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# Signaling discourse structure

**The marking of discourse topic boundaries in Jahai and  
Mah Meri spontaneous narratives**

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## **Abstract**

This study has examined how the right edge of a discourse topic is signaled through the use of  $F_0$ , duration, and particles in the two Aslian languages Jahai and Mah Meri. The goals of this study were to contribute to the knowledge of these languages, compare them to the related Kammu language in the search for similarities that could be applied to Austroasiatic as a whole, and to explore what kind of analysis is possible with a material not collected for prosodic research.

By comparing smaller non-topic-final and topic-final discourse units to each other, it has been shown that  $F_0$ , duration, and particles all do signal the end of a discourse topic, though in different ways depending on the language in question. A hypothesis was proposed that, while Kammu and Mah Meri display a similar use of  $F_0$  to mark the end of a discourse topic, Jahai and Kammu might belong to the same category when it comes to prosodic typology, and although little could be said on Austroasiatic as a whole, the results can be used in future studies on this topic. Finally, it was shown that working with this kind of material can indeed yield interesting and significant results.

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## ABBREVIATIONS

AFF	affirmative
ASST	assertive
ALT	alternative
DEM	demonstrative
EMP	emphatic
EQU	equative
FAM	familiar
GOAL	goal
HAPP	happenstance
HORT	hortative
ID	identification
IMM	immediate
INCL	inclusive
IRR	irrealis
LOC	locative
NEG	negative
NOM	nominalizer
PERF	perfect tense
PL	plural
PST.PROX	past proximate tense
REL	relative
RT	relational tense
SAY	reported speech
SUBJ	syntactic subject
THING	indefinite pronoun
TR	transitivizer
1	first person
3	third person

# 1. INTRODUCTION

Research on prosody beyond sentence level in various languages around the world has shown that the macro-structures of discourse, such as discourse topics, can be marked by various prosodic means. Such research has been conducted on for example Kammu, an Austroasiatic language of Southeast Asia (Karlsson et al., 2012), but for most languages, some of them otherwise well-described, research on macro-level prosody and discourse structure has not been carried out extensively. This is also true for the Aslian branch of the Austroasiatic languages, in which as of today prosody has only been described on word-level, and discourse structure has not been examined at all. Thus, this study is meant to be a first, preliminary and explorative study on the interaction between macro-level prosody and discourse structure in the Aslian languages.

## 1.1 Goals

The present study has several goals. The main goal, as mentioned above, is to investigate the connection between prosody and discourse structure in the Aslian languages. More specifically, this study will examine if and how the right edge of a discourse topic in two Aslian languages, Jahai and Mah Meri, is signaled through prosodic cues, namely pitch and duration, as well as non-prosodic cues, which here is the use of particles.

Also, larger scale goal is, as well as to document a part of this still under-described branch of languages and contribute to our understanding of these languages, to try take the first steps towards a typological sketch of prosody in Austroasiatic as a whole, comparing the results found here to existing work on prosody in Kammu. Since Jahai, Mah Meri and Kammu share the same basic word order and the same syntactic structure, a comparison of prosodic typology, as proposed by Jun (2012), is possible, to see if the three languages are prosodically similar.

Building onto this, a more general goal is to show what kind of analysis is possible using recordings of spontaneous language use that have not specifically been collected for prosodic research. As Himmelmann (2006) notes, standard linguistic fieldwork as it is carried out today does not usually include “reasonably detailed and comprehensive documentation and description of prosodic features”. Here then, is an opportunity to evaluate how well the material of the type used in this study is suited for the documentation of prosodic features.

To summarize, this study will examine if and how the right edge of discourse topics are marked through various cues in Jahai and Mah Meri. It will also compare the results with what is known about prosody and discourse in Kammu, and discuss if they are similar to each other and possibly belong to the same type when it comes to prosodic typology, and if what has been found for these languages somehow can be extended to Austroasiatic as a whole. This study will also show how spontaneous material can be used for prosodic research. Hopefully, the outcomes of this study can serve as a hypothesis for future studies.

## **1.2 Choice of languages**

Two languages have been chosen to be examined in this study: Jahai, a Northern Aslian language, and Mah Meri, a Southern Aslian language. The main factor to the choice of working with the Aslian languages and in particular these two languages, is the factor of convenience. The access to spontaneous material is limited, but the Aslian languages have rich data sets thanks to their presence in the DoBeS archive at the Max Planck Institute for Psycholinguistics. This material offers interesting analytical environments, and allows for a comparison both between closely related languages when it comes to the Aslian branch, as well as between the most distantly related of these languages, namely Jahai and Mah Meri. Doing this study on Aslian also allows for the ability to compare the results with those of earlier work on Kammu, due to their shared word order and syntactic structure. There is thus a possibility to, through this particular choice of languages, generate interesting questions, results and hypotheses.

## **1.3 Structure of the study**

In the first section of this study, the Aslian branch and the Jahai and Mah Meri languages will be further introduced and described, particularly mentioning their differences and similarities to each other as well as to other Aslian languages and Austroasiatic languages. Earlier research on the Aslian languages will also be presented. Thereafter, what is known about the function of particles and exclamations in Jahai and Mah Meri will be treated briefly, before describing the basic concept of discourse structure. Here, from the viewpoint of this study, attention will be paid to how discourse can be segmented and what terminology and definitions have been proposed in previous studies. Earlier findings will also be presented, if relevant.

The following method chapter contains information about the material, the speakers, and the narratives, as well as a short mention of the tools used. Then the actual process of segmenting

the discourse, measuring  $F_0$  and duration, and dealing with the particles, will be described. Following that, the way the analysis of  $F_0$ , duration and particles was conducted will be presented.

The result chapter then deals with one language at a time, one feature at a time, and in the following discussion chapter, the results will be discussed and related to earlier research. Here methodological problems will be given a thought as well, and the possibilities for future research will be evaluated.

Finally, the core findings and outcomes of this study, as well as possible hypotheses, will be summarized in the conclusion chapter.

## 2. BACKGROUND

### 2.1 The Aslian languages

#### 2.1.1 Overview

The Aslian languages, spoken in peninsular Malaysia and parts of southernmost Thailand by the *orang asli* ('original people' in Malay), constitute the southernmost branch of the Austroasiatic language family which is spread across the Southeast Asian mainland and parts of India. It has been suggested that the Austroasiatic language family is the oldest present language family in the area (Sidwell & Blench, 2011), and this seems to be a quite well-established theory today (Diffloth, 2012). As for the Aslian languages, they seem to be most closely related with the Mon language of Burma (Diffloth 1984), and possibly Nicobarese spoken on the Nicobar Islands, although no detailed study on their relationship exist as of today (Benjamin, 2011).

The Aslian branch is further divided into three groups; Northern Aslian, Central Aslian, and Southern Aslian, the terminology reflecting their geographical spread (Matisoff, 2003) as can be seen in Figure 1. The status of the Jah Hut language uncertain, and might by itself constitute a fourth group (Diffloth & Zide 1992; Dunn et al. 2011).

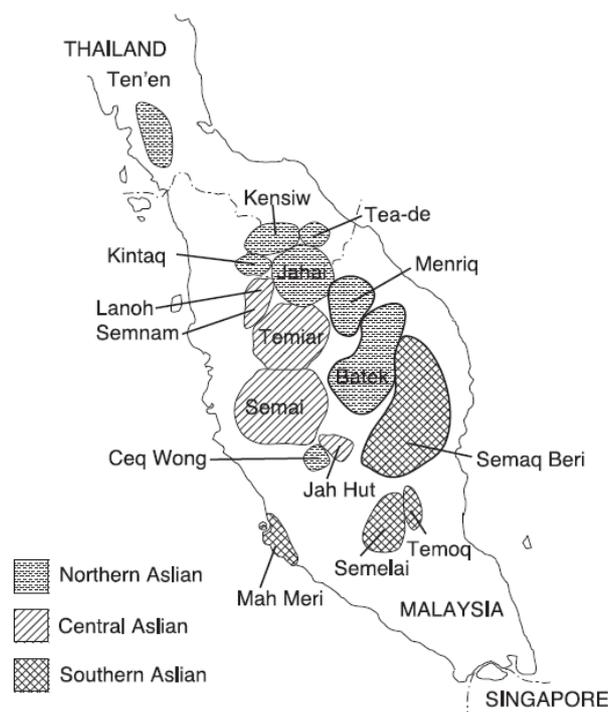


Figure 1. Map showing the general distribution of Aslian languages in Malaysia and Thailand, as well as the geographical spread of the three main branches and the location of Jahai and Mah Meri (Dunn et al., 2011).

### ***2.1.2 The Jahai language<sup>1</sup>***

The Jahai language belongs to the Northern branch of the Aslian languages, and is spoken in the Malaysian states of Perak and Kelantan, and in the Yala and Narathiwat provinces in southernmost Thailand. The total number of speakers is uncertain, but the safest bet is probably within the range of 1,000 to 1,500 individuals, or possibly some hundred more (Benjamin, 2010).

Jahai features a fairly typical phoneme inventory for an Aslian language, and a few interesting features of its phonology includes the disallowance of open syllables in word final position, which is quite typical for parts of the Aslian languages, including the neighboring language Temiar, its word-final stress, which is quite typical for all Austroasiatic languages (Diffloth, 2012), and its lack of a length distinction in its vowels, which is found in Central Aslian, for example in Temiar (Benjamin, 1976), but not in the other branches of Aslian. Another feature which has some importance in this study is the prestopped allophones of the nasal consonants in word-final position when preceded by oral vowel.

When it comes to morphology, Jahai is, like most other Aslian languages, rich in morphology compared to other Austroasiatic languages (Matisoff, 2003), except for the Munda branch (Anderson, 2006a), and this morphology is above all employed for various derivational processes. Verbs and nouns are two easily distinguishable word classes, with very few forms being able to work both as verbs and nouns. Both these classes are also syntactically distinct from each other.

Syntactically, Jahai is a fairly typical head-initial language with a SVO word order.

### ***2.1.3 The Mah Meri language<sup>2</sup>***

In contrast to Jahai, Mah Meri is located on the other side of the Aslian branch, being a Southern Aslian language, and it is also the Aslian language located the furthest away from Jahai geographically speaking, as evident in Figure 1. It is spoken on the south-west coast of Peninsular Malaysia in the Selangor state, just south of Kuala Lumpur, and it is also the southernmost language in the whole Austroasiatic family. Its speakers number about 2,200 (Kruspe & Hajek, 2009), but might be as many as 2,800.

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<sup>1</sup> Where not stated otherwise, the main references for this section in Burenhult (2005), as well as personal communication with Burenhult (2012, 2013).

<sup>2</sup> Where not stated otherwise, information on the structural characteristics of Mah Meri was supplied by Nicole Kruspe (2012).

Noticeable phonological features in Mah Meri include a distinction between breathy voice and modal voice (Kruspe & Hajek, 2009), which seems to be unknown in Aslian languages in general but is found in other Austroasiatic languages (Diffloth, 2012). It also allows word-final syllables without a coda consonant (Kruspe & Hajek, 2009), unlike Jahai.

Mah Meri is typologically an isolating language, and is, with its marginal derivational morphology, less morphologically complex than its northern relatives such as Jahai. It is notable for its rampant zero anaphora, which distinguishes it from for example Kammu (Karlsson, personal communication, 2012), and its large set of sentence final particles.

Mah Meri is, like Jahai, a SVO language with a head-dependent word order, although SOV seems to be a fairly common alternative.

#### ***2.1.4 Research on the Aslian languages***

The first documented research on the Aslian languages was conducted over a century ago, with the earliest transcription of an Aslian language being made by R. J. Lloyd in 1902, and an early grammatical description of Jahai was produced by Schebesta in 1928. Since then, research on the Aslian languages has not been very regular, although Benjamin (1976) and Diffloth (1972, 1974a, 1974b, 1975, 1976a, 1976b, 1976c, 1976d, 1977, 1979) did some important work in the 60s and 70s, as well as Asmah (1964, 1976). Systematic work in the form of modern description and documentation has only been carried out during the last twenty years (Benjamin 2011), and quite recent major contributions to the description of these languages are a grammatical sketch of Temiar (Benjamin, 1976), two grammars, one of Jahai (Burenhult, 2005) and one of Semelai (Kruspe, 2004), as well as a dictionary of Mah Meri (Kruspe, 2010).

Despite these works, the Aslian languages are still rather understudied, not least when it comes to their prosodical systems. While other Austroasiatic languages have been studied prosodically, for example Kammu (Karlsson et al., 2012) and Chrau (Thomas, 1966), there is little mention of Aslian prosody in the descriptions available, except for brief descriptions of stress, voice register, lexical tone, vowel duration, vowel nasalization, and rhythm (Benjamin, 1976). Whether Aslian has got lexical tone is however still an ongoing controversy.

## 2.2 Particles and exclamations<sup>3</sup>

The particles concerned in this study are sentence final particles located at the right edge of a basic discourse unit. The use of particles in Jahai and Mah Meri is not well described, and what little is known will be presented below, focusing on the particles that are relevant here.

### 2.2.1 *Particles and exclamations in Jahai*

Two particles are present in the Jahai material, *leh* and *bəh*. *Leh* is described as having an emphatic and affirmative use by Burenhult (2005). It can either be word, phrase, clause or sentence final, and originally stems from the Malay particle *lah*.

The second particle is *bəh*. It is not certain whether it should be described as a particle or exclamation, but it is glossed as an exclamation in the material and seems to be able to stand alone as an utterance and sometimes occur at the beginning of a sentence, and it is also often preceded by a long pause that separates it from the preceding clause. It has therefore not been included in the smaller-size discourse units here, but since it otherwise generally patterns with the other particles covered, it will therefore hereon be treated as a particle for the sake of ease of analysis. It is possible that *bəh* might be used to signal that the information presented by a speaker is first-hand information, and it is likely to be conditioned by stylistic and personal reasons.

### 2.2.2 *Particles in Mah Meri*

Mah Meri, as has been mentioned, distinguishes itself from other Aslian languages by making use of a large set of sentence final particles; more than 30, whereas other Aslian languages usually have four or five. These particles constitute a separate word class, distinguished by their inability to stand alone as an utterance, and their meanings vary with the context they appear in. They serve a large range of functions, working as declaratives, imperatives, markers of polar and content questions, and show epistemic and illocutionary distinctions as well as speaker attitude.

Of the particles relevant here, *yək*, *lew* and *kə* are described by Kruspe having assertative functions. *Yək* is further described as having an evidential-type function, and is used by the speaker when talking about his or her own bodily sensations or processes, or mood. It can also

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<sup>3</sup> Where not stated otherwise, information on the particles and exclamations in Jahai comes from Burenhult (2005) or personal communication with Burenhult (2012), and information on the particles in Mah Meri comes from personal communication with Nicole Kruspe (2012).

be used in the third person, functioning as a hearsay or reportative marker. The particle *kɔ* is also described as a possible factual marker.

Two other particles, *ʔɔs* and *=ã*, are described by Kruspe as markers both of questions and assertions. *ʔɔs* suggests that the speaker's opinion is contrary to what has been said, while *=ã* usually is associated with statements, and has been described by a native consultant as indicating that the speaker has got more to say, likened to the '...' in cartoon captions. Kruspe and Hajek (2009) mention that it is described by other speakers as having a rhetorical function, indicating "some kind of tailing off". *=ã* appears as a clitic on the preceding word, and is not described as a particle, but it is always clause-final and has here, just like *bəh* in Jahai, been counted as a particle.

The last two particles that appear in the material, *mbo* and *hã*, both have question marking functions.

## **2.3 Discourse, discourse structure, and the segmentation of discourse**

### ***2.3.1 Discourse***

Discourse concerns the structures above sentence level where single sentences are organized into a flow of speech that communicates our thoughts (Chafe, 2003). This means that, just like morphemes, words and phrases are organized into a hierarchical structure within a clause, discourse consist not just of a string of sentences but has a structure of its own where lower-level units are grouped into larger units, which themselves then are grouped into even bigger units. Speakers can mark this structuring of the discourse through both non-prosodic and prosodic means (Swerts & Geluykens, 1994). Below, a short overview of what kinds of discourse units the authors of previous works on the role of prosody in discourse have worked with, what criteria they have used for segmenting the discourse into these units, what units and criteria are used in this study, and what has been found out about the role of prosody and other linguistic cues in discourse in earlier studies, will be presented.

### ***2.3.2 Segmenting the discourse***

Defining and comparing the discourse units presented in earlier works on prosody and discourse in languages around the world is hard due to a number of factors. The units vary a lot in size, from small intonation units (Lovick & Tuttle, 2012), prosodic phrases (Karlsson et al., 2012), or intonational phrases (Kong, 2004), to very large structures such as the supertopic (Chafe, 2003). When employing these different units, different authors have worked on

different levels of the discourse, and those who have worked with the same-level structures often make use of varying terminology and/or varying definitions.

This study deals with two different discourse units that are equal or similar to the units used by earlier authors; the smaller *basic discourse unit* and the larger *discourse topic*. The reason for using two units is simple; the discourse topic is the main focus of this study, but calls for a lesser unit to compare it to. Below, these discourse units will be introduced, the origin of their definitions will be explained, and examples will be given from other studies that have worked with similar units.

### ***2.3.3 The smaller units of discourse***

The smaller discourse unit used here is, as mentioned, the basic discourse unit, though smaller segments of the discourse can be found in the literature, such as the *prosodic phrase* (Karlsson et al., 2012) or the *intonation unit* (Chafe 1994). Similar units to the basic discourse unit is the *prosodic utterance* used in Karlsson et al.'s (2012) work on Kammu and Lovick and Tuttle's (2012) *story unit* that they used in their study of Dena'ina prosody and discourse. Karlsson et al. (2012) define their prosodic utterance by prosodic criteria, while the Dena'ina texts were segmented into story units by native speakers that were shown to have clear intuitions of where the boundaries between these units would go (Lovick & Tuttle, 2012). The story unit is, according to Lovick and Tuttle (2012), the "closest correlate to the concept of a sentence". Similar units are referred to in the literature variously as *verse* (Hymes, 1981), *line* (Woodbury 1983; 1985), and *prosodic sentence* (Chafe 1994), depending on the language described. These different ways of defining the discourse units work in their respective studies, but none of them were possible to use here; the lack of native speakers made segmentation in the spirit of Lovick and Tuttle (2012) impossible, and since nothing is known about prosody above word level in Aslian, a prosody-based definition could not be used.

A third way of segmenting discourse however, as presented by Degand and Simon (2009), is to base the segmentation on syntactic structures. They state, as has already been observed, that there is little agreement in the existing literature on what a discourse unit is and how such a unit should be defined. They suggest the basic discourse unit as a good choice, and they identify it as belonging to one of three types: basic discourse units defined by syntactic criteria, basic discourse units defined by prosodic criteria, and basic discourse units for which the syntactic and prosodic criteria overlap.

The basic discourse unit as used in this study has been adopted from Degand and Simon's (2009) study, and would, according to them, be a syntax-bound basic discourse unit. The verb and its governed complements constitute the core of this unit, together with additional adjuncts that are not based on syntactic criteria since they are not governed by the main verb, but rather by semantic and pragmatic criteria. The adjuncts are thus not independent units in the discourse but are linked to the dependency clause semantically and pragmatically. This fits the definition of a story unit in Lovick and Tuttle's work (2012), which, among other criteria, is said to have or express "one center of interest". The center of interest in the definition of a basic discourse unit here is the action expressed by the verb. In the procedure section, examples will be given of how exactly the texts were segmented.

#### ***2.3.4 The larger units of discourse***

The larger discourse unit in this study, which spans one or several basic discourse units and which also is the unit whose right-edge boundaries are the focus here, is referred to by Chafe (2003) as the *discourse topic*; this is the terminology employed in the present study as well. It is mentioned by Lovick and Tuttle (2012) as the *paragraph*. The term paragraph is also used by Karlsson et al. (2012) following Bruce (1998), and a similar unit is used by Oliveira (2006) in his study of prosody as a marker of discourse segmentation in Suyá, a Macro-Jê language.

Since the focus here is on examining the role of prosody in the structuring of discourse, prosody cannot use as a criteria for identifying discourse units, due to the risk of circularity (Swerts & Geluykens, 1994). Also, according to Oliveira (2006), prosody does not directly match syntactic structure but rather follows semantics and pragmatics, which expresses the need of another method of segmenting the discourse into topic than was used for the basic discourse units, which only serve as reference units.

Thus, the discourse topics as they are defined in this study build on semantic and pragmatic criteria. Following Chafe (1994), the discourse topic is a segment of discourse during which one or more speakers talk about "the same thing". It is further defined as a unit that can vary greatly in length, usually has a defined beginning and sometimes a defined end as well, and is above all identifiable from its semantic content. These are the main definitions of the discourse topic observed here. Multiple discourse topics can further be included in larger supertopics, but these seem to lack the internal structure that is common of discourse topics (Chafe 1994). Geluykens (1992a, 1992b) mention that "new discourse topics are defined as non-recoverable pieces of information"; they thus introduce something new to the discourse.

### *2.3.5 The role of prosody and other linguistic cues in discourse*

Prosody and other linguistic cues have been proven to be important indicators of discourse structure in several languages in the works by the authors mentioned above, as well as others.

Intonation is probably the most widely known parameter that is employed in the structuring of discourse. Swerts and Geluykens (1994) found that speakers of Dutch may mark the right edge of a paragraph, corresponding to our discourse topic, through the use of a low boundary tone, while high boundary tones are used within a paragraph to signal the coherence between its constituent smaller units.

Kong (2004) discovered that downdrifts similarly occur throughout a discourse segment in Korean. A pitch reset then marks the beginning of a new discourse segment. An important conclusion in his study is that the degree of pitch reset corresponds to what kind of boundary in the hierarchical structure of the discourse it is located at in spontaneous speech, but not in read speech. He also states that these findings are similar to findings for English, Japanese, and Mandarin Chinese.

Similar results were also found in Suyá (Oliveira, 2006). As mentioned, intonation units were here segmented into larger units, where each unit represents a single speaker intention. As with the paragraphs in Dutch, a majority of the boundaries between these larger discourse units were marked with a low boundary tone, while other boundaries usually were marked with high boundary tones. Similar results have also been found for Swedish by Bruce (1982), here taking the form of a downstepping of accents and a pitch reset at the beginning of a new discourse topic.

In Kammu too, intonational cues of underlying discourse structures have been found (Karlsson et al. 2012). Of particular interest here is that the coherence within a discourse topic is signaled through an upstepping of the final accents in prosodic utterances (that equal basic discourse units) up until the point where the speech paragraph ends, with the highest tonal rise thus appearing at the end of a paragraph. This is a deviant pattern compared to the languages described so far, in which the right-edge boundary of a discourse topic is marked with a low, not high, boundary tone. As will become evident, this is particularly interesting concerning the focus of this study.

In these earlier studies then, it has been shown that intonation is an important cue for the underlying discourse structure, perhaps in particular when followed by a pitch reset. This

pitch reset is described by Oliveira (2006) as a very accurate indicator of a discourse boundary, and Kong also made the interesting finding that the discourse structure is more clearly reflected in spontaneous speech than in read speech, which also shows why it is important to use spontaneous material when doing research on discourse structure.

As for duration, it has been shown that both rhyme length and pause length can be utilized for the marking of the right edge of a discourse topic. In Dutch for example, longer-than-normal pauses can be employed to separate paragraphs from one another (Swerts & Geluykens, 1994), and Lovick and Tuttle (2012), while not studying discourse boundaries, found that rhyme length and pause length are employed to mark the ends of lesser discourse units in Dena'ina. Oliveira (2006) too found that pauses are lengthened after discourse topic boundaries in Suyá.

Many of the authors above, for example Swerts & Geluykens (1994) and Kong (1994), also note that there usually is a fair deal of variation between speakers, so that different speakers make use of the different parameters they have at their disposal to different extents, and Bruce (1982) writes that the speaker has the ability to choose “how much use to make of the intonational possibilities for signalling coherence and boundaries”. Swerts and Geluykens (1994) further note that it would also seem like final cues are more important than initial ones, at least in Dutch.

A final observation can be made then, that for all the languages presented here, the marking of a discourse topic boundary prosodically takes the form of a breaking of the general pattern, whether this breaking occurs through duration or pitch, which Bruce (1998) notes.

## **3. METHOD**

### **3.1 Informants**

#### ***3.1.1 Jahai informants***

The Jahai recording features two speakers, a male, CP, and a female, CW. Both were between 60 and 70 years old at the time of the recording.

#### ***3.1.2 Mah Meri informants***

The Mah Meri recording features four speakers (though one only appear once in the recording), but only the speech of two speakers was examined: that of a male, AZ, and that of a female, GA. At the time of the recording, AZ was 36 years old, while GA was around 90 years old. GA noticeably was the oldest person in the village, and features, according to Nicole Kruspe, a way of speaking that does no longer occur in younger speakers.

### **3.2 Material**

The material used in this study consists of two recordings of spontaneous narratives in Jahai and Mah Meri, one for each language. Both are audio as well as video recordings, and are accompanied by transcriptions, glosses, and translations, which were made by Niclas Burenhult and Nicole Kruspe for their respective languages<sup>4</sup>. The recordings come from the multimedia archive for the DoBeS endangered languages program at the Max Planck Institute for Psycholinguistics in Nijmegen, the Netherlands, and are available as .wav, .mpg and .eaf files. For the Mah Meri material, glosses were provided in a separate .txt file.

Both recordings feature narratives that are varyingly of monologic and dialogic nature, although the monologic parts were the most useful. The Jahai recording is more of a monologue than the Mah Meri recording, with one speaker carrying the narrative forward, with the other speaker usually just adding comments here and there.

#### ***3.2.1 Jahai Material***

The Jahai recording, which can be found as NarrTrad1 in the DoBeS archive, is 12 minutes and 20 seconds long, of which 12 minutes and 15 seconds were used here. The material consists of a total of 219 basic discourse units shared between two speakers.

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<sup>4</sup> All glosses presented in this study have been taken directly from the annotations in Elan made by Burenhult and Kruspe. In a few cases the abbreviations used have been adjusted slightly for the sake of coherence.

The recording was made in the Hulu Perak District, Perak State, Malaysia, on March 3, 2007, and the themes featured in the narrative mainly concern childbirth, such as the procedures undertaken during and after the moment of birth, taking care of the infant, watching the child learning to walk and talk, and the making of a traditional Jahai medicine. The narrative is mostly of a procedural nature, which facilitates segmentation of the discourse.

Below in (1) is an excerpt from the first part of the Jahai material from Elan, which concerns the birth of a child, showing the one of the themes of the narrative, its general structure, and the segmentation into basic discourse units (surrounded by square brackets []) and discourse topics (followed by exclamation marks !). This excerpt can be seen as representative for the for the whole material in terms of structure.

(1) Excerpt from the Jahai material, segmented into basic discourse units and discourse topics.

orth-CW bəh, [darah, lpas darah, ja=ley ʔoʔ,] [ʔoʔ gis ley ʔoʔ,] bəh !

gloss-CW X [blood after blood RT=body 3] [3 to.descend body 3] X !

transl-CW (exclamation) [blood, after the blood comes its body,] [its body comes down,] (exclamation) !

orth-CW haʔih, [ja=pn=ʔəh]

gloss-CW AFF [RT=EQU=DEM]

transl-CW yes, then like this

orth-CP [ca=ʔel ba=ʔaniʔ] [ʔoʔ gis b=ʔuyih X]

gloss-CP [HORT=to.look GOAL=DEM] [3 to.descend GOAL=DEM X]

transl-CP [look that way] [it comes down X]

orth-CW haʔih, [ʔoʔ gis b=ʔuyih pn=ʔəh,] [ʔoʔ sriləm pn=ʔəh,] bəh !

gloss-CW AFF [3 to.descend GOAL=DEM] [EQU=DEM 3 to.X EQU=DEM] X !

transl-CW yes, [it comes down there like this,] [it comes out like this] (exclamation) !

orth-CW s<n>rəh ləh, [ʔoʔ sriləm pn=ʔəh] !

gloss-CW to.be.born<NOM> EMP [3 to.X EQU=DEM] !

transl-CW birth, yes, [it comes out like this] !

orth-CP s<n>rəh

gloss-CP to.be.born<NOM>

transl-CP birth

orth-CW [ja=lpas ton, ja=ʔoʔ wet cpah,] lpas cpah, ja=darah, [lpas darah

ja=ʔoʔ gis ley ʔoʔ,] bəh, [ʔoʔ turun ley ʔoʔ b=ʔuyih]

gloss-CW [RT =after DEM RT=3S to.flow amniotic.fluid] after amniotic.fluid  
RT=blood [after blood RT=3 to.descend body 3] X [to.descend body 3  
GOAL= DEM]

transl-CW [after that the water breaks], after the waters there's blood, [after  
blood its body comes down,] [its body goes down]

orth-CW bəh !

transl-CW (exclamation) !

orth-CP ley leh [ja=lpas ton ja=gin kɛc leh pn=ʔəh]

gloss-CP body EMP [RT=after DEM RT=3PL to.cut.off EMP EQU= DEM]

transl-CP the body [after that they cut off like this...]

orth-CW ja=... [ja=lpas ton ja=gin kɛc]

gloss-CW RT= [RT=after DEM RT3PL to.cut.off]

transl-CW [after that they cut off]

orth-CW [gin kɛc sək ʔoʔ,] [sək ʔoʔ ton, gin kɛc,] [ja=gin boh leh səm ʔoʔ ton,]  
[gin bay,] [gin bay ba=teʔ,] bəəəh !

gloss-CW [3PL to.cut.off umbilical.cord 3] [umbilical.cord 3 DEM 3PL to.cut.off]  
[RT=3PL to.put EMP placenta 3 DEM] [3PL to.dig] [3PL to.dig GOAL=ground X] !

transl-CW [they cut off the umbilical cord,] [its umbilical cord, they cut it,]  
[then they put away the placenta,] [they dig,] [they bury it in the  
ground] (exclamation) !



orth-NDK kədɔ saʔi nake pahoʔ sultan mələkə  
 orth-NDK critə hŋkiʔ, tapiʔ həuəʔ ɲgət

orth-AZ [citaʔ cinaʔ ke nɔŋ dəke ʔɔs,] [cələy haʔ take ke nɔŋ] [bukaʔ maŋgəʔ met  
 bukaʔ dah ke nɔŋ] !  
 gloss-AZ [story chinese that PST.PROX like.that too.bad] [to.descend LOC there that  
 PST.PROX] [to.open older.person eye to.open PERF that PST.PROX] !  
 transl-AZ [The Chinaman's story was just like that,] [(they) descended there  
 (and) opened (their eyes),] [the ancestors had opened their eyes...] !

orth-AZ [təpaksə] [təhɔʔ təmpat hiʔ=ə̃ dəke yɔk] !  
 gloss-AZ [x] [here place 2 ASST like.that] !  
 transl-AZ [(They) were forced,] ["Here is your place", I heard (the story) like that.] !

orth-GA ʔəʔə̃ [mɛt təbukaʔ dah]  
 gloss-GA [eye HAPP-to.open PERF]  
 transl-GA Yes, [their eyes opened.]

orth-GA [hmaʔ ke nɔŋ kajət ɲgət, bukaʔ=ə̃] !  
 gloss-GA [person that PST.PROX TR-to.allow NEG to.open ASST] !  
 transl-GA [The person wouldn't allow them to open (their eyes)..] !

orth-GA [ʔaga cɔʔ nəgəriʔ cinaʔ namaʔ kələ yɔk]  
 gloss-GA [IMM to.go country chinese THING also SAY]  
 transl-GA [(They) were on their way to China or somewhere, it is said.]

orth-GA [ʔaga cɔʔ kah,] [ʔaga nimbol kah] !  
 gloss-GA [IMM to.go ALT] [IMM to.come.from ALT] !  
 transl-GA [(They) were setting off,] [or (they) were going to arrive?] !

orth-S hŋkiʔ ke, maŋgəʔ naleʔ pɛhɛʔ ke hāp dah man  
 gloss-S 3 that older.person to.be.of.old past that NEG.EXIST PERF x  
 transl-S The old timers are all gone...

### 3.3 Software

Four pieces of software were used in the study. *Elan* was the program used for exploring the recordings and their time-aligned annotations, which include transcriptions, glosses, and translations, as can be seen in (1) and (2). Selected parts of the material were then transferred to *Praat* for measurement of pitch and duration. The measurements were noted and organized in *Excel*. Linear regression analysis was performed in the software *R* as a part of the analysis of the data.

### 3.4 Procedure

The following section describes how the data presented in the results chapter was collected from the material. In order to reveal if the right-edge of discourse topics were marked by intonation, duration or the use of particles, discourse-topic-final (hereafter topic-final) and non-topic-final basic discourse units were compared.

#### 3.4.1 Identifying basic discourse units

Due to the need of a prosody-independent segmentation, the discourse was segmented into basic discourse units following the method for segmenting discourse according to syntactic criteria as was suggested by Degand and Simon (2009), presented earlier. This approach was generally followed, and (3) shows a stretch of speech divided into three basic discourse units.

- (3) [kambək biri biri ke, cəʔək] [lambuʔ pət cəʔək] [hayam pət cəʔək]  
goat x x that roast bovine also roast fowl also roast  
'Lamb, (they) roast (it). Beef too (they) roast. Chicken too (they) roast.'

In order to follow Degand and Simon's (2009) approach as faithfully as possible, some utterances that certainly are clauses in their own right were excluded from the analysis due to their failure to meet the criteria. Since the verb is the very core of the basic discourse unit, this was the case for verbless clauses, which arise for example in Mah Meri due to zero anaphora, as in (4) and (5), or in Jahai when the identification marker l= is used, as in (6).

- (4) ʔəʔət jarək, ca kələ, jarək  
1 infrequent to.eat also infrequent  
'I infrequently (ate it), ate (it) too, (but) not often.'

(5) sək baŋkək kədɔ hmaʔ kapal himay yək  
 Bangkok.Hill to.say person ship previous SAY  
 ‘People say Bangkok Hill (was) once a ship.’

(6) ton lɛh l=jahay btol, mɔh ya=ʔtʔet  
 DEM EMP ID=Jahai to.be.true 2.FAM IRR=to.know  
 ‘That’s the true Jahai way, you’ll know.’

### 3.4.2 Identifying discourse topics

The discourse was segmented into discourse topics by semantic and pragmatic criteria following Chafe (1994), and also Geluykens (1992a, 1992b), as described in the background. A simple but effective approach to the identity of a discourse topic was the question “What are they talking about now?”, asked at any point in the narrative. A stretch of speech that first deals with one particular kind of food, and then another kind of food, would be segmented into two different discourse topics, although they may belong to the same supertopic food, as exemplified in (7). Again, square brackets [ ] are employed to mark basic discourse units, while the right edge of a discourse topic is marked by an exclamation mark !. Here the first topic is different kinds of meat, while the other topic concerns plant-based food. Note that these two topics are unusually small.

(7) [kambək biri biri ke, cəʔək] [ləmbuʔ pət cəʔək] [hayam pət cəʔək] !  
 goat x x that to.roast bovine also to.roast fowl also to.roast  
 ‘Lamb, (they) roast (it). Beef too (they) roast. Chicken too (they) roast.’

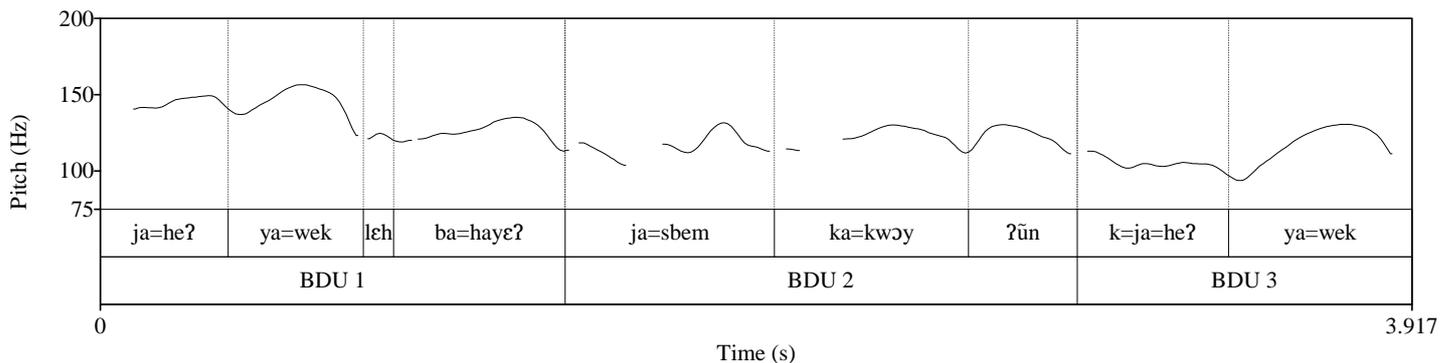
[kadək kadək ke, cəʔək kəntək, muntɛt] [tukal ke cəʔək]  
 sometimes sometimes that to.roast x little pumpkin that to.roast  
 ‘Sometimes there, (they) roast a little potato. Pumpkin (they) roast.’

In some cases the existence of a discourse topic boundary was uncertain. In such cases a boundary was placed rather than not.

### 3.4.3 Measuring $F_0$

$F_0$  was measured on the last peak in the intonation curve in each basic discourse unit, as shown in Figures 2 and 3. This last pitch peak often coincides with the last syllable of a discourse topic. This is particularly true for Jahai, with some occurrences of the sentence final particle *leh* being the main exception from this general pattern. Figure 2 below shows a typical  $F_0$  contour for Jahai, here specifically for the three non-topic-final basic discourse units in (8).

- (8) [ja=he?      ya=wek      leh ba=hayε?] [ja=sbem      ka=kwɔy      ?ün]  
 RT=1.PL.INCL IRR=to.go.back EMP GOAL=house RT=to.be.full SUBJ=tuber.sp DEM  
 ‘Then we’ll go back home, we already have lots of those tubers,  
 [k=ja=he?      ya=wek]  
 REL=RT=1.pl.incl IRR=to go.back  
 so let’s go back’

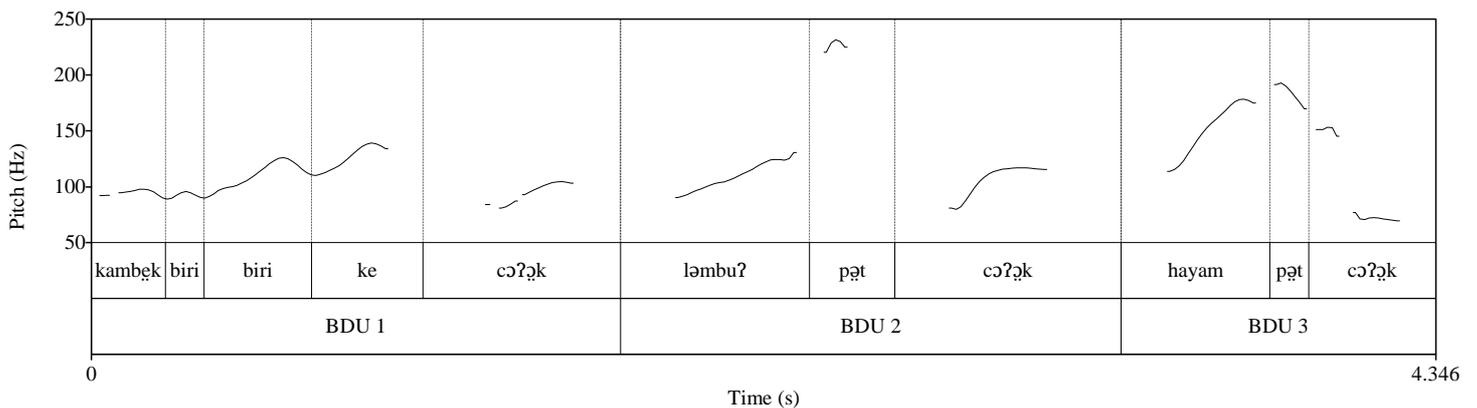


**Figure 2.**  $F_0$  contour for (8), from CW (Jahai), showing three non-topic-final basic discourse units. The locations of the  $F_0$  measurement are the highest point in the words *ba=hayε?* ‘home’, *?ün* ‘those’, and *ya=wek* ‘will go back’. The  $F_0$  contour has been smoothed with a bandwidth of 10 Hz.

In Mah Meri, the last pitch peak less often located in the last word of a basic discourse unit, in particular, it seems, when the last word is a particle. In other cases something that might be focus was encountered, as in Figure 3, which seems to cause the  $F_0$  peaks to move. What should be noted here then, is that the measurement point for the  $F_0$  is not necessarily located directly in the affinity of a segment boundary, though it usually is.

All  $F_0$  measurements were performed by hand in Praat, and the pitches were noted in Hertz. Generally, a pitch setting of 50-250Hz was used for the males, while a pitch setting of 100-

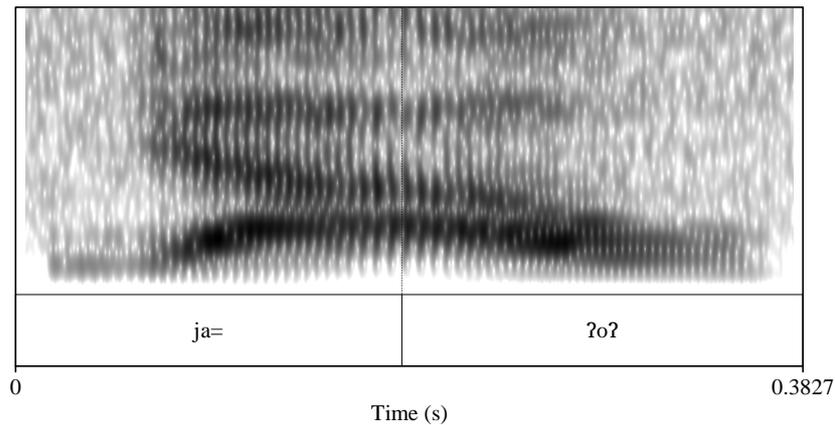
350Hz was used for the female speakers. In the case of GA (Mah Meri), the pitch range had to be increased up to 450Hz in a few cases. For comparison between speakers, the  $F_0$  values were later converted into semitones, as described in the following analysis section, and are presented as semitones in the result chapter. In Figure 3 however, where the  $F_0$  contour of an individual speaker is shown, Hertz is used.



**Figure 3.**  $F_0$  contour for (3), from AZ, showing three separate basic discourse units, the last one being topic-final. In each story unit, the highest point in the word *cəʔək* ‘to roast’ is the location of  $F_0$  measurement. In the last basic discourse unit, the pitch peak is not located at the edge; it is followed by a lower pitch. Note that the pauses between the basic discourse units have been shortened due to space limitations, and that the  $F_0$  contour has been smoothened with a bandwidth of 10 Hz.

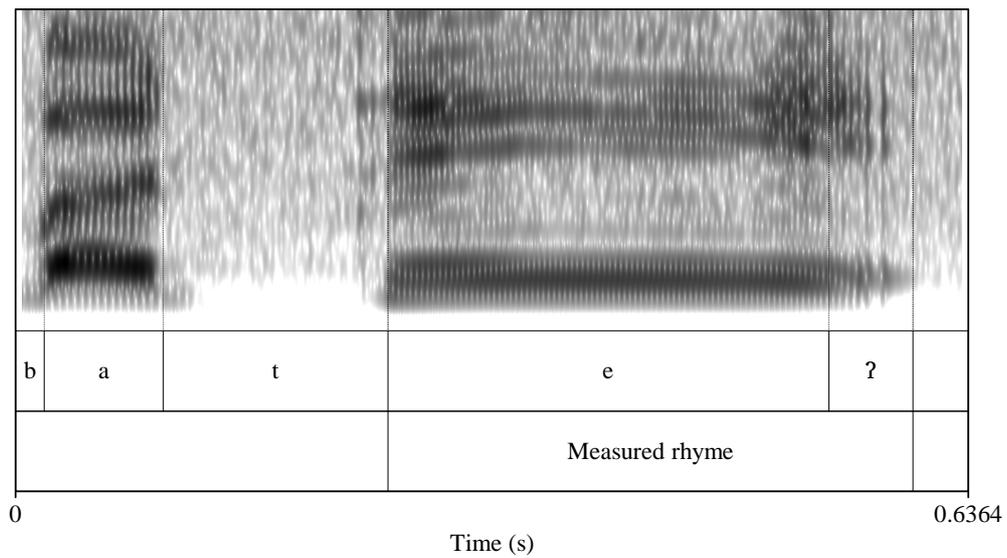
### 3.4.4 Measuring rhyme length

As with  $F_0$ , the measurement of duration was tricky in some places. More specifically, rhyme length was generally measured from the beginning of the second formant in the rhyme to the end of speaker oral noise in the same syllable, as can be seen in Figures 4 and 5, and all measurements presented here are in milliseconds. This was a straight-forward method in most but not all cases, most noticeably syllables ending in or beginning with a glottal stop. This glottal stop was, particularly in Jahai but also in Mah Meri, realized as creaky voice on parts of or the whole following or preceding vowel, as shown in Figure 3, which made the measurement of rhyme duration more difficult in these cases. In these cases the duration was consistently measured from the middle of the creak if the glottal stop was intervocal, or from or to the beginning or end of the creak if the glottal stop occurred in the onset or the coda of the syllable.

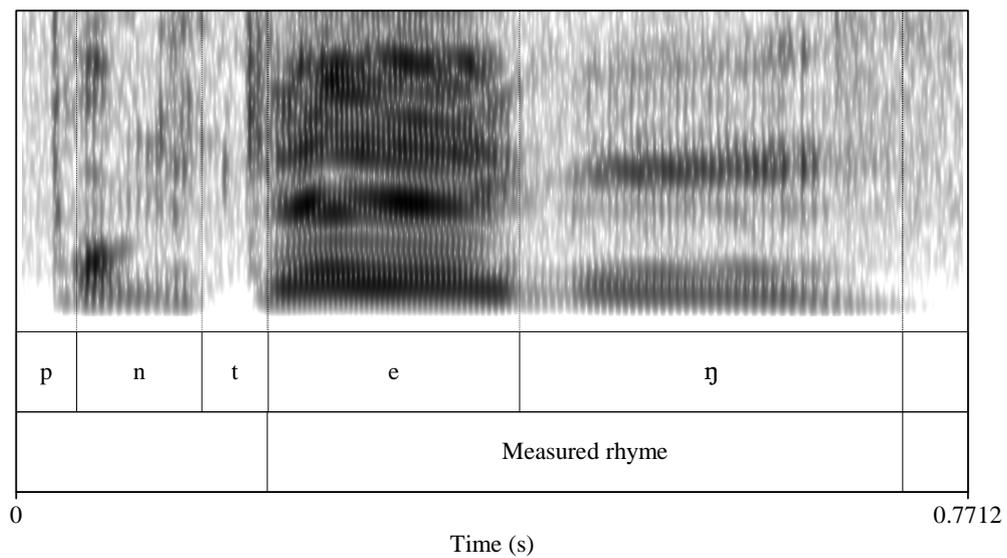


**Figure 4. Spectrogram showing the realization of the intervocal glottal stop in word *ja=ʔoʔ* ‘then it’ as creaky voice on the adjacent vowels in CW (Jahai). Here, the syllable break was placed in the middle of the creaky portion of the vowels.**

Another complication during the measurement of rhyme duration, which required special attention, was the difference in rhyme length depending on different types of consonants in coda position. This was first observed in Jahai word-final syllables ending in nasals, due to their allophonic realization as prestopped nasals in this position, as shown in Figure 4. Their allophonic variants usually rendered the rhymes they occur in much longer than they otherwise would have been. Further examination showed that rhyme length was similarly, though not as drastically, affected by semivowels and laterals, and the same principle held true for Mah Meri as well. To avoid getting misleading results when comparing non-topic-final and topic-final rhymes due to for example an unequal distribution of a certain coda between the two positions of basic discourse units, the rhymes in both languages were further divided into two groups depending on the type of consonants, if any, in the coda. The two groups are here termed *obstruent rhymes*, that is rhymes that end in either stops or fricatives, and *sonorant rhymes*, that end in nasals, laterals or semivowels. For Mah Meri, the latter group also includes rhymes without a coda. An obstruent coda is shown in Figure 5.



**Figure 5. Spectrogram and annotation showing the measured obstruent rhyme in the word *ba=te?* ‘in the ground’ for CW (Jahai) in topic-final position. The rhyme duration is about 350 ms.**



**Figure 6. Spectrogram and annotation showing the measured sonorant rhyme in the word *pntey* ‘to hang’ for CP in topic-final position. The rhyme length is about 515 ms.**

Despite these challenges, the duration presented in this study always corresponds to the length of the rhyme in the last syllable of a basic discourse unit. This means however, that the measurement point for  $F_0$  and duration is not always located on the same syllable.

### 3.4.5 Particles

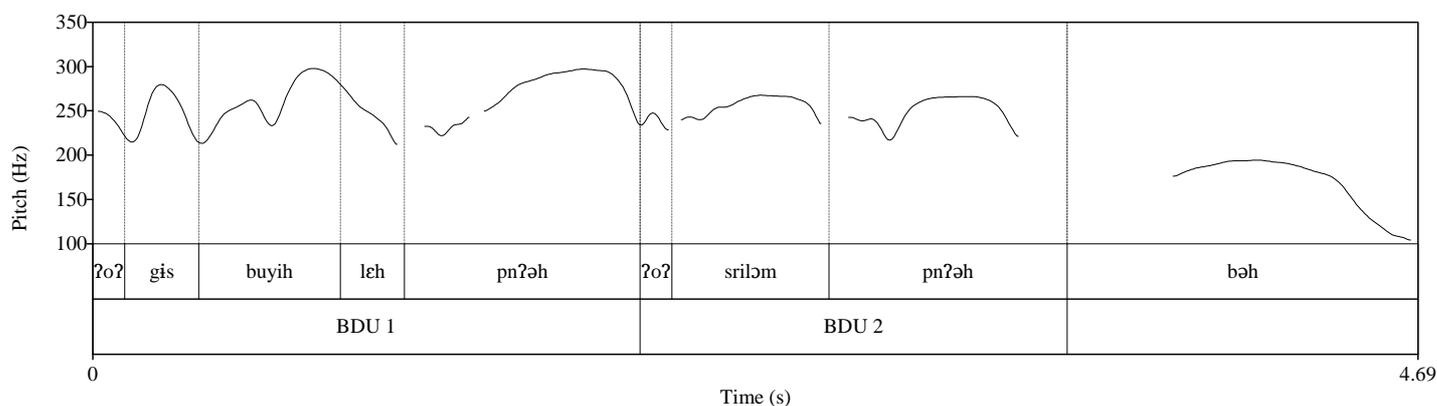
Particles were identified in the material through the glossing, a method mostly used for Jahai, and for Mah Meri through a list of particles compiled by Nicole Kruspe. The particles were noted together with their corresponding basic discourse units in Excel. Unlike measuring  $F_0$  and duration, the observation of particle use was a straightforward task in all but one case, that of *bəh*.

The use of *bəh* is exemplified in (9), where it occurs in topic-final position. In Figure 7 the  $F_0$  contour for the same utterance is shown as well as the common  $F_0$  contour for *bəh*, its relative duration, and the duration of the preceding pause. Since the preceding pause is so long, as well as its apparent independency of the adjacent clause, *bəh* might not be a true particle, as has been mentioned in the background, but rather an independent micro-unit. Because of this, it was not included in the basic discourse units as shown in both (8) and in Figure 6, but is otherwise similar enough to the other particles that there is no need to put it in a category of its own in this study.

(9) [ʔoʔ gis buyih ləh pnʔəh] [ʔoʔ sriləm pnʔəh] bəh !

3 to.descend EMP EQU=DEM 3 to.X EQU=DEM X !

‘It comes down there like this, it comes out like this.’



**Figure 7.**  $F_0$  contour and annotation for the utterance in (9). The segmentation of the end of a discourse topic into two basic discourse units, followed by the particle *bəh*.

### 3.5 Data processing

The following section describes how the data analyzed once collected from the material.

#### 3.5.1 *The analysis of $F_0$ and duration*

The same approach was taken for analyzing  $F_0$  as for analyzing duration. The measurements were noted in an Excel file and divided into separate groups depending on whether they came from topic-final or non-topic-final basic discourse units. The data for each speaker was noted separately. This allowed for the calculation of the medians for  $F_0$  and duration for the two positions of basic discourse units. For duration, the data was further divided into subcategories depending on rhyme type, due to the reasons mentioned.

For visual analysis and easy comparison, box plots of the data were created through the software *R*. These various box plots were employed to compare the different speakers and features, and are included in Appendix 1. Differences and similarities between the median values of the non-topic-final and topic-final measurements for each feature were examined and consistent patterns, if existent, were identified, and the results were then compared between speakers, as well as between languages.

For duration, the differences and similarities between sonorant and obstruent codas were analyzed in the same way to make sure that the patterns observed would hold true here as well, and while not presented in the results, the box plots can be found in the appendices. Again, the box plots can be found in Appendix 1.

Outliers, where they occur, were included in the calculation of the various medians. It is possible however, that these outliers represent other uses of  $F_0$  and duration than the marking of discourse structure, such as for effect. It was for example observed that GA (Mah Meri) used a very high  $F_0$  at some points in her story, particularly when quoting other people. All outliers have been re-measured in case they were faulty measurements, and in a bigger study, the outliers could have been examined separately. This is however beyond the scope of this study.

The relevance of the differences between topic-final and non-topic-final basic discourse units when it comes to  $F_0$  and duration were examined through linear regression analysis. Here, the data for the two speakers of each language was combined, which means that the results of the linear regression analysis are not speaker specific but rather language specific.

All measurements in Hertz were converted to semitones from the average of each speaker using the formula  $12 * \log(\text{freq1}/\text{freq2})/\log(2)$ . Note that this average does not reflect the average pitch of a speaker's voice, but rather the average pitch for the last pitch peak in a basic discourse unit. This can thus not be expected to accurately represent the average pitch range of each speaker's voice. 0 semitones equal 190 Hz for CP (Jahai), 270 Hz for CW (Jahai), 150 Hz for AZ (Mah Meri), and 230 Hz for GA (Mah Meri).

### ***3.5.2 The analysis of particle use***

Due to their nature, the use of particles could not be analyzed in the same way as  $F_0$  and duration. For analysis, two calculations were performed; the amount of topic-final occurrences of each particle was compared to the total amount of occurrences of that particle to examine how many percent of the individual occurrences of each particle are located at the end of a discourse topic. Also, the amount of topic-final occurrences of each particle was compared to the amount of topic-final basic discourse units in order to see how large percentage of all topic-final basic discourse units end in said particle. The basic assumption here is that a large percentage of topic-final occurrences for a particular particle might not indicate that it has a function as a marker of the edge of a discourse topic if it does not occur quite frequently at the end of topic-final basic discourse units.

Though not a part of the analysis per se, the known function of the particles which statistically best qualify for markers of the discourse topic boundaries will be examined in the discussion.

## 4. RESULTS

In this chapter, the results of the analysis will be presented. For further information about the results, see the box plots in Appendix 1.

### 4.1 Jahai

#### *4.1.1 Distribution of topic-final and non-topic-final basic discourse units*

A total of 219 basic discourse units were used in the Jahai analysis, 140 for CW and 79 for CP. For CW, 35% of the basic discourse units were topic-final, while 36% were topic-final for CP.

#### *4.1.2 $F_0$*

Linear regression analysis showed that there is a significant difference between topic-final and non-topic-final basic discourse units in Jahai ( $p < 0.00363$ ). The difference between these two positions of basic discourse units was estimated to -1.0 semitones for the speakers combined.

For CP, the median value for the non-topic-final basic discourse units is 0.58 st, while the topic-final value is -1.72 st. The difference between these two medians is -2.3 st.

For CW, the median value for the non-topic-final basic discourse units is 0.13, while the topic-final value is -0.32. The difference between the two medians is -0.45 st.

The results for Jahai indicate then that the last  $F_0$  peak in a topic-final basic discourse unit generally is lower than the last pitch peak in a non-topic-final one for both speakers. The difference is greater in CP than CW.

#### *4.1.3 Duration*

The linear regression analysis showed that there is a relevant difference between non-topic-final and topic-final basic discourse units in Jahai when it comes to duration as well ( $p < 5.00e-10$ ). The difference was estimated to 123 milliseconds.

For CP, the median value for the non-topic-final basic discourse units is 223 ms, while the topic-final value is 400 ms. The difference between the two is 177 ms, and the topic-final median is thus on average 1.79 times longer than the non-topic-final median.

For CW, the median value for the non-topic-final basic discourse units is 298 ms, while the topic-final value is 417 ms. The difference between the two medians is 119 ms, and the topic-final median is thus 1.4 longer than the non-topic-final median on average.

When analyzing the two groups of rhymes, those that end in sonorants and those that end in obstruents, separately for each speaker, the difference is even more pronounced ( $p < 3.28e-12$ ), with the average estimated difference being 143 ms. Otherwise, the pattern observed is similar to the one described above, although the group of sonorant rhymes feature longer non-topic-final and topic-final rhymes than the group of obstruent rhymes.

These results indicate that the last rhyme in topic-final syllables is about one and a half times longer than in non-topic-final syllables for both speakers.

#### 4.1.4 Particles

CP and CW share the use of the particle *leh*, which is not statistically very common in topic-final position. CW however also uses *bəh*, which is very prevalent, both throughout the material and in topic-final position. The distribution of the particles for the two speakers can be seen in Table 1.

**Table 1. Particles use for CP and CW. A high correlation between the topic-final occurrences of a particle and topic-final basic discourse units might indicate that said particle has a function as a marker of the right edge of a discourse topic.**

Speaker	Particle	All occurrences	TF occurrences	TF occurrences (% of total occurrences)	Correlation between TF occurrences and TF BDUs
CP	<i>leh</i>	7	2	29%	7%
CW	<i>leh</i>	6	2	33%	4%
	<i>bəh</i>	25	20	80%	41%

#### 4.1.5 Other cues of discourse structure

Instances of what seems to be a non-verbal cue of discourse structure were additionally observed in the Jahai recording. This non-verbal cue appears in the form of CW fairly consistently turning her head away from and breaking eye-contact with the listener when using *bəh*. However, since cues like this were beyond the focus of this study, this phenomenon was not further examined.

## 4.2 Mah Meri

### 4.2.1 *Distribution of topic-final and non-topic-final basic discourse units*

A total of 144 basic discourse units were used for the Mah Meri analysis, 103 for GA and 41 for AZ. For GA, 22% of the basic discourse units were topic-final, while 39% were topic-final for AZ.

### 4.2.2 $F_0$

The linear regression analysis showed that there is a relevant difference in the last  $F_0$  peak in Mah Meri ( $p < 0.00150$ ). The difference between the two types of basic discourse units is about 2.2 st.

For AZ, the median value for non-topic-final discourse units is -2.21 st, while the topic-final median is 1.49 st. The difference between the medians is 3.7 st.

For GA, the median value for non-topic-final discourse units is -1.08 st, while the topic-final median is 0.3 st. The difference between the medians is 1.38 st.

### 4.2.3 *Duration*

The linear regression analysis failed to show that there is a relevant difference between non-topic-final and topic-final basic discourse units in Mah Meri ( $p < 0.224$ ). The estimated difference is 29 ms.

For AZ, the non-topic-final median is 204 ms, and the topic-final median is 193 ms. The difference between these is -11 ms, and topic-final rhymes are on average 0.95 times the length of non-topic-final ones.

For GA, the median for non-topic-final basic discourse units is 218 ms, while the topic-final median is 328 ms. The difference between the medians is 110 ms, and topic-final rhymes are on average 1.5 times longer than non-topic-final ones.

Analyzing the two types of rhymes separately gives the same result ( $p < 0.447$ ). Here, the estimated difference is even smaller, and negative: -17.33 ms. For GA here there is still a difference between non-topic-final and topic-final rhymes, while no consistent pattern can be found for AZ; in obstruent rhymes the topic-final duration is longer than the non-topic-final duration, but in sonorant rhymes the topic-final duration is shorter than the non-topic-final duration.

#### 4.2.4 Particles

As described in the background, Mah Meri has got a larger array of particles than is usual for the Aslian languages, which is evident when looking at the usage of particles for AZ and GA. The distribution of particles for each speaker varies, shown in Tables 2 and 3; they only share the use of the particle *yək*. This particle, together with *=ə̃* and *hã* for GA, are the only particles that show a statistical correlation with topic-final basic discourse units.

**Table 2. Particles use for GA. A high correlation between the topic-final occurrences of a particle and topic-final basic discourse units might indicate that said particle has a function as a marker of the right edge of a discourse topic.**

Particle	All occurrences	TF occurrences	TF occurrences (% of total occurrences)	Correlation between TF occurrences and TF BDUs
<i>=ə̃</i>	16	6	38%	26%
<i>yək</i>	8	2	25%	8%
<i>kə</i>	3	0	0%	0%
<i>hã</i>	1	1	100%	3.8%
<i>mbo</i>	1	0	0%	0%

**Table 3. Particles used by AZ. A high correlation between the topic-final occurrences of a particle and topic-final basic discourse units might indicate that said particle has a function as a marker of the right edge of a discourse topic.**

Particle	All occurrences	TF occurrences	TF occurrences (% of total occurrences)	Correlation between TF occurrences and TF BDUs
<i>yək</i>	4	3	75%	19%
<i>lɛw</i>	1	0	0%	0%
<i>ʔəs</i>	1	0	0%	0%

## 5. DISCUSSION

### 5.1 The discourse topic and its linguistic cues

#### 5.1.1 *Jahai*

The results show that the discourse topic is a structurally identifiable discourse unit in both Jahai and Mah Meri, and further show that the speakers of the two languages employ various prosodic and non-prosodic strategies to signal the right edge of this discourse unit, albeit in different ways.

In Jahai, both  $F_0$  and duration seem to be exploited to signal the right edge of a discourse topic. While a high  $F_0$  peak seems to be correlated with the right edge of a smaller phrases, both speakers typically feature a lower last  $F_0$  peak in topic-final basic discourse units compared to the last  $F_0$  peak in non-topic-final discourse units. This might indicate the presence of a downdrift in pitch throughout a discourse topic such as has been observed in for example Dutch (Swerts & Geluykens, 1994), Korean, English, Mandarin Chinese, Japanese (Kong, 1994) and Suyá (Oliveira, 2006).

Duration however seems to be the strongest prosodic indicator of the end of a discourse topic for both Jahai speakers; the topic-final rhymes are more than one and a half times longer than non-topic-final rhymes for CP, and slightly less than one and a half times longer than non-topic-final rhymes for CW. Such a lengthening has been found to be an indicator of the end of a discourse topic by earlier authors, for example Swerts and Geluykens (1994).

While it is unclear whether *bəh* should be analyzed as an exclamation or a particle, it is so prevalent in topic-final position for CW that it seems to have a pretty clear function as a marker of the end of a discourse topic. It is also possible, since *bəh* sometimes can be found at the beginning of a new discourse topic, that it is not as much a marker of the right edge of a discourse topic as a marker of the boundary between two discourse topics. *Bəh* is however not used by CP at all, though this might be due differences in personal use. It could also be that it possibly is linked to the nature of the narrative, and since CW usually is the one who carries the narrative forward, she is perhaps more likely to make use of this particle.

Another possible explanation, looking at the results, is that there might exist a kind of balance between the three strategies for marking the edge of a discourse topic in Jahai. While CP uses the prosodic strategies of pitch and duration to a greater extent, CW uses the prosodic

strategies less, but on the other hand uses *bəh* to a very high degree, while this strategy is not found in CP. This can perhaps then be likened to what previous research has shown, namely that speakers have the possibility to vary which parameters they use, which they also do here, at least to a certain extent.

### **5.1.2 Mah Meri**

In Mah Meri, it seems like the last  $F_0$  peak in a topic-final basic discourse unit generally is higher than the last  $F_0$  peak in non-topic-final story units. The difference is greater in AZ than in GA. It is however not possible to say whether the higher  $F_0$  at the end of topic-final basic discourse units is a boundary or something else, since measured  $F_0$  peak is not always located directly at the edge of a basic discourse unit.

Rhyme duration on the other hand, judging from the results, does not seem to function as a cue of the right edge of the discourse topic in Mah Meri. For AZ, topic-final rhymes are surprisingly shorter than non-topic-final rhymes, but the difference is extremely small. GA displays a pattern more that reminds much more of CP and CW, and proportionally GA has a lengthening of final rhymes that is greater than that of CW, with topic-final rhymes being 1.5 times longer, compared to CW's 1.4. If linear progression analyses had been done for each speaker separately, it is possible that GA would have shown relevant, albeit small, difference in duration as well. Another possibility is that the small amount of data for AZ, only 41 basic discourse units, might obscure existent patterns.

Regarding particle use, a particle for the marking of discourse topic boundaries does not seem to exist in Mah Meri. The most likely particles in terms of statistics are  $y\grave{o}k$  for AZ and  $=\tilde{\delta}$  and for GA.  $Y\grave{o}k$  also used by GA, but does not occur as frequently at the end of a topic-final basic discourse unit as for AZ, and its quite high prevalence in AZ might very well be due to chance, especially considering the few story units for this speaker. Furthermore, these two particles do not seem to have function that can easily be correlated with the marking of the edge of a discourse topic, judging from what is known about them.

### 5.1.3 Comparing Jahai and Mah Meri

When comparing Jahai and Mah Meri, a few similarities can be noted. In both languages the discourse unit is identifiable from various cues. Both languages use pitch for what seems to be the marking of the right edge of a discourse topic, and possibly also through a lengthened final rhyme, though this is very uncertain for Mah Meri and have not been proven here.

From what can be seen though, there seems to be more differences than similarities between these two languages, this despite their structural similarities. Lengthened rhymes are perhaps the most prevalent way of signaled the right edge of a discourse topic in Jahai, while this does not seem to be the case in Mah Meri. Also Mah Meri does not seem, despite otherwise having a large set of particles, to use these similarly to the way *bəh* is used in Jahai, to mark the boundary between discourse topics. The two statistically most likely particles, *yək* and *=ə*, do not seem to be similar to *bəh* function-wise, and are not correlated nearly as frequently with topic final basic discourse units as *bəh* is in Jahai.

While the use of pitch to signal the right edge of a discourse topic is found in both Jahai and Mah Meri, the way in which this feature is employed is mirrored in the two languages, with Jahai featuring a lower pitch peak at the right edge of a topic-final basic discourse unit, while Mah Meri speakers seemingly use a higher pitch peak instead, compared to the pitch peaks found in non-topic-final syllables. Also, when looking at the material, the last  $F_0$  peaks in Jahai are almost invariably located at the end of a basic discourse unit, while in Mah Meri, pitch events have been found to occur also within these units, at least in some cases, for example in the cases hypothesized to be focus in the method chapter. It might be possible that this variation might be a typological one, and that Jahai and Mah Meri belong to different prosodic types.

There might also be other indicators of discourse topic boundaries, prosodic, non-prosodic, and non-verbal that have not been studied here, such as the observation that CW look away from the listener and break the eye contact when saying *bəh*, or initial pitch range reset at the beginning of a new discourse topic, among other things.

## 5.2 The larger picture

Both Jahai and Mah Meri display interesting patterns when it comes to what can be said about their prosodic systems and the way they use  $F_0$  to signal the end of a discourse topic. The higher-than-usual  $F_0$  peak that is seemingly used to mark the end of a discourse topic in Mah Meri does not seem to be affected by  $F_0$  downdrift, which, judging from earlier works, appears to be common in other languages. A similar pattern to that found in Mah Meri does however appear in Kammu, as evident from Karlsson et al.'s (2012) work. It could be then, that Mah Meri, like Kammu, employs some sort of high boundary tone to mark the right edge of a discourse topic, which is unusual.

However, Mah Meri seems to be different from Kammu in that its high pitch peaks are, at least sometimes, located some distance from the end of the discourse topic, which leads to the impression that Mah Meri possibly is not an edge-marking language like Kammu. In this respect, Jahai seems more similar to Kammu than Mah Meri. Although Jahai features lower-than-normal pitch peaks at the end of a discourse topic, these are still peaks, and they are located right at the edge of a discourse topic, and also at the edges of smaller phrases, which is very reminiscent of Kammu. It could be then, that Jahai and Kammu are similar to each other when it comes to prosodic typology, in that they both have prosodic events at the edges of units of different sizes (Jun, 2012), and what makes the discourse topic marking though  $F_0$  different in Jahai is that it possibly features a downdrift, which causes the last  $F_0$  peak to be lower than the preceding peaks, which is not found in Kammu.

To summarize this then, Mah Meri seems to be similar to Kammu when it comes to marking discourse structure in that they both employ  $F_0$  as their main or only indicator of the end of a discourse topic, and this takes the form of higher-than-normal pitch peak is used to mark the end of a discourse topic. On the other hand, Jahai seems more similar to Kammu than Mah Meri when it comes to prosodic typology, in that the pitch events in these two languages are always located at phrase boundaries.

All this said, too little information can be gathered here to make any sure claims about the similarities between the three languages, and the hypotheses discussed here need to be examined in future work.

## **5.3 Material, method, and present knowledge**

### ***5.3.1 Suitability of the material and its limitations***

As is evident from this study, using material not specifically collected for prosodic work is certainly possible to use for prosodic as well as non-prosodic research. That said, working with such material does involve several challenges that make prosodic work more difficult.

One such challenge is background noise. Recordings made in field generally are, to a lesser or greater extent, noisy. While the Jahai recording was quite free of interfering sounds coming from the background scene, since it was shot away from the settlement, the Mah Meri recording featured background noise such as dogs barking, chickens clucking, motorcycles driving by and at one point also the takeoff of an airplane at a nearby airport. In addition, the microphone picked up the voice of GA quite badly in places, and while other kinds of analyses certainly would be possible, such as morphological analyses and the like, the automatic pitch calculation in Praat failed in some of moments of sudden background noise, which made  $F_0$  measurements in those cases virtually impossible.

Another challenge was the structure of the material. In both recordings, particularly in the Mah Meri recording but also in the Jahai recording, the speakers were prone to speaking at the same time. This, perhaps more so than the background noise, made  $F_0$  and also duration measurements hard at some points, where again other kinds of analyses would still be possible. This is an indication that single-person narratives are preferable, both when recording as well as when trying to find prosodically useful materials.

The structure of the material also affected the segmentation process carried out in this study, and the segmentation of the Mah Meri material was particularly hard due to its less sequential nature compared to the Jahai material. This led to fewer usable parts of the material, and with more material it is possible that the results could have been different, particularly when it comes to AZ.

Despite these challenges, the study of prosodic features was possible with the material used here, and relevant results were found.

### ***5.3.2 Limitations by method and present knowledge***

The challenges presented by the material were certainly not the only limitations to this study. With more knowledge about the prosody and the use of particles in the two languages, the outcomes of the analysis could also have been different. We know that the particles in Jahai

and Mah Meri can have many different functions, but it is also possible that  $F_0$  and duration are harnessed for other functions as well, such as focus, or stylistic variation. However, since we do not know anything about prosody beyond word-level in these languages as of today, nothing can be assumed to be true.

Also, when basic prosodic descriptions have been done of these languages, prosodic criteria can be incorporated into for example the definition of a basic discourse unit, since there, as Degand and Simon (2009) say, is an important correlation of syntax and prosody when it comes to the structuring of the discourse. This might facilitate the segmentation of the discourse, and thus a combination of syntactic and prosodic definitions for a basic discourse unit might yield even clearer results of the discourse structure in Jahai and Mah Meri.

Similarly to the above, another method of segmenting the discourse into discourse topics than the one used here might yield clearer results. This is perhaps particularly true here, since the semantic and pragmatic criteria for discourse topics used still allowed for a certain degree of objectivity, which should be avoided. However, the method of segmentation used in this study has worked well and provided statistically significant differences between the chosen discourse units.

## **5.4 Future research**

For future work, narratives in the form of monologues, preferably of a more sequential nature such as used by Karlsson et al. (2012), would be a good form of material to use for the study of prosody as well as of discourse, due to such monologues having a relatively organized structure but still being spontaneous. Using monologues of sequential nature would aid the segmentation of the discourse, by making different speakers talk about roughly the same things, which would also facilitate the comparison of different speakers. More indirectly, the use of monologues would avoid the challenges of doing prosodic research where several speakers are prone to speaking at the same time. It should also be stressed that the more speakers recorded, the more accurate the results.

Besides doing a larger version of this study, with more material, it could be interesting to segment Jahai narratives after the use of *bəh*, with the assumption that this is a marking of discourse topic boundaries, to see what results when it comes to prosodic signaling of these boundaries could be obtained. Similarly, future studies could shed more light on the discourse-marking function of *bəh*, which has related forms in other Aslian languages, and possibly might have a similar function there. Also, the observation that the two female

speakers use particles more frequently than the two male speakers could serve as an interesting basis for a study on particle use and gender.

During this study, a number of prosodic features have been observed in Jahai and Mah Meri. It has been noted that the  $F_0$  peak seems to move together with its verb when OV constructions are formed in Mah Meri, and it has been observed that semantically rich verbs in Jahai generally have a higher  $F_0$  peak than their objects, which does not seem true for less semantically rich verbs. Also, Jahai and Mah Meri seem to show typological differences such as the location of pitch events, and a further studies on the prosody of these two languages would show how different or similar they really are.

## 6. CONCLUSION

This study has shown that the discourse topic is a structurally identifiable unit in two Aslian languages, Jahai and Mah Meri, and it has examined how various linguistic features, both prosodic features such as pitch and duration as well as non-prosodic features such as the use of particles, are employed to signal the segmentation of the discourse in these two languages into discourse topics.

It has become evident that all the studied features are employed as cues for the signaling of the right edge of a discourse topic, although there is variation between the two languages. Jahai speakers make use of both pitch and duration, as well as a particle for one of the speakers, with duration being the main prosodic feature used, while Mah Meri speakers were shown to only use pitch for this purpose.

Although sharing the use of pitch for signaling the end of a discourse topic, the two languages employ this feature in different ways. Mah Meri speakers feature a higher-than-normal pitch peak in the proximity of the end of discourse topic, while Jahai speakers have a lower-than-normal pitch peak at the end of a discourse topic. The use of a higher-than-normal pitch peak in Mah Meri reminds of the high boundary tones used in Kammu (Karlsson et al., 2012) for this purpose, and this, together with the fact that they both only employ  $F_0$  as a cue of the discourse structure, makes these two languages similar. Looking at the more general prosodic patterns in these languages however, as far as is possible in this study, Jahai is possibly more similar to Kammu in that they both seem to mark the edge of smaller prosodic phrases with high peaks in the  $F_0$  contour, whereas in Mah Meri something that might be pitch even within phrases has been found.

As for the non-prosodic cues, the particle or exclamation *bəh* in Jahai seems to have a very firm function as a marker of the boundary between two discourse topics for one speaker of Jahai. Particles of similar form exist in other Aslian languages, and it is possible that they might have a similar function.

It has also become evident that, if recordings have a certain degree of internal structure as well as having fairly low background noise, it is possible to use them for research on discourse structure as well as prosody, as has been done here. It is also possible to see here, that even when working with a very small number of speakers, consistent patterns and statistically relevant results can be found.

This study then, has shown what kind of analysis is possible with material such as the one used here, and the first steps towards a description of Jahai and Mah Meri prosody and discourse structure have been taken. Theories for larger scale similarities have also been proposed, comparing these two languages with Kammu, particularly noting that Jahai and Kammu seem to share a certain structure when it comes to prosodic typology. It is possible that other Austroasiatic languages display similar patterns, but it is difficult to make any concluding remarks about Austroasiatic prosody from this paper. Future studies, however, should aim to further define the nature of the prosodic systems of Jahai and Mah Meri as well as to look at other Austroasiatic languages, which would allow for a better comparison to be made between these languages to figure out just how similar or different these languages are, prosodically.

## REFERENCES

- Anderson, G. D. S. 2006a. *Austroasiatic Languages*. Brown, Keith et al.(eds) 2006. *Encyclopedia of Language & Linguistics 2.ed.* 1: 598-600. Oxford: Elsevier.
- Asmah Haji Omar. 1964. *Bahasa Semang: dialek Kentakbong*. Unpublished Honours thesis, University of Malaya.
- Asmah Haji Omar. 1976. The verb in Kentakbong. Philip N. Jenner, Laurence C. Thompson and Stanley Starosta (eds), *Austroasiatic Studies, Part II*, Honolulu: University Press of Hawaii, pp. 951–970.
- Benjamin, G. 1976. An Outline of Temiar Grammar. *Austroasiatic Studies.*, ed by P.N. Jenner et al. Honolulu: U. Press of Hawai.
- Benjamin, Geoffrey. 2011. *The current situation of the Aslian languages*. M.s.
- Bruce, G. 1982: Textual aspects of prosody in Swedish. *Phonetica* 39: 247-287.
- Bruce, G. 1998. Allmän och svensk prosodi. *Praktisk lingvistik* 16. Lund: Department of of Linguistics, Lund University
- Burenhult, N. 2005. *A grammar of Jahai*. Pacific linguistics, 566. Canberra: Pacific Linguistics.
- Chafe, W. 1994. *Discourse, consciousness, and time: the flow and displacement of conscious experience in speaking and writing*. Chicago: University of Chicago Press.
- Chafe, W. 2003. The analysis of discourse flow. Schiffrin, Tannen & Hamilton (eds.), *The Handbook of Discourse Analysis*. Blackwell Publishing. Blackwell Reference Online.
- Degand, L. & Simon, A.C. 2009. On identifying basic discourse units in speech: theoretical and empirical issues. *Discourse* 4: 1-19.
- Diffloth, G. 1972. Ambiguïté morphologique en semai. Jacqueline M. C. Thomas & Lucien Bernot (eds), *Langues et Techniques, Nature et Société: Approche Linguistique*, Paris: Klincksieck, pp. 91–93.
- Diffloth, G. 1974a. Austroasiatic languages. *Encyclopedia Britannica (15<sup>th</sup> edition)* 2: 480–484.
- Diffloth, G 1974b. Body moves in Semai and in French. *Papers From the 10<sup>th</sup> Regional Meeting, Chicago Linguistic Society*, pp. 128–138.
- Diffloth, G. 1975. Les langues mon-khmer de Malaisie: classification historique et innovations. *Asie du sud-est et monde insulinde* 6 (4): 1–19.
- Diffloth, G. 1976a. Jah hut: an Austroasiatic language of Malaysia. Nguyen Dang Liem (ed.), *South-east Asian Linguistic Studies*, Volume 2, Canberra: Pacific Linguistics, pp. 73-118.
- Diffloth, G. 1976b. Mon-Khmer numerals in Aslian languages. *Linguistics* 174: 31–38.

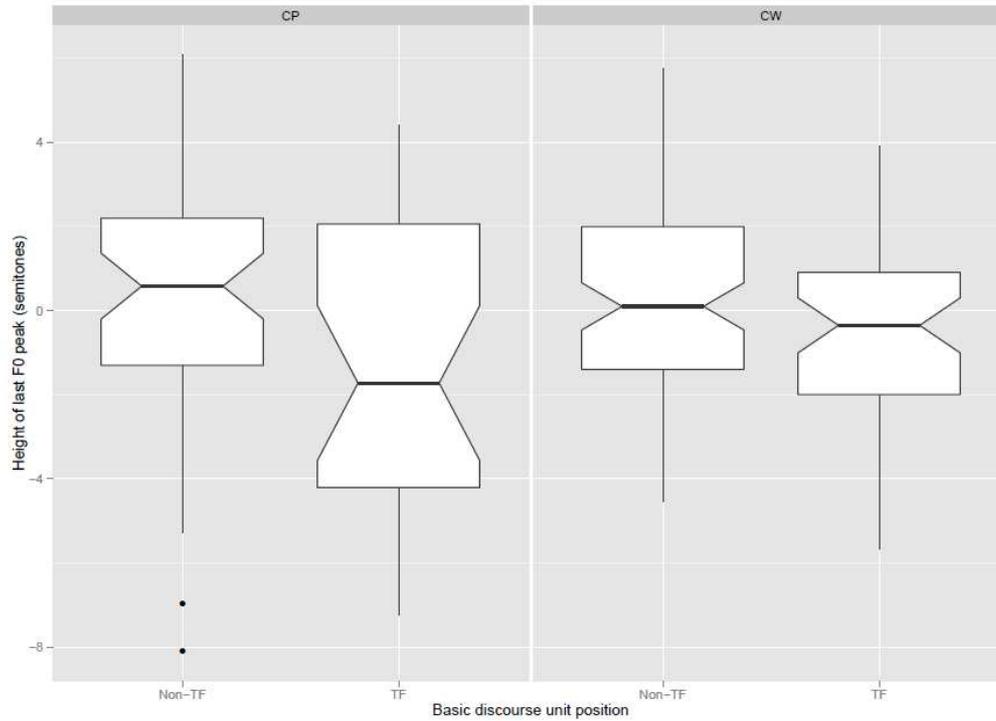
- Diffloth, G. 1976c. Expressives in Semai. Philip N. Jenner, Laurence C. Thompson & Stanley Starosta (eds), *Austroasiatic Studies, Part I*, Honolulu: University Press of Hawaii, pp. 249–264.
- Diffloth, G. 1976d. Minor-syllable vocalism in Senoic languages. Philip N. Jenner, Laurence C. Thompson & Stanley Starosta (eds), *Austroasiatic Studies, Part I*, Honolulu: University Press of Hawaii, pp. 229–247. 47
- Diffloth, G. 1977. Towards a history of Mon-Khmer: Proto-Semai vowels. *Tonan Ajia kenkyu [South East Asian studies]* 14: 463–495.
- Diffloth, G. 1979. Aslian languages and Southeast Asian prehistory. *Federation Museums journal (new series)* 24: 2–16.
- Diffloth, G. & N. Zide. 1992. Austro-Asiatic languages. William Bright (ed.): *International Encyclopedia of Linguistics*. New York: Oxford University Press. Vol. I:137–42
- Diffloth, G. Austroasiatic languages. 2012. *Encyclopædia Britannica. Encyclopædia Britannica Online Academic Edition*. Encyclopædia Britannica Inc. Web. 30 Dec. 2012. [britannica.com/ludwig.lub.lu.se/EBchecked/topic/44541/Austroasiatic-languages](http://britannica.com/ludwig.lub.lu.se/EBchecked/topic/44541/Austroasiatic-languages)
- Dunn, M., Burenhult, N., Kruspe, N., Tufvesson, S. & Becker, N. 2011. Aslian linguistic prehistory: a case study in computational phylogenetics. *Diachronica* 28: 291–323.
- Geluykens, R. 1992a. *From Discourse Process to Grammatical Construction: On Left-Dislocation in English*. Amsterdam/Philadelphia: John Benjamins.
- Geluykens, R. 1992b. *Topics in English conversation: On topic-introduction in conversational discourse*. M.s.
- Himmelman, Nikolaus P. 2006. Prosody in language documentation. *Essentials of language documentation* Gippert, Jost, Nikolaus P. Himmelman & Ulrike Mosel (red.), Berlin: Mouton de Gruyter, pp. 163–181.
- Hymes, D. 1981. *In Vain I Tried to Tell You: Essays in Native American Ehtnopoetics*. Philadelphia: University of Pennsylvania Press.
- Jun, S.-A. 2012. Prosodic Typology Revisited: Adding Macro-rhythm. *Proceedings of Speech Prosody*, 6<sup>th</sup> international conference, Shanghai, China.
- Karlsson, A. 2012. Prosodic features of Kammu tonal and non-tonal dialects: read and spontaneous speech. Endo, M., Saitô, Y. (eds.) *Tone, Accent and Intonation in eastern Eurasian Languages*. Tokyo: Aoyama Gakuin University, pp. 19–28.
- Karlsson, A, House D., Svantesson J.-O. 2012. Intonation Adapts to Lexical Tone: The Case of Kammu. *Phonetica* 69: 28–47. Basel: S. Karger AG.
- Kong, Eun Jong 2004. The role of pitch range variation in discourse structure and intonation

- structure of Korean. *Proceedings of the International Conference on Spoken Language Processing*.
- Kruspe, N. & Hajek, J. 2009. Mah Meri. *Journal of the International Phonetic Association* 39: 241-248. Cambridge Journals.
- Kruspe, N. 2010. *A dictionary of Mah Meri as spoken at Bukit Bangkong*. Honolulu: University of Hawaii Press.
- Kruspe, Nicole. 2004. *A Grammar of Semelai*. Cambridge grammatical descriptions. Cambridge: Cambridge University Press.
- Lloyd, R. J. 1921–23. On the phonology of the Malay and Negrito dialects spoken in the Malay states of Lower Siam. *Bulletin of the School of Oriental Studies, London Institution* 2: 27–38.
- Lovick, O. & Tuttle, S. G. 2007. The Prosody of Dena'ina Narrative Discourse. *Nouveaux cahiers de linguistique française* 28: 305-216.
- Matisoff, J. A. 2003. *Aslian: Mon-Khmer of the Malay Peninsula*. University of California.
- Oliveira, M. 2006. *Prosody as Marker of Discourse Segmentation in Suyá*. School of Languages, Linguistics and Culture, University of Manchester. Web. 8 Jan. 2013. [http://sprosig.isle.illinois.edu/sp2006/contents/papers/PS3-02\\_0009.pdf](http://sprosig.isle.illinois.edu/sp2006/contents/papers/PS3-02_0009.pdf).
- Schebesta, Paul. 1928*b*. Grammatical sketch of the Jahai dialect as spoken by a Negrito tribe of Ulu Perak and Ulu Kelantan. *Bulletin of the School of Oriental Studies, London Institution* 4: 803–826.
- Swerts, M. & Geluykens. 1994. R. Prosody as a marker of information flow in spoken discourse. *Language and Speech* 37 (1): 21-43. Institute for Perception Research, Eindhoven.
- Thomas, Dorothy M. 1966. Chrau intonation. *Mon–Khmer Studies* 2: 1–13.
- Woodbury, A. C. 1983. Switch reference in Central Yup'ik Eskimo. *Switch Reference and Universal Grammar*, Winnipeg, May 1981, ed. John Haiman and Pamela Munro, pp. 291-315. Amsterdam: John Benjamins.
- Woodbury, A. C. 1985. The functions of rhetorical structure: A study of Central Alaskan Yupik Eskimo discourse. *Language in Society* 14: 153-90.

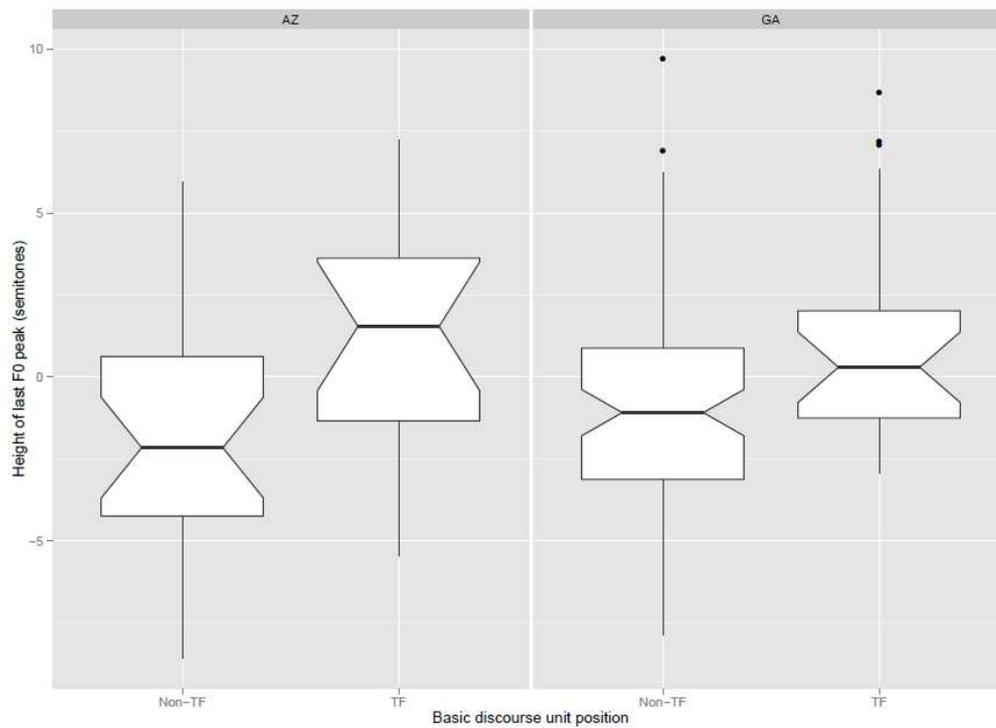
## APPENDIX 1

Included here in Appendix 1 are the box plots for  $F_0$  and duration.

### $F_0$

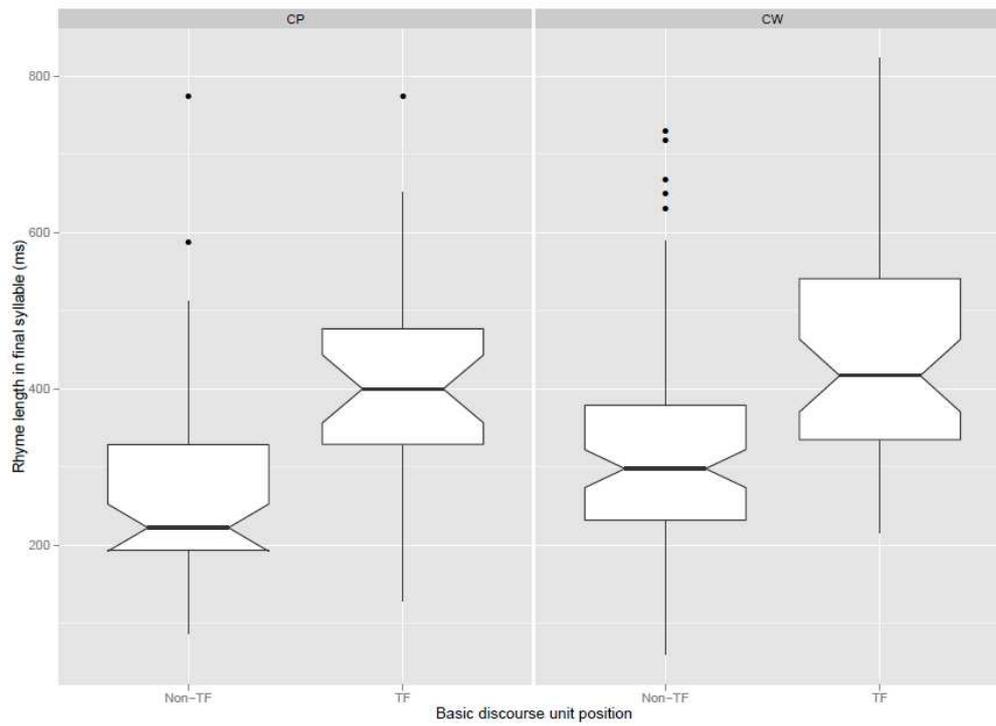


Box plots showing the height of the last  $F_0$  peak of a basic discourse unit for CP and CW (Jahai).

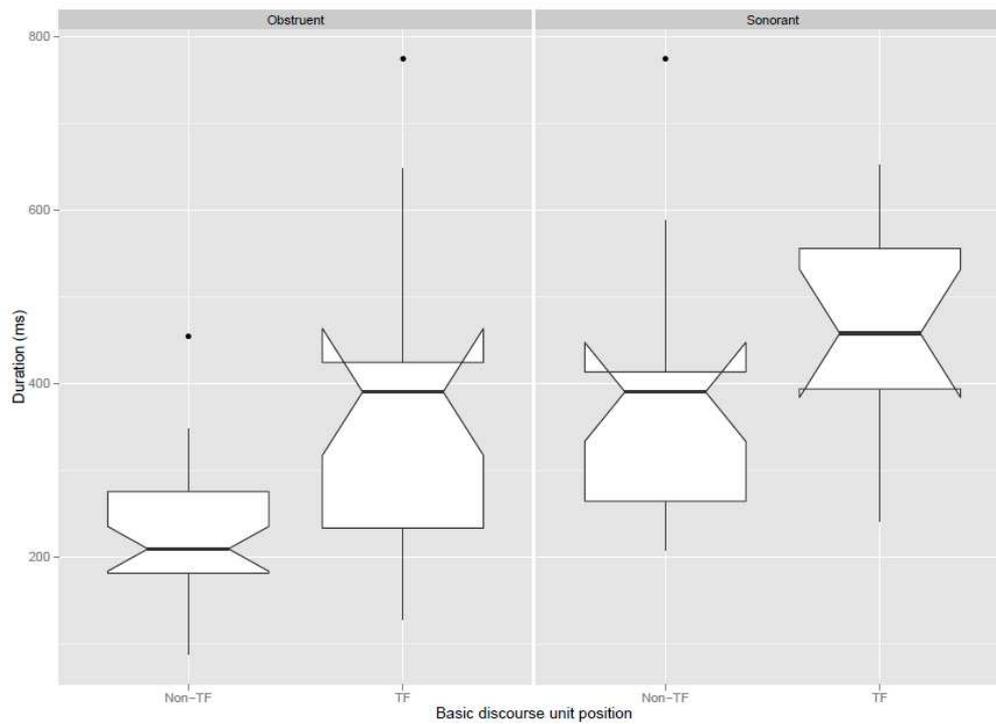


Box plots showing the height of the last  $F_0$  peak of a basic discourse unit for AZ and GA (Mah Meri).

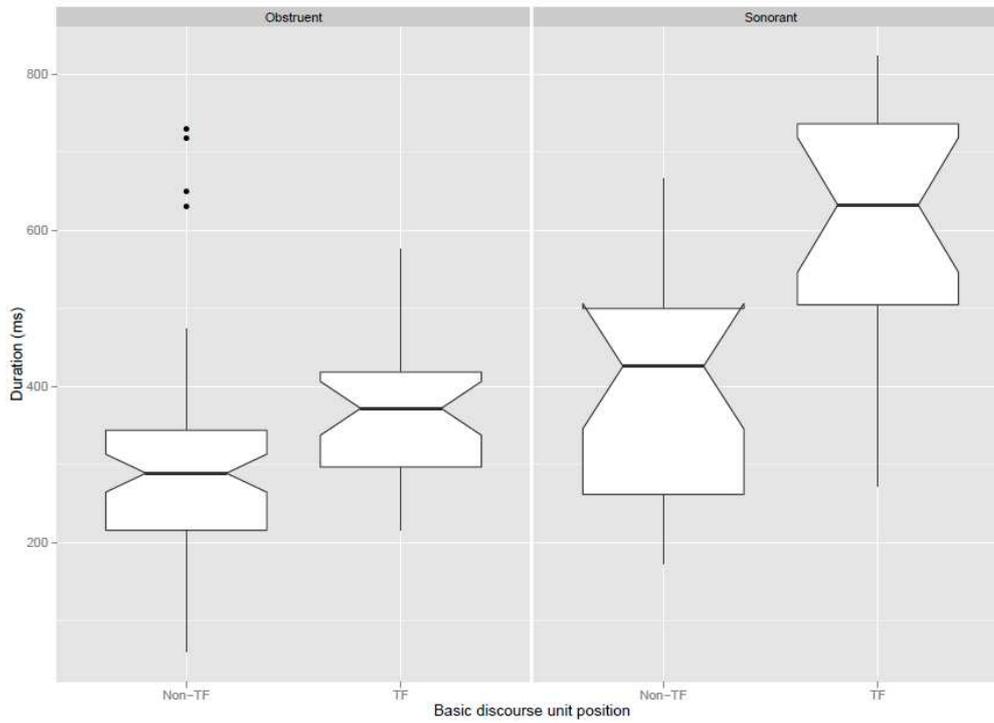
## Duration



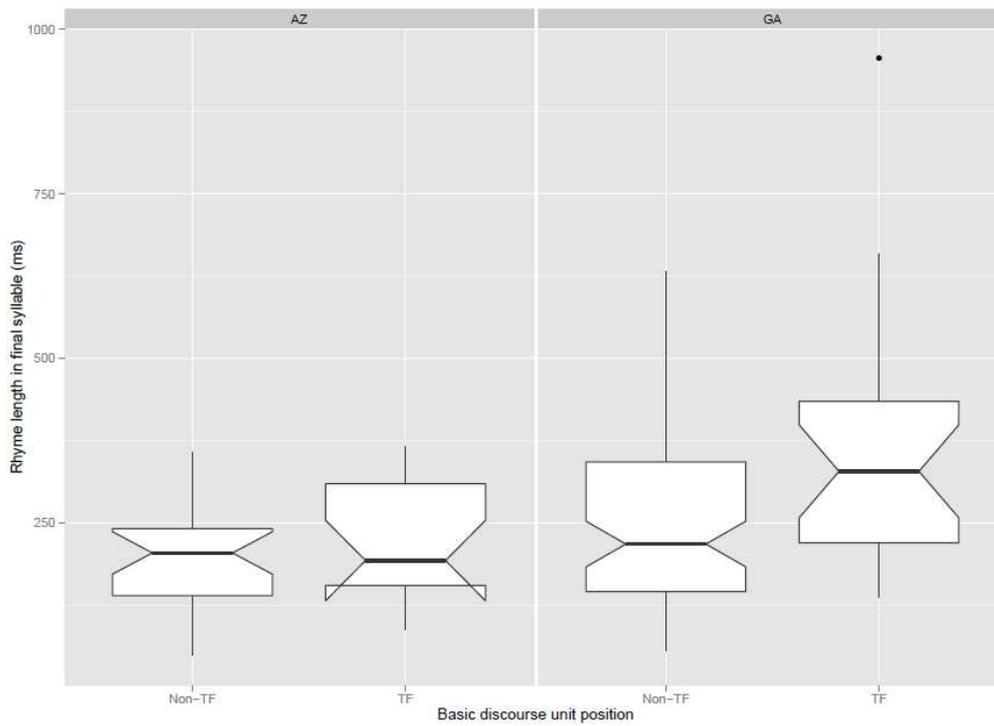
Box plots showing the rhyme length in the final syllable of a basic discourse unit for CP and CW (Jahai).



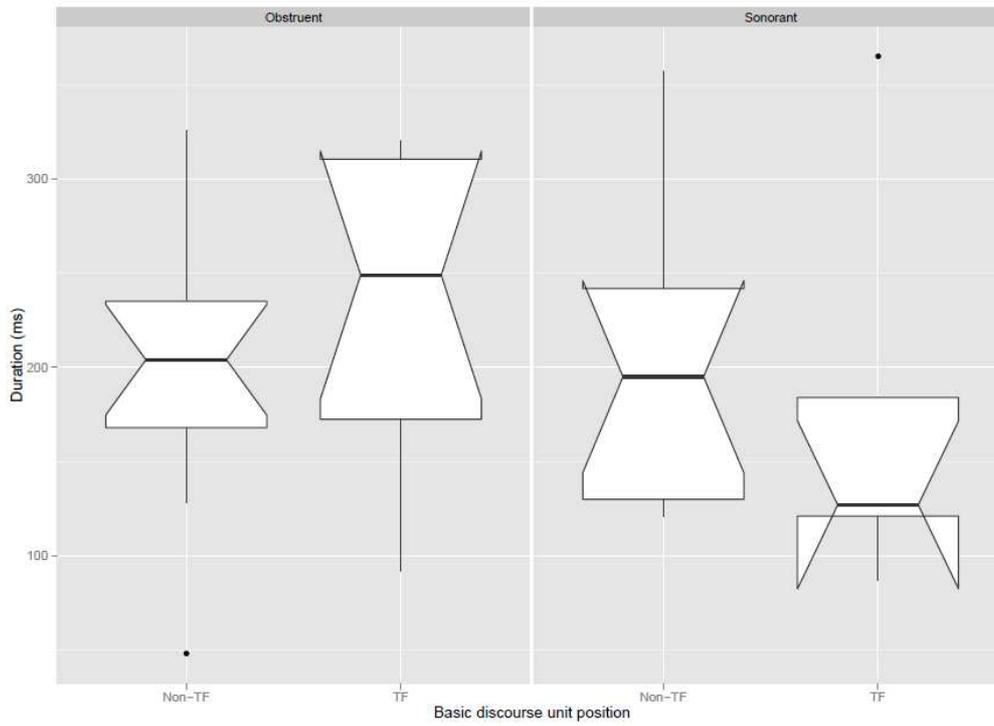
Box plots showing the differences in rhyme length between obstruent and sonorant rhymes for CP (Jahai).



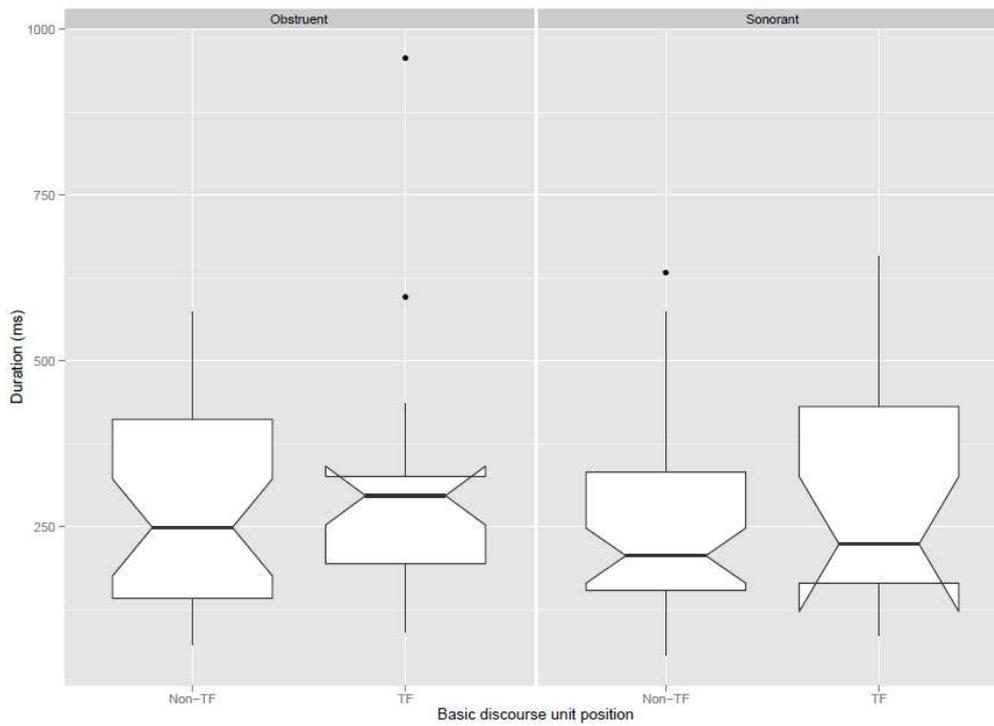
Box plots showing the differences in rhyme length between obstruent and sonorant rhymes for CW (Jahai).



Box plots showing the rhyme length in the final syllable of a basic discourse unit for AZ and GA (Mah Meri).



**Box plots showing the differences in rhyme length between obstruent and sonorant rhymes for AZ (Mah Meri).**



**Box plots showing the differences in rhyme length between obstruent and sonorant rhymes for GA (Mah Meri).**