as they occur on syllables with a short vowel. Remember that for final short syllables, the domain of the rise or fall to the T- phrase tone is the penultimate syllable. In contrast, a final syllable with a long vowel is the domain for either the rise or fall to the phrase tone T- as well as the subsequent boundary tone T%.

Examples (11) and (12) end on the word *po.moo* 'back then/first'. Their realizations are shown in figures 17 and 18, respectively. The F0 contour in figure 17 shows the realization of IU-final *pomoo* with the LH-L% boundary-tone complex. Figure 18 shows the realization of the same word with a final L-H% boundary-tone complex.

(11) ramean tau pomoo
rame -an tau pomoo
lively -NMLZ person back.then
'the amusement of the people back then' [explanation-lelegesan_SYNO]

FIGURE 17. F0 CONTOUR OF (11) WITH IU-FINAL LH-L% AND FINAL LONG VOWEL, MALE SPEAKER SYNO.

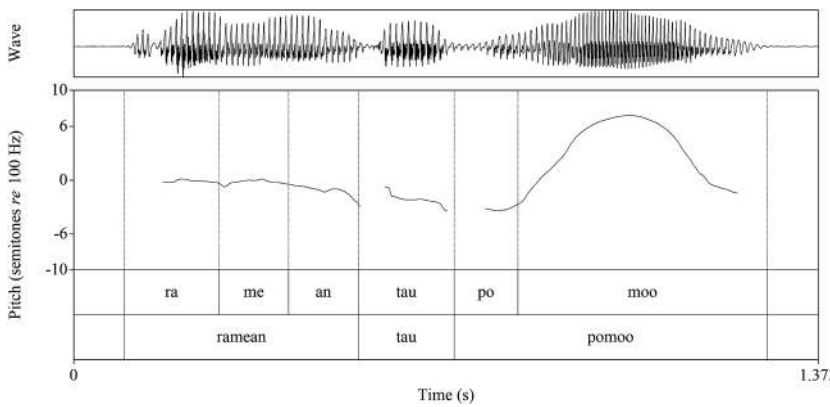
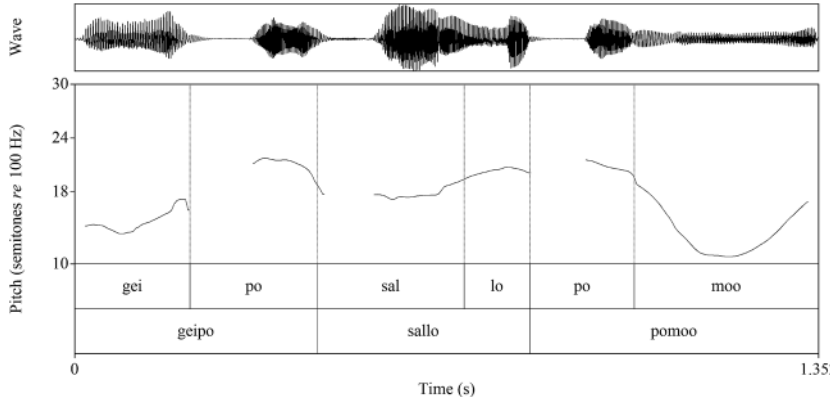


FIGURE 18. F0 CONTOUR OF (12) WITH IU-FINAL L-H% AND FINAL LONG VOWEL, FEMALE SPEAKER RD.



(12) geipo sallo pomoo
gei =po sallo pomoo
NEG =INCPL basket first
'not yet (but) a basket first' [pearstory_13_RD]

The F0 contour of (11) in figure 17 shows that F0 is flat over the initial five syllables of the IU. The rise to the LH- phrase tone and the subsequent fall to the L% boundary tone are both realized on the ultimate syllable [.mo:].

The F0 contour of (12) in figure 18 shows another IU-internal high target on the second syllable of *geipo* 'not yet' and on the second syllable of *sal.lo* 'basket'. After these IU-internal high targets, F0 drops toward the low target of the L- phrase tone. Parallel to the (L)H-L% pattern above, the drop in F0 and the subsequent rise toward the IU-final H% boundary tone are both realized on the final long syllable [mo:].

The F0 contours of examples (11) and (12), both ending on the same word with the final open long syllable [.mo:], show that the rise or fall to the T- phrase tone as well as the subsequent rise or fall to the T- boundary tone is realized in full on the single long syllable. (An example for the LH-H% accent is not at hand, since this intonational pattern does not occur frequently in the corpus; see figure 7.)

More frequently attested in the corpus, however, are IUs ending on dissimilar vowels. Two dissimilar vowels occurring in IU-final position can be pronounced as either bisyllabic or monosyllabic. This alters the alignment of tonal targets for the reason that the domain for the rise or drop in F0 toward the phrase tone is always the penultimate syllable.

Previously, I described the alignment of tonal targets for the (L)H-L% and L-H% boundary-tone complexes: The F0 peak of the LH- phrase tone of the (L)H-L% boundary-tone complex is reached at the beginning of the ultimate syllable; whereas the L- phrase tone of the L-H% boundary-tone complex is located at the boundary between the ultimate and penultimate syllables.

Hence, a change in syllabification of IU-final vowel clusters results in a shift of the domain of the F0 movements.

The most frequently occurring vowel cluster in IU-final position is final demonstrative *ia* 'PRX', which can be pronounced either monosyllabically [ja] or bisyllabically [i.a]. The domains for F0 movements shift according to the syllabification. For the boundary-tone complexes L-H% and (L)H-L%, two examples of each are given to exemplify the prosodic realizations of the boundary-tone complexes on monosyllabic and bisyllabic *ia* 'PRX'. First, the F0 contours of examples (13) and (14), illustrating the boundary-tone complex (L)H-L%, are given in figures 19 and 20.

(13) ee niuntudnako ibeenannamai alpukat mangngana ia

ee	ni-	untud	-Ø	=na	=ko	ni-	been	-an	=na
EMPH	RLS-	bring	-UV1	=3SG.GEN	=AND	RLS	give	-APPL	=3SG.GEN

=mo	=ai	alpukat	ma<ngo>ngana	ia
=CPL	=VEN	avocado	<COLL>child	PRX

'it was brought by him, the avocados were given to the children.'
[pearstory_14_SP]

(14) mollinjon lolo ondo nnea ia

mo-	RDP1-	linjon	lolo	ondo	nnea	ia
AV-	RDP1-	meet	all	day	today	PRX

'(they) all meet at that day' [explanation-wedding-tradition_ZBR]

Figure 19 shows the realization of the (L)H-L% boundary-tone complex on bisyllabic [i.a]. Syllable [i.] is the penultimate syllable of the IU and thus serves as the domain for the rise in F0 toward the high target of the H- phrase tone, which is reached in the first part of the ultimate syllable [.a]. The F0 contour of (14) in figure 20, however, shows an instance of [ja] produced monosyllabically. The rise in F0 thus occurs on the preceding syllable [.nne̯a], while the F0 peak of the phrase tone is realized at the beginning of the now final syllable [ja].

FIGURE 19. F0 CONTOUR OF (13) WITH BISYLLABIC [i.a] AND IU-FINAL LH-L%, MALE SPEAKER SP.

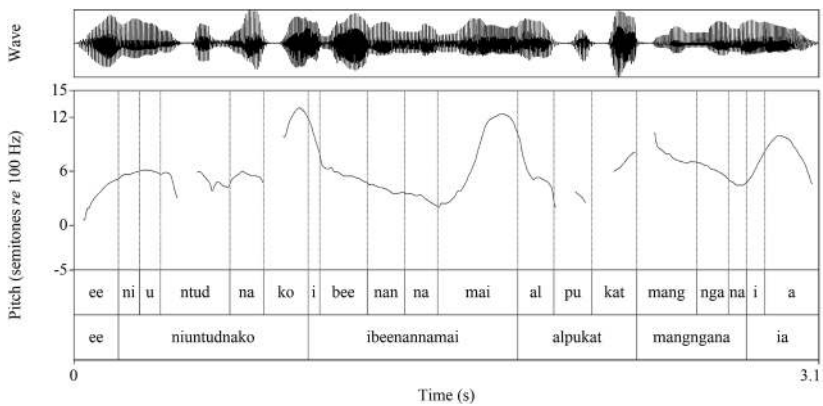
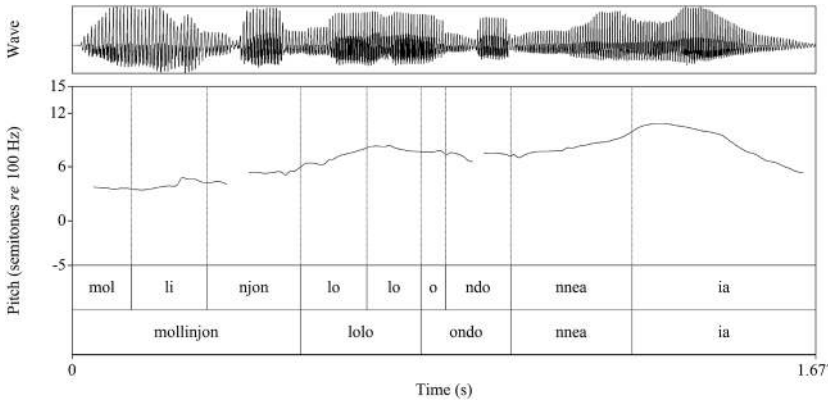


FIGURE 20. F0 CONTOUR OF (14) WITH MONOSYLLABIC [ja] AND IU-FINAL H-L%, MALE SPEAKER ZBR.



Second, the realization of *ia* 'PRX' with IU-final boundary complex L-H% is given in examples (15) and (16) with the corresponding F0 contours in figures 21 and 22.

(15) nolumulasmoko alpukat uliai llengget ia
no- l<um>ulas =mo =ko alpukat uli =ai RDP1- lengget ia
AV.RLS- <AMOT>scatter =CPL =AND avocado from =VEN RDP1- basket PRX
'The avocados scattered out of this basket' [pearstory_14_SP]

(16) douamo nellengget nopuling bungo piir ia
doua =mo no= RDP1- lengget no- puling bungo piir ia
two =CPL LK= RDP1- basket ST.RLS- full fruit pear PRX
'two baskets are already filled with pears' [pearstory_12_RSTM]

FIGURE 21. F0 CONTOUR OF (15) WITH BISYLLABIC [i.a] AND IU-FINAL L-H%, MALE SPEAKER SP.

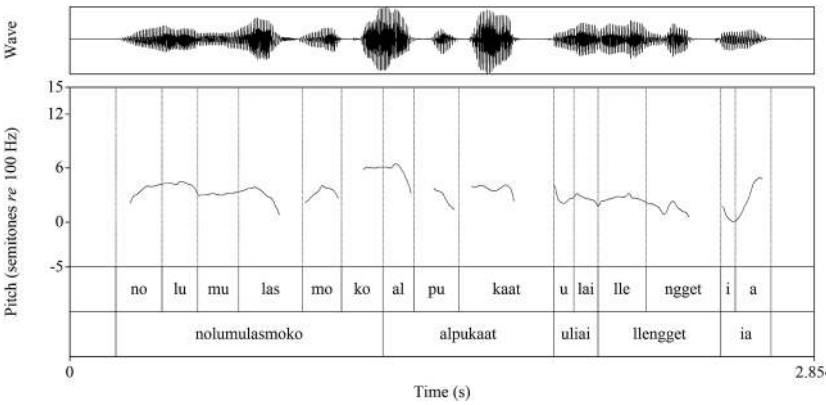
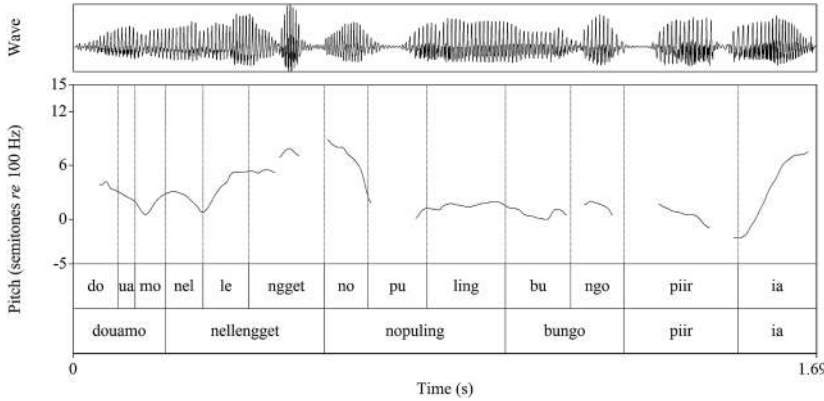


FIGURE 22. F0 CONTOUR OF (16) WITH MONOSYLLABIC [ja] AND IU-FINAL L-H%, MALE SPEAKER RSTM.



Analogous to the (L)H-L% boundary-tone complex discussed previously, the alignment of tonal targets of the L-H% boundary tone is also affected by a difference in syllabification.

As shown by the F0 contour of (15) in figure 21, the domain for the rise to the high target of the H% boundary tone is the syllable [.a] of the IU-final word *i.a* 'PRX'. The low target L- of the boundary-tone complex is located between the penultimate syllable [i.] and the ultimate syllable [.a]. When *ia* 'PRX' is produced monosyllabically, the domain for the final major rise is [ja], as it is the ultimate syllable of the IU. The low target is located between the ultimate syllable [ja] and the preceding syllable ([.long] in the case of (16) in figure 22).

To complete the discussion of tonal patterns at the right edge of the IU, the less frequently attested phenomenon of IU-final discourse markers will be discussed in the following section.

6. DISCOURSE MARKERS. In addition to one of the boundary-tone complexes, a discourse marker can optionally occur at the end of an IU. They occur either with a rise, a fall, or a rise–fall pattern. The discourse markers are uttered under a coherent pitch contour with the host IU, and no pause can occur between them. However, they are not fully integrated into the IU as they occur after the IU-final boundary-tone complexes. The discourse markers differ with regard to their tonal patterns but are independent of the boundary-tone complex of the host IU.

A frequently occurring discourse marker in the corpus is *wi*. Similar to Indonesian *kan*, the Totoli discourse marker *wi* is used as "a request of verification or confirmation, or it may be a marker of conjoint knowledge" (Wouk 1998:403). In the corpus, this discourse particle frequently occurs in recordings

of the Space Game task (Levinson et al. 1992). Two participants are given the task to find a matching photo, in a memory game, where both are given an equal set of photos. As they have to identify the photo the other person is currently describing, without seeing his stack of photos, the consultants frequently ask for verification or confirmation of whether the photo selected indeed matches the intended one. In these contexts, the discourse marker *wi* is used. The marker *wi* always occurs in IU-final position in the form of a discourse marker and occurs with a pitch rise.

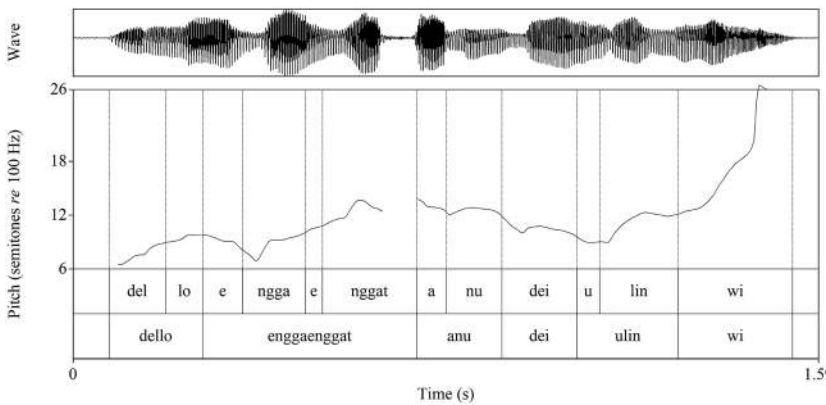
Figure 23 shows the F0 contour of (17), with the discourse marker *wi* in IU-final position. Example (17) is realized with IU-final boundary-tone complex L-H%, to which the rise of the discourse marker added.

(17) dello enggaenggat anu dei ulin wi
dello RDP2- enggat anu dei ulin wi
like RDP2- lift REL LOC back INTJ
'like being lifted up the one at the back, right?'
[spacegames_sequence3_ KSR-SP]

The L-H% boundary-tone complex is realized on the word *ulin* 'back'. After an IU-internal high target on the last syllable of *enggaenggat* 'being lifted', F0 drops toward the low target of the L- phrase tone, located at the boundary between the penultimate and ultimate syllables of the IU-final word *u.lin* 'back'. On the final syllable, F0 rises 6 st toward the high target of the H% boundary-tone complex. The discourse marker *wi* is uttered with a rise and occurs after the L-H% boundary-tone complex, which extends the F0 rise by another 15 st.

Taken from the same recording, the F0 contour in figure 24 of (18) shows an instance of the same discourse particle following the low target L% of the boundary-tone complex.

FIGURE 23. F0 CONTOUR OF (17) WITH IU-FINAL L-H% AND FINAL DISCOURSE MARKER L-H%, MALE SPEAKER SP.



(18) molitenggean wi
moli- tengge -an wi
RCP- back -RCP INTJ
'(they are) back-to-back?' [spacegames_sequence4_KSR-SP]

Figure 24 shows the F0 rising 6 st toward the high target of the phrase tone, located at the beginning of the syllable [.an]. The consecutive final major drop in F0 is only partially realized, as the rise of the discourse marker extends into the coda of the preceding syllable.

Another frequently occurring IU-final discourse marker is *ee*. The discourse marker is prosodically realized with a fall in pitch. It is used as an emphasizer, asserting the validity of the question or, as in (19), reaffirming the correctness of the statement of the host IU. Often it is a request for action. In (19), the speaker urges the interlocutor to find the intended photo. Figure 25 shows the F0 contour of (19).

(19) ia molitenggean ee
moli- tengge -an ee
RCP- back -RCP INTJ
'(they are) back-to-back' [spacegames_sequence4_KSR-SP]

The IU ends on the L-H% boundary-tone complex with a following fall of the discourse marker. The boundary-tone complex is realized on the final two syllables of *mo.li.te.ngge.an*, to which the discourse marker is added. On the vowel of the syllable [ngge], the low target of the L- phrase tone is located somewhat earlier than in contexts without a discourse marker. F0 then rises 5 st toward the high target of the H% boundary tone, reaching its peak at the boundary of the syllable [an] and the following discourse marker. F0 then drops 9 st on the discourse marker *ee*. In other instances, the discourse marker is not strongly integrated into the prosodic structure of the host IU and is

FIGURE 24. F0 CONTOUR OF (18) WITH IU-FINAL LH-L% AND FINAL DISCOURSE MARKER L-H%, MALE SPEAKER SP.

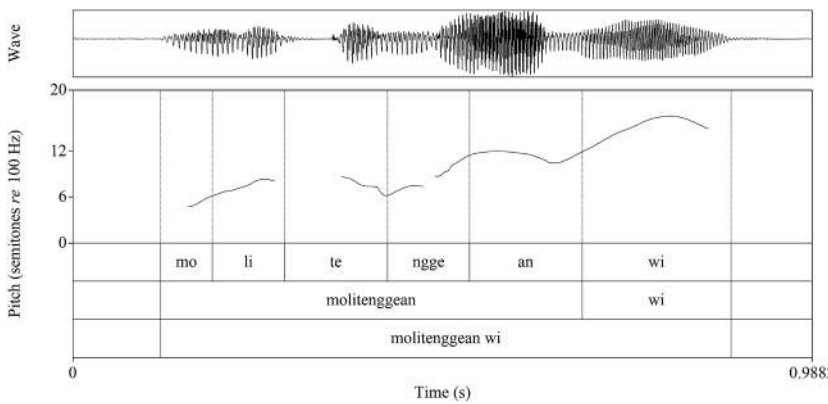
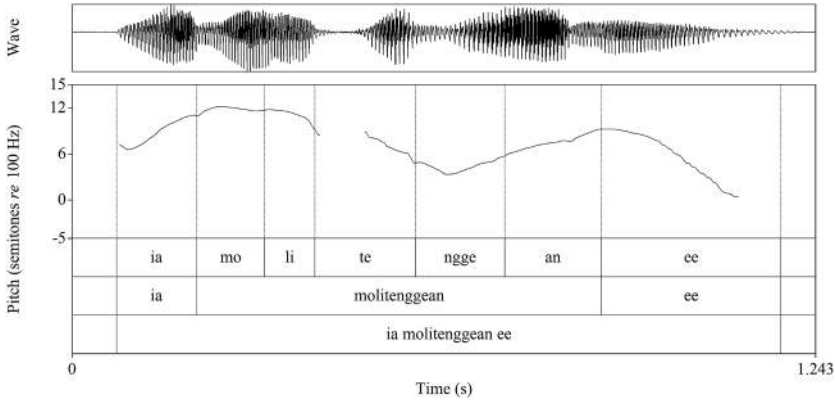


FIGURE 25. F0 CONTOUR OF (19) WITH IU-FINAL L-H% AND FINAL DISCOURSE MARKER (L)H-L%, MALE SPEAKER KSR.



realized with a rise–fall. An example is given in (20). Its pitch track is given in figure 26.

(20) mallako turuus ituko ee
ma- RDP1- lako turuus itu =ko ee
AV- RDP1- walk further DIST =AND INTJ
'just go over there' [maptask_2b.050-51]

The combination of an (L)H-L% boundary-tone complex followed by a discourse marker uttered with a fall is realized either as a sustained pitch plateau following the L% of the boundary-tone complex of the host IU, or is integrated in the IU-final major final drop in F0. As can be seen in figure 27 depicting the F0 contour of (21), the major final fall to the L% of the H-L% boundary-tone complex of the host IU is realized on the last syllable of *moliulunan* 'being in a row'. The discourse marker is then added, resulting in a plateau at the bottom of the speaker's range.

FIGURE 26. F0 CONTOUR OF (20) WITH IU-FINAL H-L% AND FINAL DISCOURSE MARKER WITH (L)H-L%, FEMALE SPEAKER MNG.

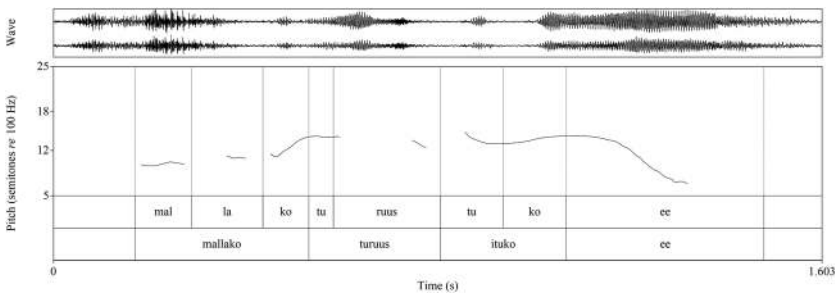
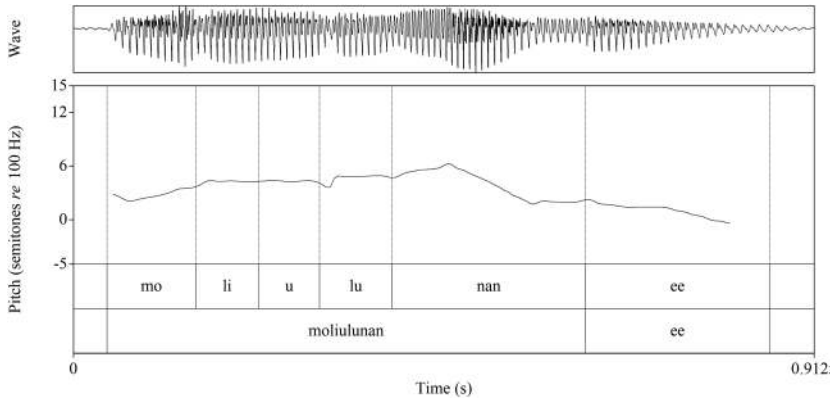


FIGURE 27. F0 CONTOUR OF (21) WITH IU-FINAL H-L% AND FINAL DISCOURSE MARKER (L)H-L%, MALE SPEAKER KSR.

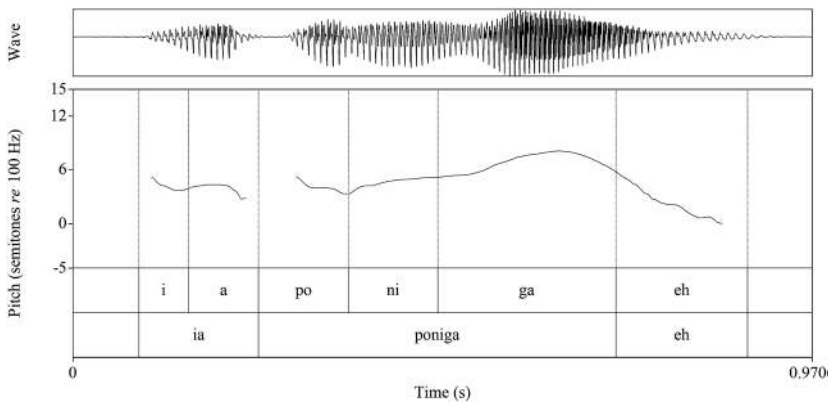


(21) moliulunan ee
moli- ulun -an ee
RCP- row -RCP INTJ
'(they are) in a row' [spacegames_sequence3_KSR-SP]

If the preceding syllable ends with a vowel, the final discourse marker tends to be realized as part of the final major fall in F0, as shown in figure 28 depicting the F0 contour of (22).

(22) ia poniga eh
ia poni =ga eh
PRX still =? INTJ
'there is this one still' [spacegames_sequence3_KSR-SP]

FIGURE 28. F0 CONTOUR OF (22) WITH IU-FINAL H-L% AND FINAL DISCOURSE MARKER (L)H-L%, MALE SPEAKER KSR.



The two discourse markers *wi* and *ee* are the most frequently attested in the corpus. The four other particles that are attested in the corpus are not frequent enough as to allow for any generalizations.

7. CONCLUSION. This study is the second corpus-based study of the intonation of an Austronesian language, after the study on Manado Malay (Stoel 2005, 2007). For Totoli, I showed that the right edge of IUs in Totoli is obligatorily marked with an edge-tone complex. Following Himmelmann (2018:360), I analyzed this tonal pattern as a bitonal edge-tone complex, consisting of a phrase tone and a boundary tone. A set of three IU-final tonal patterns suffices to describe the intonational patterns at the end of IUs in Totoli. These IU-final patterns can optionally be followed by a discourse marker, specified for either a high tone or a low tone.

Regarding the function of IU-final tonal patterns, I showed that the LH-H% pattern is used for nonfinal elements of lists. With distributional evidence in narratives, the function of the other two patterns—L-H% and (L)H-L%—can be best described as differing in finality. Further in-depth investigations are needed to see how Totoli speakers employ IU-final prosody in conversations, which would include a comprehensive analysis of the prosodic realization of questions. Initial observations from elicitation as well as from spontaneous discourse suggest that each of the patterns is used in a similar way in wh-questions and in polar questions. The latter are often differentiated from statements through tags. My observations from Totoli are hence similar to Geluykens (1988:484), who states for English that IU-final rises versus IU-final falls should rather be attributed to the "signalling of 'non-finality' in the turn-taking system in conversation." Similarly, Levinson (2010) found that prosody is not used to distinguish polar questions from statements in Yélî Dnye; rather, speakers use facial expressions and prosodic tags.

Another point that requires further clarification concerns the alignment of tonal targets of the boundary-tone complexes. In particular, I have discussed IU-final sequences of unlike vowels. These can be realized as either monosyllables or disyllables. This alters the alignment of tones, as the phrase tone is associated with the prefinal syllable and the boundary tone with the final syllable. This is with the exception of the rarely occurring syllables containing long vowels, which attract both the phrase tone and the IU-final boundary tone. However, this may be explained by analyzing long vowels as consisting of two underlying short vowels, which surface as one phonetically single long vowel: CV.V# → CV:#. The tonal targets of the phrase tone and the boundary tone regularly spread over the underlying final two syllables.

The motivations for resyllabification are as yet unclear; if triggered by certain intonational patterns, it would point to a strong influence of tune on text. However, the majority of syllables are of the type CV(C). For this syllable type, I have presented evidence that the segmental material does not affect the alignment of tonal targets, impacting only the realization and the shape of the pitch

contour. Further detailed investigations into the interplay of text and tune are needed to determine the degree of influence wielded by the sonority of segmental material on the alignment of tonal targets and the shape of the pitch contour. It may well be the case that tonal targets are entirely independent of the segmental material.

This study is a first step in better understanding the intonation of Totoli, and there are a great number of questions that cannot be addressed in a single article. One topic that was not discussed here is the interplay of the prosody of Totoli with information-structural categories such as focus. As mentioned in section 2, some data used for the analysis here were obtained through the Animal Game stimulus tools for broad/narrow focus (Skopeteas et al. 2006:111). Information-structural categories do not appear to be a relevant category in Totoli with regard to the prosodic realization of utterances (see Bracks [2020] for an in-depth investigation).

One crucial point that needs further research is the analysis of IU-internal pitch events. The analysis presented here only focused on IU-final pitch events. Himmelmann's model (2018) analyze IU-internal pitch events as boundary-tones occurring at the right-edge boundary of smaller prosodic units, the intermediate phrase (ip). Himmelmann (2018:359) claims that these ip-final pitch events are always monotonal, consisting of simple rises only. Yet, the data he presents clearly show that ip-final tonal targets are much more varied. Further research is needed to identify the different IU-internal tonal patterns and to compare these to IU-final tonal patterns (see Bracks 2020).

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c.bracks@uni-koeln.de