A LOOK AT PROSODY IN NASAL

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ABSTRACT

This paper presents a phonological description of basic intonation contours in Nasal, an Austronesian language spoken in Sumatra, with a focus on boundary tones. Data in this paper is based on fieldwork and experiments carried out in November 2019. This research represents the first step in a long-term project to document the intonational phonology of Nasal, and serves as an example for documenting intonation in endangered language research. Acoustic data were collected in a dialogue task with four native speakers of Nasal. Recordings were annotated using Praat scripts and the data were analyzed using the Praat pitch tracker.

1.0. INTRODUCTION

This paper represents the first study of the intonational phonology of Nasal, an Austronesian language spoken in Sumatra, Indonesia. This study is part of the first project to create a complete, robust and archivable documentation of the Nasal language; still, it is also rare in that intonation is a rarely studied aspect of endangered languages, and Indonesia is certainly no exception.

The goal of this paper is to present the results of a pilot experiment carried out in the Nasal villages in October and November of 2019, particularly regarding the system of boundary tones. The organization of the paper is as follows: Section 1 will present background and demographic information about the Nasal language, as well as a summary of relevant previous research; Section 2 will present in detail the methods used in the design of the pilot experiment and data collection; Section 3 will summarize the results, focusing on the inventory of boundary tones in Nasal intonation; Section 4 will present issues that arose during the study and directions for future research.

1.1. Previous Research

Intonational phonology as a descriptive subfield of linguistics is relatively young compared to other aspects of linguistic description, especially as it relates to the description of minority languages. Though segmental phonology was a significant field of study represented in linguistic literature since the 19th century, intonation was given little attention until the mid-20th century at the earliest (see Pike (1979) for an early description of the intonation of American English). Even then, the study of intonation was restricted largely to the study of English (especially American English). Gussenhoven (2004) covers the basics of the acoustics of tone and intonation, and Jun (2005) and Jun (2014) include many seminal articles covering topics that range from the history of transcription to the most updated publications on intonational typology to date.

The study of intonation in American English led to one of the most significant contributions to the field to date: the ToBI transcription framework. This system, based in the Autosegmental-Metrical theory of phonology (see Arvaniti (in press) for a recent summary of this theory as it pertains to the study of intonation) was first developed between 1991-1994 at a series of meetings involving academics from various fields of study, including psychology, computer science, and phonetics (Beckman et al., 2005). Originally designed to provide a reliable, easily understood system of transcription for American English, the ToBI framework, which is designed around marking acoustic cues such as tonal targets, tone boundaries, and disjuncture between words, quickly spread and was used to describe various other languages. Because of its general applicability to the transcription of acoustic phenomena that are prosodically relevant, ToBI is still widely used as the main mode of transcription in almost all prosodic descriptions (see Hualde & Prieto (2016) for a discussion of an "International Prosodic Alphabet (IPrA), a prosodic analogue to the Internatinoal Phonetic Alphabet (IPA)).

There are still issues with ToBI, and best practices for intonational description are frequently discussed and improved upon. There have been many recent publications that aim to address these issues: Frota (2016) discusses

the importance of consistency in describing surface and underlying structures within and across languages, and Cangemi & Grice (2016), from the same volume, address the implications of what they call a "distributional approach" to intonational analysis on intonational transcription. Thus, ToBI is both well-established and always evolving, and will be extremely useful in the transcription of Nasal intonation.

Though intonational description was, for most of the history of the study, reserved for already well described and widely used languages, there has been a recent movement toward the study of the intonational inventories of underdocumented and endangered languages. This shift is very recent, especially in the study of Austronesian languages; Austronesian prosody has been largely overlooked in favor of the description of morphosyntactic phenomena, especially *symmetrical voice*. For instance, it has been the long-time assertion of most Austronesianists that Indonesian languages, for the most part, feature penultimate stress (Himmelmann, 2005; Blust, 2013). However, this analysis may have been purely impressionistic, as more recent studies, such as van der Hulst et al. (2010) and Kaland (2019), have called this assertion into question by reanalyzing Indonesian languages with carefully collected acoustic evidence. Thus it is clear that there is a wider need for thorough prosodic analysis in the study of Austronesian languages (and Indonesian languages in particular). This effort is already underway, and can be seen in a few prosodic descriptions of endangered Austronesian languages that have been published recently (for example, Vicenik & Kuo (2010) for Tongan and McDonnell & Turnbull (2018) for Besemah).

There have also been various publications focused specifically on describing fruitful methods of data collection for intonational description and analysis. Jun & Fletcher (2014) provides an extremely detailed description of various strategies for eliciting and analyzing intonational structures (especially relevant are the elicitation templates described for languages with different types of word-level prosody), though the article does have some limitations. For example, the methodologies described are intended for data collected in a laboratory, limiting their relevance for linguists hoping to collect data in the field. There is a section about intonational fieldwork, though it is decidedly less helpful for fieldworkers, as it is mostly composed of anecdotes detailing how previous attempts at intonational fieldwork have met with little success, rather than an organized set of methodologies, as in the first section. Himmelmann & Ladd (2008), however, addresses these issues specifically, and is designed to aid fieldworkers in the collection of useful prosodic data. This article is extremely useful, as it provides a detailed summary of any relevant prosodic information a researcher might need, making it easier for fieldworkers whose work focuses on other aspects of language documentation and description to collect prosodic data and include an informed analysis of that data in their descriptions. It also posits an effective workflow for collecting and analyzing prosodic data in undocumented languages that includes planning, analyzing word-level prosody, conducting effective production experiments, and designing and analyzing the results of perception experiments.

1.2. Background

This project represents the first attempt at a robust documentation and description of Nasal ([ˈnasal]; ISO 639-3: nsy), a previously undocumented language of the Malayo-Polynesian branch of the Austronesian language family. Nasal is spoken in the Kaur Regency of Bengkulu Provinces in three villages, Tanjung Betuah, Tanjung Baru, and Gedung Menung, with an estimated speaker population of around 3000 (Eberhard et al., 2019). The first descriptions of Nasal were published in an SIL survey and consisted of a wordlist and analysis of the probable proto-forms of Nasal words (Anderbeck & Aprilani, 2013). There has been very little description or analysis of Nasal so far, and no analysis of its prosodic features (indeed, there has been very little effort toward the description of the prosody of any languages of Sumatra so far).

Having learned from the successes and shortcomings of the aforementioned publications, I aim to create a robust and useful description of the prosodic structure of Nasal. With this description, I seek out multiple objectives:

1. First and foremost, the creation of a useful document that describes the prosodic systems of Nasal, which is also easily accessible to native speakers;
2. The foundation of my doctoral dissertation, which will also form a significant part of a planned published grammar of Nasal;
3. A step forward in the study of intonation in minority/endangered languages, especially in Indonesia.

This project will begin to fill a void of knowledge regarding the prosodic inventories of the languages of Sumatra (and Indonesia at large). Building on analyses of local languages, including grammatical (Nababan (1981) for Toba Batak, Walker (1976) for Lampung) and prosodic (e.g. McDonnell & Turnbull (2018) for Besemah, which is also spoken in the Nasal community), the description of the Nasal phonological inventory will form a significant part of the documentary effort. This project is designed to highlight the importance of intonational analysis and documentation in the conservation of endangered languages.

2.0. METHODS

All of the data in this study were collected as part of controlled experiments conducted during a fieldwork trip with my advisor, Bradley McDonnell, for two weeks in October and November of this year. As the duration of our stay was so short, and my knowledge of the language was very scant, the preparation for the experiment was quite limited. That is, before arriving to Tanjung Betuah, all that had been prepared were a series of English sentences, divided by sentence type, which featured content that might be culturally relevant. The six sentence types were: 1) declarative statements; 2) Wh- questions; 3) polar (yes/no) questions; 4) lists; 5) exclamations; 6) commands.

The experiment consisted of three dialogues between two speakers, labelled A and B; A was usually the person asking questions, and B usually only answered. The dialogues were designed in collaboration with two native Nasal speakers and members of our long-term research team, Johan Safri and Wawan Sahrozi (who were also recorded for the experiment). After explanation of the main ideas behind the dialogues, Johan and Wawan quickly composed dialogues in three situations: one in which A meets B on their way to work; one in which A talks to B (who is a family member) at home about going to the market, and one in which A meets B after they've just returned from a journey.

Originally, the sentences in the dialogues were very short; this reflected a more naturalistic speech style, as Nasal speakers rarely give long answers, and argument dropping is the norm. Below is an example of the original Dialogue 1:

(1)   A: Hago dipo kau?
            `Where are you going?'
        B: Hago kebun.
            `To the fields.'
        A: Nakhuk api di kebun?
            `What do you grow in the field?'
        B: Nakhuk bacih, gegulaian, jekhing.
            `I grow peppers, vegetables, *jekhing*.'   (BJM02-004)

For the purposes of an intonational study, the data are more useful if there is more material in each utterance, and therefore more ground for an intonational phrase to cover. Thus it was necessary to extend the lines in the dialogue, which Johan and Wawan also did with ease. Below is the final version of the same sentences from Dialogue 1:

(2)   A: Hago dipo kiyo kau?
            `Where are you going?'
        B: Nyak hago ilung kebun Wawan.
            `I'm going to Wawan's field.'
        A: Nakhuk api kio Wawan di kebun ni ganto?
            `What does Wawan grow in his field?'
        B: Iyo nakhuk bacih, gegulaian, khan nilam di kebunnyo.
            `He grows peppers, vegetables, and patchouli in his field.'   (BJM02-013)

Note that the translation of A's first line is identical despite the addition of the word *kiyo*; this is often the case, as there were many sentences which were extended with the use of particles which did not alter the meaning (such as the use of the polite interrogative particle here). There was an attempt to control for microprosodic interference, such as by replacing the word *jekhing*, which features a uvular fricative (transcribed as *kh*), with *nilam*, which is composed entirely of sonorants. However this was only possible in a few instances.

It should also be noted that there is not an equal number of tokens for each sentence type. Because of the nature of naturalistic dialogue, the data are made up overwhelmingly of Type 1 (declarative) and Type 2 (Wh-question) sentences.

2.1. Data Collection

The data for this experiment are comprised of two recordings, recorded on different days, with two pairs of speakers. The first pair of speakers was Johan and Wawan, who were involved in the creation of the dialogues. Both are male native Nasal speakers in their 30s. It may be worth noting that they had practiced the dialogues a few times in previous sessions. The second pair of speakers was Een and Nera, two female native Nasal speakers in their 20s. Speakers were compensated with a monetary reward for their participation in the experiment.

High-fidelity recordings were made using a 4-channel TASCAM DR-701D audio recorder in WAV format at 128kHz, 32 bit, and high-quality video was recorded during both of the sessions using a Canon XA30, which has an external audio input, set up on a tripod. Camera audio was recorded using a Røde NTG2 shotgun microphone connected through the camera's external audio input. Video was recorded in AVCHD format at 30fps with 1920 x 1080 resolution. Speakers wore Shure SM35 headset microphones to capture individual utterances, and a shotgun microphone was placed on the floor. Speakers read dialogues from a word processor on a laptop while I scrolled the page for them as they read. In the case of Een and Nera, each speaker read every dialogue twice, once as both A and B for each dialogue. Johan and Wawan only read each dialogue once. This resulted in 171 total individual tokens.

All of these recordings are in the process of being archived in the PARADISEC archive alongside all other recordings made throughout the duration of this project.

2.2. Analysis

First the recordings were edited so that each reading of any one dialogue by a single speaker was saved as an individual .wav file using Audacity. This resulted in eighteen recordings (three recordings of each role in each dialogue). Each of those recordings was imported into Praat, where a script was used to generate a .TextGrid file for each recording, which automatically segmented to silences (and marked the silences with a code) and added three interval tiers for the words in the Intonational Phrase (IP), sentence type, and token number. Sometimes the .TextGrid generator was inaccurate, so the script allowed the user to adjust the intervals before the next step, which filled the empty intervals with labels from previously created .txt files. Thus the script automatically generated .TextGrid files and annotated them.

Next, two point tiers were added to label tones and breaks in intonational transcription. Using these, the intonational contours of all utterances were transcribed with an *ad hoc* system (tentatively called NasToBI – Nasal Tones and Break Indices).

After the data were transcribed, tokens were compared between speakers and between sentence types (namely declaratives and interrogatives) to form a preliminary hypothesis about salient prosodic cues in Nasal.

2.3. Transcription

The aforementioned NasToBI system was essentially developed simultaneously as the .TextGrid files were being hand-coded. Since there is no intonational transcription system for Indonesian (which is the largest and best-research related language), the basic elements of the MAE-ToBI system were used, namely: numbers to indicate breaks, H and L to refer to high and low points in the pitch contour, and % for boundary tones.

Originally, only the numbers 1, 2, and 3 were used to mark boundaries, as at first I only perceived word boundaries (1), some sort of phrase accent (2) and an IP boundary (3). However, by the time I had coded all the files I realized there were phenomena that couldn't be accounted for with just these labels, and the system was redesigned. The current system of marking breaks is outlined below, though it will continue to be modified as the phenomena of Nasal's prosodic cues become better understood.

> 0 – no boundary
> 1 – word boundary
> 2 – phrase-medial lengthening without tonal accent
> 3 – phrase-medial lengthening and accent
> 4 – IP boundary

Even after coding the files twice, the presence and patterning of phrase accents was still unclear, so they are vaguely marked with H for a high tonal target (so far, no evidence of a low phrase-medial tonal target has been found).

In Nasal, most of the intonational information seems to be coded in boundary tones, which are transcribed as follows:

> L% – falling boundary tone
> H% – rising boundary tone
> LH% – fall-rise boundary tone
> HL% – rise-fall boundary tone
> HLH% – rise-fall-rise boundary tone
> H!HH% – rise-dip-rise boundary tone
> HLHL% – rise-fall-rise-fall boundary tone

This system also includes a hyphen (-) which is used to label boundary tones that spread over multiple syllables and occur before the phrase-final syllable. For instance, if a HLHL% boundary tone is spread over two syllables, it will be labelled as HL- at the nucleus of the first syllable and HL% at the end of the utterance. This system does not match general ToBI transcription in which the hyphen is used to indicate intermediate phrase (ip) tone targets, so this method of transcription for Nasal will most likely be altered in the future.

These labels will be explained in greater detail in Section 3.

3.0. RESULTS

3.1. Boundary Tones

Here the various types of intonation phrase boundary tones will be exemplified and described (in the greatest detail possible).
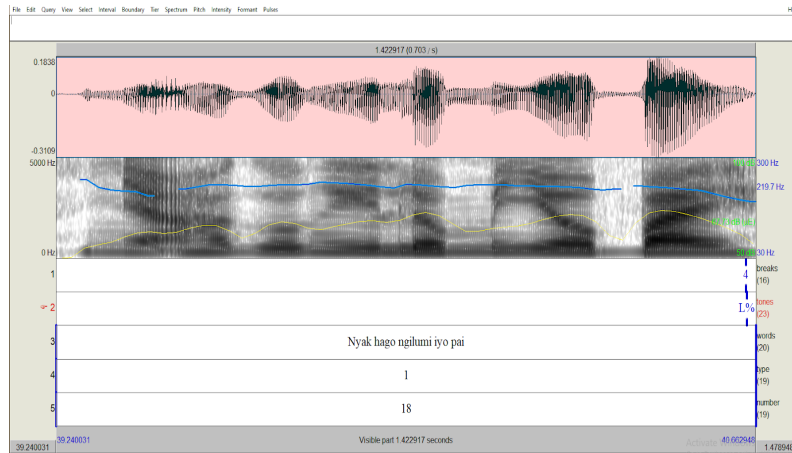
3.1.1. L% falling boundary tone

Figure 1. 'I'll go look for him now.'

This boundary tone type is very common and is mostly associated with basic declarative statements. It is characterized by a flat intonation contour over the duration of the utterance followed by a drop in pitch at the very end of the IP (Intonation Phrase).

3.1.2. H% rising boundary tone
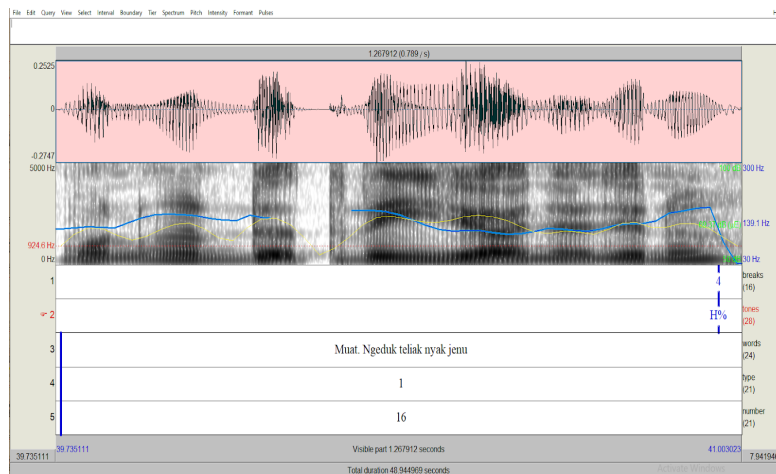
Figure 2. 'I didn't see him earlier.'

This boundary tone is found in statements, though it rarely occurred in this study. The meaning of this boundary tone (as opposed to statements with a L% boundary tone) is unclear, but it is clearly distinct, as it was used in one token by multiple speakers.
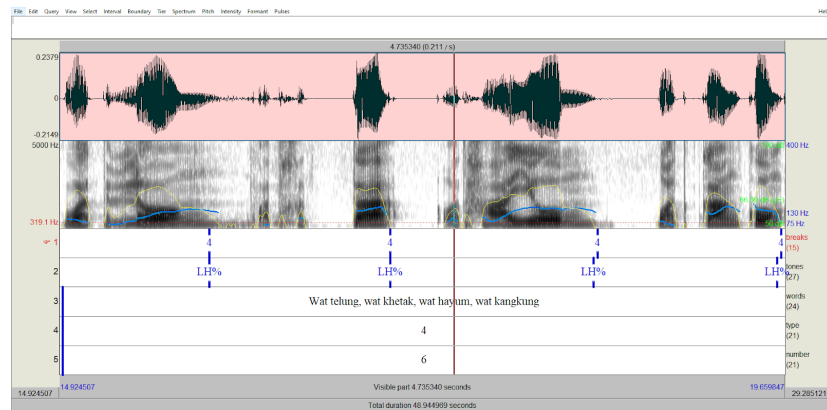
3.1.3. LH% fall-rise boundary tone

Figure 3. 'There's eggplant, long beans, spinach, kale...' (list).

This pattern is used in primarily lists and features a fall on the penultimate or final syllable of the IP with a late rise on the final syllable.

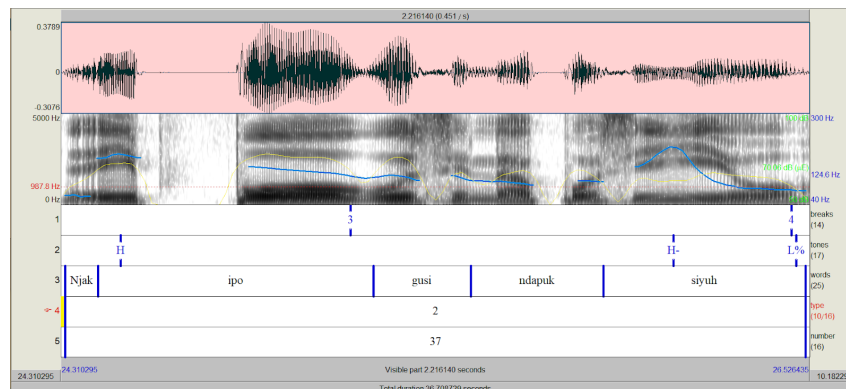### 3.1.4. HL% rise-fall boundary tone

Figure 4. 'Where did you get snails?'

This boundary tone is by far the most numerous, and is the default boundary tone for questions, regardless of whether it is a "wh-" or "polar" question. This boundary tone is characterized by a rise to a high tone target followed by a steep fall.

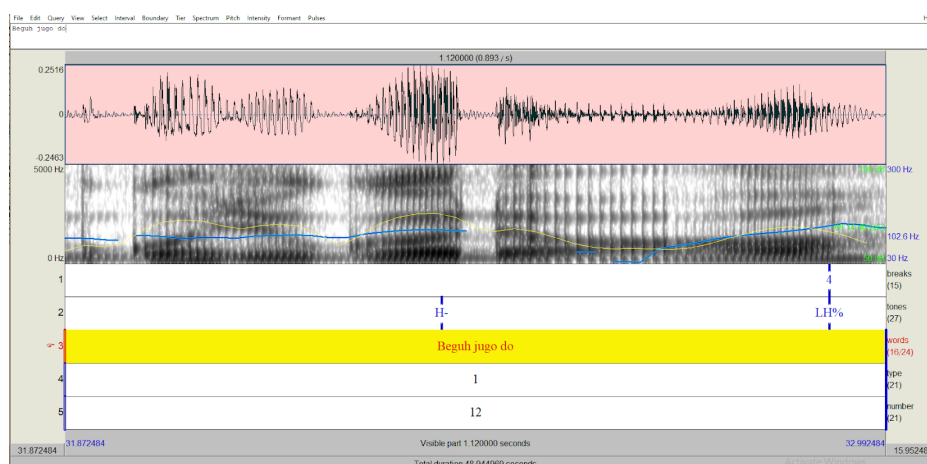### 3.1.5. HLH% rise-fall-rise boundary tone

Figure 5. 'Quite a few.'

This boundary tone occurs only in statements, and is associated with emphasis and agreement, especially with the emphatic particle *do*. It is characterized by a sharp rise, followed by a sharp fall, followed by a final sharp rise.

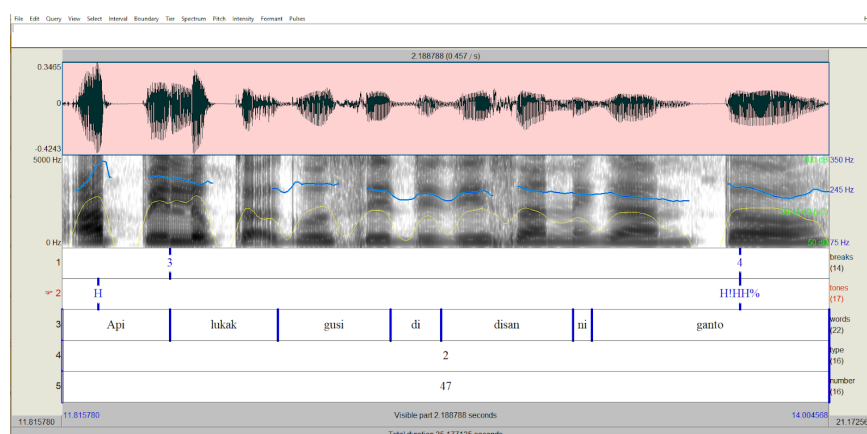### 3.1.6. H!HH% rise-dip boundary tone

Figure 6. 'What were you doing there?'

This rarely used boundary tone has only appeared so far in questions. It is characterized by a sharp rise and a slight dip, then a rise back to the same height as the first rise. It is distinct from the rise-fall-rise boundary tone in that the dip in the H!HH% pattern is far less drastic than the fall to a low tonal target in an HLH% boundary tone pattern (that pattern is also used only in statements).]
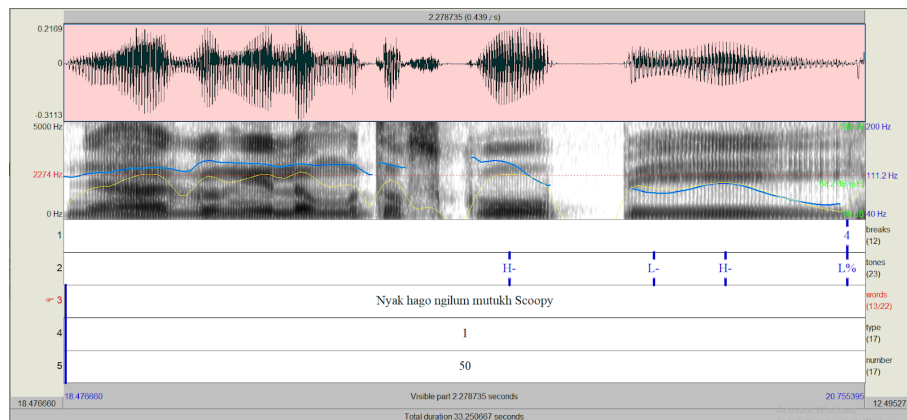
3.1.7. HLHL% rise-fall-rise-fall boundary tone

Figure 7. 'I wanted to look for a Scoopy.'

This boundary tone is used in statements with narrow focus, and is characterized by a rise followed by a steep drop, followed immediately by a second rise with a (usually) slightly lower target than the first, followed again by a drop to a low final tone target.

The tone targets of the sequence of H L H L tones do not always align the same way; for example, in Figure 7 above, the first low target aligns with the second syllable, though in other examples the first high and low targets align with the penultimate syllable while the second high and low targets align with the final syllable. This topic will be further explored in future studies of Nasal intonation.

3.2. Prominence Marking

So far prominence marking is the most loosely understood aspect of Nasal intonation. This study has focused mainly on the qualities of boundary tones; in order to more fully explore and define prominence marking, definite acoustic correlates must first be identified. However, based on impressionistic judgments, prominence marking in Nasal has been basically defined as: one syllable/word in the utterance that receives tonal prominence as well as significant lengthening (thus patterning with "head-marking" languages as defined in Jun (2005)). At present it is unclear what tonal targets are available for marked syllables; for now, it has been hypothesized that H is the only valid target. If length is truly a correlate of this prominence marking, it will not be difficult to identify and measure in a future study.

4.0. RESULTS

Though this descriptive study does shed light on a few salient phenomena that form part of Nasal prosody, the results lead to more questions than answers. For example: typologically, languages that mark polar questions with falling intonation are the exception rather than the norm. Does Nasal really use falling intonation as a cue for all interrogatives? What features (if any) influence the alignment of boundary tone and accent targets? What is the intonational hierarchy in Nasal, and how does prominence marking work? These are only a few of the questions that will direct upcoming prosodic experiments.

During the next fieldwork trip to Nasal, this study can be repeated, but with a variety of dialogues which feature topics and speaking styles that are culturally relevant to both men and women, and which have also been better controlled for microprosodic interference. In the future, other types of projects may prove fruitful, such as a

map task or the type of controlled exercises described in Jun & Fletcher (2014). The latter may be especially helpful in determining the patterns and conditions of prominence marking in Nasal, which is a crucial next step in understanding the basic tunes of Nasal intonation. This study presents an inventory of boundary tones, but without an understanding of what happens inside the phrase, the tune is only half finished. Finally, a truly robust description of the intonational phonology of Nasal would include acoustic analyses of each aspect of the phonology, ideally based on a corpus of naturalistic speech. These are the goals that will guide the direction of this project over the next several years.

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