Intonation & Prosodic Structure in Beaver (Athabaskan)

Explorations on the language of the Dane<u>z</u>aa

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Abstract

This dissertation reports on qualitative and quantitative investigations on the intonation and the prosodic structure of Beaver, an endangered Athabaskan language of Northwest Canada. The focus of the study is on the Northern Alberta dialect of Beaver, which has lexical tone and is a *high marking* Athabaskan language. The theoretical framework of the analysis is the Autosegmental Metrical (AM) theory.

Following some background on intonation and prosody as well as the theoretical modelling, we summarize contributions dealing with intonation in languages that share certain features with Beaver, i.e. tone languages, polysynthetic languages and finally the related Athabaskan languages.

After a brief introduction to the grammatical structure and the sociolinguistic situation of Northern Alberta Beaver, the database of the present study is introduced. It consists of narratives and task oriented dialogues as well as recordings elicited with stimuli sets.

In the domain of intonation and prosody, three topics are investigated in detail. First, domain initial prosodic strengthening is analyzed. We show that a boundary initial position at higher constituents of the prosodic hierarchy has a lengthening effect on VOT of both aspirated and unaspirated plosives, while nasals are shortened in this context. Additionally, effects of morphological category (stem vs. prefix) and intervocalic position – two mechanisms that have been described for other Athabaskan languages – are also attested for Beaver to some degree.

Second, the intonational tones that have been found in the corpus are analyzed within the AM theory. In Northern Alberta Beaver, boundary tones and phrase accents make up the intonational inventory. Most notably, an initial phrase accent is used to mark contrast, which is a device that has not been reported for the marking of information structure in other languages.

Lastly, the interaction of information structure with pitch range in complex noun phrases is tested in a controlled experiment. Here, we find that pitch range is significantly wider for new information than for given, which is due to a raising of the top line, while the baseline is not affected to the same extend.

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Chapter 1

Introduction

Intonational phonology has long been neglected in the study of linguistics, and has in the last decades seen a rising interest. A large body of studies is now available on the intonation systems of most European languages, and an awakening interest can be observed in the study of intonation of more exotic languages or dialects of better studied languages. These will be of great importance for testing theories that mainly are based on findings from the usual suspects, such as English and other European languages and more recently, major Asian languages such as Chinese and Japanese.

Intonation and prosody in Beaver (Daneẕaa)[1], an endangered Athabaskan language of Canada, are the object of this study. The focus will be on the Northern Alberta dialect of Beaver, spoken by members of the Beaver First Nations of Alberta at Child's Lake and Boyer River. The investigation of Beaver intonation and prosody is aimed to be a contribution to intonational typology. Research on intonation in Native American languages is still scarce and Beaver presents an interesting case because it is a tone language. However, it differs from the better known representatives such as Chinese or the African tone languages in that its tonal system is very simple and does not carry a high functional load which seems to leave more room for exploiting the means of intonation.

The data collection and the analyses in this thesis were conducted as part of the DoBeS-project[2] for the documentation of Beaver, funded by the VW-Foundation. The documentation is archived at the MPI in Nijmegen and can be accessed there[3]. The present study is a first investigation into the intonation and prosody of Northern Alberta Beaver (NAB) and is based on data collected on fieldtrips from 2004–2008 by the author and other members of the documentation team.

[1] Throughout this study, the English language name will be used because it is used by members of the Northern Alberta communities as well. The Beaver term *Dane ẕaa ẕagé'*, literally "language of the real people", may include other Athabaskan languages as well. The other self-designation *Tsááty'ę*, literally "Beaver people" is more restricted – not including all Beaver speaking communities –, but is also used by the neighbouring Slavey.

[2] Dagmar Jung, Julia Colleen Miller, Patrick Moore, Gabriele Müller, Olga Müller (now Lovick) & Carolina Pasamonik, 2004–present, DoBeS Beaver Documentation, DoBeS Archive MPI Nijmegen, www.mpi.nl/DOBES/projects/Beaver.

[3] http://corpus1.mpi.nl/ds/imdi_browser?openpath=MPI689499%23.

1.1 Aims of the Dissertation

The present thesis aims at providing first insights into the prosodic structure of Beaver, into the intonation system and its interaction with tone, based on mostly spontaneous data in order to contribute to our understanding of intonation in a tone language and to compare our typological expectations with phenomena found in Beaver.

More specifically, the intonational tones in Beaver will be explored, in order to add to the small body of studies on intonation in Athabaskan languages. Furthermore, this will give the opportunity for typological comparison with other tone languages and further the search for areal features of intonation in North America.

The investigation of domain initial prosodic strengthening will show that evidence for prosodic structure can be found in fine grained phonetic detail in Beaver, as has been shown for many other languages. In addition to this well-known mechanism, two further effects will be analyzed that influence the phonetic realization of segments, i.e. the strengthening of stem initial consonants and intervocalic lengthening. This will support the observation that prosodic strengthening is in interplay with or counteracted by language specific constraints with evidence from a polysynthetic language.

The analysis of the prosodic expression of information structure is hoped to provide evidence that tone languages can employ prosodic means and possibly intonational tones for the encoding of information structure.

Lastly, the thesis documents aspects in the post-lexical phonology of this disappearing language.

1.2 Structure of the Dissertation

In the following introductory section of the thesis, basic concepts concerning intonation and prosody will be introduced and discussed. After defining intonation and prosody, the main theoretical framework, the Autosegmental Metrical theory will be sketched together with a brief introduction of other phonological models. Then some typological background will be provided to survey what influence different features of Beaver such as lexical tone or polysynthetic morphology might have on intonation patterns, and what mechanisms are at work in other Athabaskan languages. The next chapter will briefly introduce the Beaver language. This is followed by a description of the database used in this study, and the transcription system employed to annotate the data. Chapter five will address the prosodic structure of Beaver, with a phonetic investigation of domain initial prosodic strengthening and other effects on segmental realization. After that, intonational tones that have been found in the corpus will be introduced and discussed. In the subsequent chapter, the expression of information structure will be analyzed based on elicited data. Finally, in the conclusion, the findings will be summarized and issues for future research will be presented.

Chapter 2

Intonation & Prosody

2.1 Definitions of Intonation & Prosody

In human communication, various kinds of information are simultaneously transmitted through different channels. Alongside the segmental material, many factors are present in face-to-face communication that are lacking in a written text. Gestures and eye gaze, breathing patterns and the posture of speakers, but also the pitch movements and qualities of their voices together with a rhythmic composition of the utterances contribute to a smoother, more effective course of the communication while not necessarily adding to the linguistic content being communicated.

However, intonation not only encodes paralinguistic functions, such as emotions, speaker involvement, and the like, but can also serve to mark linguistic concepts such as sentence mood, phrasing or information structure. Furthermore, the structuring of discourse and the management of turn-taking are largely organized by means of intonation and prosody. The fact that intonation also encodes psychological states of speakers may have contributed to the neglect that it has seen in linguistics:

> "Intonation is a half-tamed savage. To understand the tamed or linguistically harnessed half of him one has to make friends with the wild half." (Bolinger 1978: 475)

Intonation and prosody are very alike in this respect. Pierrehumbert (1999) defines prosody as the "grouping and relative prominence of the elements making up the speech signal". Grice (2006) argues in favour of a broader definition of intonation, which goes beyond the mere pitch movements of an utterance:

> "However, this distinction between prosody and intonation is rather artificial, since the terms are often used interchangeably – not only in more traditional phonetic models such as the British School (Crystal, 1969; Cruttenden, 1997), but also within phonological models of intonation which embrace the autosegmental-metrical framework. In this account, we use the term intonation, in its broad sense, to cover both aspects." (p. 778)

So this broader definition of intonation not only includes F_0, i.e. the acoustic correlate of the perceivable pitch movements of the voice, but also "includes loudness, and segmental length and quality, although languages differ in the extent to which they modulate these to achieve highlighting and phrasing." (Grice & Baumann 2007: 27).

	linguistic		physical
lexical	tone stress quantity	⟺	fundamental frequency intensity
			duration
non-lexical	intonation proper	⟺	spectral characteristics

Table 2.1: Intonation and lexical phenomena like tone, stress or quantity are marked by the same physical features (adapted from Hirst & Di Cristo 1998: 5).

The physical characteristics that are of interest here are summarized in table 2.1. An important distinction is that between lexical features such as tone and post-lexical (here "non-lexical") features such as intonation. This distinction will be of interest for this study because Beaver has lexical tones which need to be separated from intonational ones.

2.2 Modelling Intonation & Prosody

In this section the main framework of the thesis will be presented, the Autosegmental Metrical Theory of Intonation, and some background will be given on work on the prosodic hierarchy. Furthermore, the PENTA Model will be briefly introduced as an alternative, though a not as widely accepted, model of intonation. It has the advantage of having been developed using English as well as Chinese data, thus being more specifically aimed at describing intonation in tone languages.

2.2.1 The Autosegmental Metrical Theory

The Autosegmental Metrical (AM) Theory of Intonation will be used as the frame of analysis in this study; Ladd (1996) and more recently Gussenhoven (2006) provide overviews of this theory. The term “Autosegmental Metrical Theory” was coined by Ladd (1996); the theory itself has its origin in the analysis of American English intonation by Pierrehumbert (1980). Her work in turn was influenced by earlier studies in autosegmental phonology, such as Goldsmith (1976), Leben (1973) and Liberman (1975), and by the work of Bruce (1977) on the Swedish word accents.

In the AM model, intonational contours are analyzed as a sequence of high (H) and low tones (L) on an autosegmental tier which are associated with metrically strong syllables or edges of prosodic domains. The phonetic realization of these tones is described in terms of the alignment, i.e. the temporal position on the horizontal axis relative to segmental landmarks, such as the onset of a syllable or a vowel, and the scaling which describes the size of the pitch-excursions on the vertical axis. The final F_0 contour arises through interpolation between the atomic targets.

There are three different kinds of intonational tones in AM theory[1]:

- pitch accents: prominence lending pitch excursions associated with metrically strong syllables, marked by an asterisk: T*

- phrase accents: associated with the edge of a prosodic domain, and possibly secondarily associated with tone bearing units (TBUs) in the segmental tier, marked by a dash: T-

[1] Here, the “traditional” notation as shown in Ladd (1996) is used. There are notations, as e.g. found in Gussenhoven (2004) where other diacritics are employed to differentiate the different types of tones.

- boundary tones: associated with edges of larger prosodic domains, marked with a percent sign: T%

Pitch accents have the main function of highlighting important parts in an utterance, while boundary tones have a demarcative function and do not highlight any constituents. The phrase accent finds itself in a position in-between the pitch accents and the boundary tones as it is associated with a prosodic edge and sometimes secondarily associated with a TBU. It can in some cases be prominence lending as well (Grice et al. 2000). The German calling tune, a stylized contour that is used with slight variations in different languages (e.g. French, Hungarian, Dutch, English, cf Ladd 1996: 136–138), will serve here as an illustration of the difference between pitch accents and phrase accents. In German, this contour is analyzed as H*!H-, with the pitch accent H* associated with the lexically stressed syllable and the downstepped[2] phrase accent !H- associated with the subsequent syllable with the biggest relative metrical prominence. Thus, we see different realizations on words with different numbers of syllables and different prominence patterns (cf Grice et al. 2000: 176):

(1)	H*	!H-	H*	!H-	H*	!H-	H*	!H-
	|	|	|	|	|	|	|	|
	Wil-	ma	Anni-	ka	Fre-	ed	Angst-	hase

Interestingly, in the monosyllabic name *Fred* the syllable is lengthened in order to supply enough room for the two tonal targets to be realized.

A last important type of tones are lexical tones. They are not part of the intonatory inventory but a property of syllables defined in the lexicon. The lexical tones are often written without any diacritics: T. However, in this study the notation T_{lex} will be used to make the difference to intonatory tones more obvious.

[2]Downstep describes the lowering of a H tone, for more details see p. 11.

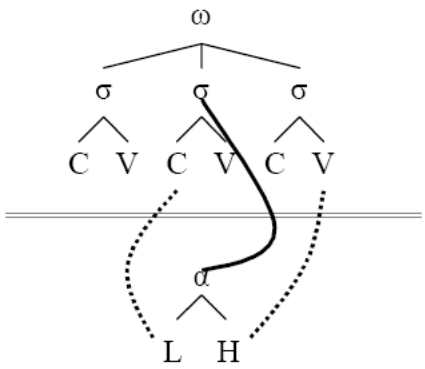

Figure 2.1: A complex accent α is primarily associated with the second syllable (σ) of a word (ω) indicated by the thick line, while L is secondarily associated with the consonant of that syllable and H with the vowel of the next (Ladd 2004: 127)

.

The three different types of intonatory tones are associated with tone bearing units (TBU) in the segmental string or edges of domains in the prosodic structure. Ladd (1996) defines association as "the abstract structural property of 'belonging' together in some way" while alignment is a "phonetic property of the relative timing of events in the F_0 contour and events in the segmental string" (p. 55). Thus, as shown in fig. 2.1, an accent α is associated with the second syllable of a word (indicated by the thick line). In some cases, secondary association is assumed, as e.g. in the Greek prenuclear accent L+H. This accent is primarily associated with the accented syllable but secondarily with the beginning of the consonant of that syllable, while the H is secondarily associated with the vowel of the following syllable (Arvaniti 1998). Both tones are phonetically aligned with these landmarks. Furthermore, secondary association is a property of phrase accents, as analyzed in Grice et al. (2000). This idea of secondary association and the exact nature of alignment poses problems to the AM theory, as discussed in Ladd (2004), giving rise to newer developments that try to integrate articulatory phonology as a solution to these problems into the AMs framework (Ladd 2006).

As has been discussed this far, there are only two levels of tones in AM theory to describe relative pitch height, L and H. In order to capture relevant features of intonation contours, it is necessary to additionally model manipulations of the tonal space (Grice 2006: 783). Hence, the H tones can be manipulated and set into relation to each other by diacritics describing upstep (ˆT) and downstep (!T). Downstep is a concept which has been borrowed from the analysis of African tone languages. It has already been introduced by Pierrehumbert (1980) in her analysis of English intonation. Downstep constitutes a relative lowering of the tone it modifies, while upstep models the expansion of the pitch range by the raising of a H tone. These two concepts have been included in AM analyses of other languages as well.

2.2.2 The Prosodic Hierarchy

Human speech is structured into units of different sizes, some of which seem to be intuitively clear such as utterances, words or syllables. A number of phonological rules and processes define and motivate various levels of prosodic structure. However, there are different ways to analyze this structure and no single prosodic hierarchy has yet been established that cannot be challenged in some way or another.

An influential proposition of a prosodic hierarchy can be found in Nespor & Vogel (1986), other models include Selkirk (1978, 1980), Hayes (1989), Jun (1993), Gussenhoven (2004), and Keating et al. (2003).

The proposed hierarchies consist of as many as eight different levels, starting from the mora (μ), the syllable, (σ), the foot (ϕ), the prosodic word (ω),

U, υ
(Phonological) Utterance
|
I, IP, ι
Intonation(al) Phrase
|
ϕ, P MaP, ip
Phonological Phrase, Major Phonological Phrase, intermediate phrase
|
C, MiP, AP
Clitic group, Minor Phrase, accentual phrase
|
ω, Pwd
Prosodic word, Phonological word, P-word
|
Σ, F, ϕ
Foot, rhythm group
|
σ
Syllable
|
μ
Mora

Figure 2.2: The prosodic hierarchy with the maximum number of constituents, illustrating different terminologies and variables found in the literature. The equivalence of the levels between the IP and the word is still disputed and is only an approximation here, cf also fig. 2.3.

the clitic group (C), the phonological phrase (P), the intonational phrase (I), and lastly, the utterance (U). However, there is considerable variation as to how many levels are included in a certain theory and in the terminology as well. In fig. 2.2 a hierarchy with the maximum number of constituents has been drawn up with the different labels and terminologies for the constituents found in the literature. The first labels for every constituent are the ones initially introduced by Nespor & Vogel (1986)[3], the alternative labels are the ones found in the other models mentioned above. Especially the constituents between the prosodic word and the intonational phrase are subject to considerable variation, and even notions as basic as the word cannot be claimed to be universal Schiering et al. (2007). So it is only as an illustration of the heterogenous nature of the different frameworks that these categories are summarized here. The hierarchy in fig. 2.4 is used in studies on prosodic strengthening and assumes fewer levels of structuring (Keating et al. 2003). It will be used here as a starting point from which to investigate prosodic strengthening in Beaver 5.1. It includes the syllable, the foot, the word, the "smaller phrase", the intonational phrase, and finally the utterance. It is thus less elaborate between the IP and the word, so that the "smaller phrase" may be equated with a Phonological Phrase, an intermediate phrase or an Accentual phrase (Grice 2006: 779). The approximate equivalence of levels from different frameworks is illustrated in fig. 2.3 as adapted from Shattuck-Hufnagel & Turk (1996).

2.2.3 The Parallel Encoding & Target Approximation Model

In addition to the Autosegmental Metrical theory of intonation which will be the main framework of the present study, it might be useful to also consider another more recent model, the Parallel Encoding & Target Approximation (PENTA) model that has been proposed by Xu et al. (1999) and was further elaborated, among others, in Xu (2004, 2005). This model, although very rudimentary, might be useful since it has been developed mainly based on Mandarin Chinese and English data and is thus aimed at coping with the

[3]Note that the mora was not included in the prosodic hierarchy as proposed in Nespor & Vogel (1986).

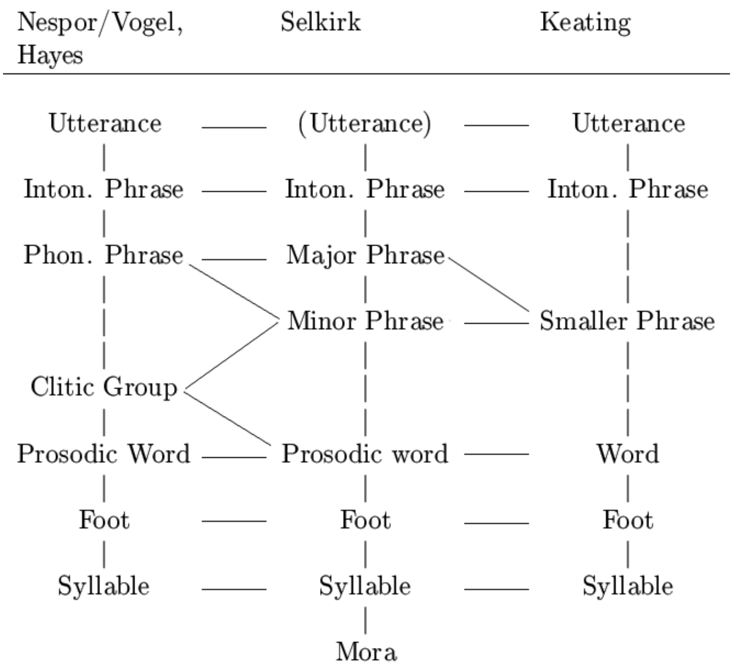

Figure 2.3: A comparison of different prosodic hierarchies found in the literature (adapted from Shattuck-Hufnagel & Turk 1996: 206, with the addition of Keating's hierarchy, 2003).

U
Utterance
|
IP
Intonational Phrase
|
XP
Smaller Phrase
|
W
Word
|
F
Foot
|
S
Syllable

Figure 2.4: An alternative prosodic hierarchy as employed by Keating et al. (2003).

intricacies of intonation in a tone language, perhaps even more fundamentally than the AM theory.

As schematized in fig. 2.5, in the PENTA model communicative functions, such as topic and focus marking, demarcation, but also lexical tone are encoded in parallel in the speech signal through encoding schemes in which melodic primitives are specified. These basic encoding elements or primitives such as local pitch target, the pitch range and the articulatory strength, in Prom-on et al. (2009) and Xu (2007) also the duration, are specified in the encoding schemes. Then F_0 is generated by the articulatory system in approaching the local pitch targets in synchronization with syllables with the specified pitch range and articulatory strength. The primitives for the parameters are given in table 2.2 with their transcription conventions. Note that the local pitch targets can be either static (high, low) or dynamic

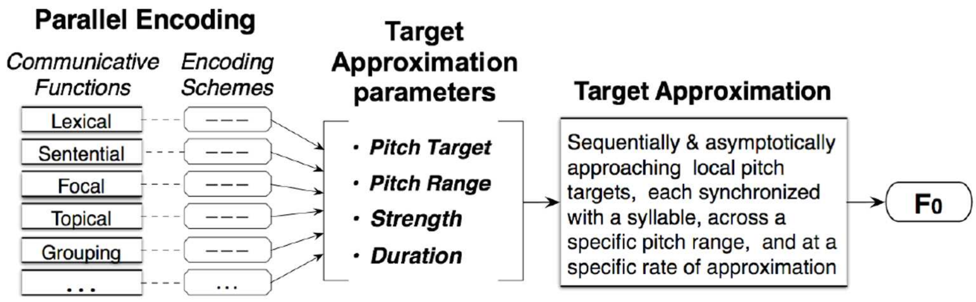

Figure 2.5: The PENTA model as shown in Prom-on et al. (2009).

Local Target:		
	Regular target:	[high], [low], [rise], [fall]
	Boundary tone:	high% , low%, mid%
Pitch Range:		
	Height:	|high|, |low|, |mid|
	Span:	|wide|, |narrow|, |normal|
Articulatory Strength:		<strong>,<weak>,<normal>

Table 2.2: Values of the melodic primitives with the suggested transcription conventions, adapted from Xu (2004).

(fall, rise) and that the set of boundary tones is very limited (high, low and mid). In the AM model, pitch movements are decomposed into static targets (either high or low) and combinations thereof, and thus the edge tones that have been analyzed for various languages yield a more complex picture than the three possibilities posited here.

As we have noted before for the AM theory, we also find for the PENTA model that concepts of Articulatory Phonology (Browman & Goldstein 1992) can be usefully applied to pitch contours. Not only with the articulatory strength parameter that is reminiscent of the “stiffness” of a gesture in Articulatory Phonology do concepts of this framework find their way into the PENTA model[4]. This model might be useful in addition to the AM Theory, when dealing with features such as compression or expansion of pitch range or reset and higher register, because in the former theory these features are modelled as properties of one tone (upstep, downstep) while in the PENTA-model, they are properties of stretches of speech. This might be more appropriate when analyzing a tone language.

2.3 Intonational Typology

In the following, intonation and prosody in languages with features similar to those of Beaver will be briefly summarized in order to set the stage for an investigation of those phenomena in Beaver. Beaver is a polysynthetic language with lexical tone and belongs to the Athabaskan language family. Before starting to investigate intonational typology, a word of warning by Fletcher (2007) is in order:

> "There are relatively few complete descriptions of word-level and phrase level prosody of the world's languages so no-one assumes that our typologies are finite. Nor should we assume that assigning a language to a typology might be a simple process of ticking off a list of parameters or features that are typical of one type of language compared to another [...]. Many languages fall between typological groupings [...] or show features that would put them in more than one conventional category." (p. 2f)

[4]Other concepts are e.g. the syllable timing in PENTA that resembles the work on this topic in Articulatory Phonology (e.g. the coupling modes) or the role of articulation constraining the output.

The classic division of languages into the categories tone language, stress accent language and pitch accent language (Trubetzkoy 1958: 181) has been found not to be quite sufficient since there are languages with e.g. both tone and stress such as Mandarin Chinese (Jun 2005b: 431) or languages that do not seem to belong to either of the three major groups Lindström & Remijsen (2005), Jun (2005a). This tripartite system is challenged by Hyman (2006). Because of a number of problems with finding a way to define those three categories unequivocally so that the types do not overlap, he proposes to work with the two prototypes "tone language" and "stress accent language". He defines these two as follows:

> "A language with tone is one in which an indication of pitch enters into the lexical realization of at least some morphemes" (p. 229)

whereas stress accent is defined in terms of metrical prominence:

> "A language with stress accent is one in which there is an indication of word-level metrical structure meeting the following two central criteria:
> a. OBLIGATORYNESS: every lexical word has *at least* one syllable marked for the highest degree of metrical prominence (primary stress);
> b. CULMINATIVITY: every lexical word has *at most* one syllable marked for the highest degree of metrical prominence" (p. 231; emphasis in the original, G. S.),

with "obligatoryness" being the more important criterion.

When following Hyman (2006), as well as in the traditional categorization of word prosodic systems, Beaver would be considered a tone language (for more discussion of the tonology of Beaver cf section 3.3.2 on page 57).

Therefore "pitch accent languages" or those languages that cannot be easily assigned to the one or the other will not be considered any further here[5].

Starting out from this word prosodic approach, the question is whether, and if so, how word prosodic types correlate with different intonational features. Intonational typology has not been discussed as widely as the typology of word prosodic systems. Nevertheless lexical and post-lexical features are ideally investigated together. However, it seems that it is not possible to

> "predict the postlexical prosody of pitch (e.g. intonational pitch accent, phrase accent) based on the lexical prosody (i. e tone, stress, lexical pitch accent) of a language, the prosodic units above the Word are not predictable from the timing unit of the language" (Jun 2005b: 432).

Thus it is not yet clear what features might be relevant in intonational typology or which "cells in the typological possibility space" need to be investigated before correlations can be observed between different dimensions of intonational and morphosyntactic organization and the word prosodic system in languages (Fletcher et al. 2002: 4).

In the remainder of this chapter, we will sketch findings on intonation in tone languages, then we will briefly consider what influence the fact that Beaver is a polysynthetic language might have on its prosody. Finally, we will present findings on intonation in other Athabaskan languages.

2.3.1 Intonation in Tone Languages

Tone and intonation are both linguistic uses of pitch, one on the lexical level, one post-lexically. The question now arises if and how tone and intonation

[5] For more details on this discussion cf Hyman 2006 or Jun 2005.

are compatible in a language. Pike (1948) states that "all tone languages have intonation of the emotional type" to which he does not attribute structural organization as that found for contours in languages without lexical tone (p. 16f.). He claims that those superimposed pitches do not change the basic tones "even though they may modify the phonetic character of the tonemes or temporarily obliterate their contrasts, or even constitute narrative versus interrogative contours, and the like, which are superimposed on the lexical pitches" (p. 17). These temporary obliterations of tonal contrasts by intonational tones do not "seriously interfere with the tonal system as a whole" (p. 18). Similarly, Cruttenden (1997) claims that intonation can be found in tone languages, albeit to a more restricted degree. He describes four different types of "superimposed intonation" (p. 10):

1. "the pitch level of the whole utterance may be raised or lowered"
2. "there will usually be downdrift in the absolute value of tones but downdrift may be suspended"
3. "the range of pitch used may be narrower or wider"
4. "the final tone of the utterance may be modified in various ways"

These possibilities are manipulations of the tonal space in which the lexical tones can be realized; pitch range (wide vs. narrow) and pitch span (higher vs. lower), the suspension of downdrift and the modification of the last lexical tone. Additional intonational tones are not explicitly part of this list, however, intonational tones can be found in tone languages. As demonstrated by Hyman (1990) for Luganda, Gokana and Kinande, boundary tones can be present in tone languages at different levels of the prosodic hierarchy. Likewise, Yip (2002) states that "in many Chinese languages we see the effects of intonational boundary tones, even though they are often not recognized as such" (p. 274). This might be the case for other tone languages outside the Asian context as well.

Furthermore, some cases of floating tone, i.e. a tonal morpheme without any segmental material, could be alternatively analyzed as boundary tones (e.g. Good 2002).

As a way of correlating the type of tone system with the choice of intonational mechanisms in a language, Michaud (2008) proposes that level tone systems with decomposable tone will make use of intonatory tones. On the other hand, languages with contour tone systems in which tone is not as easily analyzed as combinations of H and L do not tend to make use of intonation in the form of additional tones; instead they utilize pitch range manipulations and other mechanisms[6]. This would predict that some intonational tones can be found in Beaver.

2.3.2 Intonation & Prosody in Polysynthetic Languages

Even though a clear definition of polysynthesis in languages is hard to arrive at (cf Evans & Fletcher 2002), Beaver will be classified here as a polysynthetic language, because of its complex verbal morphology as discussed in 3.3.3. Comrie (1989) defines a polysynthetic language as allowing the combination of "a large number of morphemes, be they lexical or grammatical, into a single word, often corresponding to a whole sentence of English" (p. 45). However, he concedes that the morphological types he defines are only (extreme) points on a continuum (p. 47). Athabaskan languages are very rich in their morphology, as can be seen in this Beaver example of the equivalent of an English sentence consisting of one complex word:

[6] Thai could possibly be a counterexample to this hypothesis.

(2) ḭh- ts'i- wu- gha- da- dyih -ts
rec- to- areal- 3pl- lex- talk -asp
"They are talking to each other." (fieldnotes, G. S.)

Prosodically, polysynthetic languages are as diverse as languages of any other morphological type: Polysynthetic languages can be stress-accent languages, such as the Australian languages Bininj Gun-Wok (Bishop 2003) or Mawng (Hellmuth et al. 2007). Non-tonal and non-lexical stress languages such as West Greenlandic (Nagano-Madsen & Bredvad-Jensen 1995, Arnold 2007) can also be found among the polysynthetic languages, while Chickasaw (Muskogean) (Gordon 2005) – also polysynthetic – has both, lexical stress and lexical pitch-accent. Many Athabaskan languages are examples of a polysynthetic language with lexical tone, e.g. Slave (Rice 1989b) or Navajo (McDonough 2003b).

So the fact that a language can be classified as polysynthetic will probably not have much influence on intonation patterns as such. It is however interesting to note that polysynthetic languages may pose problems to the classic prosodic hierarchy which has been assumed to be universal by Nespor & Vogel (1986). On the one hand, there are indications from polysynthetic languages that the "verb-word" corresponds to the level of the phonological phrase and can be made up of more than one prosodic word, e.g. in Evans & Fletcher (2008) on Australian languages. Similarly, Russel (1999) notes on Plains Cree, Swampy Cree and Dakota:

> "[...] the most likely candidates for being phonological words are a fair bit smaller than the 'words' that have traditionally been assumed in the linguistic literature. Indeed, the traditionally defined 'words', if it is a phonological constituent at all, seems to be at the level of the phonological phrase. This is in line with work

> on other North American languages, which has found that the linguists' traditional 'words' are better analyzed as phonological phrases [...]" (p. 220).

For similar observations on Slavey Athabaskan compare Rice (1994) and on Cayuga compare Dyck (2001). On the other hand, there also seems to be evidence for a level of phrasing that is higher than the utterance, containing a paragraph of speech, e.g. Beck & Bennett (2007) on Lushotseed. Polysynthetic languages might thus expand our understanding of phonological phrasing, and consequently of intonational typology. And reports on intonation in these languages will fill blank spots in areas that are as of yet underrepresented in intonational typology.

2.3.3 Intonation in Athabaskan Languages

Ladd (1996) offers the speculation that "in some languages – the languages of western Siberia and the American Northwest are possible examples – there are no core tones at all, only edge tones" (p. 149). Whether Athabaskan languages and thus Beaver are part of this linguistic area remains to be seen.

In terms of prosody, the main focus in the Athabaskanist literature has long been on lexical and grammatical tone and tonogenesis (for tone in Beaver cf section 3.3.2), so that the publications dealing with intonation or prosodic features other than tone in Athabaskan languages are all of a fairly recent date. In the following sections, these studies on intonation and prosody will be summarized.

2.3.3.1 Tanacross – Holton (2005)

Tanacross is spoken in Alaska and therefore is geographically remote from traditional Beaver territory. It is, like Beaver, a Northern Athabaskan language, but belongs to a different subgroup: Central Alaska-Yukon. Nevertheless, Holton's study is one of the few about intonation proper and thus provides some useful indications for investigations in Beaver. Holton (2005) explores the interaction of lexical tone with intonation contours by examining the resulting pitch.

Tone Tanacross has High and Low lexical tones (unlike many other Athabaskan languages, where only one tone must be lexically specified), as well as contour tones. These arose historically from bisyllabic stems that due to loss of the medial consonant or the final vowel were reduced to one syllable without the tones being lost. Holton analyzes contour tones as two tonal events associated with a single tone bearing unit (p. 252ff) through *Leftward T-Association.* Ex. 3 shows an example of a bisyllabic stem in Proto-Athabaskan (PA), the word for "a woman's grandchild" that has lost the second syllable in Tanacross with the L tone being associated leftwardly to the remaining syllable[7]:

(3)	H L		H L
	| /	⟵	| |
	-tsâ:y		PA *-kʲa': ye:
	"woman's grandchild"		(Holton 2005: 253)

This *Leftward T-Association* also occurs when suffixes that consist of a tone with no segmental material are attached to stems (such as the possessive or the nominalization suffixes) resulting in contour tones as well.

[7] No tone is reconstructed for Proto-Athabaskan, only constriction of syllables that then later developed into tone. The constriction in this example is indicated by the apostrophe following the constricted syllable. The tones that are associated with the two syllables in the example for illustrative purposes actually arise later in tonogenesis (cf section 3.1.3 for a discussion of Athabaskan tonogenesis).

For prefix syllables only high tone seems to be lexically specified because here high tone spreads from stems in the preceding word or from preceding prefixes to the right onto tonally unmarked syllables (*Progressive tone-spread*). So for prefix syllables there seems to be the synchronic asymmetry of marked (here high) and unmarked (here low) tone. An important point to note here is that tonal structure can be sensitive to morphological structure in Athabaskan (the progressive tone-spread only applies to high tones on prefix syllables and never spreads onto the stem). In addition, it can be blocked by a high (or falling HL) tone on the stem. An exception to the unmarked low tone for prefixes is the iterative prefix *nà-* that does leave a low tone behind if its segments are morphologically "absorbed" (p. 261) and can block the rightward H-spread.

Summing up, the Tanacross tonal system is rather complex compared to that of other Athabaskan languages, with synchronic processes altering the association of tones and the resulting contour. The lexical tones and these processes can interact with intonation contours.

Intonation Holton (2005) presents intonation contours marking different utterance types, here summed up in table 2.3. Declaratives are accompanied by a final falling contour, yes-no questions with a final high-rise, imperatives are marked by a final low fall and content interrogatives with a pre-final rise with a following low fall.

For the yes-no questions, the final rise goes up to "the extreme upper end of a speaker's pitch range" (p. 265). There is a rise even for a high toned final stem, and a combination of H_{Lex} H* and H% starts rather low and becomes very steep as in fig. 2.6. The imperative has a final low-falling contour that neutralizes the lexical tone of the prominent syllable keeping it at the level

Utterance Type	Intonation Contour	Notation
Declarative	final fall	H* L%
Interrogative (yes-no)	final high-rise	H*H%
Imperative	final low-fall	L*L%
Content interrogative (wh)	final rise low-fall	H+L* L%

Table 2.3: Utterance types and associated intonation contours in Tanacross (Holton 2005: 263).

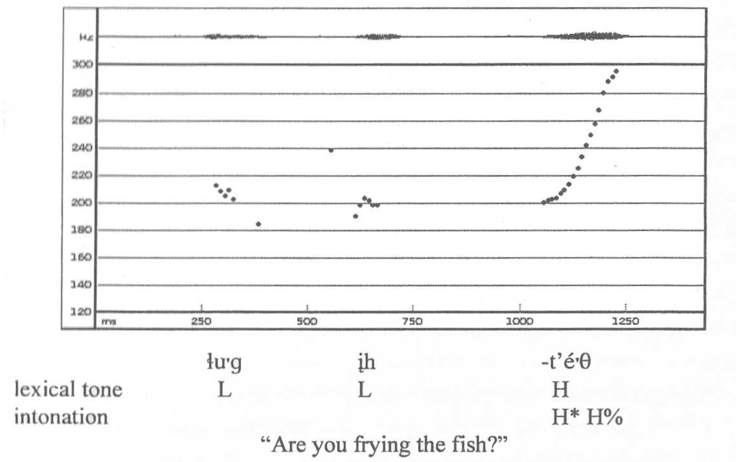

Figure 2.6: A yes-no question in Tanacross with a high toned stem, marked with the contour H*H% (reproduced from Holton 2005: 265, fig. 2).

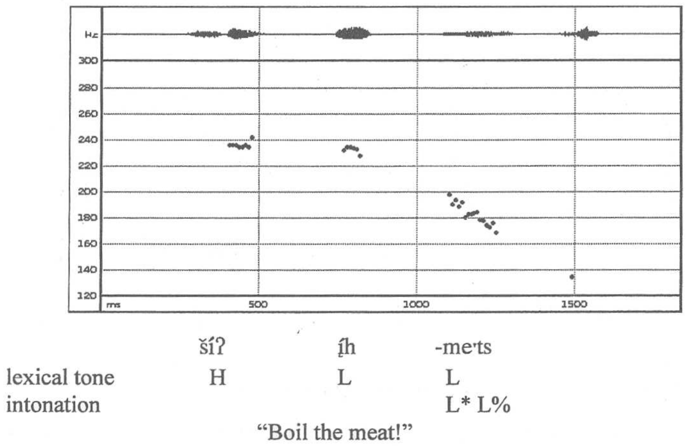

Figure 2.7: An imperative in Tanacross with a low toned stem, marked with the contour L*L% (reproduced from Holton 2005: 266, fig. 3).

of a low tone. The content interrogative contour is distinguished from the imperative by the shape of the pitch peak: "The imperative exhibits a low fall from a relatively low peak (L*)[8]; whereas the content interrogative shows a sharp rise, then fall in pitch (H+L*) immediately preceding the prominent syllable" (p. 265). Illustrations of the two contours are reproduced here in fig. 2.7 for the imperative and in fig. 2.8 for the wh-question. Just like for the yes-no questions the end of the contour excedes the speaker's usual pitch range, this time falling very low. Concerning alignment with regard to fig. 2.7 and 2.8, Holton explains "the middle syllable being the most prominent, due to the presence of high tone (from Rightward H-Spread) immediately preceding a low stem tone." (p. 265f.), but apparently (in figures 3 and 4 in Holton) the starred tone is not associated with this penultimate "prominent" syllable but with the stem syllable (the last syllable in the utterance).

Holton uses autosegmental labels for the contours, describing the alignment as follows: "The starred ('central') tones align with the left edge of

[8]The question arises whether there really is a *peak*, and if so, it might be better to label it as a downstepped !H, or if it is just a low turning point.

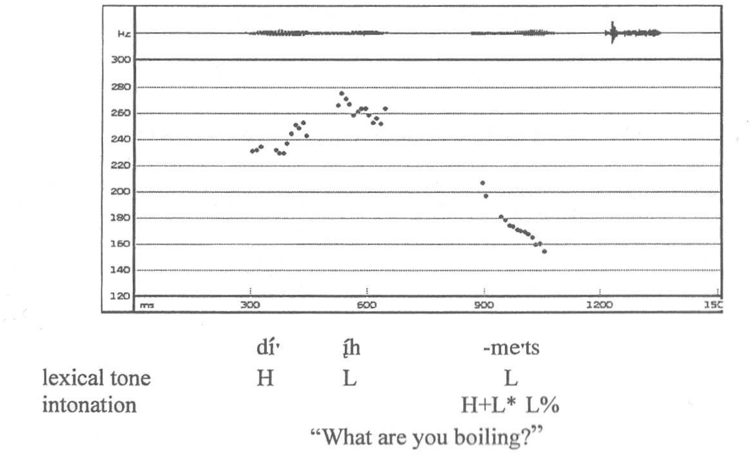

Figure 2.8: A wh-question in Tanacross with a low toned stem, marked with the contour H+L*% (reproduced from Holton 2005: 266, fig. 4).

the metrically prominent or 'stressed' syllables, which is also the morphological stem syllable" (p. 263) This is problematic since stress has not been well described in most Athabaskan languages, especially not based on phonetic studies. Here the question arises as to whether this alignment will remain the same when final particles or enclitics are added – if this is possible in Tanacross without altering the contour[9], i.e. has lexical stress in Tanacross been independently established or is it always by default on the stem syllable.

Further research on how the association of the starred tones actually works, and on details of alignment would be interesting to see. However, contrary to some expectations, there are a good number of intonational tones to be found in Tanacross.

Interaction between tone and intonation The surface pitch is determined by intonational contours as well as the structure of the lexical tones. Holton's

[9]Final discourse particles are rather frequent in Athabaskan languages, especially in questions. Furthermore, enclitics or suffixes can follow the stem, thus creating a final syllable that is not the stem syllable.

Imperative	šíʔ	į́h	-me·ts
underlying T_{Lex}	H	L	L
surface T_{Lex}	H	H	L
Intonation			L*L%
translation	the meat	you boil it!	
Interrogative	dí·ʔ	į́h	-me·ts
underlying T_{Lex}	H	L	L
surface T_{Lex}	H	H	L
Intonation			H+L*L%
translation	what	you boil it?	

Table 2.4: Imperative and wh-interrogative contours in Tanacross (Holton 2005: 266).

first question is whether one can override the other – as mentioned above in sentence final neutralization – or if lexical H or L can still be distinguished even when marked with an intonational contour. The second question that is addressed is if the phonological processes – as the tone-spread – are sensitive to intonation.

For declaratives (H*L%) and wh-interrogatives (H*L*L%) recoverability of lexical tones remains, a H_{Lex} causing the final fall to start on a higher level and to be steeper. The rightward H-spread seems to be sensitive to underlying lexical tone, except in wh-interrogatives where the high tone can be spread to a prefix right before a lexically high toned syllable (this is usually not possible, the high tone on the stem blocking the spread for the preceding prefix) because the lexical tone is neutralized to low. A second (maybe more probable) explanation for the resulting pitch contour could be that the high tone on the penultimate syllable is a result of the leading H in H+L*, that aligns with this syllable, so that, based on the data here, it is not possible to tell if the rightward H-spread is sensitive to lexical tone or to combined lexical and intonational tones or if it is completely overridden by the intonational H.

In declaratives and content interrogatives, there is a pitch distinction on the stem that serves as a cue to the lexical tone. The pre-stem tone-spread constraint may be a help in discerning lexical tone in declaratives, yes-no question and imperatives if it is applicable to the pattern of lexical tone of an utterance. So if there are no H tones present in the prefix complex, it is not possible to decide whether the final syllable of a yes-no questions has H_{Lex} or L_{Lex} from the realized pitch contour. In conclusion, Holton states:

> "In looking at the Athabaskan languages as a whole, it seems very possible that observed differences in pitch pattern may be due not so much to differences between tonal or intonational patterns, but may rather be attributable to differences in the way tone and intonation interact in the individual languages." (Holton 2005: 275)

This section on Tanacross indicates that the careful selection of levels will be important in finding adequate ways of analyzing tonal phenomena in Beaver. In the presence of complex tone rules, the tone tier should therefore be analyzed at both underlying and surface levels for an easier way of keeping track of the phonological processes that take place. The question remains how the starred tones are associated and aligned in Tanacross, and if stress has been analyzed independently before. However, this study indicates that important insights may arise when examining intonation structure in tone languages.

2.3.3.2 Slave – Rice (1989a)

Slave is a group of dialects that are spoken to the North of the Beaver territories. NAB communities are in very close contact with Slavey[10] (Dene tha', South Slave), the southernmost variety of the dialect complex. Northern Alberta Beaver and Slavey are mutually intelligible and some speakers are bilinguals.

In her *Grammar of Slave*, Rice (1989a) includes some short notes on intonation, that are interesting with respect to Beaver because of similarities to what has been noted impressionistically for Beaver.

Declaratives are marked by falling intonation, which Rice indicates with a small arrow over the last syllable of a sentence. For the Hare dialect of Slave, she explains that the vowel of a verb stem "is often reduced or is lost entirely in declaratives, with frequent lengthening of the stem initial consonant when the stem initial is a sibilant" (Rice 1989a: 47). In the examples an arrow over the last lengthened consonant indicates some sense of falling intonation on the last vowel-less syllable.

(4) léht'éedóné hehsį
[léht'édóné hehss↘]
bread 3-makes
"she is making bread." (Rice 1989a: 47)

We will return to the issue of final devoicing in chapter 5.2, where we show that it can also be found in Beaver as a marker of finality in larger units, also related to low boundary tones (cf section 5.2).

[10] *Slave* denotes the whole dialect complex while *Slavey* is the Southern dialect within this complex.

Yes-no Questions are usually formed with a question particle. This type of yes-no question has a falling intonation. There is a second type of yes-no questions however, that is formed without a particle using rising intonation. For questions ending in a high toned syllable, this syllable is usually lengthened[11]. For those ending in low toned syllables, the lengthening seems to be optional:

(5) łéht'ée whenehtsį
[łéht'ée whenehtsį ↗], [łéht'ée whenehtsįį ↗]
bread 2sg.made
"you sg. made bread?" (Rice 1989a: 47)

The optional lengthening for the L toned syllable is probably related to the fact that L tones are unmarked. The more frequent lengthening in questions ending in a H tone could be an indication that for high-toned syllables the lexical high tone and the high boundary tone need more room to be realized, whereas if the last syllable is tonally unmarked, no tonal crowding occurs and thus the lengthening is optional.

In a later chapter on syntax in Slave, this question type without the particle is revisited, and more information on the contour is given. The meaning of the "intonation questions" differs from yes-no questions with a particle in that the former are "requests for confirmation" with a positive bias. "If the questioner really does not know" the answer, a particle would be used (p. 1128). One of the examples given for a question without a particle is the question "You went to the store?" in a situation where the addressee is carrying bags (p. 1128).

Here the contours described (and the intonation marks drawn over the examples) are different from the description in the earlier chapter, because here a slight fall follows the steep rise on the last syllable.

[11] This is indicated by the double vowel in the transcription.

> "The vowel lengthening may be slight, in which case the fall in intonation is minimal, or the lengthening may be distinct, in which case there is a much more noticeable drop in intonation" (p. 1128).

The difference between a final syllable bearing a lexical H or a L is still maintained in the higher relative level for questions with a final H_{Lex}. If a final consonant is present in the verbstem, this is usually lost[12].

The Fort Liard dialect employs a different marker for this type of question: a high tone vowel /é/ – /í/ or /á/ after a final /a/ – that is attached to the final syllable of the utterance. No contour is described for this dialect.

In the Hare dialect, a way of forming an alternative question is to join two sentences with a final rise:

(6) ʔedį̨tl'ékǫ́é ts'ę́ dewǫʔa↗ jǫ wǫdá↗
school to 2sg.opt.go here 2sg.opt.sit
"are you sg. going to school or staying here?" (Rice 1989a: 1140)

"Conjoined Structures" For a list of nouns, Slave employs the typical list intonation where rise marks the end of each item on the list. Similarly in conjoined sentences "the first clause has rising intonation" and for conjoined structures "the conjuction is in the same breath group as the preceding conjunct" usually followed by a pause with the second part after the pause falling in intonation (p. 48). Furthermore, "all non-final verbs carry rising intonation" as e.g. in complement or periphrastic verb constructions:

[12] Synchronically, the loss of final consonants is a characteristic of the Slave languages, the consonants lost in this position are usually glottal fricatives, since most other consonants in final position have been historically lost.

(7) ʔǫde nágwe↗ borihshǫ íle↘
where 3.lives 1sg.know neg
"I don't know where s/he lives" (Rice 1989a: 48)

Emphasis can be indicated by the lengthening of a stem vowel: According to Rice, *łǫ* means "lots", *łǫǫǫ* means "really lots", *łekǫ* means "it is good, sweet", *łekǫǫ* means "it is really good". This way of marking emphasis can be found in Beaver as well, there might be a typical contour that accompanies this lengthening.

2.3.3.3 Navajo – McDonough (2003b)

Navajo belongs to the Southern branch of the Athabaskan family, it is thus geographically and linguistically rather removed from Beaver. According to McDonough (2003b), native speaking linguists state for the Navajo language that there is no use of "tonal intonation". In her article, she argues in favour of this hypothesis and claims that the reason lies in the syntactic structure of the language. She states that the relationship between syntax and prosody is well-known, while instrumental studies that provide evidence for this point are very scarce.

In Navajo, every syllable has a tonal target, and "only in the stem domain does tone function contrastively", while the contrast is neutralized in the conjunct domain. Yes-no questions as well as constituents that are focused are marked by particles, so that "no local or global F_0 pertubations associated with focus constructions or yes-no questions" are to be expected[13].

[13] Claims based on this type of argumentation might possibly be misleading, since intonation and particles are not mutually exclusive, and redundant marking has been found in this and other domains as well. There may also be yes-no questions without a particle, as in Slave.

In the data the F_0 turning points are realized late in a syllable (p. 198). McDonough (2003b) finds no indication that Navajo uses pitch to distinguish yes-no questions from declaratives, neither are there any edge tones.

2.3.3.4 Prosodic Strengthening in Two Apachean Languages – Tuttle (2005)

The Apachean languages belong to the Southern Athabaskan branch, again geographically removed from Beaver. Tuttle (2005) shows for two Apachean languages that morphological as well as prosodic domains have an influence on the duration of consonants and syllables. In the San Carlos dialect of Western Apache, stem initial position causes consonant strengthening; an increased duration in unaspirated plosives, and increased loudness and duration in nasals. In Jicarilla, phrase-final lengthening was noted. “A parametric measure of linguistic rhythm” applied to a Jicarilla text placed the language between French and English, somewhat closer to French.

2.3.3.5 Intonation in Dena’ina –Tuttle & Lovick (2007)

Dena’ina is a non-tonal Athabaskan language of Alaska. Tuttle & Lovick (2007) analyze boundary marking in the Inland dialect spoken in Lime Village and Nondalton based on two traditional stories. They measured duration and pitch in syllables in final position in “narrative units” as identified by the speakers. Tuttle & Lovick found that the durations of rhymes were greater in final position of a narrative unit and before a pause; and that F_0 was significantly lower unit finally than unit internally. Thus, duration and lowering in F_0 were shown to mark the end of an utterance.

Interestingly, they note that points for F_0 measurement were “occasionally impossible to set due to voiceless or absent vowels” (Tuttle & Lovick

2007: 307). This utterance final devoicing may be widespread in Northern Athabaskan languages and will be investigated for Beaver in 5.2, where it appears to have a demarcating function in discourse

2.3.3.6 Intonation in Kwadacha – Hargus & Abou (2008)

Sekani (Tsek'ene) is close to Beaver, both genetically and geographically. Those two languages share a lot of common features to the extent that the boundary between them is hard to draw based solely on linguistic data (cf e.g. Randoja 1990). A first report on intonation in the Kwadacha dialect of Sekani can be found in the presentation of Hargus & Abou (2008). The Kwadacha dialect is low marking, lexical H is the default tone, and there are rising lexical tones and some rare cases of falling tones.

Hargus & Abou (2008) describe three intonation contours, the declarative contour H*L%, the uncertainty contour HL% and two boundary tones for yes-no questions %L[14] and H%. In declaratives, wh-questions and yes-no questions that are morphologically marked, H* links to the leftmost H tone syllable while L% is associated with the last syllable of the phrase. There also seem to be L phrase accents marking the boundaries of smaller non-final phrases. In yes-no questions %L links to the leftmost lexical L, or to the first syllable of the question, while H% is linked to the last syllable of the question. The uncertainty contour HL% is obligatory in sentences with the particle *sǫ* but can occur in other sentences as well. The boundary tone is associated with the right edge of the verb stem.

[14]This initial boundary tone is transcribed by Hargus as L%. In this study the convention is used that initial boundary tones are preceeded by their diacritics in order to make the distinction to final boundary tones that are followed by their diacritics clearer.

2.3.4 Summary

The review of the literature on intonation in tone languages, polysynthetic languages and members of the Athabaskan language family will now be summarized in order to come to assumptions of what to expect for Beaver prosody. Within languages with lexical tones, additional intonational tones and intonational mechanisms of pitch range and span have been described. The hypothesis by Michaud (2008) is that languages with decomposable tone, such as many African languages, will be more likely to make use of intonational tones, while tone languages of the Asian type with complex contour tones, that are usually accompanied by other features, do not tend to use "tonal intonation". This leads to the hypothesis that intonational tones are to be expected in Beaver since the tone system is a fairly simple one with a H and L tone.

The literature on intonation and prosody in polysynthetic languages does not reveal any patterns concerning intonation but it does seem noteworthy that problems with the established prosodic hierarchy are often reported when analyzing this type of languages.

The review of the literature on Athabaskan languages paints a heterogeneous picture: On the one hand, there is McDonough (2003b) and her strong claim that there is no intonation in Navajo, and none to be expected, although she does concede Northern Athabaskan languages may be different in this regard. On the other hand, Northern Athabaskan languages have been shown to use intonation to mark questions (Tanacross, Kwadacha, Slave) and imperatives (Tanacross). Phrase accents that mark smaller boundaries such as in subordinate structures are described for Slave and Kwadacha. There is evidence that intonational tones interact with lexical tones (Holton 2005). Furthermore, a feature that is often mentioned but not explained in detail is

	decl.	ynq	imp.	whq	emb.	unc.	dev.
Slave	L%	L%, H%			H-		yes
Tanacross	H*L%	H*H%	L*L%	H+L*L%			yes
Tena'ina	L%						yes
Kwadacha	L%	%LH%			L-	HL%	

Table 2.5: Intonational tones and phrase final devoicing in Athabaskan languages, adapted from Hargus & Abou (2008). (The abbreviated headers stand for "declaratives", "yes-no questions", "imperatives", "wh-questions", "embedded structures", "uncertainty" and "final devoicing".)

final devoicing[15] which affects not only the last consonant but also the last vowel or the whole syllable (Holton 2005, Rice 1989b, Tuttle & Lovick 2007). The intonational tones and the presence of final devoicing in Athabaskan languages are summarized in table 2.5.

[15]The domain of the final devoicing is not always stated explicitly, and it might vary from language to language.

Chapter 3

Beaver

Beaver is an endangered First Nations language of Northern Canada, it belongs to the Athabaskan language family. The first textual sources on Beaver are manuals of devotion (Garrioch 1886) or primers Garrioch (1885). In his text collection and short grammatical sketch of the Beaver language of 1917, Pliny Earl Goddard states:

> "Of all the Athapascan languages of the north that of the Beaver Indians has been most neglected."(Goddard 1917: 403)

Still today the body of work on Beaver is humble compared to that of its sister-languages. Furthermore, the majority of publications focus on the British Columbian dialects of Beaver. There is an extensive amount of mostly pedagogical materials by Jean and Marshall Holdstock on Doig River Beaver. Story (1989) presents the phoneme inventory of Doig River Beaver and discusses problems in its analysis. Ethnological work has been undertaken in Doig River and Prophet River by Robin Ridington (e.g. Ridington 1981). Later, Tiina Randoja worked on Halfway River Beaver for her dissertation (Randoja 1990) where she presents an analysis of the phonology and morphology of this dialect. And most recently, Julia Colleen Miller has worked on tone in Doig River and Blueberry River Beaver (Miller 2003) and is currently working on a detailed and more extensive study of the phonetics and phonology of tone in Beaver (Miller in prep.). Krauss (2006) has compiled a comprehensive annotated bibliography starting with the earliest sources on Beaver and ranging up to the most recent ones.

In this chapter some background on the Athabaskan language family will be provided using Beaver examples so that in later chapters reference can be made to concepts idiosyncratic to Athabaskan grammatical description. Then a short overview of the dialectal structure and the speakers of the language will be given. To conclude, a short survey of grammatical structures of Beaver will be supplied.

3.1 Beaver, an Athabaskan Language

Concepts idiosyncratic to the description of Athabaskan languages will be briefly introduced for readers not familiar with this language family.

3.1.1 The Athabaskan Language Family

The Athabaskan languages are spread out over a large area of Northern America. They are traditionally divided into three branches: the Northern branch stretching from Northwestern Alaska down the coast and across the inland of Alaska and Western Canada and to Hudson Bay, the Southern branch occupying an area in Colorado, New Mexico and Arizona and the

Figure 3.1: Map of Athabaskan languages (in blue) adapted from Mithun (1999); Beaver is shaded in dark blue, its Athabaskan neighbours in light blue, the grey area is Cree with its various dialects, one of the contact languages of Beaver.

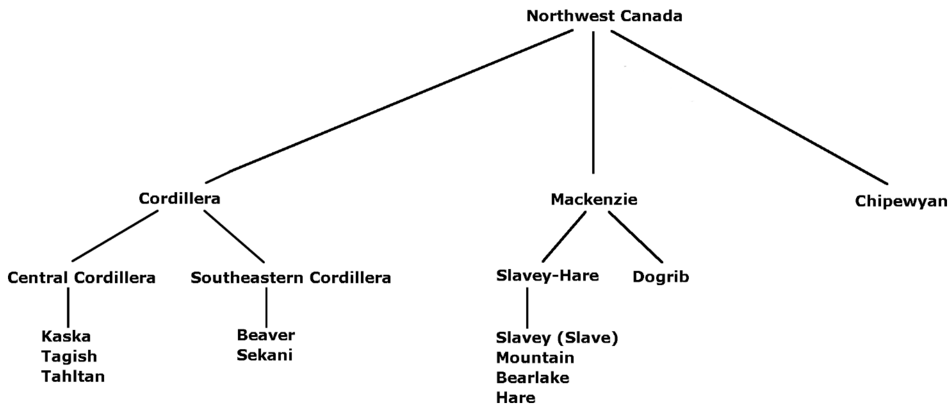

Figure 3.2: The Athabaskan languages of Northwestern Canada. Beaver belongs to the Southeastern Cordillera subgroup together with Sekani.

Pacific Coast languages located in Oregon and California. A full family tree of the Athabaskan languages is supplied in the appendix (cf section A.2). Beaver belongs to the branch of the Northwestern Canada languages which is shown in fig. 3.2, based on the classification by Goddard (1996). This classification is not undisputed, and the structure of the Athabaskan language family is blurred by intensive contact between the various languages so that it is not always clear where to draw the boundaries in this dialect continuum (cf Krauss & Golla 1981).

Athabaskan languages are polysynthetic, many are tonal, all have in common a complex verbal structure.

3.1.2 Conjunct & Disjunct

Verbs in Athabaskan languages have a complex structure that is challenging for morphosyntactic theories because “it is morphologically rich, the surface ordering of morphemes is apparently without reason, discontinuous dependencies are frequent, and blocking effects between morphemes of identical shape but different meaning are abundant.” (Rice 2000: 9). An example of a

<table>
<tr><th>Kibrik 1995</th><th>Kari 1989</th><th>Rice 2000</th></tr>
<tr><td>proclitic
oblique pronoun
derivational
reflexive
iterative
distributive
incorporate
number</td><td>Disjunct</td><td>Lexical</td></tr>
<tr><td>direct object
deictic subject</td><td>Pronominal</td><td rowspan="2">Functional</td></tr>
<tr><td>transitivity decrease
qualifier
conjugation
mode
1/2 subject</td><td>Conjunct</td></tr>
<tr><td>transitivity indicator
root</td><td>Clf-Stem</td><td>voice/valence-Stem</td></tr>
<tr><td>mode/aspect
enclitic</td><td></td><td></td></tr>
</table>

Table 3.1: Pan-Athabaskan templates: The first one according to Kibrik (1995), slighty adapted using the terminology from Rice (2000), the second one shows the zones following Kari (1989), the third column shows Rice's analysis.

Pan-Athabaskan template is given in table 3.1, where the first column shows the template Kibrik (1995) calls "Standard Average Athabaskan", the next two columns indicate how the slots are organized into zones (Kari 1989, Rice 2000).

Traditionally, on a macrolevel the long chain of prefixes is divided into the disjunct zone, the conjunct zone and the stem with the voice and valence prefix. These zones are phonologically motivated. The distinction between the disjunct and the conjunct zone has already been observed by Li (1933) for Chipewyan, and by Kari (1975) in Navajo and Tanaina (Dena'ina). In her article on the conjunct-disjunct boundary in Babine-Witsuwtit'en Hargus (1991) sums up the phonological properties of these two zones as follows:

> "This evidence primarily concerns the distribution of alternants of prefixes which are relatively close to the verb stem. Typically, one alternant of a prefix occurs word-initially or when preceded by a disjunct prefix and another alternant occurs when preceded by a conjunct prefix." (p. 488)

Additionally, it has been claimed that disjunct prefixes are phonologically more salient than conjunct prefixes: They have a larger number of initial consonants and can contain full vowels whereas the conjunct prefixes usually only show a restricted set of onset consonants (typically coronals), and a tendency for a reduced vowel.

McDonough (2000) in her analysis of the Athabaskan verb in a "bipartite model" argues from a psycholinguistic viewpoint against the position class or templatic analysis and for a zonal model that more accurately reflects a native speaker's linguistic knowledge. In her bipartite model, the verb is divided into two constituents: the verb (the stem) and its inflection (the conjunct). This compounded structure can be preceded by a number of proclitics (traditionally the disjunct prefixes).

3.1.3 Tonogenesis & Marked Tone

Looking at the map in 3.3, one can see that the property of tone does not pattern according to the the genetic sub-grouping of the Athabaskan languages in Northern, Pacific Coast and Southern languages nor do these languages seem to obey any other logical areal pattern. There are languages that are non-tonal (such as those of the Pacific Coast, and some languages in South and West Alaska, and West British Columbia) and some that are tonal.

Figure 3.3: Map of Lexical Tone in Athabaskan languages, acute cross-hatching indicates H marking languages, grave cross-hatching indicates L marking languages, white areas are non-tonal (reproduced from Krauss 1979: 69).

Within the languages with lexical tone there is a second subdivision, since some languages show high lexical tone where others show low tone in cognate words.

In his article on lexical tone, Krauss (1979) offers a comprehensive historical account of the tonal correspondences that have been puzzling Athabaskanists since Sapir and Li discovered them. He shows that tone cannot be reconstructed for Proto-Athabaskan and argues that a glottal feature termed "constriction" later developed into different tonal categories in the many daughter languages. Some Athabaskan languages have not developed tone and retained the glottal feature e.g. in final ejectives which have been lost in tonogenesis in the others. Kingston (2005) analyzes the phonetics of Athabaskan tonogenesis, presenting a solution to the problem of asymetric patterns in the development of Pre-Proto-Athabaskan rhymes into the tonal categories of the present day languages.

The historical development has been reconstructed as follows: In the transition from Pre-Proto-Athabaskan to Proto-Athabaskan, rhyme final glottalization (from a glottalized consonant) was suprasegmentalized becoming a phonation type feature of the syllable, termed "constriction". There are two hypotheses as to how constriction developed further into tonal features (Kingston 2005):

1. For some languages constricted syllables obtained a lexical H tone while for others constriction developed into a L tone.

2. Constriction has first developed into a L tone, and has through a tonal reversal been turned into a H. This innovation then spread through the language family which explains the geographic distribution of H marked languages.

Beaver constitutes an interesting case: the dialects of West Moberly Lake and Halfway River have developed a low tone from constriction while the other dialects have developed a high tone from this feature. This "tonal flip-flop" is illustrated below with an example from Slave and Sekani (Ft. Ware) (adapted from Rice & Hargus 2005b: 8) with additional data from Halfway River Beaver and NAB for comparison:

The phonetics and phonology of tone in Beaver are analyzed in Miller (in prep.) in great detail.

reconstructed	Slave	Sekani	HRB	NAB	
* tu:	tù	tú	chúú	tyùù	“water”
* ča’	tsáʔ	tsàʔ	chààʔ	tsááʔ	“beaver”

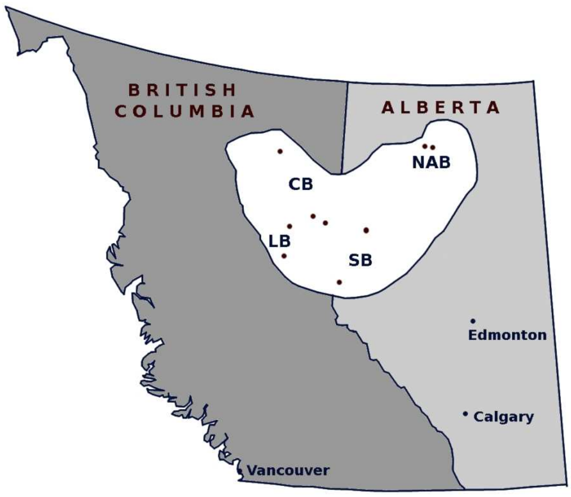

Figure 3.4: A map of the territory traditionally occupied by the Beaver (adapted from Ridington 1981).

3.2 Dialectal Structure & Number of Speakers

Beaver is a Canadian First Nation language belonging to the Athabaskan language family spoken by some 150 speakers in Alberta and British Columbia. On the map in fig. 3.4 the traditional territory occupied by the Beaver is marked by the white area, the dots indicate reserves where Beaver was or still is spoken. The letters are abbreviations for the four dialects of Beaver:

- Northern Alberta Beaver (NAB) spoken by 25 people at the Beaver First Nation at Child’s Lake and Boyer River, Alberta. The youngest speaker is in his fifties.

- For Southern Beaver (SB) there are no known speakers. It used to be spoken in the Dunvegan area. Reserves where this dialect of Beaver used to be spoken are Clear Hills, Duncan's and Horse Lake in Central Alberta. The only record of this dialect is in fieldnotes by Young (1939).

- Central Beaver (CB) is spoken in Northern British Columbia, Beaver reserves where this dialect is spoken are Doig River First Nation and Blueberry First Nation. The youngest speakers here are in their forties. The variety spoken in Prophet River seems to be slightly different, and might constitute a different dialect.
- Low marked Beaver (LB) is spoken on the reserves of Halfway River and West Moberly Lake[1] in British Columbia. There still seem to be younger speakers at least for Halfway River, for West Moberly it is reported that there are about ten elderly speakers.

The internal linguistic structuring of Beaver is not yet clear, however a number of features distinguishing these dialects have been established. The most striking feature setting apart the Low marked Beaver dialect from the others is that it has the opposite tone, it is low-marking while all the others are high-marking.[2] In addition to some lexical differences, there are a number of phonological differentiating the Halfway River dialect from the other dialects and make it appear closer to its neighbouring language Sekani which is also low-marking. For example: syllable final /h/ seems to have been lost in Halfway River Beaver (HRB) in many contexts, sometimes only leaving a trace in a different quality of the preceding vowel (Randoja 1990), while it is still present in the other dialects. The velar plosive /g/ in the high marking dialects corresponds to /w/ in HRB in intervocalic contexts[3].

[1] The fact the West Moberly Lake variety is low-marking as well has been established by Julia Colleen Miller and Pat Moore, p. c.

[2] The tonal phonology for the low-marking dialects of Halfway River and West Moberly Lake still has to be established, for a detailed comparative study cf Miller (in prep.).

[3] These are preliminary findings from the Beaver Language Workshop conducted by the DoBeS-team in Ft. St. John, in May 2008 that need to be studied in further detail.

Within the high-marking dialects, the NAB and the Central Beaver dialect can be distinguished on phonetic, phonological and lexical grounds. For the Southern dialect of Beaver it is very hard to make any claims, the only available data for this dialect are the fieldnotes made by Young (1939).

When we compare the two dialects for which we have the most data, namely the dialect of Doig River (Central Beaver) and the dialect of Child's Lake and Boyer River (NAB), several distinguishing features can be outlined which need to be checked for the other varieties as well. For example the areal morpheme is *-wu* for NAB and *-wa* for DRB, which is a feature mentioned by NAB speakers as being quite salient. In DRB reconstructed *t and *d have been "palatalized" to the post-alveolar affricates /t͡ʃ/ and /d͡ʒ/ respectively before closed vowels, while NAB speakers show more variation, their pronunciation ranging from /tʰ/ through /t͡ç/ to /t͡ʃ/, similarly for the unaspirated plosives, with the palatalized variants being the most frequent. This variation in NAB is possibly due to the close contact that those speakers have with South Slavey, where this palatalization process has not taken place at all. Another feature that can be ascribed to contact of NAB with Slavey communities is the presence of interdentals for some NAB speakers, while others use lamino-dentals, like the DRB speakers. Finally, in DRB the palatal fricative /ç/ is missing, while it is found in NAB in words like /çin/ "song", which is /ʃin/ in DRB or /çis̻/ "mountain", which is /s̻is̻/ in DRB. There are also differences to be found in the vowel system of the two dialects; e.g. the nasalized vowel /ĩ:/ in NAB corresponds to /ẽ:/ in DRB as in the word for "snare", which is *mį́įl* in NAB and *mę́l* in DRB. Furthermore, lexical differences are found between the two dialects. All these features are summarized in table 3.2. For a detailed dialectal study of Beaver this list of features needs to be expanded to include the other dialects as well.

	NAB	DRB	Translation
Palatalization	tyuu	chuu	“water”
Interdentals	[θán]	[s̪̺án]	“star”
Pal. Fricative	[çɪn]	[ʃɪn]	“song”
Nasal Vowel	mį́į́l	mę́l	“snare”
Areal	wu-	wa-	areal prefix
Lexical	dabitsee	walale	“butterfly”

Table 3.2: Some dialect differences between NAB and DRB.

Even though the investigation of dialect differences has only been rudimentary so far, it is possible to note that within these dialects we find a great variability, sometimes speaker internally, sometimes between speakers, which may be explained by the social structuring of the Beaver communities (cf Ridington 1981). Usually small groups, not larger than an extended family, used to follow the paths of the game for hunting, sometimes there were gatherings and the families regrouped. Furthermore, the Beaver were in close contact with speakers from neighbouring languages, sometimes being bilingual themselves, sometimes conversing across language boundaries. The scarce resources and harsh environment made it necessary for the Beaver to entertain good relationships with their neighbours. Thus the Beaver are less rigid in their use of language, employing language not to differentiate themselves from others but rather to blurr the boundaries between families, clans and communities, the result being a great deal of variation (cf Jung & Müller 2008). Concluding, a deeper understanding of the dialect structure is needed which would also shed light on the historical movement of the Beaver as well as the present day structure of their communities[4].

[4] Julia Colleen Miller has started investigating the sociolinguistic structures and their relationship to the realization of tone in the British Columbia dialects.

3.3 Overview of Grammatical Structures

In this chapter, those features of NAB will be summarized that are likely to be relevant to intonation and prosody and that will provide an orientation for readers not familiar with Athabaskan languages. We will start out with an overview of the phonemic inventory and a brief discussion of lexical tone, followed by an introduction to the morphological structure and concluding with remarks on word order and some particles that are relevant for intonational analysis.

3.3.1 Segmental Phonology

The phonology of Doig River Beaver is outlined in Story (1989) with references to reconstructed forms. Story also discusses problems that remain with the phonemic representation of some sounds, such as the representation of rounding. In Randoja (1990), information on the phonemic system of Halfway River Beaver can be found. In the following, the phonemic system of NAB will be sketched, while still some questions as to the best representation of certain sounds remain.

3.3.1.1 Consonants

NAB, as is common for Athabaskan languages, has a good sized consonant inventory, as summarized in table 3.3. For plosives, there is a three-way distinction between ejectives, voiceless aspirated plosives and voiceless unaspirated plosives[5]. In affricates this distinction is present as well, however the voiceless unaspirated affricates show a tendency to voicing due to the voiced

[5] The more conventional analysis of the contrast being one of aspiration is upheld here, despite the claim of McDonough & Wood (2008) that the aspirated plosives t^h and k^h are better analyzed as the complex segments $\overset{\frown}{tx}$ and $\overset{\frown}{kx}$, cf section 5.1 for a more detailed discussion.

	labial	lam.-dental	alveolar	post-alv.	pal.	velar	glot.
plosives	p pʷ		tʰ t t'			kʰ k k'	ʔ
affricates		t͡s̪ d͡z̪ t͡s̪'	t͡s̺ d͡z̺ t͡s̺'	t͡ʃ d͡ʒ t͡ʃ'			
nasals	m		n				
fricatives		s̪ z̪	s̺ z̺	ʃ ʒ	ç	x ɣ	h
laterals			ɬ l				
lat. affr.			t͡ɬ t͡ɬ' d͡l				
glides	w				j		

Table 3.3: The consonants of Beaver, presented with their phonemic IPA transcription. The lamino-dentals are interdentals for some speakers of Alberta Beaver, whereas the alveolar fricatives are pronounced apically. The velar fricatives are phonetically realized in between the velar and the uvular place of articulation.

fricative. This three-way contrast is only fully realized in syllable-onset position, word finally, only voiceless (aspirated) obstruents exist. The (post-)-aspirated plosives can sometimes be pre-aspirated as well. A detailed study of aspiration in different contexts can be found in chapter 5.1. For the labial place of articulation there is neither an aspirated nor an ejective plosive[6].

Beaver has a fair number of fricatives, occurring at the dental, alveolar, post-alveolar, lateral, palatal, (post-)velar and glottal place of articulation. The dental and alveolar fricatives are further distinguished by their active articulator which is laminal for the dental fricatives and apical for the alveolar ones. Most fricatives may occur either voiceless or voiced. The voiceless lateral fricative /ɬ/ patterns with the lateral approximant /l/ as its voiced counterpart, e.g. in alternations of the verbal stem (cf ex. 8a). Similarly, the voiceless palatal fricative /ç/ patterns with the palatal approximant /j/ in phonological processes as in 9a below:

[6]There is one ideophonic particle for the sound of kissing *p'aa* that is the only example of the labial ejective plosive. This sound is still not included in the phoneme inventory because ideophones are often characterized by sounds not usually present in the language.

(8) a. as- łį́į́
ɐs- ɬĩ́ː
I- be
“I am” (fieldnotes, G. S.)

b. na- lį́į́
nɐ- lĩ́ː
you- be
“you are” (fieldnotes, G. S.)

(9) a. yhin
çɪn
song
“song” (fieldnotes, G. S.)

b. sa- yin -é’
sɐ- jɪn -ɛ́ʔ
my- song -poss
“my song” (fieldnotes, G. S.)

The fricatives are subject to a great deal of phonetic variation conditioned by a variety of factors. The lamino-dental fricatives /s̻/ and /z̻/ and the respective affricates are interdentals [θ] and [ð] for some speakers, some speakers even use both realizations interchangeably. This is probably caused by an influence of South Slavey which is a second language for those speakers, and by the contact they have with speakers of South Slavey. Furthermore, the post-alveolar fricatives /ʃ/ and /ʒ/, that are not found very frequently, are sometimes produced as alveolar fricatives. This could be due to a historic development in many Northern Athabaskan languages during which the whole fricative system was fronted (Krauss & Golla 1981). Possibly, this is still an ongoing process which could explain the variance for the post-alveolar fricatives and the respective affricates.

There are a number of secondary articulations of the phonemes presented above that have not been included in the phoneme inventory in tab. 3.3, because their status is still not quite resolved. In Beaver, alveolar plosives are palatalized before closed vowels, in DRB this results in post-alveolar affricates. In NAB, this process is seemingly hindered by the close contact with Slavey where no such palatalization exists. Thus in NAB, plosives vary in these contexts, usually pronounced as a palatalized plosive [tʲ], sometimes plain and without any palatalization, and sometimes closer to the DRB variant [tʃ]. The picture is complicated by a few words that never show palatalization even though it would be expected, e.g. *madee* “his eye” is never palatalized. There are historic reasons for this, in Krauss (2006), the non-palatalizing forms are linked to the presence of a reconstructed *ɣ. However it is not clear synchronically whether this suffices as an argument for the phonemic status of the palatalized variants.

Another problem is whether rounded plosives, affricates and fricatives are to be considered distinct phonemes. Again, these rounded variants occur very rarely. E. g. for the labialized bilabial plosive this near minimal pair can be given: *náábee* “otter” and *agháábwee* “stroud”, contrasting /b/ and /bʷ/. For more discussion on the analysis of rounding cfLovick (2006).

3.3.1.2 Vowels

The vowel system in Beaver is sketched in table 3.4. There are ten oral vowel phonemes and seven nasal ones. The long oral vowels are /iː/, /eː/, /aː/, /æː/, /oː/, and /uː/, the short vowels are /ɪ/, /ɛ/, /ɐ/, and /ʊ/. Examples are[7]:

i: <sa<u>ts</u>íí’> /sɐt͡s̠íːʔ/ “my head”

e: <sakéé’> /sɐkʰéːʔ/ “my foot”

[7] As can be noted here, the orthography is not strictly phonemic, rather it is learner oriented, hence redundant information is sometimes transcribed.

i:	u:	ĩ:	ũː
ɪ	ʊ	ĩ	
e:	o:	ẽː	õː
ɛ	ɐ	ɛ̃	
æ:	a:	æ̃:	ãː

Table 3.4: The vowel phonemes in Beaver. The oral vowels are represented on the left; the nasal vowels on the right. Note that the reduced vowel /ɐ/ is sometimes transcribed as /ʌ/, e.g. Story (1989).

a: <satáá’> /sɐtʰáːʔ/ “my father”

æ: <k’yáek’uts> /k’æ̂k’ʊts/ “it crawls around”

o: <nóódaa> /nóːtaː/ “lynx, cat”

u: <tyuu> /tçuː/ “water”

ɪ <ghadi> /ɣɐdɪ/ “animal”

ɛ <usbéh> /ʊspɛ́h/ “I am picking berries”

ɐ <sabát> /sɐpɐ́tʰ/ “my belly”

ʊ <sagut> /sɐkʊtʰ/ “my knee”

There are seven nasal vowel phonemes in Beaver. The nasal vowels are /ĩ/, /ẽ/, /ɛ̃/, /æ̃/, /ã/, /õ/, and /ũ/, the nasal inventory, as typologically expected, is thus smaller than the non-nasalized vowel system. Examples for the nasalized vowels are:

ĩ: <mį́į̨l> /mĩ́:l/ “snare”

ĩ <nį́į̨lį> /nĩ́:lĩ/ “it flows”

ẽ: <adęę> /atẽː/ “(s)he”

ɛ̃ <kwę̂> /kʰʷɛ̃̂/ “house”

æ̃: <akyą́ę> /ɐkæ̃̂ː/ “little haystack, little pile”

ã: <chwą́ą> /tʃwã̂ː/ “bird”

õ: <sachǫǫgé’> /sɐtʃõːɡɛ́ʔ/ “my ribs”

ũ: <gųųl> /kũːl/ “worm”

3.3.1.3 Diphthongs

There are a number of diphthongs in Beaver, though they are not very frequent. For some diphthongs only a handful of tokens have been found in the data. The falling diphthongs are:

ui̯ <nááskui> /náːskʰui̯/ “I vomit”

ai̯ <sǫkai> /sõkʰai̯/ “it poked me”

ʏɪ̯ <łaaníí’ui> /ɬaːníːʔʏɪ/ “cross”

ɵɪ̯ <mois̠k’ói> /mɵɪ̯s̪k’ɵɪ̯/ “seagull”

The two last diphthongs /ʏɪ̯/ and /ɵɪ̯/ can sometimes be realized as the monophthongs [iː] and [eː] respectively. However, since this variation is never found for the long vowel phonemes /iː/ and /eː/, these two categories should be kept apart.

A different case is the phonetic diphthong [ei], which is a variant of /eː/. It is reliably triggered by the context when it precedes dental fricatives, e.g. néis̠tǫ /nêːs̪tʰõː/ [néis̪tʰõ] “log”. In other contexts [eː] and [ei̯] are in free variation, the same holds for their nasal counterparts.

The rising diphthongs in Beaver are[8]:

o̯a <sak'oade> /sɐk'o̯ade/ "my armpit"

õ̯ã <at'ǫ́ą̀> /ɐt'ṍ̯ã̀/ "little flower"

õ̯ɛ̃ <iitl'ǫę́> /iːtl'õ̯ɛ̃́/ "after that"

u̯ɛ <nadyue> /nadʲu̯ɛ/ "nothing"

For NAB a practical orthography has been devised by the DoBeS-team for the documentation of Beaver, based on the one created by Jean and Marshall Holdstock for DRB (cf Holdstock & Holdstock 1984). This practical orthography will be used in this thesis (if appropriate together with IPA correspondences), the Beaver alphabet together with the phonemic transcription is supplied in the appendix under A.1.

3.3.2 Tone

Beaver, like many Athabaskan languages, has developed lexical tone as a reflex of syllables that were historically produced with a constricted glottis. These syllables now bear a lexical high tone in NAB, while the others are lexically low. Thus the dialect that is the object of this study is a "high-marking" language in Athabaskanist terminology. As mentioned above, the dialects of West Moberly Lake and Halfway River are "low-marking", displaying the opposite tone on historically glottalized syllables (for a detailed phonetic analysis of tone in different dialects of Beaver cf Miller in prep.).

An understanding of the phonology and phonetics of lexical tone is crucial before proceeding to the exploration of intonation mechanisms. Thus, a short

[8]The transcription with a non-syllabic vowel for the first part of the diphthong instead of the glide /w/ is used here because it allows a more accurate rendering of the quality of this first portion.

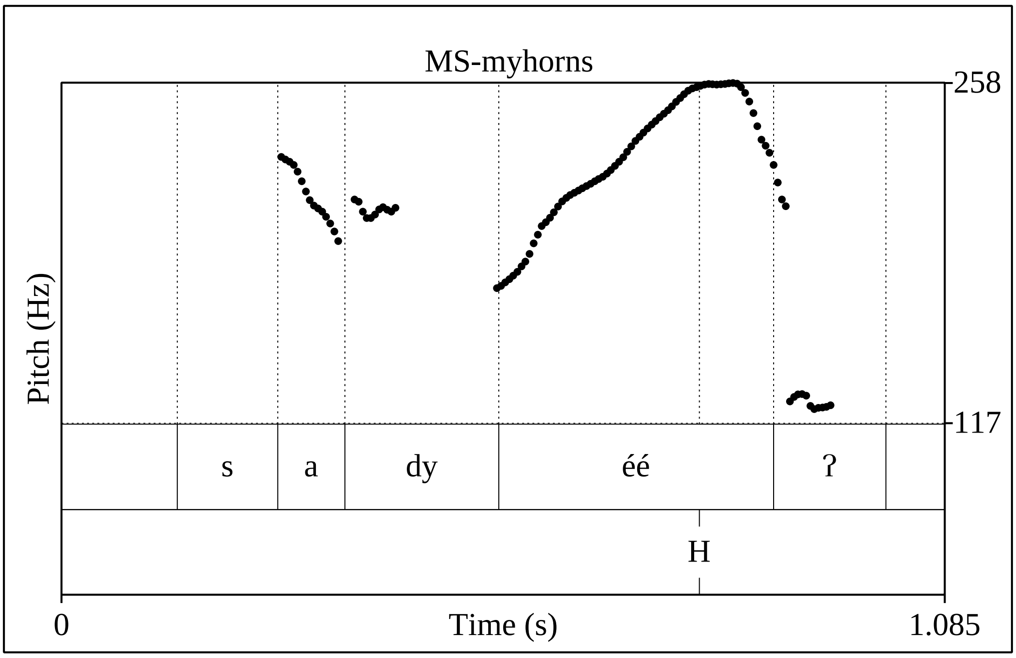

Figure 3.5: An example of a lexical H *sadyéé'* "my horn(s)". (MS-myhorns)

survey of the tones in NAB will be given here. Minimal pairs are a problem in Athabaskan languages because of the complex morphological structure of many words. Nevertheless, there are a handful of (near) minimal pairs that may serve to illustrate the phonemic status of lexical tone.

NAB has a high (H), a low (L) and a falling tone (HL) in its inventory. The falling tone being either historically or morphologically complex. An example for a tonal minimal pair can be seen in figures 3.5 and 3.6. The second syllable in the word for "my horn(s)" is lexically high. Figure 3.5 illustrates this with high pitch on the second syllable in relation to the first syllable. By contrast, the L tone on the second syllables of the word for "my food" is illustrated by low pitch on that syllable in fig. 3.6.

(10) sa- dyéé -'
my- horn -poss
"my horn"

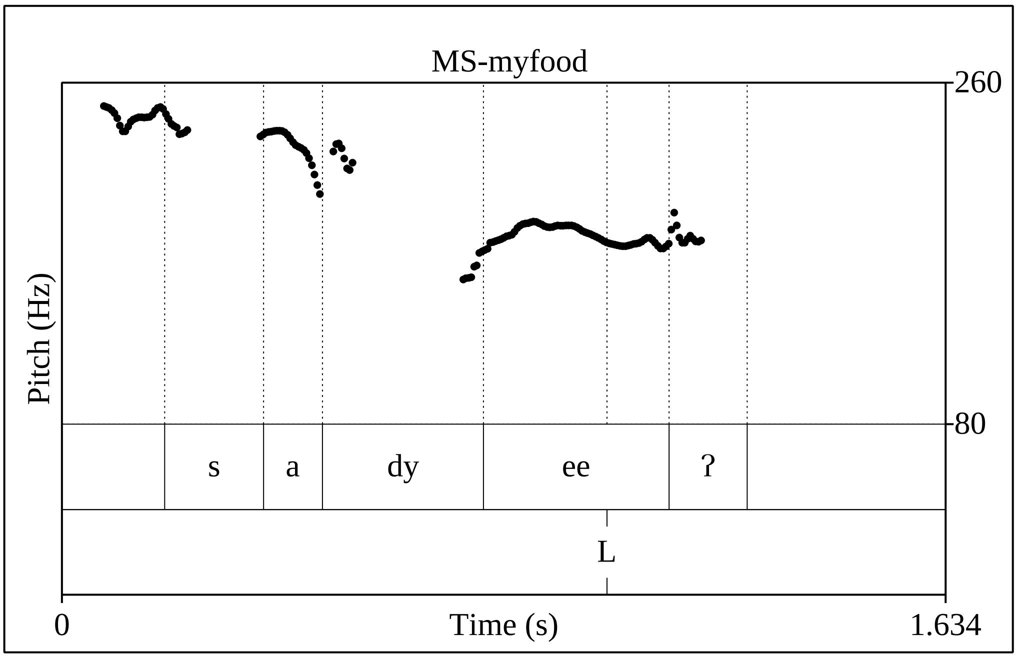

Figure 3.6: An example of a lexical L *sadyee'* "my food". (MS-myfood)

(11) sa- dyee -'
my- food -poss
"my food"

The first syllable in both examples is low: It starts on a mid to high level since it is the beginning of an utterance and then drops[9]. The lexical H is either realized as a rise with the highest point towards the end of the vowel or as a high plateau, while the L tone is often realized as a fall, as in the first syllable in the examples, or as a flat low contour as in the second syllable in fig. 3.6.

A further example of a (near) minimal pair is *yaa* "sky" and *yáá'* "louse".

Some examples of contexts where falling tones are encountered will be supplied here, for a more detailed study cf Miller (in prep.). Contexts in

[9]Since both words were elicited in isolation, the beginning of the word is also the beginning of the utterance.

which falling tones arise diachronically through the loss of a syllable include kinship terms (compare Holton 2005) where the final syllable is lost, while the tones are retained, thus resulting in a falling tone:

ah-shéi	"(woman's) grandchild"	<PA *-kɔ'yə
ah-séi	"grandfather"	<PA *-čə'yə
as-tói	"father's brother"	<PA *-tɔ'yə

Another example of a context for falling tones is the future/optative stem of some verbs, for example:

(12) uu- ghu- s- bį́į
dir- fut- 1s- pick.berries.fut
"I will pick berries." (fieldnotes, G. S.)

(13) dy- u- h- zį́į
incep- fut- 1s- walk.fut
"I will go." (fieldnotes, G. S.)

Cases where falling tones arise through synchronic complexity include the diminutives, perfective verb forms, relativized verb forms or combinations with the question enclitic *-aa* .

In NAB, diminutives are formed by adding the suffix *-áa* or *-ée* to the last syllable of the noun, which can change the quality of the final vowel and interact with the tone of the last syllable if it is open[10]. An example of a lexicalized diminutive is *ch'uunéi* "coyote" which is the diminutive of *ch'uuné'* "wolf". The two words are presented in figure 3.7 for comparison. The last syllable in "coyote" carries the falling tone which is realized first as a rise followed by a steep fall, while the last syllable in the word "wolf" is

[10] In DRB, diminutives are much less productive and only the *-ée* variant is used to form diminutives. The frequent use of the *-áa* suffix in NAB might be yet another influence from South Slavey in the Northern Alberta variety of Beaver (Pat Moore, p. c.).

lexically high. The whole utterance in the figure was "ch'uunéi that's coyote, ch'uuné"'.

Another example of a near minimal pair is *tsáá'* "beaver" and its diminutive form *tsáa* "small beaver". Furthermore, falling tones occur in perfective forms such as:

(14)	éi-	$\underline{s}$ii
	thus.I.perf-	say
	"I said." (fieldnotes, G. S.)	

Note that falling tones can only occur on long vowels, the only exception being *kwę̂* "house".

All these contexts for falling tones have been summarized here in order to supply cases where pitch movements like these are indeed lexical, so that intonational mechanisms can be teased apart from the lexical tonology of Beaver.

The concept of marked tone, which is important in Athabaskan languages, will be addressed here for Beaver. In some Athabaskan languages, it is diachronically but also synchronically valid, since, on the one hand, the marked tone has developed on glottalized syllables, and, on the other hand, has a marked status in the phonological system of that language. Historically "marked" syllables have obtained a high tone in NAB and in that sense, this dialect is "high marking". Whether or not the H tone can be analyzed as the only specified (marked) tone in the phonological system is less straight forward. This analysis would imply that only H is active in the phonology, that only H can parttake in phonological processes (dissimilation, restrictions of occurrence ...), and that there can only be H floating tones while L is merely the absence of tonal marking.

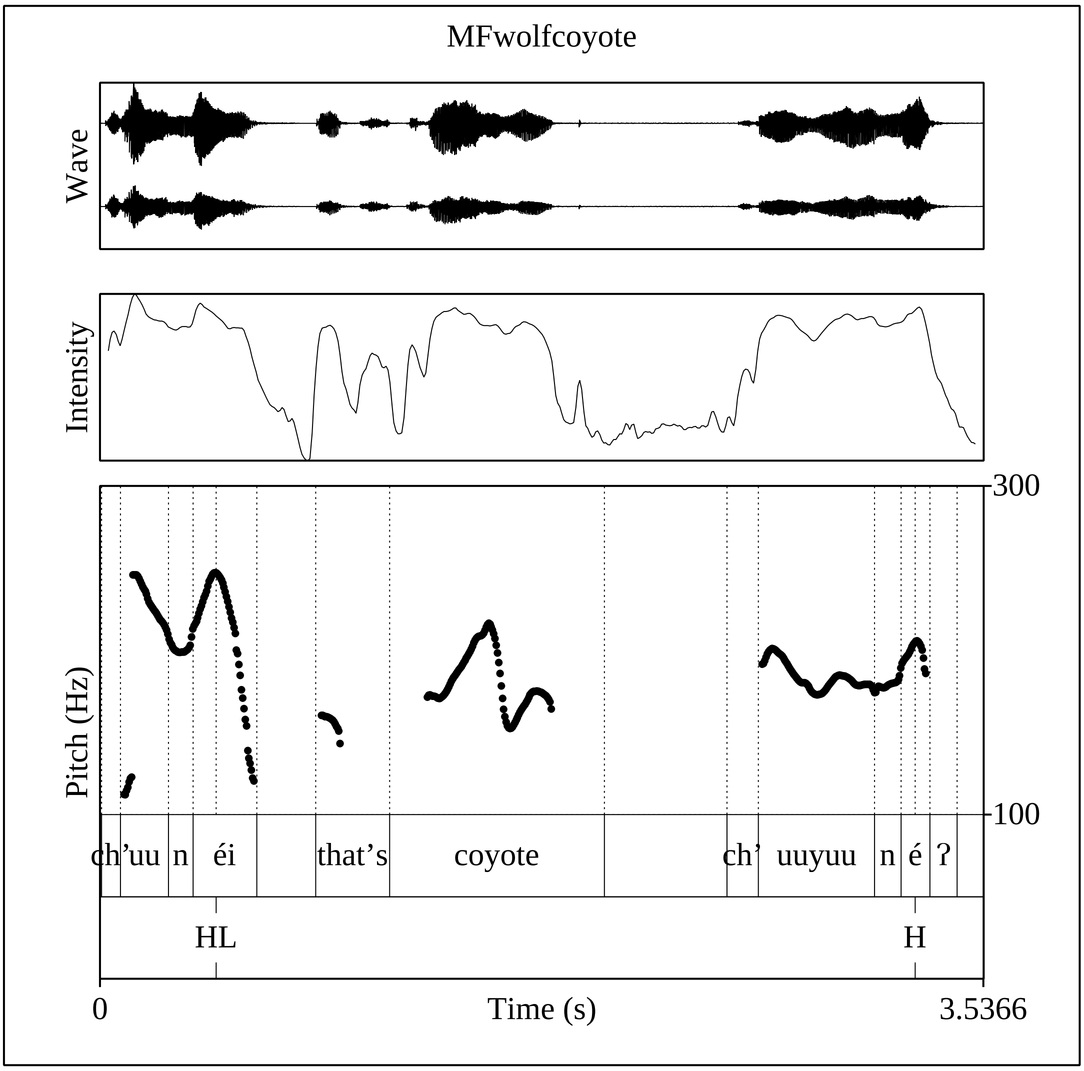

Figure 3.7: An example for a lexical falling tone. The first word *ch'uunéi* "coyote" bears a falling tone on the last syllable, marked with HL and the last word *ch'uuné'* "wolf" has a simple high tone, marked with H. (MSwolfcoyote)

In Sekani, only L (marked tone) is retained after vowel deletion. Analogously, if in cases of vowel deletion only the high tone is left this could be taken as an indication that only H is specified (Rice & Hargus 2005b: 12). However, for Beaver, it could be assumed in this line of argumentation that both tones are phonologically active on the following basis: Consider the two forms of the verb "skate", given below.

(15) a. k'éé- na- ką́ą́s
around- you- skate
"You are skating around." (fieldnotes, G. S.)

b. k'yæ̂s- ką́ą́s
around.I- skate
"I skate around." (fieldnotes, G. S.)

In 15a the perambulative[11] morpheme is *k'éé-* bearing a simple high tone, in 15b it merges with the 1st person singular morpheme *as*-which is low-toned or potentially "unmarked". This results in a falling tone. Were the L tone on the 1st singular morpheme to be a considered toneless or unmarked, one could expect the result of the merger to be a high toned syllable. However, Hyman (1999a) argues that the presence of contour tones does not suffice for an analysis, in our case, of a specified H and a specified L. He proposes a complex representation of those cases such that the TBU has two tonal nodes, one of which is underspecified (p. 240). In the absence of a floating L or tonal processes that point to the markedness of L, we do not have enough evidence to decide whether L in Beaver actually is a specified tone. We will assume the more conservative analysis here, that H is marked and L is unmarked.

[11]This is the Athabaskanist term for the aspect category that the morpheme *k'éé-* expresses, it is also sometimes called repetitive aspect (Rice 1989a). This morpheme is often translated by speakers with "around", hence the gloss in the examples.

In concluding this chapter, we will briefly adress the question what type of tone languages Beaver belongs to. When considering the possible combinations of tones for monosyllabic words in table 3.5, one can observe that the occurrence of the falling tone is somewhat restricted. Nevertheless, NAB should be classed with Donohue (1997) as a syllable tone language or with Hyman (2006) as a full tone language where the TBU is the syllable. In longer word forms in the verbal paradigm, one can see how tones are linked to affixes or stems and move around in the word with them.

Monosyllabic			Bisyllabic		
L	gah	"hare, rabbit"	L.L	dadal	"it is red"
H	sán	"star"	H.H	nóótáá	"Western Grebe"
HL	tsáa	"beaver-dim."	L.H	sabát	"my stomach"
			H.L	nóódaa	"cat"
			L.HL	ahshéi	"my grandfather"
			HL.L	zéexwį	"I killed it"
			HL.H	néesdák	"I choked (on it)"
			H.HL	nóódáa	"cat-dim."
			HL.HL	núuzáe	"skunk"

Table 3.5: Tonal combinations in monosyllabic and bisyllabic words.

Trisyllabic words are not given here, however, we both find words with all low tones or all high tones. However, we are not aware of a trisyllabic word with three falling tones, which is related to the diachronic complexity of this tone that is very unlikely to be present in a trisyllabic word. This short introduction to the tonology of Beaver is intended to serve as a basis for the following chapters on post-lexical manipulations of pitch and phonetic implementation of lexical tones in different contexts.

3.3.3 Morphological Structure

The nominal morphology in Beaver is rather straightforward and will not be addressed here. The diminutive has been discussed above on page 60.

Verbal morphology, on the other hand, is characterized by a complex template that is similar to the Pan-Athabaskan templates in tab. 3.1 on p. 43 above. The division of the verbal word into disjunct and conjunct has already been introduced as a Pan-Athabaskan concept in section 3.1.2 above. The disjunct zone includes the positions: postposition (and its object), adverb, incorporate, reversative, and distributive. In the conjunct zone, the following slots are found: object, deictic, derivative, conjugation, mode and subject. The stem consists of a 'classifier' (valence indicator) and the verb-stem, which can be followed by aspectual suffixes and enclitics. An example of a complex verb in Beaver is given below:

(16)	į̨h-	ts'-	ų́ų́-	gha-	da-	dyihts
	rec-	towards-	at-	they-	lex-	talk

"They talked to each other." (fieldnots, G. S.)

This illustrates how verb forms in Beaver may convey as much information as is contained in a sentence in English.

3.3.4 Word Order

Even though it has been noted that assigning a basic word order type to a language is not an easy task (Dryer 1996, Mithun 1992, Downing 1995), we will at least try to make some generalizations for Beaver. The corpus of Beaver narratives will be used as a database, assuming with Longacre (1995) that "[i]f storyline clauses in narrative discourse in a given language are VSO, then that language should be classified as a VSO language" (p. 333).

In almost all utterances in Beaver narratives, the verb is in final position. Exceptions to this very strong pattern can only be intonationally separate afterthoughts or particles that can follow the verb or conjunctions that are usually clitics to the verbal stem. Since Beaver marks subjects and pronominal objects on the verb, it is very rare in narratives to actually find clauses that have a full noun phrase for both subject and object. However, in these few cases, the subject precedes the (postpositional) object; and the verb is in final position.

(17) askáayuu tlįz̲ááyuu tyéhk'azi kaaghanehtah.
boy.and dog.and frog they.at.him.look
"The boy and the dog are looking at the frog."(MSfrogstory003)

(18) ii ma- chwą́ą dane -ts'į́ dahdadyis.
dem his- son man -at he.point
"Her son pointed at the man."(CPnaabahne006)

We will therefore assume that the basic word order for Beaver is SOV. When looking at the verbal complex, the order of the affixes is the other way around, i.e. the subject affixes are closer to the stem and the object affixes occur earlier in the verb word. Within the noun phrase, the unmarked case is for the specifiers to follow the noun. In example 19, the colour term "red", which is a stative verb in Beaver with a complementizer, follows the noun:

(19) tlįchuk dadale
horse red
"A red horse"(fieldnotes, G. S.)

For numerals this would be the expected word order as well, but it is also possible for numerals to precede the noun, most probably a result of language contact with English[12].

[12] I wish to thank Dagmar Jung and Pat Moore for pointing out this variation to me on separate occasions.

3.3.5 Particles

Beaver makes use of a number of particles, some of which will be introduced here because of their potential interaction with intonation patterns. On the one hand, particles may be an alternative to intonation in marking a certain sentence type, as has been described by Rice (1989b) for Slave yes-no-questions. On the other hand, special intonation contours may accompany certain particles. A discussion of particles in relation to intonation patterns can be found in section 6.4.

3.3.5.1 Question Particles

There are two particles that mark yes-no questions and one encliticon that accompanies wh-questions in Beaver. In yes-no questions, either of two particles may be used: The sentence initial particle *gǫ́ǫ́* signals an unbiased yes-no question, as in:

(20) gǫ́ǫ́ lidyíí kuudyį̨dyih?
ptcl tea you.want
"Do you want tea?" (fieldnotes, G. S.)

The particle *laa* is added in sentence final position to produce a positively biased yes-no question, as for example the following:

(21) lidyíí kuudyį̨dyih laa?
tea you.want ptcl
"You want tea, right?" (fieldnotes, G. S.)

One speaker translated this particle with the Canadian question tag "eh?" in order to explain the difference to *gǫ́ǫ́* which reflects the positive bias associated with *laa*.

In content questions, neither of these two particles can be used, but there is a question final clitic *-aa* added to the last syllable of the question[13]. As has been described above, this can produce falling tones (cf section 3.3.2, page 60). An example of a content question is:

(22) Yéé kuudyįdy -aa?
what you.want -ptcl
"What do you want?"(fieldnotes, G. S.)

This particle can also be added to the question words themselves in elliptical questions such as *Yáa?* "What?" (from yéé-aa "what-particle").

3.3.5.2 The Particle *laa*

The particle *laa* can mark contrast in Beaver with varying scope. In the more frequent cases, a noun phrase is in the scope of this particle yielding a contrastive reading:

(23) sįį laa yaghíí gáá nuseesi.
I ptcl dem now I.will.marry
"Me, I am going to marry that one over there." (PMmarriedtothestars005)

This sentence is taken from a story where three girls are looking at the stars at night and each one of them is picking one star that she wants to be married to.

It is also possible that a verb is in the scope of the particle, which is not very frequent, though. Only one case has been found in the corpus of stories, here the meaning is assertive:

[13]Even though this is true for most elicited content questions in the corpus, some were produced without this final clitic. It is not clear whether this was a result of the elicitation situation, since questions observed in a natural context were always marked with this clitic, or if there is indeed some difference between a content question with and one without *-aa*.

(24) méénéézhid -ǫ́ laa éhjudze -ts'į k'áádyihtyih.
I.was.scared -but part trap -from I.took.it.out
"Even though I was scared, I took it out of the trap." (MSfisher017)

Finally, this particle is used when stating someone's name, where no strong contrastive or assertive meaning is implied:

(25) sį́- jizíí laa Mary úúyaa.
my- name part M. it.is.called
"My name is Mary." (fieldnotes, G. S.)

Summing up, there are particles in Beaver that are associated with the typical functional categories often marked by intonation. The question to be addressed in section 6.4 is whether this renders additional intonation contours in these contexts superfluous or if there are interactions to be observed.

Chapter 4

The Corpus

The corpus on which this study is based consists of 2,376 utterances of spontaneous or semi-spontaneous speech produced by ten speakers and additional material obtained in various traditional elicitation sessions. The data were recorded on several field trips between 2005 and 2008 by the author, supplemented by stories recorded by Dagmar Jung and Olga Lovick between 2004 and 2006[1]. The recordings represent the Northern Alberta dialect of Beaver.

The situation of data collection in a speaker community of an endangered language is somewhat different from the laboratory set-up that other studies are based on. Certain tasks are not possible, e.g. the acquisition of reading data because speakers are not used to reading Beaver. Consequently, the

[1] I wish to thank them both for letting me use those recordings; in the Appendix A.5 those stories are indicated.

corpus does not include this type of highly controlled data[2] but is mainly based on spontaneous or semi-spontaneous speech. This leads to another problem; since the language under scrutiny here is moribund, speakers are used to switching to English as soon as there is someone present who does not speak Beaver. This is a problem for recording spontaneous dialogues, so that the dialogue material in the corpus has been recorded with the help of different interactive tasks. These tasks had to be selected so as to be simple and not too far removed from what everyday conversations might be about, e.g. some of the materials in the QUIS stimuli kit (Skopeteas et al. 2006) were excluded on this account. The age of the speakers was another factor contributing to the exclusion of certain tasks. In the context of the documentation of a disappearing language and from the point of view of the younger generations, traditional or personal stories are more desirable to collect than artificial data such as task oriented dialogues. Thus stories, a natural format, make up a large part of the corpus as well.

Since uncontrolled data constitute the major part of the corpus, a note on possible F_0 perturbances is in order. There are a number of factors that might have an influence on the measured fundamental frequency: First of all, voiceless segments will be breaks in the pitch contour. Since Beaver only has voiceless plosives and a series of ejectives, and word-finally obstruents are devoiced – even nasals and laterals can optionally become voiceless – there will be many instances without measurable pitch movements. Furthermore, it has to be kept in mind that the opposition of plain voiceless plosives versus aspirated voiceless plosives will also be reflected in the pitch of the following vowel, in that after the plain plosives F_0 will be lower, while after

[2]This is not necessarily negative: even though read speech can be controlled for the segmental material, the intonational performance can very easily become unnatural as speakers are forced to produce many similar utterances out of their natural discourse context.

the aspirated ones it will be higher (Gussenhoven 2006: 74f.). Vowels have been shown to have intrinsic F_0 values associated with them, i.e. closed vowels will have a higher F_0 than open vowels (Gussenhoven 2006: 8f.). All these microprosodic influences on F_0 were considered while annotating the data for intonational tones.

4.1 Survey of the Data

In table 4.1 the data are listed according to the section of the study in which they are analyzed, together with the materials, if any, that were used in the recording. The two letters indicating the speakers are random substitutions for their initial in order to keep them anonymous. The letters are simply the reference by which data from the respective recordings will be identified. In the following, the set-ups are described in a short survey – a more detailed description of the circumstances of recording, the processing of the data and the number of participants can be found in the methodological sections of the respective studies. A way to access the data is described in the appendix under A.5.

4.1.1 The Guessing Game

The main purpose of the guessing game is to get the speakers to interact, ask questions, guess and play along, so that the usual routine of other elicitation sessions consisting of word lists, paradigms or stories and their transcription would be broken up. For this set-up, one speaker was given a card with the picture of an animal while the other was instructed to guess what was on the picture. Only yes-no questions were allowed. Some useful data were obtained from the guessing game, even though there is still the tendency for

Sections	Materials	Speakers	References	No. of IPs
5.1	elicited list	BS	prosodic	226
5.1	elicited list	OO	prosodic	388
5.1	elicited list	MS	prosodic	239
5.1, 5.2, 6	(story)	MS	fisher	44
5.1, 5.2, 6	(story)	MS	sun	40
5.1, 5.2, 6	(story)	MS	bear	18
5.1, 5.2, 6	(story)	PM	mudhen	8
5.1, 5.2, 6	(story)	PM	chickadee	35
5.1, 5.2, 6	(story)	PM	stars	41
5.1, 5.2, 6	(story)	JD	life	29
5.1, 5.2, 6	(story)	JD	bannock	17
5.1, 5.2, 6	(story)	BS	naabahne	13
5.1, 5.2, 6	(story)	CP	naabahne	19
5.1, 5.2, 6	(story)	BG	world	12
5.1, 5.2, 6	frogstory	MS	frogstory	39
6	maptask	PM & CP	maptask 1–4	211
6	maptask	BS	directions	26
6	maptask	OO	directions	8
6, 7	animal dialogues	PM & CP	bingo, loc	604
7	animals	OO	animals 1, 2	99
7	animals	BS	animals 1, 2	99
7	animals	PM	animals	51
7	animals	AM	animals	51
7	animals	MS	animals 1, 2	59
Total no.				2376

Table 4.1: Survey of data included in the corpus and analyzed in the following sections with the materials used to elicit the data, the speakers, the reference that will be used together with the initials for examples taken from the recordings and numbers of IP's (giving the total count, some IP's have been excluded in some analyses).

the guesser to slip into some sort of list intonation or to simply stop marking the guesses as such since the setting is clear.

4.1.2 The Map Task

Recordings of map tasks (Anderson et al. 1991, Carletta et al. 1996, Kowtko 1996) have been included in the corpus. Two rather simple pairs of maps have been created with only eight items on each. One participant has a map with a path on it while the other only has a map with the landmarks. The speaker without the path on her map is instructed to reproduce the path that the other speaker has on his map by discussing it with him. The participants were told before starting with the task that the maps were not completely identical. The reason for this was simply because this reduced the amount of confusion arising during the game, considering that the speakers were all in their sixties or seventies, and, unlike university students participating in other map task dialogues, surely not used to playing games like this. Furthermore, the surprise at the fact that the maps are different is only present in the first recording of a map task, anyway, and is not an integral point of interest in the set-up. In addition to traditional map task recordings, the same maps were used as stimuli for simple route descriptions by single participants, in order to collect the same words for the landmarks in yet other contexts.

4.1.3 The Animal Game

The stimuli used were pictures from the "'Animal Game" in Skopeteas et al. (2006) with some minor adaptations. The set-up is similar to the experiment in Swerts et al. (2002). On the pictures, there are animals of different colours and sizes in different numbers; the consultants were shown the images either on a laptop screen or printed out on little cards and were asked to simply name what they saw on the card. A slow presentation of the stimuli set prevented the speakers from falling into some kind of list intonation.

4.1.4 The Animal Game – Dialogue Adaptations

In order to supplement the monological material recorded with the pictures from the "Animal Game" and to be able to test findings from the monologue set-up, some dialogues were recorded using different adaptations of the original game. In Skopeteas et al. (2006), a dialogue version of this game is described, which consists of having two speakers take turns in telling each other what they see on their cards. Even though this game was not tried, it seemed promising to have a more interactive set-up than this in order to get speakers more involved.

One version was a bingo game, where the same deck of cards as in the monological set-up was given to one speaker while the other was supplied with a paper that included many of the animal pictures arranged as if on a bingo chart. The speaker with the deck of pictures was asked to be the announcer telling the other player what he saw on each card; the other player was instructed to cross out the pictures that had been drawn, just like in a bingo game. This set-up turned out to be rather interactive because at the beginning the "announcer" did not describe the picture sufficiently so that the other player had to ask for the missing information on a number of occasions.

A second interactive set-up was inspired by the "static localization" game in Skopeteas et al. (2006), and is somewhat reminiscent of the classic map task. One speaker was given a map with a river and different groups of or single animals, and the other was given an empty map with only the river on it and cards with pictures. The second player now had to go through the pile of cards and ask if the pictured animal was somewhere on the map and if so, where, so that she could put it in the right place on her map or discard it if it was not to be included.

4.1.5 Stories

The eleven stories were told by four different speakers; they vary in length. Usually, the speakers first told the stories in English, and then were asked to retell them in Beaver. For some stories there was a Beaver speaking audience present – usually the spouse of the storyteller – so that feedback of the audience can be included in the analysis of some of the stories. The stories are usually either traditional or biographic.

4.1.6 The Frog Story

The frog story (Mayer 1967) was recorded with one speaker. The frog story is a picture book that shows the story of a boy and his dog who go to look for a frog which has escaped from the boy's room. This picture book allowed us to elicit narrative data from speakers who are not really used to telling stories in Beaver, and who, with the help of the pictures, were able to tell a story.

4.1.7 Elicitation Sessions

The data from the spontaneous or semi-spontaneous recordings were supplemented with data from a large corpus of traditional elicitation sessions, usually to provide the same word in a different context. Furthermore, the lexical tones marked on words are based on an analysis of these elicitations. Work on a dictionary with many recheckings of the same word and working on example sentences constituted a useful database for the identification of lexical tones.

4.1.8 Recording Conditions

The data were either recorded at the speakers' homes or in a motel room, so that some additional noise was always present, and sometimes even major interruptions caused by children, the telephone or visitors. However, this setting may have contributed to allowing the speakers to feel more at ease with the recording situation. Most of the recordings were made with a Marantz Solid State Flash recorder (PMD 660) and Røde directional condenser microphones (NTG-2). An alternative recording set-up, used in some of the stories, was a Sony digital video camera with a Sony ECM-MS957 Stereo microphone. The video recording was chosen for those stories because they are intended to be part of a documentation of the language where video recordings are a much more useful resource than only the audio. However, the quality of the audio recording was sufficient for those stories to be included in the analysis as well. In the DoBeS archive, where the data used in this dissertation is stored, recording set-ups are indicated for each source.

4.2 Transcription Systems for Intonation

Just as there are a great variety of systems for the transcription of tone (cf chapter 2.2 in Yip 2002), there have been a number of different ways of transcribing intonation. Starting from rather concrete notations such as Bolinger's textual notation with graphic representation of falling and rising parts of an utterance being realized through typesetting of the letters, or the use of simple curves that are drawn to indicate an idealized pitch contour or musical notation, more abstract systems have been created.

One of those systems which has been used by the British school (Crystal 1969, Halliday 1967) is the "tadpole" or "interlinear notation" where for every syllable a dot indicates the pitch height, with bigger dots indicating stressed syllables. Pitch movements occurring on a syllable are marked by a little tail in the direction of the movement. These dots are placed in-between two lines that serve as a frame of reference. On the practical side, this system is not very handy when annotating digital corpora, which was not a point of interest when it was devised.

Another annotation system is the very complex annotation scheme created at the IPO ('t Hart et al. 1990). It could be used for the annotation of corpora but is rather unintuitive and cumbersome to use and for those reasons will not be considered here any further.

INTSINT (Hirst & Di Cristo 1998) is a transcription system where turning points are labelled with arrows indicating whether a point is higher ($\uparrow$), lower ($\downarrow$) or the same ($\rightarrow$) as the preceding one. Downstep ($>$) and upstep ($<$) can also be labelled, and finally extreme values in the speaker's range can be marked by arrows for the values top ($\Uparrow$) and bottom ($\Downarrow$). Boundaries are marked by brackets, reset by double brackets. The INTSINT system was devised to provide a tool for further research on previously undescribed intonation systems and is considered by the authors to be the "equivalent of a narrow phonetic transcription" (p. 14).

Even though the INTSINT system may be suited for the present study, since nothing is known about the intonation system of Beaver, a ToBI like system has been given preference, because it is more widely used and more intricately linked to an analysis within the Autosegmental Metrical theory of intonation. For the same reasons, other more recent systems will not be used here. These systems include the IViE ("Intonational Variation in English"), a phonetic ToBI based system for the annotation of dialectal variation in British English (Grabe 2001, Grabe et al. 1998), and the RAP ("Rhythm and Pitch") transcription system (Dilley 2005, Dilley & Brown 2005), a system where more importance is given to rhythmic beats and perceived pitch and boundaries. In addition, the ToBI system has been found to be flexible enough to describe the diverse set of languages in Jun (2005c). Since one of the aims of this study is to allocate Beaver within a typology of intonation systems, a ToBI-like system will be directly comparable to those other languages.

The original ToBI system was created for the prosodic annotation of large corpora of Mainstream American English (Silverman et al. 1992, Beckman & Hirschberg 1994, Beckman & Ayers Elam 1997, Beckman et al. 2005). "ToBI" stands for "Tones and Breaks Indices". A ToBI annotation consists of several parallel tiers, the number depending on the language. Minimally it contains an orthographic tier, a tonal tier with autosegmental annotations of the pitch movements based on Pierrehumbert (1980) for English, and a break index tier with numbers indicating the size of the perceived break, with 0 indicating absence of a break and 4 indicating the highest possible disjuncture. In addition, a miscellaneous tier may be included to allow for comments and other annotations, e.g. for disfluencies or laughter.

A ToBI system has to meet a number of criteria, such as accuracy, and efficiency, but also freely available training materials and an evaluation of inter-transcriber consistency. It is expected that ToBI systems are rechecked and revised if the need arises. Complete ToBI systems are established for English (Silverman et al. 1992, Beckman et al. 2005), German (Grice & Baumann 2002, Grice et al. 2005a), Japanese (Venditti 1995, 2005), and Korean (Jun 1993, 2005a). There are, however, a large number of ToBI systems at various stages of development for languages as diverse as Greek (Arvaniti & Baltazani 2005), varieties of Italian (Grice et al. 2005b), Serbo-

Croatian (Godjevac 2000, 2005), Mandarin (Peng et al. 2005), Cantonese (Wong et al. 2005), Catalan (Prieto in press), Chickasaw (Gordon 2005), and Bininj Gun-Wok (Bishop & Fletcher 2005), among others.

The labels on the tonal tier in a full-fledged ToBI system are not a phonetic transcription, as for example the INTSINT system aims to provide:

> "Symbolic tone labels in the ToBI framework are intended to 'tag' the intonation contour and not to 'encode' it. A tag is a pointer for retrieving phonologically relevant portions of the fundamental frequency and audio signals. It is not a symbolic representation of purportedly language-neutral pitch levels [...] or pitch movements." (Beckman et al. 2005: 37).

It is thus clear that a ToBI system developed for one language cannot be used for another language or even a dialect of that language since the categories needed for transcription might be different ones. However, a ToBI-style annotation can be very useful in generating hypotheses about what categories to include in the inventory. Moreover, the simple ToBI labels are more easily entered than the arrows of INTSINT. The Beaver data will be annotated using a ToBI style system that is closer to a phonetic transcription[3], without the claim that the tonal labels constitute a finite set of tonal events which are relevant in Beaver. Rather, the labels will be used as phonetic labels that point to similar intonation events. The analysis of those events will be presented in section 6, and from there a first version of a ToBI-style system for Beaver could be created, which like all ToBI-systems would be an "ongoing

[3]Sam Helmuth proposed at the "ICPhS 2007 Satellite Meeting: Workshop on Intonational Phonology: Understudied or Fieldwork Languages" to make use of brackets and slashes to indicate the status of ToBI labels, for [phonetic] or /phonemic/ labels respectively. This convention will be followed, when there is a need to distinguish the two categories.

research program rather than a set of ‘rules’ cast in stone for all time” (Beckman et al. 2005: 46). That section will yield results which can be compared to other languages for which an analysis within the Autosegmental Metrical framework has been undertaken.

4.3 Conventions & Transcription

The data were transcribed in the practical orthography for NAB, cf A.1 for an overview. Long vowels are represented by double vowels and short ones with a single vowel. Nasality is marked by the ogonek, which is widespread in orthographies of North American languages as the diacritic for nasal vowels (ą). Lexical high tones are marked by the acute (á), while low tones are not marked, a contour tone on a long vowel is represented with an acute on the first letter and no diacritic on the second (áa). There is only one word with a short vowel bearing a falling tone in our data, this then is marked with a circumflex in *kwę̂*, the word for “house”. In the case of the stories and less controlled speech, the translation and transcription were produced together with a native speaker; for more controlled recordings the help of a native speaker was not necessary for transcription.

In the following studies, the subset of the data analyzed there will be briefly summarized with more information about technical detail. Examples of pitch contours will be given in figures with the addition of the glossed text of the example in the following format:

(26)	Kun	-ts’ii	uhs̠áa	ghadal,	dyii	ghadal,	sas.
	[k^{h}ʊn	-ts’i:	ʔʊhs̪â:	ɣɐtɐl]$_{L-}$	[dji:	ɣɐtɐl]$_{H-}$	[sɐs]$_{L\%}$
	fire	-from	pot	it.goes.around	chicken	it.goes.around	bear

“From the fire it goes around the pot, around the chicken, the bear.”

(PM1543)

In the first line, the sentence is transcribed orthographically. The second line contains the IPA transcription, with the addition of brackets to indicate phrasing and ToBI labels to indicate intonational tones, and will be only provided where necessary. The next line is a rough gloss of the words. And since this is not a study of morphology in Beaver, and the verbal morphology can get very complex, we decided against glossing single morphemes because this would make it necessary to introduce a number of concepts not relevant to the current study. The morpheme gloss is thus intended to provide an orientation for the reader not familiar with Athabaskan grammar for whom this rough glossing will hopefully prove to be more useful than the detailed one. The next line displays the free translation and indicates the source file of the utterance, which is also always indicated in the figures.

In the next chapter, the structure of the prosodic hierarchy in Beaver and its phonetic and phonological encoding will be analyzed.

Chapter 5

The Prosodic Structure in Beaver

The main part of this chapter will deal with the phonetic cues to prosodic phrasing in Beaver, it will be investigated how prosodic boundaries may alter the phonetic realization of plosives and nasals.

A little background to lower level structure will be given here. Different syllable structures are allowed for stems and prefixes in Athabaskan. Stem syllables – be it noun-stems or verb-stems – have a more complex structure than prefix syllables which are made-up of a reduced inventory and are simpler in their overall make-up. Furthermore, syllable codas are more restricted than onsets: In word final position the tripartite plosive distinction into aspirated, unaspirated and ejective plosives is neutralized and only unaspirated plosives occur. Furthermore, only voiceless fricatives are found in final position and the nasals and the lateral approximant are often devoiced. Thus, the full set of consonant phonemes is found only in onsets of stems, in codas only vowels or the consonants /t/, /k/, /s/, /ts/, /s̠/, /ts̠/, /ç/, /ɬ/, /tɬ/, /l/, /n/, /ʃ/, /tʃ/, /h/, and /ʔ/ can occur.

Word final devoicing may be seen as a signal for word boundaries in Beaver. As syllable structure is dependent on the distinction between prefixes and stems, the structure of a word is different for verbs and members of other word classes. Different minimality constraints apply: Verbs must consist of at least two syllables, while members of other classes may consist of only one syllable, compare Hargus & Tuttle (1997) for a discussion of whether this is a phonological or a morphological constraint.

In the following, we will examine phonetic cues to prosodic structuring, where we will compare consonants in syllable initial position within a word vs. in word initial position within an intermediate phrase vs. in intonational phrase initial position. The intonational phrase and the intermediate phrase are marked additionally by intonational tone, cf section 6. In the last section of this chapter, we will report on a devoicing phenomenon that marks finality in discourse or in narratives, and occurs at the end of larger entities.

5.1 Domain Initial Prosodic Strengthening

Cho & McQueen (2005) define domain initial strengthening as "spatio-temporal expansion of domain initial segments as compared to domain medial ones" (p. 123). Alongside strengthening caused by nuclear pitch accents or lexical stress, it is one of the two types of prosodic strengthening that has been described in many studies for a variety of languages cf Fougeron & Keating (1997) on English, Cho & McQueen (2005) on English and Dutch, Jun (1995) on Korean, Keating et al. (2003) on French, Korean and Taiwanese, Kuzla & Ernestus (2007) on German. It has been shown that fine-grained phonetic detail is used to encode the prosodic position, i.e. in prosodically strong positions, such as edges of prosodic domains, "segments are strongly articulated or even 'hyperarticulated"' (Cho & McQueen 2005: 4). This effect is a cumulative one "[...] in the sense that the higher in the prosodic tree an initial position is, the stronger that position and the segment in it." (Keating 2004: 51).

This strengthening effect has been observed in acoustic as well as articulatory studies for plosives, fricatives, vowels and nasals alike. Pan (2007) reports on initial strengthening effects in lexical tone in Taiwanese. In the following study on Beaver, the focus will be on plosives, especially their voice onset time (VOT), and on nasals. VOT has been found to be a strong indicator of prosodic position in English (e.g. Cooper 1991), while for other languages such as French the effect can be observed but is less pronounced (Keating et al. 2003). Jun (1995) found for Korean /p^h/ that phrase initial VOT is longer than word initial VOT, which in turn is longer than word medial VOT. Cho & McQueen (2005) compare domain initial effects – among others – on VOT in Dutch and in English and found that those two languages show an opposite pattern. VOT increases in prosodically strong positions in

English, but decreases in the same positions in Dutch. This can be explained by phonetic feature enhancement which predicts that phonological contrasts encoded in the features of segments will be enhanced in strong positions. Cho & McQueen (2005) argue that Dutch voiceless plosives have the feature [-spread glottis], while their English counterparts have the feature [+spread glottis].

Fougeron & Keating (1997) showed that nasals are produced with more linguopalatal contact when they are in initial position in higher domains than when in lower domains, the effect being cumulative. Interestingly, no speaker distinguished all five of the prosodic domains they had included in the data but all speakers did distinguish at least three different domains. The levels they compared in their analysis were: IP initial, defined as the beginning of "a complete sentence" or "when a speaker begins talking", the beginning of an Intonational Phrase (IP) which is "defined by a complete intonational contour", the onset of an Intermediate or Phonological Phrase (PP) which is defined by "at least one pitch accent and a phrase tone", the beginning of a word (W) and, as the lowest level, the onset of a syllable (S).

Keating et al. (2003) posed a hypothesis which might be interesting in our context, namely that Taiwanese as a tone language could make a greater use of prosodic strengthening to mark prosodic edges since it is more restricted in its use of intonation for this purpose (p. 147). This however, was not supported by the data. It is important to keep in mind that even though prosodic strengthening has been found in many languages, "the prosodic effects can be seen to differ across speakers and consonants within a language" (Keating et al. 2003: 157).

That prosodic strengthening has its motivation in perception has been shown by Cho et al. (2007): "Findings therefore suggest that domain initial strengthening is one of many acoustic cues used in the segmentation of continuous speech" (Cho et al. 2007: 235).

Other factors besides prosodic position (and stress which does not play a role here) can also have strengthening effects. Kochanski et al. (2003) report for Mandarin tone that part of speech or number of syllables in a word can influence the prosodic strength in that nouns and adverbs were found to be articulated more strongly than other parts of speech, and words with more syllables had a greater prosodic strength than those with fewer syllables. This is in line with the findings of Miller (2003) on Beaver, where she showed that lexical H tones on nouns were higher than those on verbs[1].

There are some additional factors that should to be taken into account when dealing with Athabaskan languages: As has been described in Tuttle (2005), strengthening at prosodic boundaries, but also at morphologically prominent positions occurs in Western Apache, a remote relative of Beaver, that is, stem initial position has been shown to be more prominent than prefix initial position.

Bird (2004) describes intervocalic lengthening effects on consonants for Carrier and found that consonants in intervocalic position are "overall substantially longer than both singleton and geminate consonants cross-linguistically". This increased duration in intervocalic position was observed also for Navajo by McDonough & Ladefoged (1993). In addition, Bird (2004) shows that morphological structure has an effect on the duration of intervocalic consonants, i.e. lengthening occurs in stem initial position.

McDonough & Wood (2008) have reclassified the aspirated plosives in Athabaskan /t/ and /k/ as the complex segments /t͡x/ and /k͡x/ respectively on the basis of their durational properties. These complex segments are

[1]Miller (in prep.) provides a more detailed account on tonal realizations on verbs vs. nouns.

opposed to the "simplex" ones, the ones termed unaspirated in traditional terminology. The dataset for the following study was collected under the traditional assumption that the opposition is due to VOT differences[2].

In the following, strengthening effects of prosodic boundaries on plosives and nasals will be examined for Beaver. It will be analyzed whether morphological categories, such as prefix and stem, have any influence on segmental duration, and whether intervocalic position is an important factor influencing consonant durations for Beaver as well. Finally, the question whether <t> and <k>[3] are best classed as aspirated plosives or as complex segments in Beaver will be briefly addressed.

5.1.1 Material & Method

The database for the following study consists of a controlled dataset of elicited speech, containing the target words in different prosodic positions. Three speakers were asked to translate words and short sentences. Each item was repeated twice, in three contexts: An example set for one word would be *tás̲* "arrow", *satáz̲é'* "my arrow" and then a sentence containing the word:

(27)	Dyii	laa	tás̲	alį.
	this	ptcl	arrow	it.is
	"This is an arrow."			

[2]The dataset was constructed and the data were recorded in May 2008, so that the reanalysis of McDonough & Wood (2008) could not be taken into account here. Here we investigate the effects of domain initial strengthening on the pulmonic plosives. However prosodic strengthening processes could possibly be an indicator as to what analysis to chose for Beaver.

[3]For the sake of convenience, the orthographic representations will be used as a shorthand for the phonetically more accurate $[t^h]$ and $[k^h]$ in opposition to <b>, <d>, and <g> or phonetically [p],[t],[k].

In the first case, the words with the target consonants were in IP initial position (here labelled BI 4), in the second case, the target consonants were word initial (BI 1) and finally word internal (BI 0).

The words used are given in table 5.1, there where seven for each consonant except for /b/ and /g/, there were five. Thus 45 words were recorded in three contexts, from three speakers with two repetitions, which would yield a total of 810. However, not all words were repeated in every context by every speaker, and the sentences were not always the same, since speakers came up with sentences that made sense for them together with the word. These spontaneous sentences were then used under the assumption that this would be a more natural rendition of the target word. Furthermore, not all speakers knew all the words, so they were replaced with other words with the same properties. A total of 853 IP's were analyzed.

The audio files were annotated in praat[4] and then cut using a praat script and converted to an Emu database[5]. In Emu, the tiers were linked in a hierarchy using an autobuild script[6] so that complex queries across tiers were made available. R was used to perform statistical analyses and create graphics[7].

The recordings were labelled using the spectrogram and the waveform to determine boundaries between segments (Turk et al. 2006). For each target syllable the closure period of the plosive was labelled (t, k, b, d and g). VOT was labelled from the release of the plosive to the onset of regular voicing in the vowel. Here the distinction was made between the different qualities of aspiration based on auditory judgment, "plain" aspiration labelled as h,

[4] Boersma & Weenink (2008), retrieved March 31, 2008, from http://www.praat.org/.
[5] http://emu.sourceforge.net/.
[6] MapLevels and LinkFromTimes.
[7] http://www.r-project.org/, together with the "R Package of the EMU Speech Database system" created by the IPS, University of Munich, 2008.

b	t	d	k	g	m	n
baláts	tás̱	dás̱	kaẕáá	gat	man	nán
“tags”	“arrow”	“driftwood”	“tongue”	“spruce”	“wall”	“earth”
beebáa	táághale	dane	kawutlíze	gah	madzih	nak’áẕi
“baby”	“drum”	“person”	“dough”	“rabbit”	“caribou”	“short”
bés̱	táádyiidze	dachin	kéé’	gaa	máás̱íílu	nahtane
“knife”	“middle”	“wood”	“shoe”	“now”	“cranberries”	“thunder”
beelíí	tááty’ii	dáats’ę	kéékoihé’	gǫ́ǫ́ẕe	méhẕį	náát’ane
“swing”	“three”	“cone”	“rubber boots”	“jackpine”	“owl”	“clothes”
bwil	tį́tliidi	deeẕúú	kún	gųẕ	mį́į́l	náábee
“sleepiness”	“soup”	“man”	“fire”	“fireweed”	“sare”	“otter”
	tǫ́dyeedú	dyę́ty’ii	kúlaa		meeyiné’	néis̱tǫ
	“long ago”	“four”	“old man”		“radio”	“log”

Table 5.1: Target words in orthographic representation with translations.

velar frication labelled as x, and palatal frication labelled as c. Lastly, the vowels following the plosives were labelled using the onset of regular voicing as a landmark, similarly the right boundaries of vowels were labelled using the offset of F2 (Turk et al. 2006: 7). For the vowels preceding the plosives, voice termination time (VTT) was labelled from the offset of the vowel to the beginning of the plosive. This label has been included since Beaver plosives can be slightly preaspirated (cf 3.3.1.1 above) and the different "phases" of plosives and vowels might behave differently in different contexts. Thus, VTT might be relevant when looking at intervocalic consonants that are reported to be geminates in other Athabaskan languages by e.g. Bird (2004). The type of vowel was noted as well, so that interactions of vowel quality and quantity with the degree and kind of aspiration can be analyzed. For nasals the total duration was labelled.

Additional positional labels were added on separate tiers, such as intervocalic position, morphological category (prefix[8] or stem) and the labels for boundary strength. For boundary strength a ToBI like system has been used with BI 0 employed here for absence of boundary, i.e. syllable initial position within a word, BI 1 has been used to mark boundaries between words, and BI 4 for IP initial position. BI 3 was used for an ip boundary; this context was not included in the basic elicitation set-up, however in some cases speakers used a construction with a small boundary before the target words. Thus the tokens for BI 3 are relatively few compared to the others. The label BI 2 was not used (for ToBI conventions cf Beckman & Hirschberg 1994, Beckman et al. 2005).

In figure 5.1 the segmental labels used in this study are illustrated: Besides the vowels (V), voice termination time (VTT) was labelled from the

[8]In the prefix category no distinction was made between conjunct and disjunct prefixes, furthermore nominal and verbal prefixes were both included in this category.

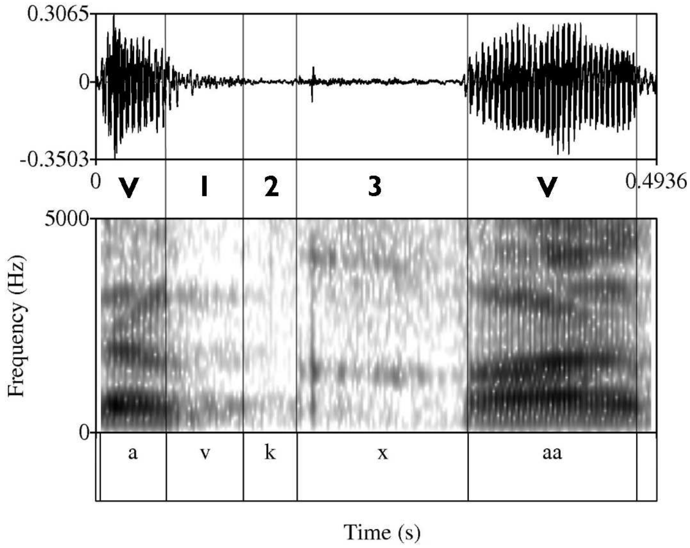

Figure 5.1: An example of the labels used in this study: Voice Termination Time VTT (1), closure period (2), VOT (3), and the Vowels (V) in the word *dakáát* "it is wide" produced by speaker OO.

offset of F2 of the preceding vowel to the beginning of the closure (1). Furthermore, closure duration was labelled (2) and voice onset time (VOT) from the burst to the onset of the vowel (3). Below the spectrogram, the labels used can be seen for the word *dakáát* "it is wide": The two vowels "a" and "aa", VTT has been abbreviated as "v", "k" labels the plosive – closure duration and category of plosive –, finally, "x" labels VOT with the additional information that it has a velar quality here.

5.1.2 Hypotheses

There are four interwoven mechanisms that can influence the expected segmental durations. Firstly, domain initial prosodic strengthening is expected to lengthen segments at the beginning of prosodic domains: the higher the domain, the stronger the effect. Secondly, the idea of feature enhancement predicts that features relevant in phonological contrasts will be enhanced in strong position. Therefore it is assumed that VOT in stronger positions is lengthened for aspirated plosives but not for unaspirated plosives. Thirdly, the distinction between stem and prefix syllables is expected to have an influence on segmental duration, as in other Athabaskan languages (e.g. Western Apache languages in Tuttle 2005). Fourthly, as has been reported for a related language of Beaver, consonants in intervocalic position are geminated. Impressionistically, this does not seem to be as pronounced for Beaver as Bird (2004) has described for Carrier. Finally, the reanalysis in McDonough & Wood (2008) of /t/ and /k/ as complex segments /t͡x/ and /k͡x/ has to be born in mind, even though this analysis is not assumed for Beaver. The following hypotheses are formulated based on these expected effects:

1. Prosodic strengthening predicts: Overall duration will be longest in isolated forms, shortest within words. In particular VOT is expected to be longest domain initially for the aspirated plosives.

2. Feature enhancement predicts: Aspiration (VOT) will be longest for /t/ and /k/ in domain initial contexts and shortest for /b/, /d/ and /g/ in the same context. That is, VOT might not be longer word initially for /b/, /d/ and /g/ than in other contexts even if this is the case for /t/ and /k/.

3. Influence of morphological domains predicts: “Stem initial strengthening”, the onset of a stem syllable will be more prominent than the onset of a prefix, which is reflected in durations, either of the whole segment or on phases of the segment, such as VOT for example. Impressionistically, the strong velar affrication of /t/ usually occurs in stem-onsets, while it hardly ever occurs in prefixes.

4. Intervocalic lengthening predicts: Overall duration of consonants will be longer in intervocalic position compared to other posistions. This runs contrary to the prediction of prosodic strengthening, which predicts that the word internal position should be considered the weakest.

Different scenarios of how these different mechanisms interact are possible in Beaver:

1. One mechanism overrides the others: e.g. prosodic strengthening and feature enhancement have the greatest effect.
   a) This would result in the same picture that has been described for many other languages, i.e. the higher the domain boundary the longer the segmental duration, overriding the other mechanisms. This scenario would predict that duration of segments is longest IP initially and shortest word internally, regardless of morphological category or of whether the segment is in intervocalic position.
   b) This would further predict that VOT for the aspirated plosives is longest IP initially and shortest word internally, regardless of e.g. morphological category. Intervocalic position has been reported to have an effect on the duration of the whole segment, there are no explicit predictions for the behaviour of VOT with regard to intervocalic lengthening.
2. Effects target only certain consonants or features of consonants.
   a) For example, closure duration could be effected by prosodic position while VOT could vary according to morphological features.
   b) Alternatively, quality of aspiration (velar vs. "plain") could be exploited to mark the distinction between stem and prefix syllables,

while the overall duration of aspiration could reflect the position in the prosodic hierarchy.

c) Or, intervocalically, VOT could be shorter because of the prosodically weak position while the overall duration of the plosive is longer due to intervocalic lengthening.

d) Nasals could behave differently from plosives.

3. All the mechanisms interact, thus blurring the overall picture making neither of them retrievable from the data.

Summing up, the following information has been annotated in the corpus so that the different effects can be analyzed separately: boundary strength, prefix vs. stem, intervocalic position, following vowel; the different phases (VTT, closure, VOT) have been labelled for plosives and the quality of aspiration for the aspirated plosives has been noted.

5.1.3 Results

As a background to the following results, overall measures of segmental durations are displayed in figure 5.2, showing that the aspirated plosives (P, 229 ms) are the longest segments, followed by the unaspirated plosives (B, 180 ms), the nasals (N, 132 ms) and finally the vowels (V, 114 ms)[9].

In figure 5.3 measurements of VOT by plosive type are summarized regardless of context. The differences in durations of VOT are found to be significant when comparing /b/ and /d/ in a two-tailed t-test ($p<0.01$), not significant when comparing /k/ and /t/ and highly significant ($p<0.001$)

[9] It should be kept in mind here that the vowels were labelled using F2 onset and offset, Vmin, as in Turk et al. (2006). Thus irregular voicing or devoiced periods at the end of a vowel were counted as the beginning of the following plosive, accounting for the rather short duration of vowels.

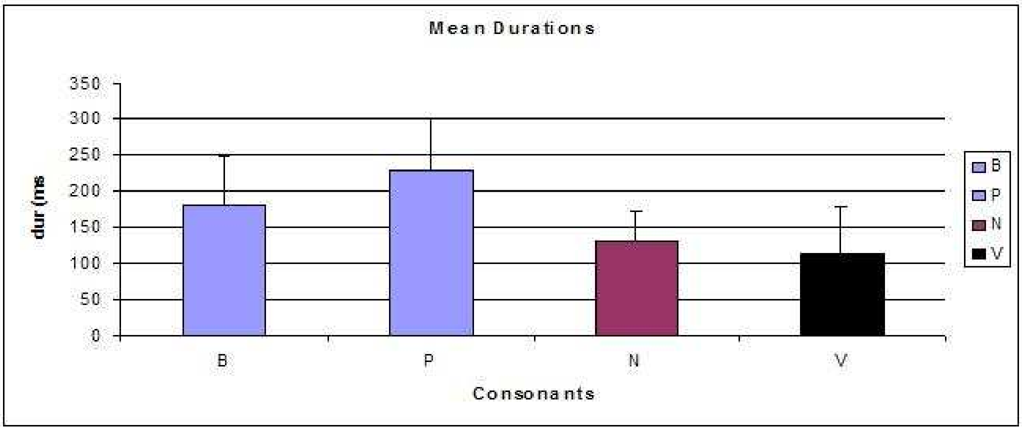

Figure 5.2: Mean segmental durations in the corpus (B=unaspirated plosives, P=aspirated plosives, N=nasals, V=vowels).

when comparing all remaining pairings. This means that plosive type has a significant influence on VOT. As expected, the difference between the two aspirated plosives /k/ and /t/, when compared with the unaspirated ones /b/, /d/, /g/, is highly significant. Interestingly, duration of VOT for the aspirated velar /k/ and the aspirated alveolar plosive /t/ does not differ significantly as is expected cross linguistically (Cho & Ladefoged 1999). Furthermore, the unaspirated velar plosive /g/ differs significantly in VOT from the other two unaspirated plosives /b/ and /d/ and from the aspirated ones. Thus, place of articulation does have a pronounced effect on VOT for the unaspirated plosives, but not for the aspirated ones.

5.1.3.1 Effects of prosodic position

To test for effects of boundary strength on VOT, durations were measured and compared for the different plosives. The same overall trend found in the pooled data (cf table 5.3) is found when looking at each boundary type separately. That is to say /b/ and /d/ have the shortest duration, /t/ and

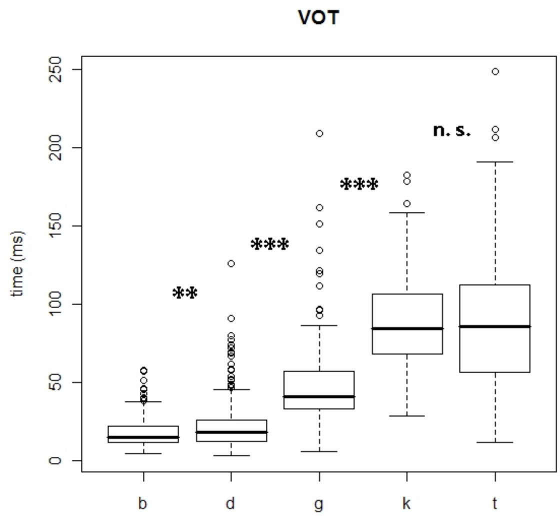

Figure 5.3: Duration of VOT in Beaver plosives (ms), by plosive type with significance levels found in a two-tailed t-test.

/k/ have the longest duration and /g/[10] is in the middle between these two extremes in each of the prosodic positions.

When looking at each plosive separately, hardly any significant difference in duration between the different positions can be found. In table 5.2, the mean durations and standard deviations are given per plosive and boundary strength. It can be noted, however, that VOT is longest in IP initial position (BI 4) for all but for the bilabial plosive /b/. In the following, aspirated and unaspirated plosives will be compared as groups.

In figure 5.4, VOT is plotted for unaspirated and aspirated plosives for each of the four boundary strengths. Unexpectedly, from a point of view of prosodic strengthening, plosives in word internal position (BI 0) do *not* show the shortest VOT, instead the duration is longer than in word initial (BI 1) position. The longest VOT was found in IP initial position (BI 4). These ten-

[10] /g/ was sometimes realized as [gɣ].

	BI 0	BI 1	BI 3	BI 4
/b/	17.9 (10.5)	18.2 (11.9)	22.2 (NA)	21.2 (11.5)
/d/	21.1 (17.1)	19.3 (18.3)	26.1 (16.4)	30.3 (22.6)
/g/	38.1 (17.4)	48.8 (18.8)	44.4 (24.9)	60.1 (37.4)
/t/	87.5 (39.4)	73.8 (46.3)	84.6 (20.1)	98.1 (52)
/k/	86.7 (32.1)	88.2 (24.3)	89.1 (40.3)	94.3 (30)

Table 5.2: Mean durations and standard deviations (in parentheses) for VOT of the plosives in different prosodic positions (BI 0= word internally, BI 1=word initially, BI 3= ip initially, BI 4= IP initially).

dencies are the same for unaspirated and aspirated plosives, although VOT is clearly different for the two categories. However, the only significant difference for the aspirated plosives is between BI 1 and BI 4 ($p<0.05$). Neither of the other pairings yield any significant difference in two tailed t-tests for the aspirated plosives. For the unaspirated plosives, significant differences were found in two-tailed t-tests for BI 0 and BI 4 ($p<0.001$), that is, between word internal and IP initial positions, and for BI 1 and BI 4 ($p<0.001$), i.e. word initial but IP medial and IP initial position. Again the other pairs were not significantly different.

In figure 5.5, the closure duration for unaspirated and aspirated plosives is shown, here only for the three positions word internal (BI 0), ip internal (BI 1), and IP internal (BI 3). For IP initial plosives (BI 4), closure duration could not be reliably established. For the unaspirated plosives, the durations are not significantly different across the different positions. For the aspirated plosives, closure duration was found to be significantly higher for BI 0 than for BI 1 ($p<0.05$). The effects of boundary strength on VTT are not separately plotted since no significant effects were found for this phase of the plosives.

Turning to the nasals, segments in word internal (BI 0) and word initial but ip internal position (BI 1) had the longest durations (125 ms and 140

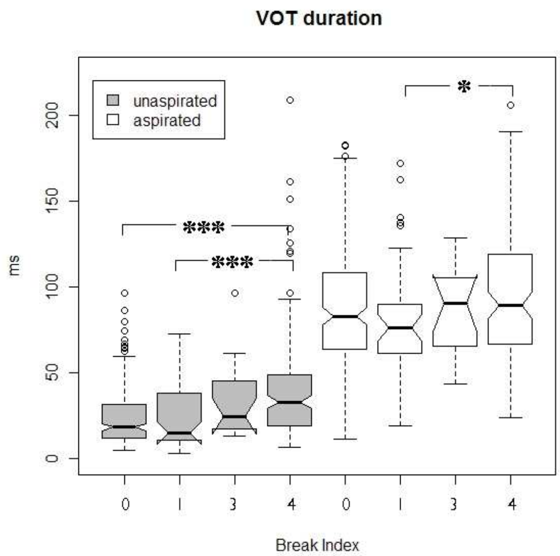

Figure 5.4: Influence of juncture on duration of VOT by plosive category (0=word internal, 1=word initial, 3=ip initial, 4=IP initial).

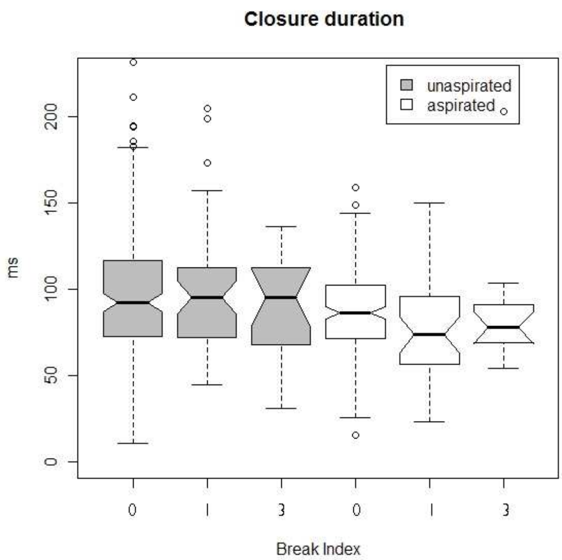

Figure 5.5: Influence of juncture on closure duration by plosive category (0=word internal, 1=word initial, 3=ip initial, no reliable measurements were possible for IP initial closures).

ms respectively) and were both found to be significantly longer ($p<0.001$ in two-tailed t-tests) than nasals IP initially (103 ms).

To sum up, we found effects of prosodic position on duration as follows: VOT is longest IP initially for both aspirated and unaspirated plosives alike. Again for both plosive categories, in word internal position VOT is *not* the shortest. For aspirated plosives, VOT is significantly longer IP initially than word initially. However, closure duration shows the opposite behaviour in that it is longest word medially and shortest word initially. For unaspirated plosives, VOT was found to be significantly longer IP initially than both word initially and word medially. Closure duration of unaspirated plosives was not affected by boundary strength. VTT did not show significant effects for either of the plosive categories. Finally, nasals had the shortest duration in IP initial position, significantly shorter than in word medial and word initial position[11].

The effects of boundary strength on the two phases of the plosives, closure and VOT, are summarized in figure 5.6. For BI 4, only VOT is plotted since closure duration cannot be measured in this context.

In table 5.3, the correlation coefficients for the durations of the phases of the unaspirated and the aspirated plosives are given. The durations of the three phases are not correlated ($r<0.5$). That is, they are effected differently by the different contexts.

5.1.3.2 Effects of speakers

Effects of speakers on duration are shown in fig. 5.7 for nasals and fig. 5.8 on VOT. A tendency exists for speaker BS to produce the shortest and speaker MS to produce the longest durations in all contexts, which is in line with

[11] It might be possible that different results could have been arrived at with additional articulatory data.

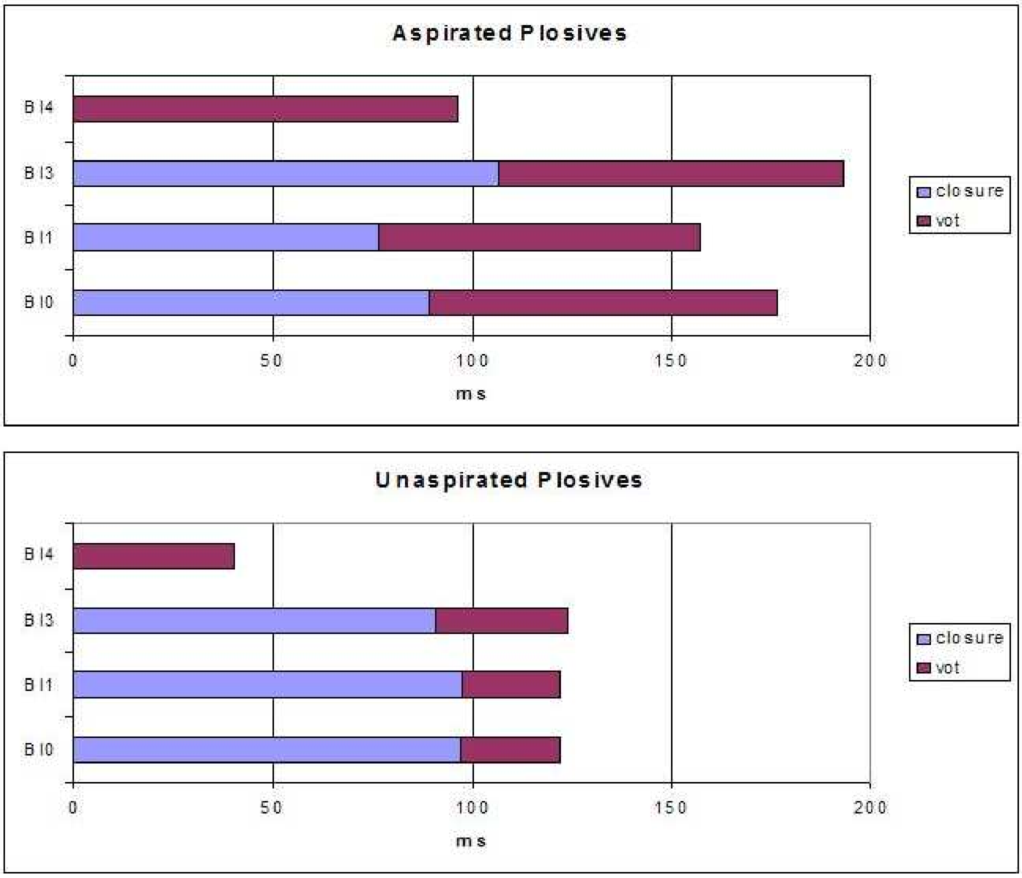

Figure 5.6: Mean durations of closure and VOT of the plosives as affected by position in phrase (for BI 4, closure duration could not be measured).

Unasp.	VTT	Closure	VOT	VTT	Closure	VOT	**Asp.**
VTT	1.00	0.00	0.24	1.00	-0.15	0.15	VTT
Closure	0.00	1.00	-0.08	-0.15	1.00	-0.01	Closure
VOT	0.24	-0.08	1.00	0.15	-0.01	1.00	VOT

Table 5.3: Correlations between VTT, closure duration and VOT for BI 0, 1 and 3 for unaspirated and aspirated plosives in the corpus.

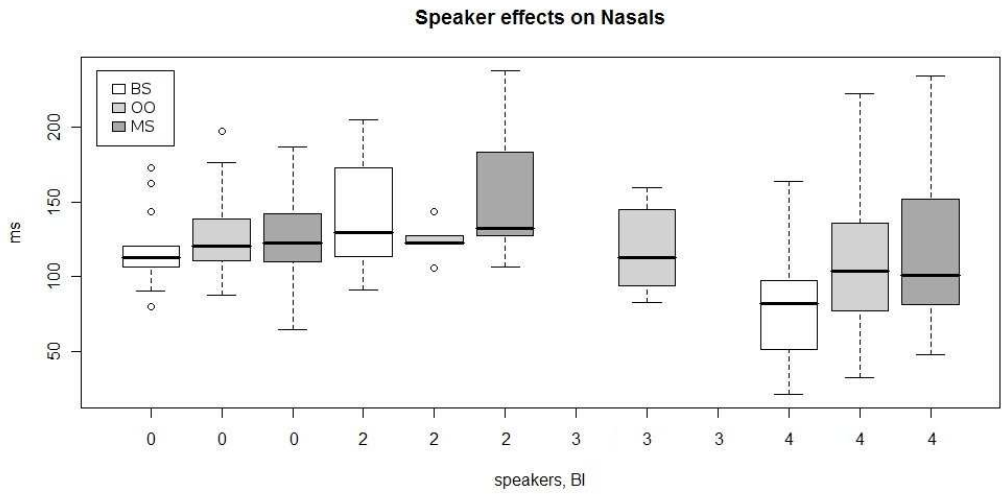

Figure 5.7: Effects of speakers on nasal duration across boundary strengths (BS in white, OO in light grey, MS in dark grey).

the impression of the speaking style of these speakers. In fig. 5.7, durations are plotted for nasals, the observation that nasals are shortest in IP initial context can be seen here as well. Effects of speaker on VOT differences across positions are plotted in figure 5.8. For the aspirated plosives, again there is the tendency for speaker BS to produce the shortest VOT and for MS to produce the longest, speaker OO being in the middle. For the unaspirated plosives no such tendency can be found. In general, the speaking style is reflected in durations of both nasals and stops alike. In the unaspirated set, however, there is less variation in-between the speakers.

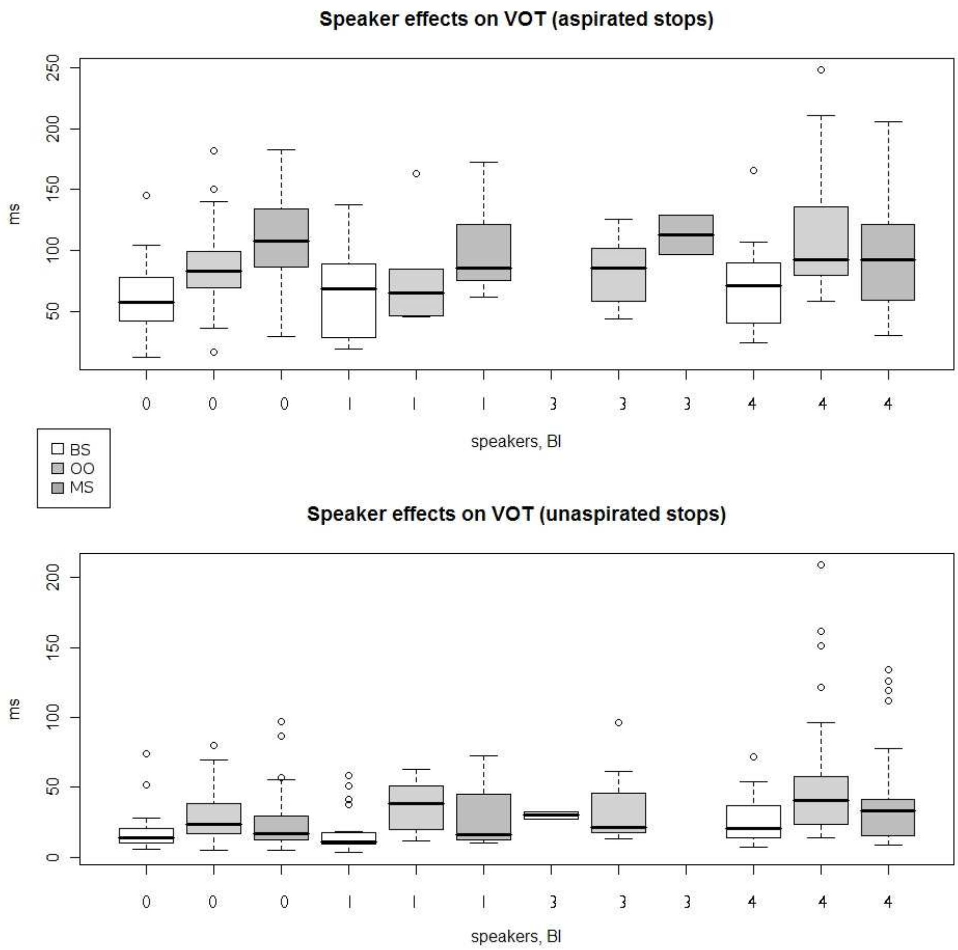

Figure 5.8: Effects of speaker on VOT differences across boundary strengths (BS in white, OO in light grey, MS in dark grey).

5.1.3.3 Interim Summary: Domain initial effects

Even though domain initial strengthening is a mechanism which has been found in many languages, Keating (2004) points out that the "empirical support [...] is somewhat mixed". In Beaver, the tendency for IP initial segments to be longer than IP internal ones is clearly present: For aspirated plosives, VOT was significantly longer IP initially (BI 4) than in word internal position (BI 0) and in ip medial, word initial position (BI 1). Similarly, for unaspirated plosives, IP initial (BI 4) VOT was significantly longer than word internal (BI 0) or word initial (BI 1) VOT. Significant effects for the other prosodic positions were not found, confirming the observation that prosodic strengthening effects are not as clear in intermediate positions as at the extremes.

Turning to the closure phase of the plosives, duration was affected differently in aspirated and unaspirated plosives. For aspirated plosives word internal (BI 0) closure duration was significantly longer than word initial ip internal (BI 1) duration, ip initial closure duration was inbetween the two extremes, though not significantly different from either of them. Closure duration did not vary significantly for unaspirated plosives.

On the one hand, the findings for Beaver are in tune with what would be predicted by prosodic strengthening, i.e. longer segment duration at higher boundaries, on the other hand, the unaspirated plosives would be expected to behave differently against the background of "feature enhancement" (cf Cho & McQueen 2005). However, this is reminiscent of the findings of Kuzla & Ernestus (2007) for German, where they report that fortis and lenis plosives are not influenced in the same way by prosodic structure.

Unexpectedly, nasals patterned contrary to prosodic strengthening related predictions. IP initial nasals were significantly shorter than word in-

Plosives:	
VOT (asp./unasp.):	BI 4>(BI 3)>BI 0>BI 1
Closure (asp.):	BI 0>(BI 3)>BI 1
Nasals:	
Total duration:	BI 0, BI 1>BI 4

Table 5.4: Summary of the influence of juncture on VOT and closure duration for plosives and the total duration for nasals (BI 0=word internal, BI 1=word initial, BI 3=ip initial, BI 4= IP initial).

ternal or word initial ones. It could be possible that for nasals it is not an increase in duration that constitutes strengthening but an augmentation of some other parameter, such as e.g. intensity or contact. Or perhaps nasals are more likely to be effected by morphological category or intervocalic lengthening, which then overrides domain initial prosodic strengthening effects. Alternatively, it could be that nasals are longer intervocalically to enhance perception of a syllable boundary or that they are syllabified differently from plosives.

The results of domain initial strengthening effects are summarized in table 5.4, stating VOT and closure duration of plosives and the total duration of nasals according to prosodic position. Values in parenthesis did not differ significantly from their neighbours but are included here nevertheless. In the following, the other two mechanisms that influence the realization of segments will be investigated, possibly explaining some aspects of the behaviour that cannot be explained by prosodic strengthening and feature enhancement alone.

5.1.3.4 Effects of morpheme category & intervocalic lengthening

After having explored the effects of prosodic position, we will now consider two other possible influences on segmental duration in our data: The morphological category, i.e. whether a phoneme is in stem or prefix initial position, and the position in the segmental string, i.e. whether it is in intervocalic position or in other contexts. As outlined in the literature review on page 89, for some Athabaskan languages, it is expected that segments in stem initial position are longer than prefix initial ones, and that intervocalic consonants are longer than those in other contexts. The data for this analysis are described in section 5.1.1 above.

As can be seen in figure 5.9, the difference in VOT between prefix and stem initial position is considerable for /t/: Prefix initially the mean duration is 61.3 ms, while stem initially it is 108.2 ms ($p<0.001$ in two-tailed t-test). However, this is the only plosive where the difference is this large, for the other plosives no significant difference was found[12].

The morpheme type distinction did not have an influence on closure time for the plosives. Interestingly, the aspirated plosives /t/ and /k/ each pattern differently in this context, VOT for the velar plosive is not significantly different in prefixes and stems but shows the same general trend. Furthermore, when testing the sum of closure duration and VOT, for both cases a significant difference was found, albeit with contrary tendencies: For /t/ the mean total closure duration and VOT was 171.3 ms for prefix initial position and 210.1 ms for stem initial position ($p<0.001$), thus verifying the hypothesis that stem initial consonants are longer than prefix initial ones. However, for the velar plosive /k/, the opposite was true, the mean total duration of VOT and closure combined in prefix initial position was 255.6 ms, while for stem initial contexts it was 196.0 ms ($p<0.05$). When analyzing closure duration for /k/ a large difference was found (170.1 ms in prefix initial position, 105.6 ms in stem initial ones with $p<0.01$).

[12]Reconstructed *b in prefixes has developed into /m/ in Beaver, this is why prefix initial /b/'s are missing in the data.

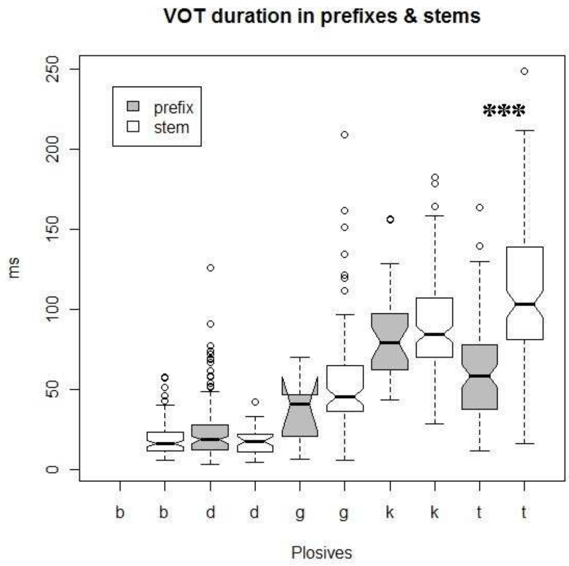

Figure 5.9: VOT in prefixes and stems for the plosives in the corpus.

Impressionistically, it seemed that the quality of aspiration of the alveolar plosive /t/ was dependent on whether it occurred stem or prefix initially. In figure 5.10, the distribution is plotted for /t/ followed by either /a/ or /aa/, or followed by high vowels; in the first case, the velar quality of the aspiration occurs in only 21% of the prefix initial cases, and in 53% of the stem initial ones. For /t/ in the context of high vowels, there was an even more pronounced tendency for the plain aspiration to occur in prefixes and the in this case palatal aspiration to occur in stem initial position. However, the total number of tokens in the corpus for these conditions was rather small (50 in total), so only tendencies can be observed here.

In table 5.5, the numbers of the distribution of aspiration type for prefix and stem initial occurrences of /t/ are given in detail, the total number of tokens of /t/ in the context of /a/ or /aa/ was 101. In the table, the absolute and proportional numbers are given, in the top half for the context before

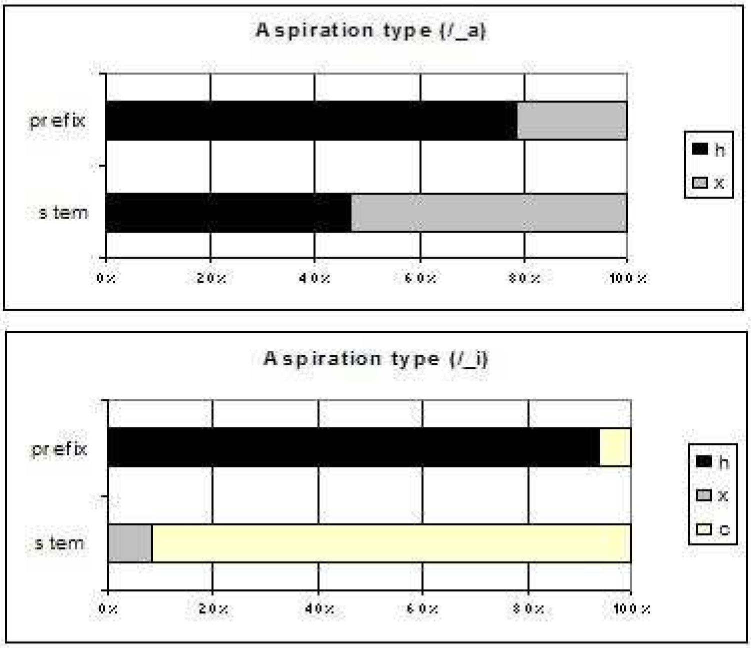

Figure 5.10: Aspiration type (h=plain, x=velar, c=palatal) for /t/ before /a/ and /aa/ on top and before high vowels on the bottom in prefixes and stems.

a	pref.	stems	pref.	stems	a
h	41	23	0.64	0.36	h
x	11	26	0.30	0.70	x
h	14	0	1	0	h
x	0	3	0	1	x
ç	1	32	0.03	0.97	ç
i	pref.	stems	pref.	stems	i

Table 5.5: Distribution of aspiration type for /t/ before /a/ and /aa/ in prefixes and stems on top and before high vowels in the lower half of the table (the raw numbers on the left, the proportional numbers on the right).

/a/ or /aa/, in the lower half for the context before a high vowel. This distribution of plain and more marked aspiration qualities could be taken as an indication of a strengthening mechanism.

We now turn to the effects of morphological category on nasals. A two-tailed t-test showed a significant difference between the mean duration in prefixes (104 ms) and that in stems (159.5 ms) with $p<0.001$, when comparing nasals in all prosodic contexts. In figure 5.11, the durations for nasals are plotted across the prosodic positions. In word internal (BI 0) and IP initial position (BI 4), a significant difference was found between prefix initial and stem initial nasals ($p<0.001$). In the other two prosodic contexts, no significant difference could be found between the nasals in prefixes and stems. However, the same general tendency for durations to be greater in stems can be observed in the figure with durations being longer in stem initial than in prefix initial position.

In the following, it will be tested whether an intervocalic position has a lengthening effect on the consonants, as has been reported for Carrier by Bird (2004). In figure 5.12, the mean durations of the sum of closure time and VOT are plotted for the plosives in Beaver. Intervocalic position does seem to have an effect, but contrary to the expectation. For each of the plosives

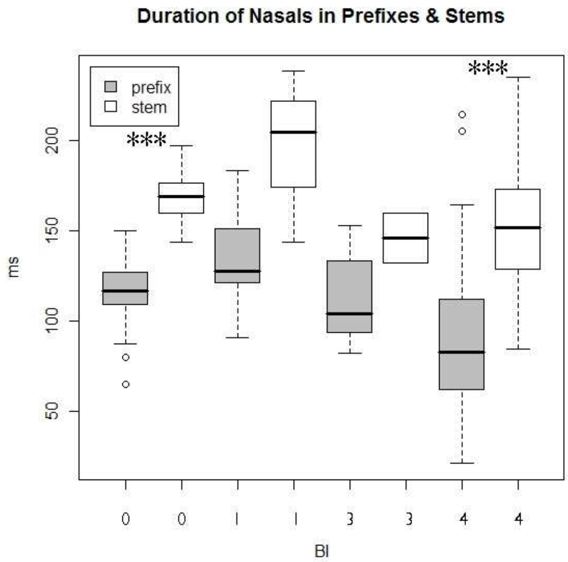

Figure 5.11: Duration of Nasals in prefix initial and stem initial position across the BI (for BI 0 and 4 p<0.001, for BI 1 and 3 p>0.05).

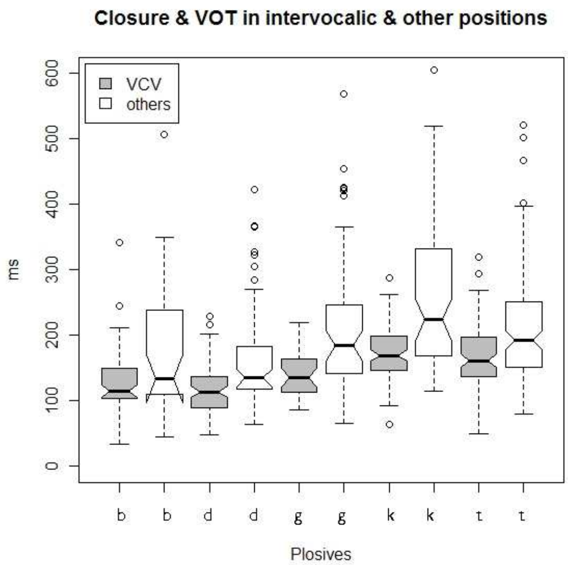

Figure 5.12: Closure duration and VOT combined in intervocalic and other contexts.

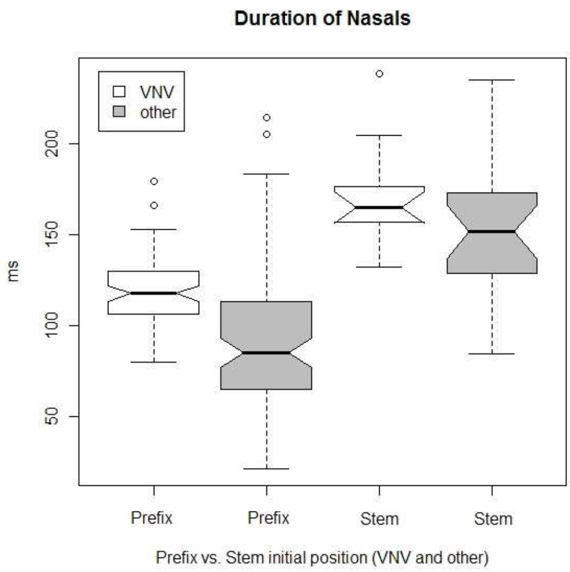

Figure 5.13: Duration of nasals in stem and prefix initial position, in intervocalic (white) and other contexts (grey).

the mean combined durations of closure and VOT was significantly shorter ($p<0.05$ for /b/, $p<0.001$ for all others) in intervocalic position.

For nasals, on the other hand, lengthening in intervocalic position was found: For intervocalic nasals the mean duration was 127.3 ms, while it was 104.3 ms in the other positions (in a two-tailed t-test this effect was significant at $p<0.001$). In fig. 5.13, durations of nasals are plotted in stem and prefix initial position in intervocalic and other contexts. Both effects can be observed, nasals are longer in stems than in prefixes and they are also longer in intervocalic position than in others. Thus, Beaver shows intervocalic lengthening for nasals but not for plosives.

5.1.3.5 Interim Summary: Morphology-prosody interaction in Beaver

An important morphological distinction that prevails in Athabaskan phonology is that between prefixes and stems. Stems are in many respects more prominent than prefixes, which has been reported for other Athabaskan languages. This trait has also shown itself in the present study.

The clearest results are those found for the nasals, in that they are significantly longer in stems than in prefixes consistently across all prosodic contexts. For the plosives, the picture is more complicated. The aspirated alveolar plosive /t/ was significantly longer stem initially than prefix initially (measuring closure duration and VOT). Furthermore, stem initial VOT was significantly longer. For the aspirated velar plosive /k/, on the other hand, the combined closure duration and VOT was significantly longer in prefixes. Closure duration alone was also strikingly longer in prefixes than in stems. Only VOT was slightly higher in stems without reaching significance level. For the unaspirated plosives no conclusive tendencies could be found.

The unexpected patterning of /t/ as opposed to /k/ could be related to the distribution of aspiration qualities in prefixes and stems for /t/. In analyzing the distribution of glottal and velar aspiration before the vowels /a/ and /aa/, it became clear that 70% of cases of velar aspiration are found stem initially, while 64% of plain aspiration is found in prefixes. Therefore /t/ has two realizations in the context before an a-coloured vowel, [$\mathrm{t^h}$] more frequently in prefixes and [$\widehat{\mathrm{tx}}$] more frequently in stems. As a result, a new perspective could be added to the analysis in McDonough & Wood (2008) for Beaver, namely that the complex segment variants [$\widehat{\mathrm{tx}}$] of /t/ are used to signal stem initial boundaries, while the plainly aspirated ones are used in prefixes.

Finally, effects of intervocalic position on duration were investigated. For nasals this was highly significant: Nasals in intervocalic position were longer than those in other positions. For all plosives, combined closure duration and VOT was significantly shorter in intervocalic position than in other contexts,

Language	bilabial	dental/alveolar	velar	uvular
W-Apache	13	15	31	
W-Apache (asp.)		58	80	
Hupa	11	16	44	27
Hupa (asp.)		82	84	
Beaver	19	25	49	
Beaver (asp.)		89	89	
Beaver (BI 4)	**21**	**30**	**60**	
Beaver (asp., BI 4)		**94**	**98**	
Tlingit		18	28	30
Tlingit (asp.)		120	128	128
Navajo	12	6	45	
Navajo (asp.)		130	154	

Table 5.6: VOT in Na-Dene languages according to Cho & Ladefoged (1999) with the measurements for Beaver for comparison. The measures for IP initial plosives are given in bold since this was the position of consonants in the database used by Cho & Ladefoged (1999), the other measures for Beaver are the means for the whole Beaver database.

notably displaying an opposite tendency. Thus, the effects of intervocalic position reported for Carrier by Bird (2004) are parallelled in Beaver for nasals but not for plosives[13].

5.1.3.6 Beaver VOT in cross-linguistic perspective

Before turning to the conclusion of this section, we will briefly try to put VOT in Beaver in cross-linguistic perspective. In their analysis of VOT in eighteen languages, Cho & Ladefoged (1999) found the two Na-Dene languages Navajo and Tlingit to have the longest durations. In table 5.6, a summary of VOT of the Na-Dene languages reported on in Cho & Ladefoged (1999) is compared with the values found for Beaver. Since Cho & Ladefoged (1999) used sentence initial tokens, the values for initial words in Beaver are given in bold. Finding itself between Hupa and Tlingit, Beaver

[13] Again with the caveat that articulatory data for nasals might yield different results.

plosives would be simply classed as "aspirated" by Cho & Ladefoged (1999), bordering on "highly aspirated". Interestingly, the difference they found between alveolar and velar plosives, namely that VOT for velars is generally longer in their corpus, does not apply to Beaver aspirated plosives. For the unaspirated plosives, however, VOT in velars was significantly longer than in alveolar ones.

Gordon et al. (2001) report for Western-Apache and McDonough (2003a) for Navajo that aspirated plosives had significantly shorter closure duration than unaspirated plosives, this was not generally significant in Beaver but observable as a trend (cf fig. 5.5, p. 101).

5.1.4 Summary of factors influencing plosive and nasal production

The results of the previous sections confirm that prosodic strengthening does exist in Beaver, as in a wide variety of languages, even if the detailed realization is influenced by the types of paradigmatic contrasts in the phonological system of a given language and by language specific mechanisms that may also interfere with fine grained phonetic details. As Cho & McQueen (2005) state: "VOT may not be uniformly subject to an increase in prosodically strong locations, but rather that it can be further modulated by the language-specific contrasts in the phonological system" (p. 125). These language specific mechanisms include for Beaver the difference between prefix and stem initial position and the influence of intervocalic position on segmental duration.

Coming back to the hypotheses in section 5.1.2, we can now describe the interaction of the four mechanisms, prosodic strengthening, feature enhancement, "stem initial strengthening" and intervocalic lengthening, that were assumed to have an influence on the phonetic realization of segments. Scenario 1, where only one of the factors can be shown to influence segmental realizations, can be abandoned since there were indications for the workings of all four effects in the data. Correspondingly, scenario 3, where none of the partially opposing factors is retrievable anymore, can be rejected as well. This leaves us with scenario 2 that predicted that all factors are present but might target only certain segments or phases of segments.

All four factors can be motivated from perception; prosodic strengthening helps to chunk the sound chain into units, feature enhancement preserves contrastive distinctions, stem initial strengthening serves the parsing of complex words and marks the stem. Finally intervocalic lengthening may be a way to mark syllable boundaries or may arise as a necessity of constraints on syllable structure. All four factors can be found in Beaver, however, targeting different segments or phases of segments: The higher the prosodic boundary the longer the VOT for aspirated and unaspirated plosives alike; but closure duration showed the opposite trend. Nasals had the longest duration in word internal and word initial position, thus behaving contrary to the prediction of prosodic strengthening. As for the morphological category, nasals were longer stem initially, though for plosives the picture is more complex. For /t/ durations were longer stem initially, and in addition a difference in the quality of aspiration distinguishes stems from prefixes. For /k/, durations were shorter stem initially. Lastly, intervocalic position had a lengthening effect on nasals but a shortening effect on plosives. This selection of different targets by the mechanisms ensures that they can coexist when they might otherwise cancel each other out.

Summing up, it can be said that prosodic strengthening, as reported for a variety of languages, has also been attested for plosives in Beaver. Intervocalic lengthening as found for Carrier is attested in nasals. Finally, the Pan-Athabaskan effect of “stem initial strengthening” was observed, indicating that in Athabaskan languages morphology is tightly interwoven with aspects of the prosody. There are also a number of questions to be addressed by future research, such as e.g. the question whether articulatory data will yield different results, or research on less controlled material such as a larger spontaneous corpus.

5.2 Final Devoicing

Final devoicing at the right edge of larger domains is found in a number of languages. Smith (2002) reports on sentence final devoicing in French, where she describes final devoicing as being linked to prosodic finality. Similarly, Andreeva et al. (2003) show for Bulgarian, that final devoicing accompanies low boundary tones and is blocked by high ones, as found in some question types.

Furthermore, it has been described for different Athabaskan languages that final devoicing of the last syllable takes place, e.g. Rice (1989a) on Slave, Holton (2005) on Tanacross and Tuttle & Lovick (2007) on Tena'ina. The domain of this devoicing and its function are not addressed in detail. Rice (1989a) states that it is found in some declaratives.

In NAB, utterance final devoicing has been found. In longer stretches of speech, as in stories, final devoicing seems to be a structuring device; (roughly) the last syllable of the last word in a phrase is devoiced or whispered. This seems to mark places where there is a break in the plot, often followed by a longer pause. Not every utterance before a longer pause shows this devoicing, though. So for Beaver this might not simply be a marker of some declaratives as in Slave (Rice 1989a), but it might have a discourse function in longer texts.

This devoicing in stories often accompanies a certain construction where the utterance after the pause is repeated in the same form or slightly varied. This appears as some sort of rhetoric figure which the storyteller can employ to signal the end of an episode while still keeping a link to what has previously been said. The following is an example taken from the fisher story. The speaker has caught an animal – a fisher – in her trap which she has never seen before. She is scared and asks the older woman to accompany her to the trap to see what it is. The devoicing occurs on the last syllable in 28a below, marked in bold:

(28) a. séhjudzé' nííníít'adze dlukxááyedyéh**ty'ii**.
my.trap we.come.close she.break.out.laughing
"When we got close to my trap, she broke out laughing." (MS-fisher13)

b. Dlukxááyedyéhty'ii, séhjii: [...]
she.break.out.laughing she.said.to.me
"She broke out laughing and said to me: [That's a fisher...]" (MS-fisher14)

In fig. 5.14, it can be seen that the final syllable of example 28a is completely devoiced. The difference becomes obvious, especially when compared to the same syllable in the second part (example 28b).

The second function that has been found in the corpus for this utterance final devoicing is related to the organization of turn taking. In the few cases, where stories were told with a Beaver speaker in the audience[14], it became clear that final devoicing marks places in the story for backchanneling, laughter or comments. Furthermore, in the interactive tasks, the final devoicing marks the end of some turns.

An interesting point concerning utterance final devoicing in Beaver is that the last word in a phrase is usually the verb. The last syllable is normally the verb stem which is considered to be the most "prominent" part of the verb (or even of the phrase) in Athabaskan languages. The verb stem is considered prominent for a variety of reasons: tonal patterns, a larger range of onset consonants, and stem initial strengthening of consonants, cf Tuttle (2005) or the results in the previous sections for Beaver. However, the data that these

[14]Usually, the recordings are made with only one Beaver speaker present, except for some with a married couple where both are present and the husband tells a story.

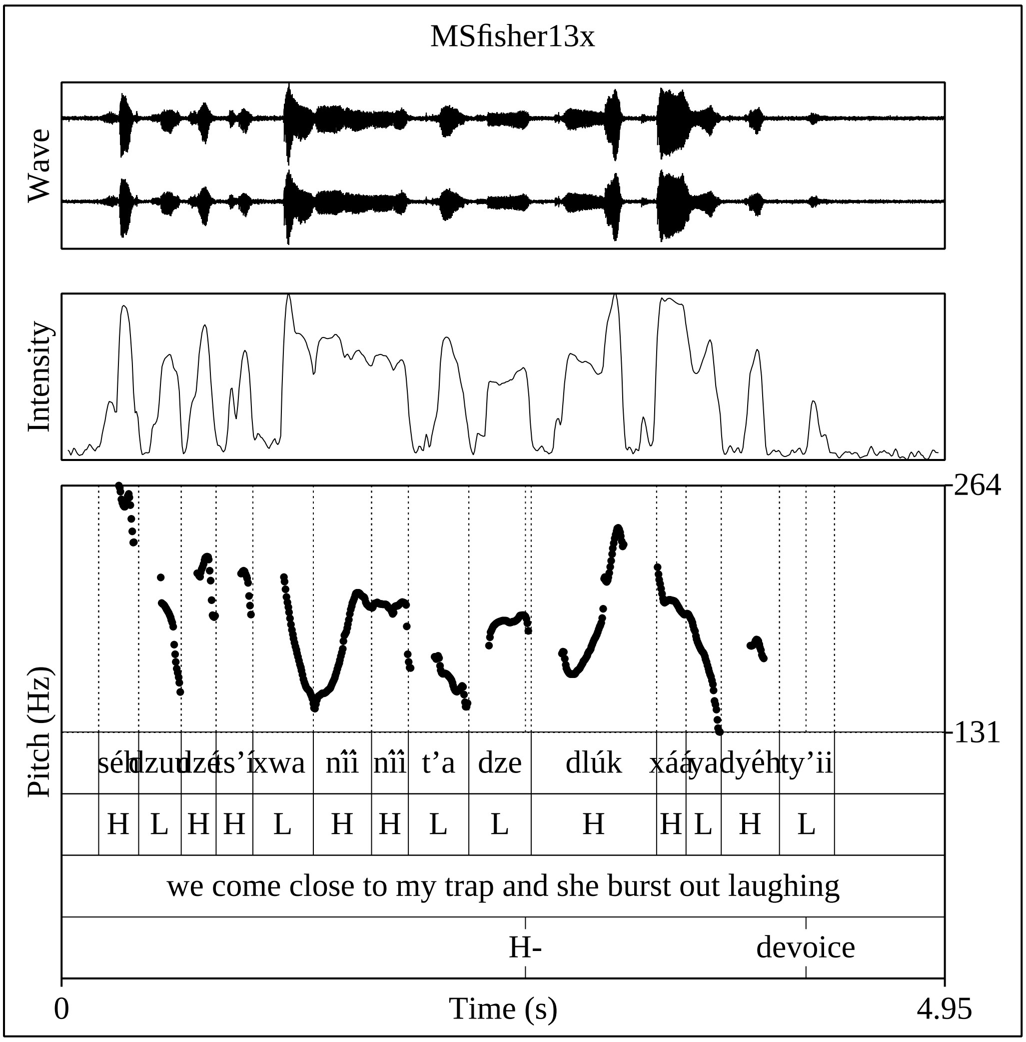

Figure 5.14: One of the utterances of the story "Fisher" that show the final devoicing; the last syllable is the stem which is barely audible and strikingly low in intensity compared to the prefixes of the word before. (MSfisher13x)

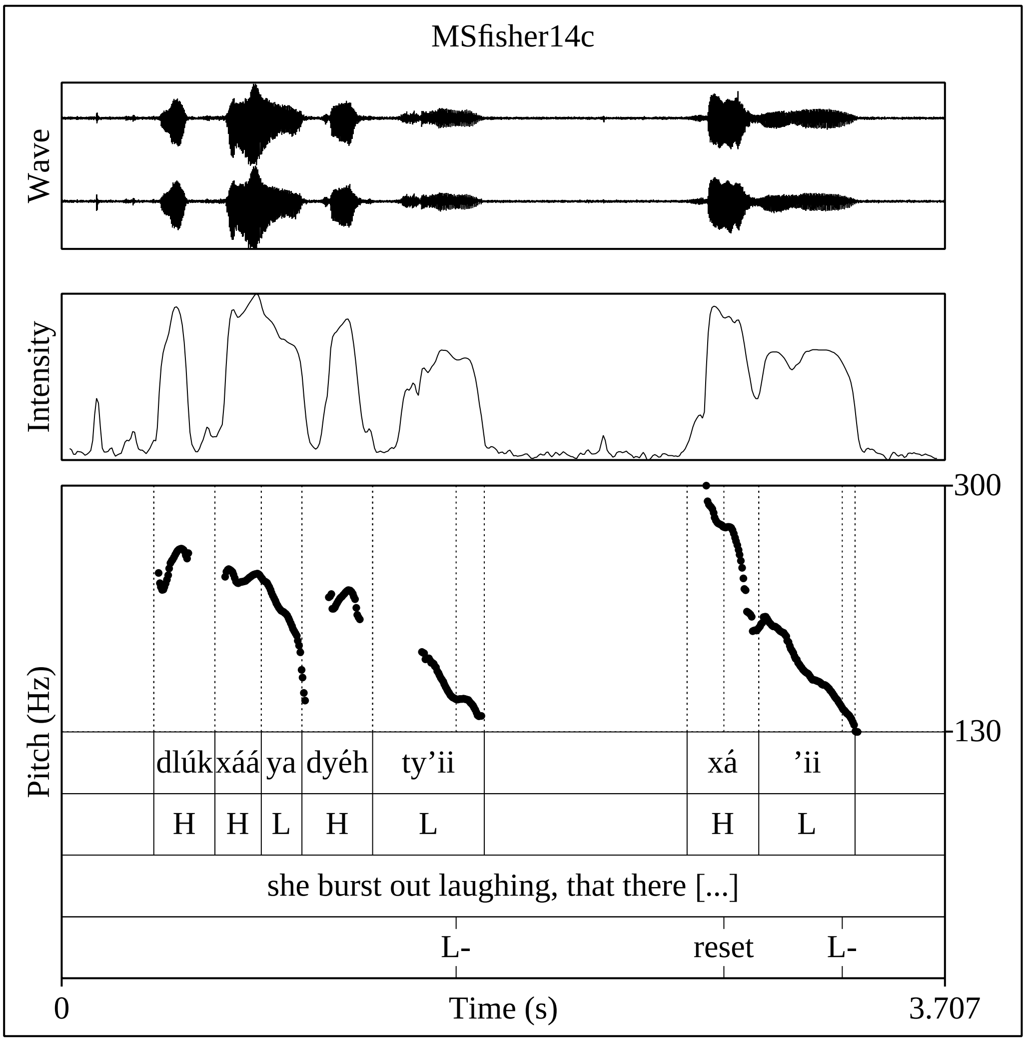

Figure 5.15: For comparison, the next sentence in the story "Fisher" with the same verb form, here without the final devoicing. (MSfisher14c)

studies are based on are in many cases single word utterances or words in carrier phrases, resulting in a different prosodic structure than the one found in longer texts. Especially in traditional elicitation session, where speakers feel they should pronounce their words very carefully, it is very unlikely that utterance final devoicing will occur, in particular because elicitations of verbal paradigms are not very natural discourse settings. Impressionistically, men use this structuring device more often than women, but all speakers in the corpus used it, so it should not be considered an idiosyncratic feature of individual speakers.

Chapter 6

Tones in the Intonation of Beaver

Even though the uses of intonation in tone languages may be more limited than in prototypical "intonation languages", there are some intonational tones to be found in Beaver which will here be introduced. The following chapter is a first investigation into the intonation of Beaver, and thus does not claim exhaustiveness.

6.1 Material & Method

The corpus on which the following survey is based consists of four map task dialogues, two QUIS-Animal dialogue adaptations, two route descriptions and twelve stories recorded with nine speakers as well as material obtained in various traditional elicitation sessions. The data were recorded on several field trips between 2005 and 2008 and represent the Northern Alberta dialect of Beaver. The corpus for this section consists of 1,164 utterances, not counting the elicited materials. The dialogues and stories were transcribed and translated with the help of native speakers. The data were cut into utterances and annotated for intonational events in an EMU database. The corpus is described in detail in chapter 4 and a way to access the data is described in the appendix under A.5.

The analysis of the utterance sized speech files was carried out as follows. The identity of the lexical tones was established in work on a topical dictionary while rechecking words and adding phrases to the entries, as well as in traditional elicitation sessions where words in question were repeatedly produced by speakers in different environments. For the stories and dialogues, we annotated pitch movements which could not be accounted for by the lexical tones present with a ToBI style annotation system. Furthermore, we noted phenomena, such as final devoicing (see section 5.2), self corrections, direct speech, compression and expansion of pitch range. These will be reported on in the subsequent sections.

6.2 The Tonal Space & Pitch range mechanisms

In the AM model of intonation, the notion of "tonal space" is used to describe a "subset of the overall speaking range which is available for realizing tonal distinctions at any given point in the utterance" or the frame of the phonetic realization of tones which is subject to changes in the course of an utterance (Ladd 1996: 73). The tonal space is delimited by a topline and a baseline, i.e. lines through the extreme points of the pitch contour, the high and the low turning points respectively. Ladd (1996) distinguishes two types of variations in pitch range:

1. "Differences of overall level" (p. 260), e.g. a female voice is usually higher than a male voice, the overall level of all tones is higher.

2. "Differences in what I propose to call *span* (the range of frequencies used)" (p. 260), e.g. women usually use a wider range than men, their minima and maxima are further apart.

Even though these two phenomena often co-occur, they should be kept apart, since they might have different functions: e.g. a raised overall level could be used to mark questions, as in Dutch (Haan 2002), while an increased span could be used locally to mark focused constituents as in Mandarin (Xu 1999).

6.2.1 Topline & Baseline

To calculate changes to pitch level and span, we calculated the F_0 minimum and F_0 maximum for each word in an IP from three stories (JDstory, JDbannock, MSraisedwithout). The average number of words per IP was five, and the average pitch range was 72.21 Hz. The mean pitch across all IP's was 151.6 Hz. In fig. 6.1 the best fit lines have been plotted for the maxima and minima per word against the normalized position of the word in the phrase. Even though, this is a rather rough measure based on only ninety IP's, a general downtrend of both lines can be made out. Furthermore, in the first portion of each IP's (roughly the first third), a register higher than the usual pitch range employed by speakers is used with a larger range than toward the end of the IP. In the first part the slope is steeper, while in the second part the downtrend is less strong.

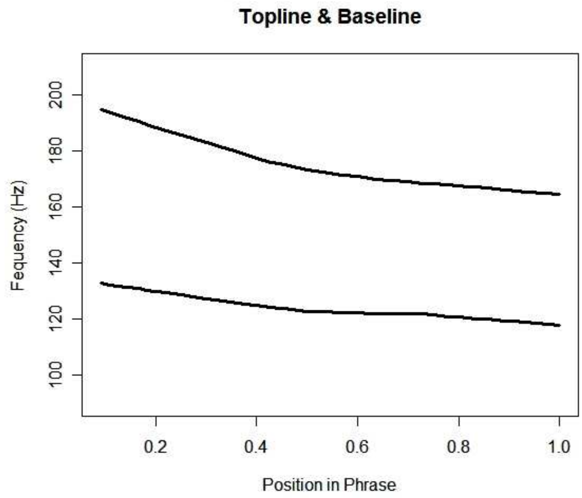

Figure 6.1: The topline and the baseline of ninety IPs of three stories (JD-story, JDbannock, MSraisedwithout), plotted against a normalized position in the phrase.

6.2.2 Expansion, Compression & Reset

As has been shown for other tone languages (Xu 1999), manipulations of the pitch range can be used to indicate information structure. The dynamics of pitch range used to signal information structure will be explored in more detail in chapter 7. Focused constituents are marked by an expanded pitch range, which is then followed by compression (cf section 6.3.5). Expansion and compression are usually found in utterances with a clear division into focal and post-focal domains with the phrase accent -HL present (see section 6.3.5 below). Here the phrase with the focused item is marked by a greater pitch range while post-focally, the pitch range is compressed. In many cases, a particle additionally marks the constituent in question but the mechanism of expansion and following compression remains the same. For an introduction to these particles cf section 6.4.2.

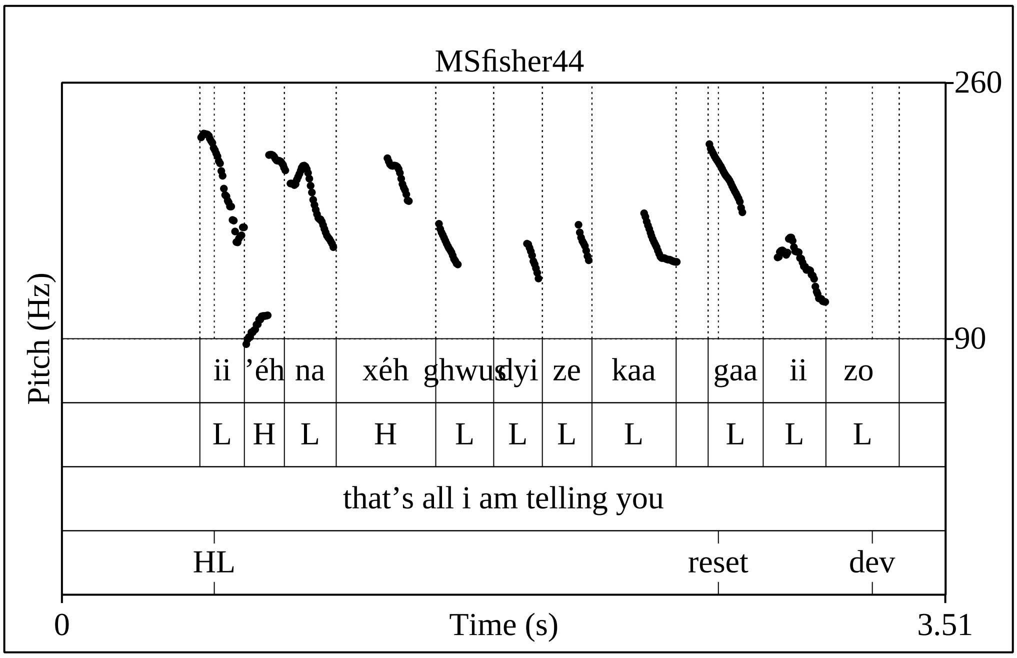

Figure 6.2: An example of a reset in the absence of a break, indicated by the annotation "reset" on the lowest tier. (MSfisher44)

A tonal reset is an interruption of general downtrends in an utterance or simply the "high beginning of utterances" compared to the end of the proceeding one (Gussenhoven 2004: 113f.). In figure 6.2 an example for reset is depicted. Here the pitch reset is the only cue to the boundary between the first and the second phrase, there is no pause nor a break in the rhythm or lengthening:

(29) ii'éh naxéhghwuwusdyise kaa, gaa ii zǫ
this I.will.tell.you ptcl now this only
"That's all I am going to tell you, that's it." (MSfisher44)

A typical context for reset is direct speech. In Beaver, reported speech is not embedded in the sentence with subjunctions as it is e.g. in English. It is usually quoted directly without necessarily being introduced as such. However, it is marked prosodically by a pitch reset, usually without any rhythmic indication of a break, and for some speakers additionally by an overall higher register compared to their normal pitch range. This has often been found in stories where the story teller speaks in a higher voice to imitate what is being said by one of the characters: Again this is the only marking for the stretches of reported speech. Self corrections are characterized by a reset of pitch as well, sometimes accompanied by an increased intensity.

6.3 The Inventory – an Overview

The intonational tones found in the corpus and their functions will be presented in this section.

6.3.1 Low Final Boundary Tone L%

A low final boundary tone L% usually marks the right edge of IP's, declaratives and questions alike. It is often accompanied by a reduced loudness and can be replaced by a final devoicing of (at least) the last syllable for final positions in larger units. It can be distinguished from a general downdrift in that it occurs in addition to it and effects only the last syllable. It is comparable to the final lowering in Yorùbá reported on by Laniran (1992), where the "magnitude of F_0 drop due to final lowering is greater than that due to declination" (p. 205). In fig. 6.3, an example pitch contour for L% on a lexically high syllable is provided in the sentence:

(30)	nóó-	naxa-	dyu-	s-	dl	-éhé
	back.down-	2pl-	fut.incep-	1s-	pull	-fut

"I will pull you back down." (PMmarriedtothestars14)

Another example for L% on a high syllable can be found in fig. 6.12 on page 141. Figure 6.4 shows the boundary tone L% on a lexically low sylla-

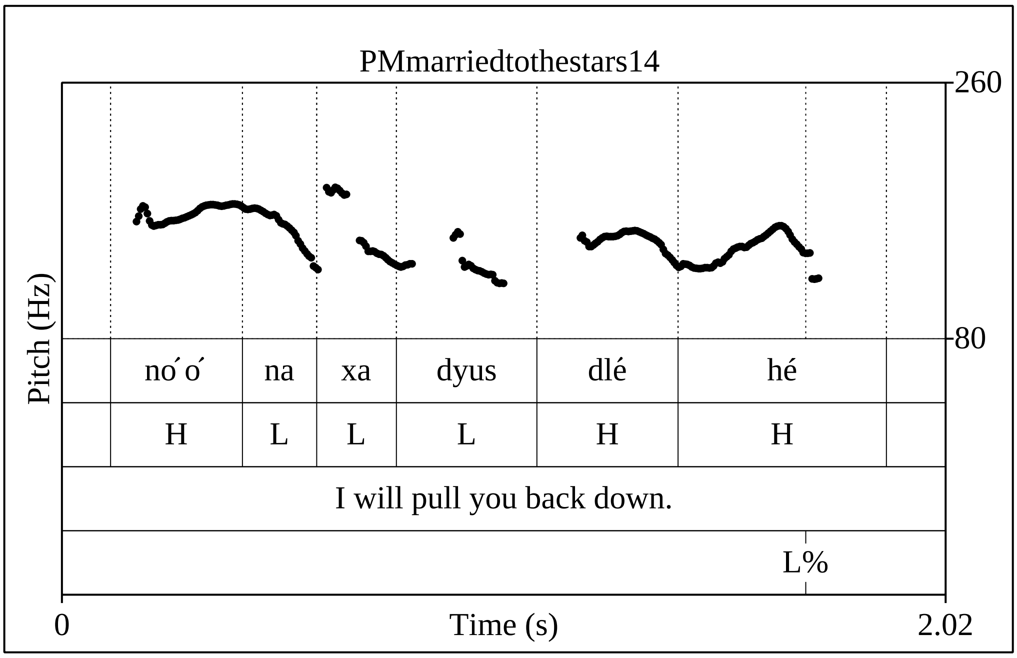

Figure 6.3: An example of L% on a lexically high syllable, causing the final fall on the last syllable. (PMmarriedtothestars14)

ble, where the fall in pitch is very steep and an additional reduction of the intensity can be noted in the last syllable.

(31) askáa ǫníı́yah
boy is.scared.of.it
"The boy is scared of it." (MSfrogstory16)

6.3.2 Complex Final Boundary Tones LH% & LL%

There are two complex final boundary tones found in the corpus. A rising tone, marking uncertainty and a low falling tone accompanying the final question parfticle -*aa*. These are analyzed as LH% and LL% respectively. The low falling contour will be reported on in section 6.4.3 on page 148 below.

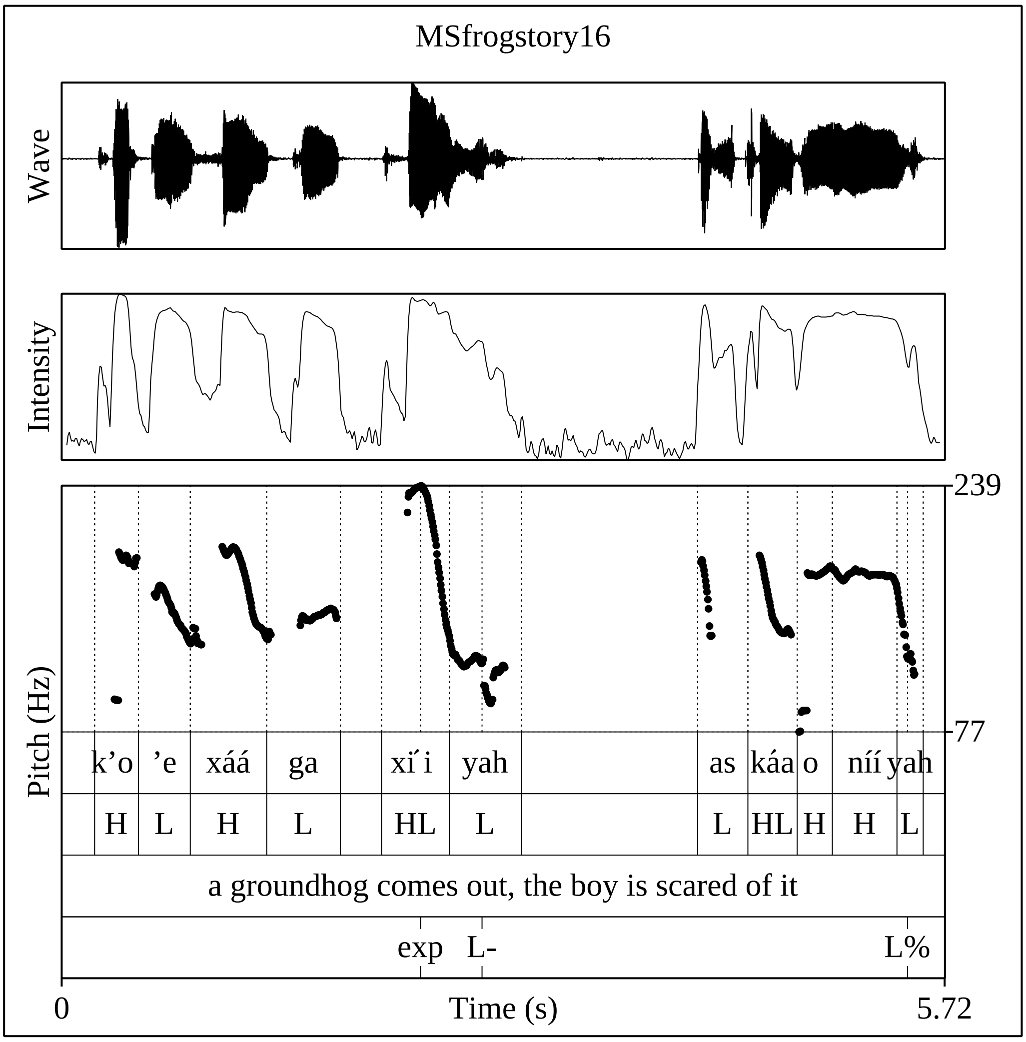

Figure 6.4: Low final boundary tone L% on a lexically low syllable. (MS-frogstory16)

The rising contour marks questions with some uncertainty. It starts on a low level and consists of a sharp rise and is analyzed here as a rising boundary tone LH%. There were only two occurrences in the corpus, one on the tonally unmarked word *sas* “bear” in fig. 6.6 and one instantiation of the tune was found on a high marked word *tsáá’* “beaver” in fig. 6.7. The rising tune starts with a low target in both examples and rises steeply, so that an influence of the lexical tones H_{lex} vs. unmarked cannot be seen here; for comparison an intonationally unmarked realization of the respective words is also supplied in figures 6.6 and 6.7. This same tune is used for requests for repetition of an utterance that was not heard correctly, as in figure 6.5.

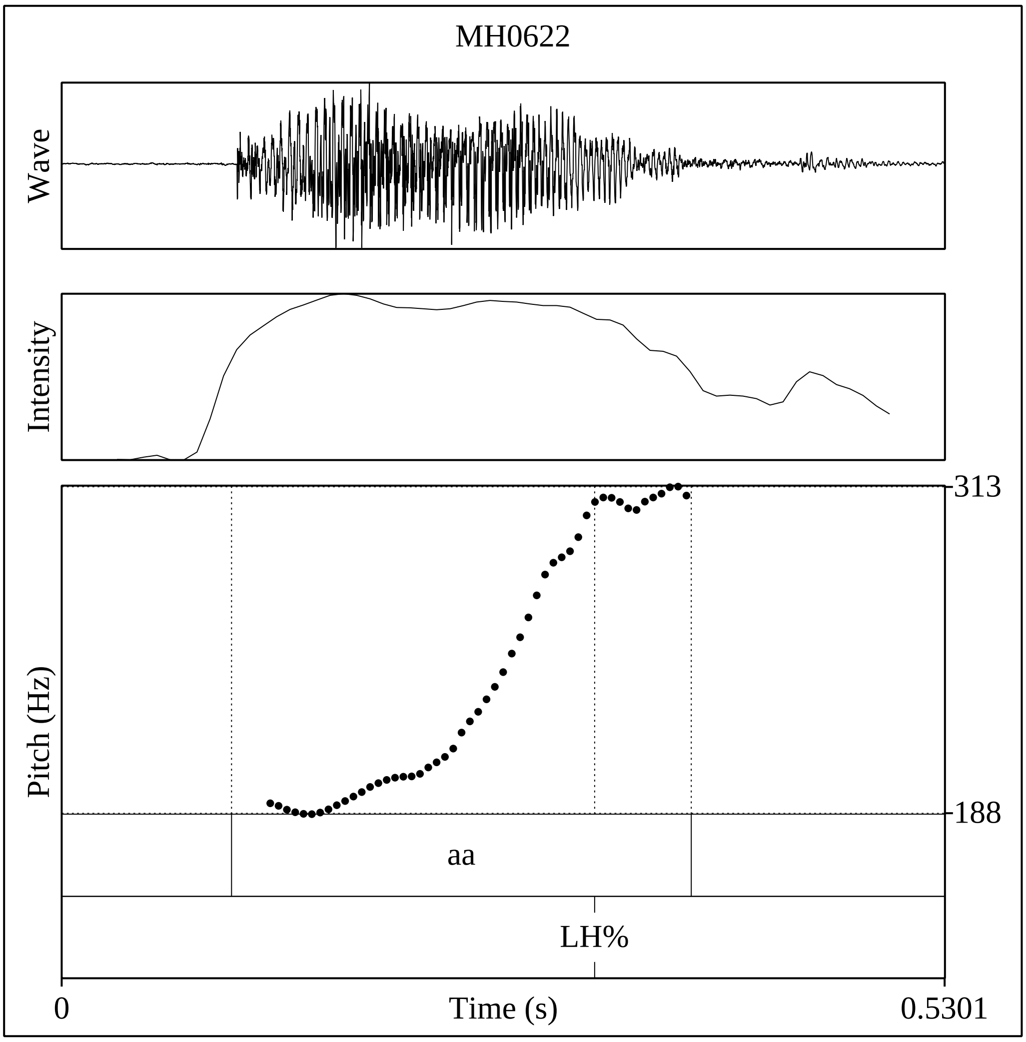

Figure 6.5: The rising tune marking a request for repetition. (CP0622)

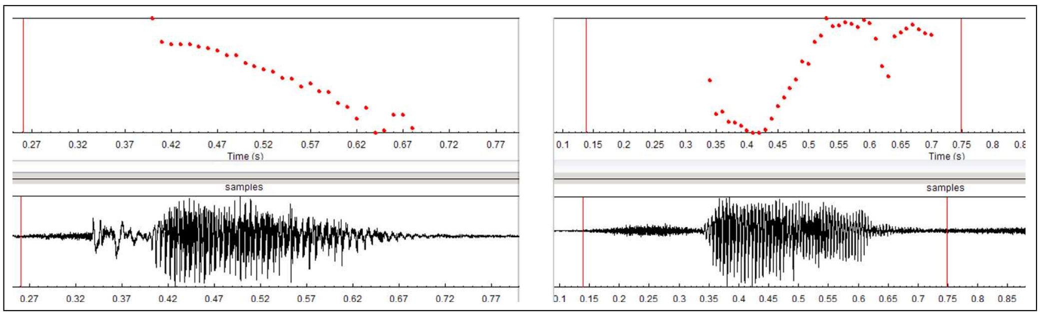

Figure 6.6: An unmarked vs. a rising rendition for the word *sas* “bear”. (2PM12012007)

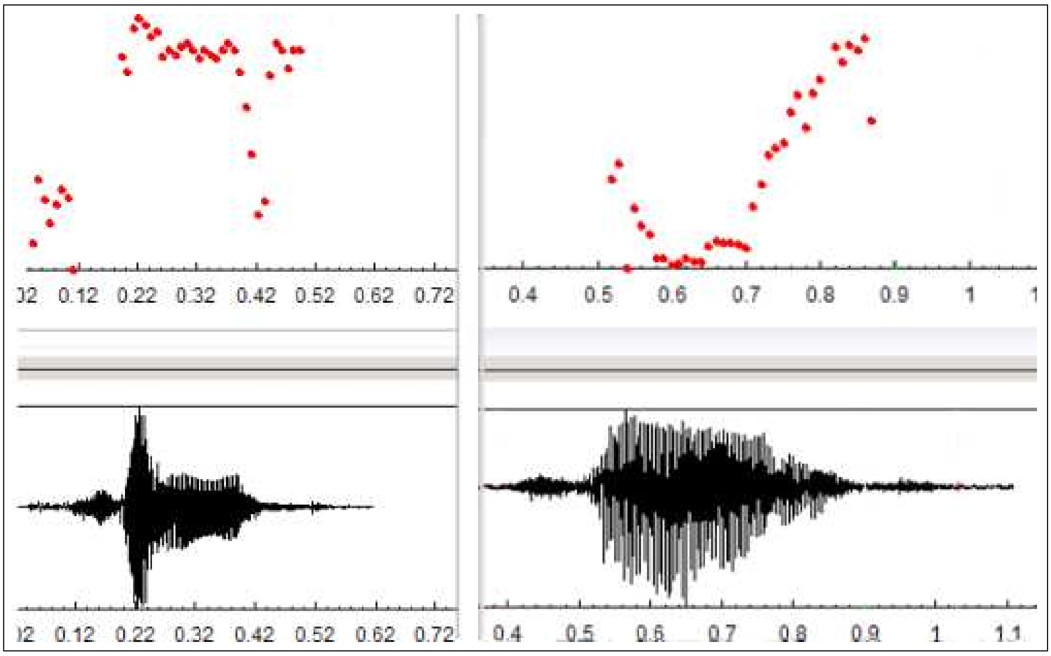

Figure 6.7: An unmarked vs. a rising rendition for the word *tsáá'* "beaver". (tsaa)

6.3.3 Final Phrase Accents H- & L-

The two simple phrase accents found in the corpus are edge tones of intermediate phrases. Their additional prominence lending function that has been found in other languages (Grice et al. 2000) is not so clearly observable for these two in Beaver. However, the presence of a phrase accent can sometimes produce a lengthening on the last syllable and is not accompanied by a drop in intensity. On the other side, the low final boundary tone L% is frequently characterized by a reduction of prominence of the last syllable (such as devoicing, reduction of intensity etc.). On right edges of intermediate phrases, the phrase accents H- and L- occur in non-final contexts. These phrase accents typically occur in non-final items in lists, as can be seen in figure 6.8 in an utterance from a map task. In other non-final contexts, H- is much more

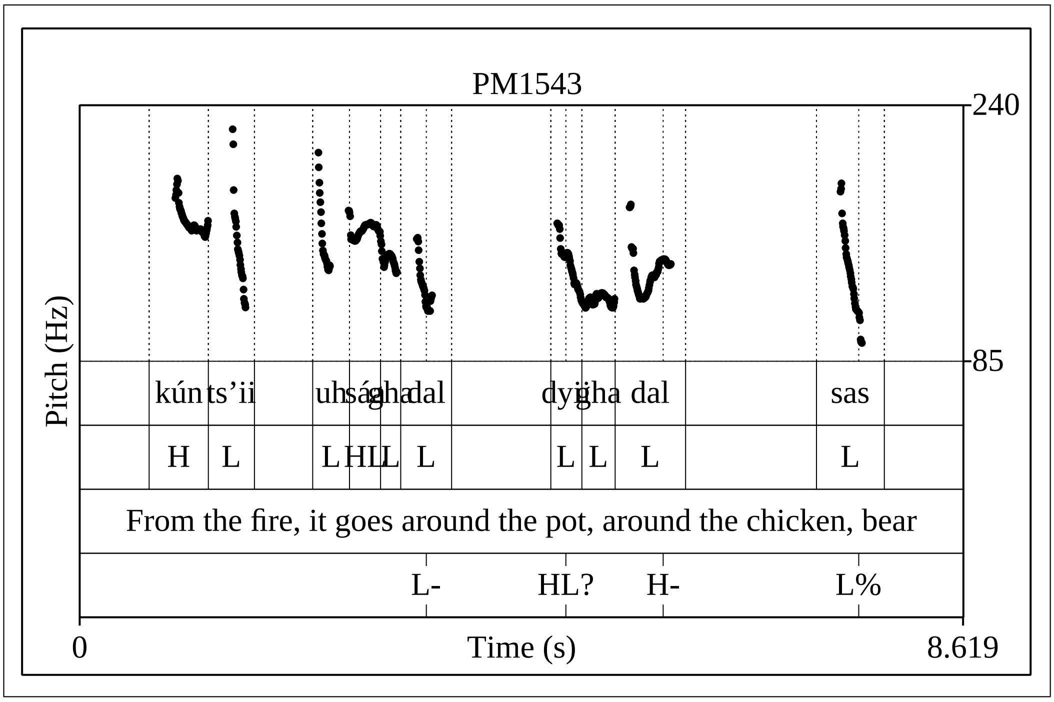

Figure 6.8: An example of L- and H- in an utterance from a map task. (PM1543)

frequent than its low counterpart. In lists, L- is interspersed between the H-as in the following example:

(32)	kún	-ts’ii	uhs̠áa	ghadal,	dyii	ghadal,	sas.
	[kʰʊn	-ts’iː	ʔʊhs̠âː	ɣɐtɐl]$_{L-}$	[djiː	ɣɐtɐl]$_{H-}$	[sɐs]$_{L\%}$
	fire	-from	pot	it.goes.around	chicken	it.goes.around	bear

“From the fire it goes around the pot, around the chicken, the bear.”
(PM1543)

Another example of L- can be found in figure 6.11 on p. 140 where it falls on a lexically high syllable. The question arises how L- is to be distinguished from L%. An important criterion, as mentioned above, is that there is a substantial drop in intensity accompanying the boundary tone L% while this cannot be observed for L-. Furthermore, syllables on which L- occurs are sometimes lengthened, while for IP-final syllables that are accompanied

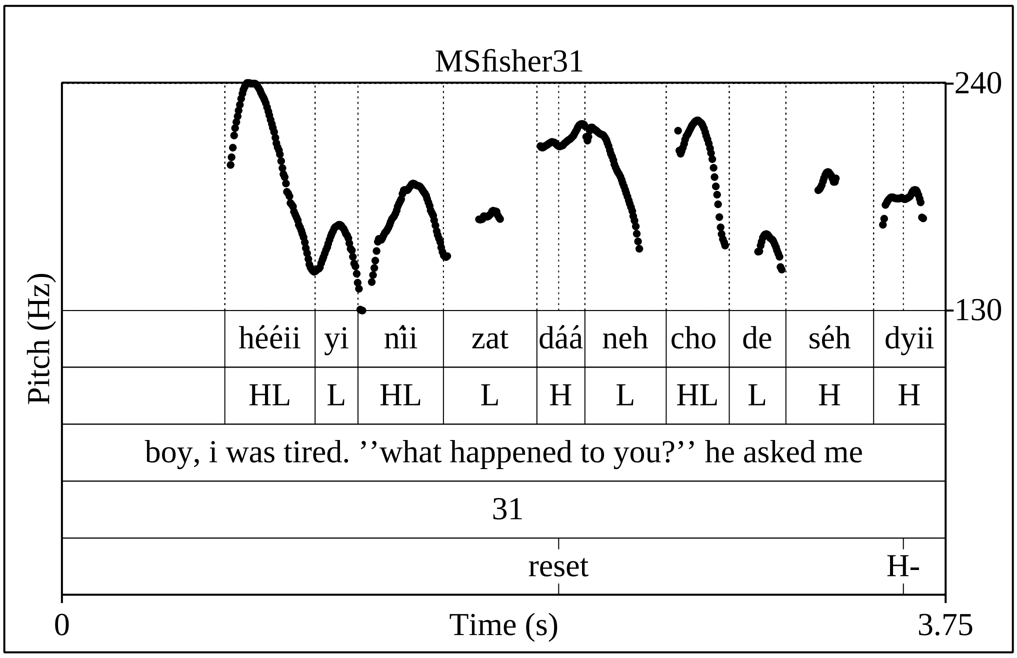

Figure 6.9: An example of H- on a lexically low syllable, producing a suspended fall. (MSfisher31)

by L% the duration may also be shorter than in non-final contexts. Thus, syllables associated with L- tend to be more salient than those associated with L%. Compare the two syllalbes *yah* in fig. 6.4 above on p. 132, the first one is produced with a low phrase accent and the second one with a low boundary tone:

(33) a. [K'ǫ́'ę xáága xį́į**yah**]$_{L-}$
groundhog out he.comes.out
"A groundhog comes out," (MSfrogstory16)

b. [askáa ǫníí**yah**]$_{L\%}$
boy is.scared.of
"the boy is scared of it." (MSfrogstory16)

It can be seen in fig. 6.4, that the duration is longer and the intensity is greater for the first *yah* in comparison with the second *yah* .

In figure 6.9, H- occurs together with a lengthening of the final syllable:

(34) hééii yiiníizat "dáá nehchǫ́ǫ́de" séhdyii, [...]
interj I.was.tired how you.are.doing he.said.to.me
"Boy, was I tired, 'What happened to you?' he asked me, [...]" (MS-fisher31)

It can be seen that the F_0 of the final syllable, which is lexically low, does not fall as low as the other lexically low syllables before it which is also cleary perceivable. We refer to the resulting contour as a "suspended fall", that is, the fact that the distance between the lexical high tone on the next-to-last syllable in a phrase and the lexical low tone on the last syllable is reduced. This often occurs at ip-boundaries and is taken as an indication for the presence of H-. In words that end in a glottal stop, H- may cause the elision of this phoneme, which could be related to the fact that some speakers use glottal closures as a signal for the end of an IP.[1] In figure 6.10, another example for H- on a lexically low syllable is given, again with additional lengthening of the last syllable in the first phrase.

(35) Séhjudze ts'iixwąą nííníít'adze dlukxááyedyéhty'ii.
[séhjudze ts'iixwąą nííníít'adze]$_{H-}$ [dlukxááyedyéhty'ii]$_{L\%,dev}$
my.trap close.to we.approach laughter.burst.out
"When we got close to my trap, she burst out laughing." (MSfisher13)

6.3.4 High Initial Boundary Tones %H

The postulation of a high initial boundary tone %H might at first sight be taken to be an attempt to model general downdrift and reset patterns, but this is not intended here. In Beaver, as has been attested for many other

[1]This process may shed a different light on other phonological processes, such as the insertion of a glottal stop after high word-final syllables in isolated words, which are lost when the word is the first part of a compound (Rice 1989b: 216, 971). This might be a more general process of marking different levels of phrasing in Athabaskan languages.

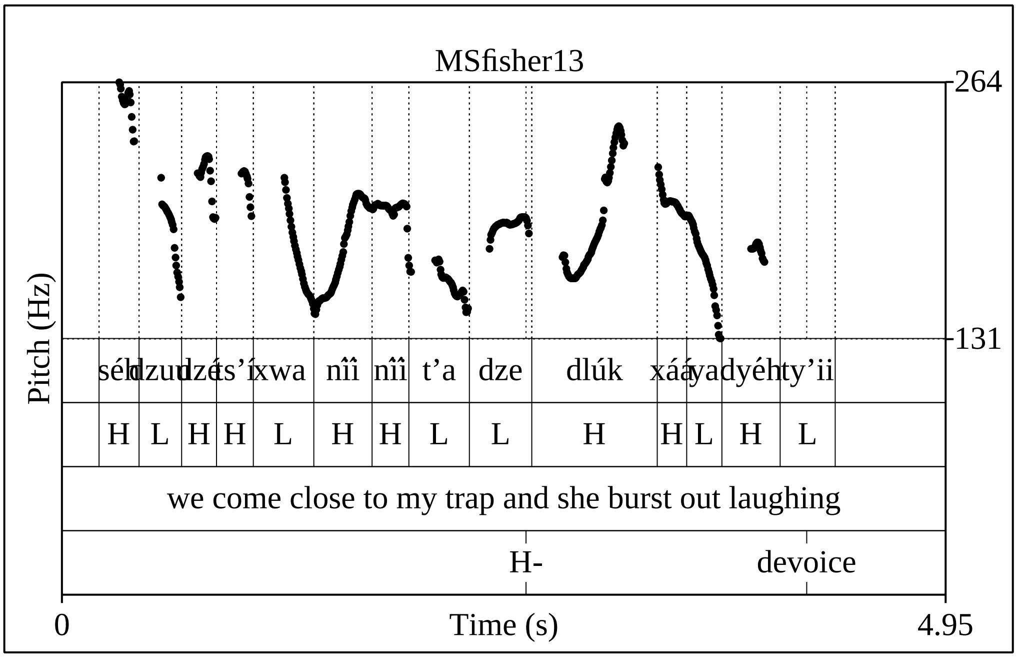

Figure 6.10: Example of lengthening at an ip-boundary caused by H-, here on a lexically low syllable with the preceding syllable being lexically low as well. (MSfisher13)

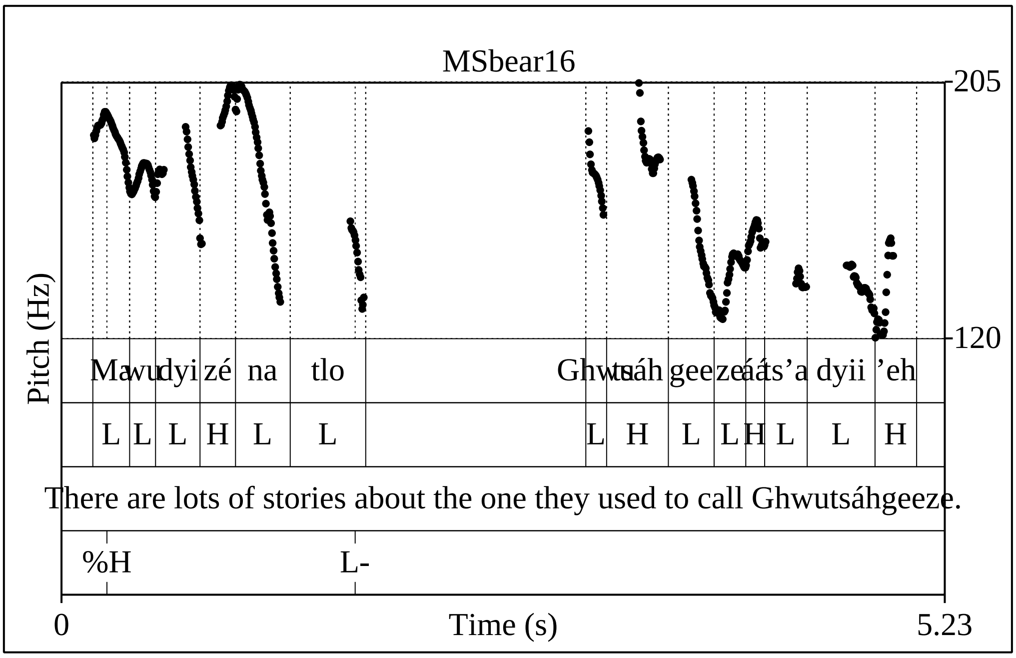

Figure 6.11: High initial boundary tone %H in an example from a story.

languages as well, an IP usually begins on a mid to high level and then ends lower, at least partly due to physiological reasons (cf e.g. Prieto et al. 2006). Accordingly, a lexically low syllable, even if it is the first in the IP, is generally not expected to be higher than a following lexically high one. A number of cases have been found in the corpus with an initial low syllable that was almost as high as high tones in the same phrase or considerably higher than a following low tone. As can be seen in figure 6.11, the first syllable, which is lexically low, is considerably higher than the following low syllable.

(36) Mawudyizé natlǫ, Ghwutsáhgeeze áátsʼadyiiʼeh.
his.stories lots G. they.called.him
"There are lots of stories about the one they used to call Ghwutsáhgeeze." (MSbear16)

This is analyzed as a high initial boundary tone %H. In stories this may be used to mark the beginning of a new episode. In the recording of the frog

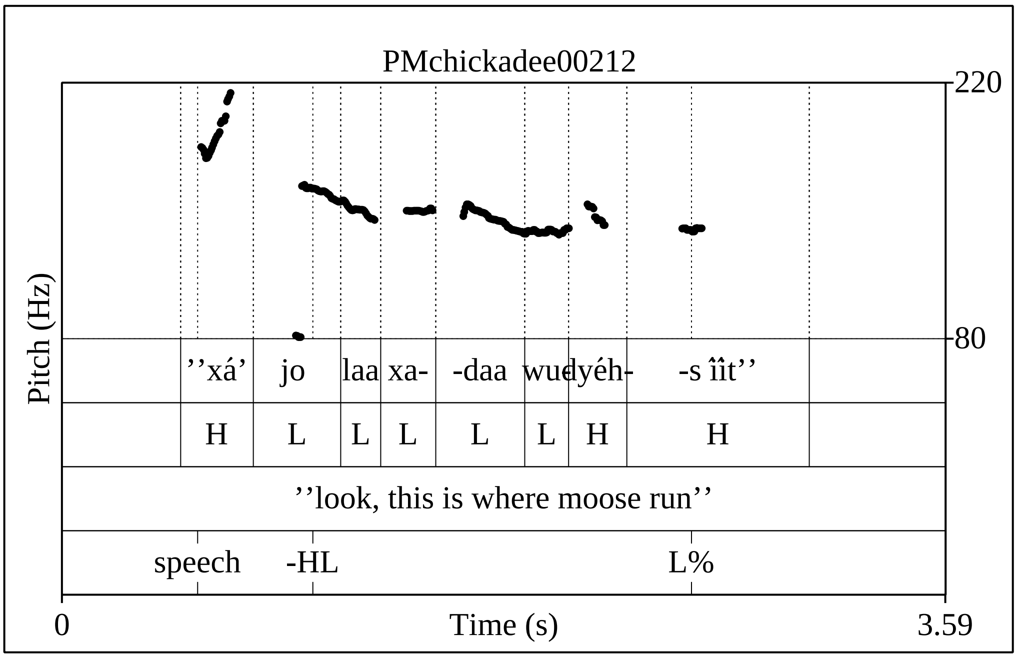

Figure 6.12: Fall on *jǫǫ* “here”, analyzed as HL. (PMchickadee00212)

story, one speaker often used this high initial boundary tone, possibly due to the fact that there is always a major break between one page and the next, sometimes with discussion of the picture and so forth.

6.3.5 Prominence Marked by -HL

A steep fall from high is found throughout the corpus on lexically high and low syllables alike[2]. It is sometimes accompanied by the focus particle *laa* or the particle *zǫ* (cf chapter 3.3.5), but it occurs on its own as well. Its function is to mark contrast.

In figure 6.12, the steep fall occurs on a lexically low monosyllabic word *jǫǫ* “here”, it is followed by the particle *laa*.

[2]The observation here is restricted to the simple lexical tones, since a lexical falling tone obviously has the same shape as this contour. For falling tones there seems to be an expansion of pitch range as a realization of this intonational tone.

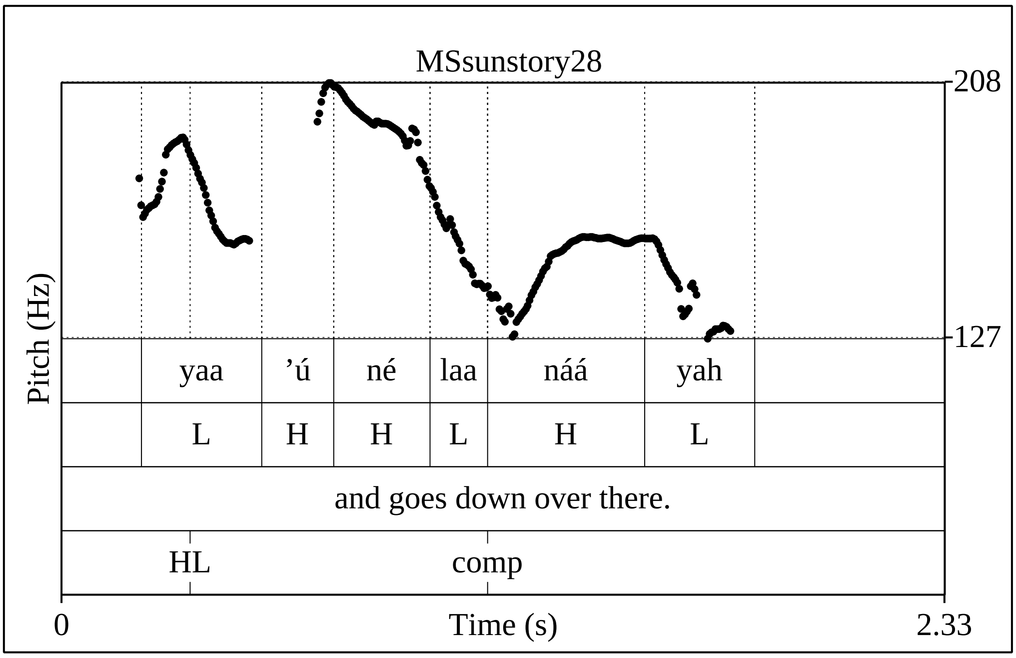

Figure 6.13: Steep fall from high on the first syllable. (MSsunstory28)

(37) [xá’] $_{-HL}$ [jǫǫ laa] $_{comp}$[xadaa wudyéhs̲íít]$_{L\%}$
look here ptcl moose they.run.through
“Look, this is where moose run.”(PMchickadee00212)

In figure 6.13, the fall is on the first lexically low syllable of a longer word, again the focus particle follows the first word *yaa’úné* “over there”:

(38) yaa’úné laa nááyaa
over.there ptcl goes.down
“It [the sun] goes down over there.”(MSsunstory28)

In the utterance preceding example 38, the grandfather in the story describes how the sun rises in this direction and then follows its path, so that the “over there” in the example above is contrasted with these other locations. The wordfinal lexical H tone in *yaa’úné* would be expected to be followed by a glottal stop, however this is not the case here. This could be taken as an indication that *laa* and the preceding word belong to one ip, i.e. that there is no boundary inbetween.

This fall could be analyzed as a complex boundary tone %HL, since it usually occurs at the left edge of an IP. However, due the fact that it can occur inside an IP, as in the example in figure 6.12 and due to its prominence lending nature, it is better represented as a complex phrase accent -HL. Furthermore, the expansion of pitch range that accompanies -HL and the subsequent compression support the impression that there are two separate ip's: The first ip with the contrastive focus is marked by the phrase accent on its left boundary and by expanded pitch range throughout. The following ip is produced with a reduced range which is comparable to the behavior of Mandarine tones in focal and post-focal position (Xu 1999). This is reminiscent of the de-accenting of post focal material in European languages[3].

6.4 Typical Contours on Particles & Conjunctions

After having explored the intonational tones in Beaver, we will now turn to what Yip (2002) calls an "alternative to intonation", i.e. to sentence and discourse particles and their interaction with intonational tones. Particles are present in many tone languages, fulfilling different functions. They can truly be an alternative to intonation because they mark e.g. sentence type in place of a marking with an intonational tone. Hyman (1990) emphasizes "the parallelism between segmental particles and boundary tones". For languages where lexical tone bears a heavy functional load, they can "provide a toneless carrier for intonation" as for example in Cantonese where toneless particles combine with three different boundary tones[4] so that the lexical

[3] I wish to thank Stefan Baumann for poiting out this parallelism.

[4] Notably, these boundary tones can also be found on particles that do have a lexical tone, in that case they will alter the shape of the contour.

tone distinctions need not be neutralized (Yip 2002: 272, reporting on findings by Law 1990). Another alternative relationship between lexical tones on particles and boundary tones might be a competitive one as proposed for Thai by Pittayaporn (2007).

A question that arises for Beaver is: Could the intonational tones that usually accompany certain particles and conjunctions be lexicalized and become part of their tonal make-up? At least for some particles and conjunctions, the tones always associated with them are reminiscent of the tones in the intonation of Beaver presented above. This makes it hard to decide whether pitch movements are lexical or intonational.

Particles and conjunctions cannot be moved to different positions in a phrase as easily as members of other word classes. It is therefore difficult to reliably establish their lexical tone or to distinguish a lexical tone from the intonational marking that typically accompanies the contexts in which they are used. There is one group of conjunctions which is always high while another group of particles is always low. This distribution might be related to their functions, as will be argued in the following.

6.4.1 High Particles

Firstly, a number of final particles or conjunctions which are clitisized to the last word of the phrase seem to carry high pitch:

- -*'ǫ́* "but"
- -*ú* "and"
- -*dú* "when"
- -*édé* "if"

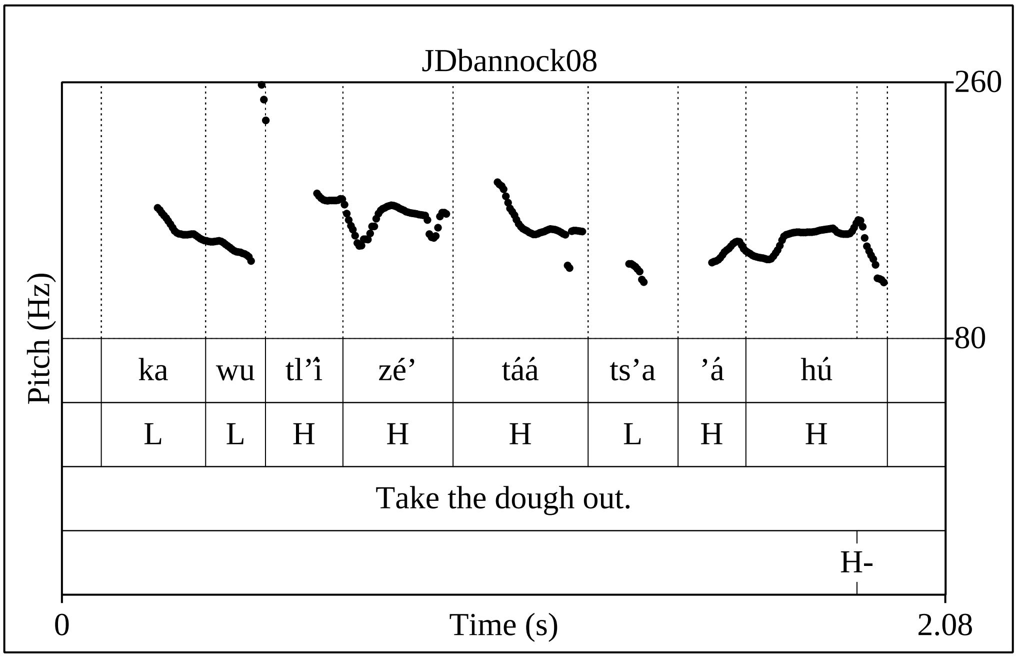

Figure 6.14: Regardless of the lexical tone of the conjunction -*ú*, the syllable is higher than the lexical high tone on the syllable; This points to the presence of an additional intonational tone. (JDbannock08)

The conjunction *-ú* whose lexical tone cannot be reliably established[5], is usually very high, considering its phrase final position where a lexical high tone would not be expected to have such an effect. This leads to the conclusion that there is also probably an additional H- phrase accent present accounting for the pitch excursion beyond the expected pitch range for a phrase final position. In figure 6.14, an example is shown where the pitch on *-ú* is very high, so that even if the conjunction were lexically high marked, only an additional intonational tone could explain this very high realization:

(39)	kawutlíze	t'áàts'a'áh	-ú	[...]
	dough	impers.take.it.out	-and	

“You take out the dough and [you bake it in the oven].” (JDbannock08)

The same pattern applies to the other conjunctions listed above. They all have in common that they usually occur in non-final contexts, that is, at the end of an intermediate phrase but within an intonation phrase:

(40)		Méhz̠į	zǫ	gwee	wusdyedl**uh**,	ajuuli	xadaa.
	[$_{-HL}$	[mɛ́hz̠̺ĩ	zõ:]	[gwe:	wʊsdjedlʊh]$_{H-}$	[ɐd͡ʒuːlĩ	xɐtaː]]$_{L\%}$
		owl	only	here	went.through	no	moose

“Only owls passed through here, no moose.” (PMchickadee00215)

Since they are all high in pitch and usually higher than they should be in these phrase final contexts, these cases can be analyzed as occurrences of H-phrase accents.

[5]It is always high in pitch and only ever occurs in positions where one could expect a high boundary tone or phrase accent. However, when speakers are forced to produce it in isolation, it is still high, so that we assume a lexical H here. Interestingly, in the transcription sessions the isolated sentences from the stories are repeated without the final *-ú*, probably because the context is missing. This is also what happens to intonational tones in such repetition contexts.

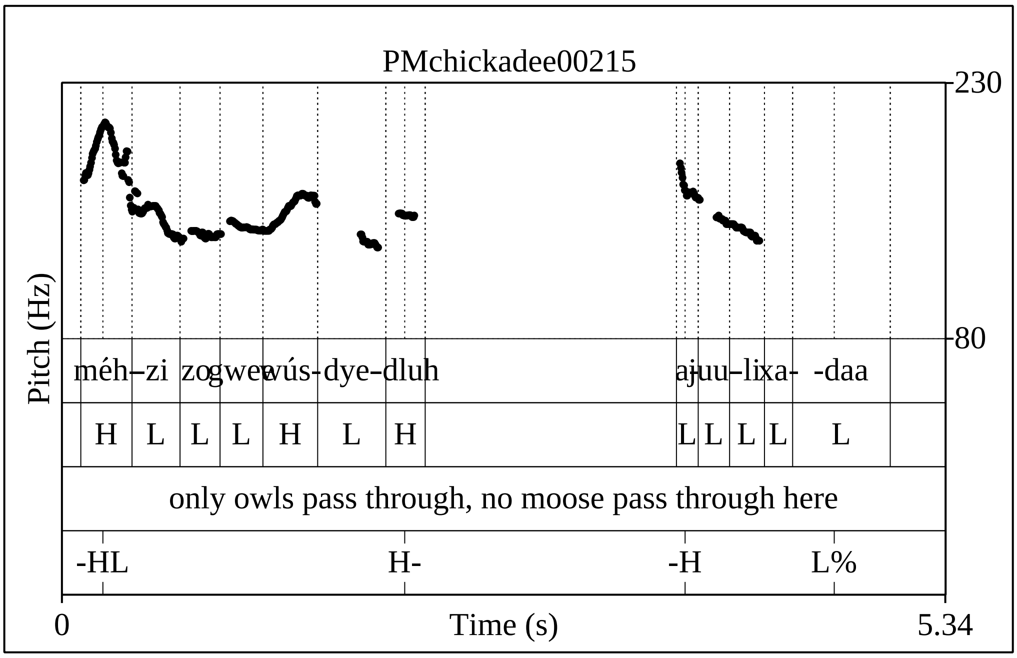

Figure 6.15: An example of the particle *zǫ* "only" which is low in pitch with the material in its scope exploiting a greater pitch range. (PMchickadee00215)

6.4.2 Low Particles

Another group of particles is usually low. They have in common that the constituent they follow is usually in focus. An explanation for the low tone is that they allow the preceding constituent to appear more prominent.

- *laa* "focus marker"
- *zǫ* "only"

In example 40 above, the first ip is marked by -HL and the accompanying expanded pitch range. The pitch track for this example is displayed in fig. 6.15.

These two particles are typically combined with with -HL and an expanded pitch range. So, it can be argued that in phrases containing one of the two particles, *zǫ* or *laa*, the material in their scope will belong to the focus domain while everything thereafter will be post-focus and is thus expected to have a compressed pitch range (comparable to the focus zones in the PENTA model, cf e.g. Xu 2004).

6.4.3 Question Particles

Contrary to the cross-linguistic tendency, for at least yes-no questions to be rising, question-final particles in Beaver are low, that is, both content questions and yes-no questions end low in pitch. This might be related to the fact that the important material comes early in questions, where the pitch range is usually greater.

- *-aa* "wh-question enclitic"
- *laa* "final yes-no question particle"
- *gǫ́ǫ́* "initial yes-no question particle"

There are no special contours marking yes-no questions, however for wh-questions an additional low falling boundary tone LL% has been found. In fig. 6.16, the contour is displayed with LL% being aligned with a lexically low verbstem, the enclitic *-aa* merging with the stem, assimilating in nasality:

(41) Méé adyéé' gha'į̨ą̨?
who horn saw.ptcl
Who saw the horn? (OOwhosawhorn2)

The contour is analyzed as LL% because the presence of a simple low boundary tone L% that marks declaratives would not predict the falling contour but rather just a low level. In this example however, the verbstem is low, the question enclitic is (probably) low and the contour is not flat as one would

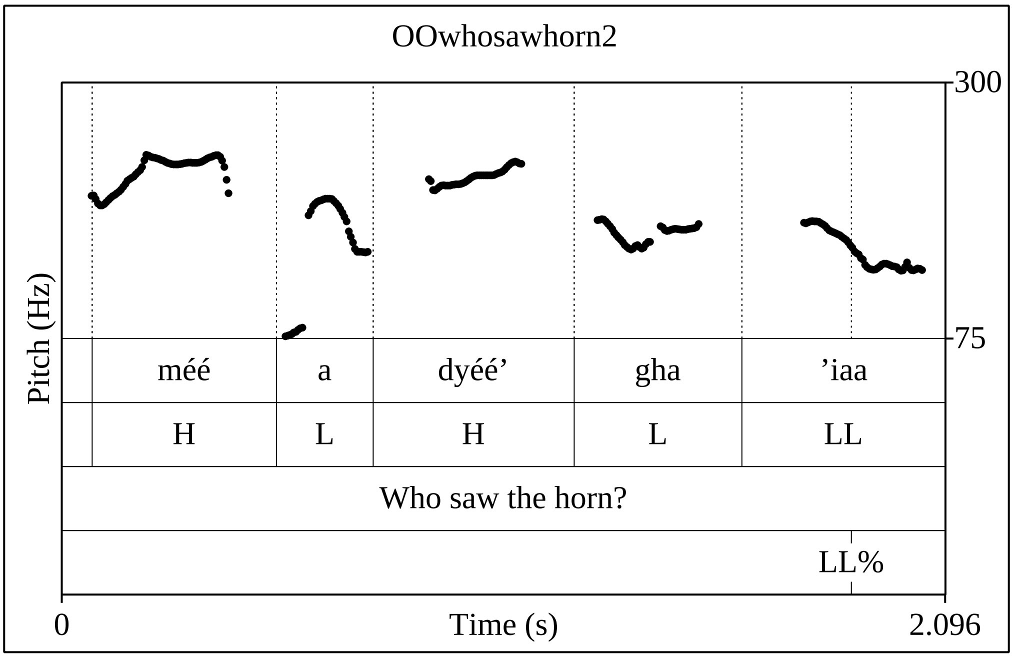

Figure 6.16: Wh question marked by HL% causing the fall at the end. (OOwhosawhorn2)

expect but shows a pronounced fall. It effects only the last syllable, and on lexically high syllables it produces a fall as well. This contour is associated with the enclitic, it is only used when the question enclitic is also present.

A fourth particle, *gúláé*, occurs in guessing questions, this one being always high, probably it is also lexically high for both syllables. A very flat, high plateau was found in two contexts. It was used often in the guessing game in all questions of the following shape, plotted in fib. 6.17:

(42) nǫ́ǫ́daa gúláé?
lynx maybe
"Maybe a lynx? / A lynx?" (PM242)

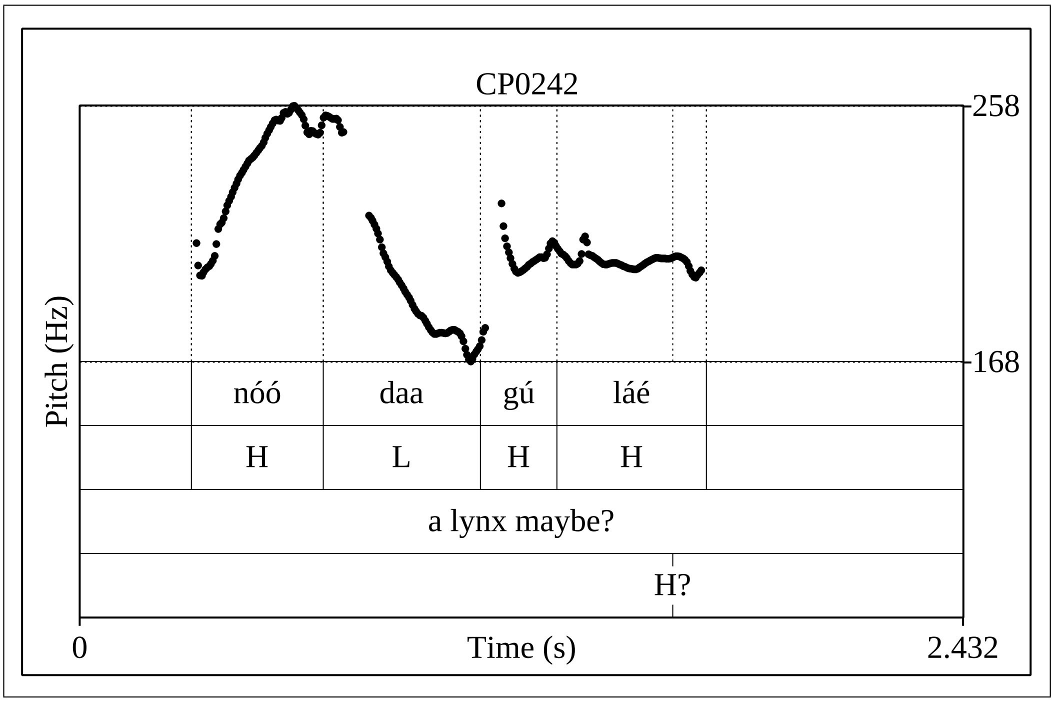

Figure 6.17: A question from the guessing game that is characterized by the flat high plateau on the word *gúláé* "maybe". (CP0242)

The last word *gúláé*, often translated as "maybe", is marked by a high plateau in the pitch track, and even in its final position this plateau is always flat and high. However, *gúláé* only occurs in questions; in other contexts, the word corresponding to "maybe" is the similar but different *gúhlaa* which can occur in various positions in a sentence[6].

The second function of *gúláé* is in disjunctive questions and sentences, where it may be used once or twice[7].

(43) ásłé gúláé asłá'
i.made.it ptcl i.made.it
"[you could say] 'asłe' or 'asłá"' (G. S. M. fieldnotes)

6.5 Summary & Discussion

In this chapter, the tones in the intonation of Beaver were introduced on the basis of natural data from stories and task oriented dialogues. First of all, because Beaver is a tone language, we investigated the tonal space, and found that across a number of IP's from stories both the topline and the baseline fell towards the end. In roughly the first third of an IP, there was a steeper decline than in the remainder. This could be due to the fact that focused constituents with their expanded pitch range or -HL marking are usually placed at the beginning of an IP.

Compression and expansion of pitch range have been found for focus and post-focus constituents respectively. These two mechanisms are linked to the phrase accent -HL. Reset is used in Beaver to mark direct speech. As direct

[6]Despite the synchronic similarity, it is possible that these two particles are not related. Sentence final particles usually evolve from verbs, while particles in other positions in the sentence probably have other origins, Keren Rice p. c.

[7]Note that there is no word for "or" in Beaver, instead this construction with the particle is used.

speech is not marked by any morphological or syntactic mechanisms, pitch reset, and optionally a higher overall register, are the only cues.

The inventory of intonational tones in Beaver is rather small compared to well-studied European languages. However, it does not appear to be so humble compared to other languages where intonational pitch accents are missing and only boundary tones are used (Jun 2005b, Himmelmann & Ladd 2008). A low final boundary tone L% marks the end of IP's, accompanied by reduced intensity and duration. At the end of a larger unit, it can be replaced by the devoicing of the last syllable. A rising final boundary tone LH% was found in only two cases, to mark uncertainty besides requests for repetition, maybe this tone would occur more frequently in truely interactive discourse. A low falling boundary tone LL% was found accompanying the question enclitic *-aa*, marking wh-question. Final phrase accents H- and L- are used in lists or non-final contexts. They sometimes cause lengthening of the last syllable and are never accompanied by reduced intensity or duration as is the case for the boundary tone L%. Two high initial edge tones have been observed. One is a boundary tone %H that occurs in stories to mark a new paragraph, the second one is a phrase accent with a different function. Finally, a falling phrase accent -HL is used in Beaver for contrastive focus marking; this can sometimes be accompanied by appropriate particles. The ip marked with -HL has an expanded pitch range, while the following ip's have a compressed range. This is analyzed as a phrase accent because of its positional distribution and because it adds prominence by means of the expanded pitch range and increased intensity.

In the last section of this chapter, we investigated particles in Beaver because their functions overlap with functions of intonation and because some are accompanied by characteristic contours. There are a number of high particles, such as conjunctions and subordinations, which indicate non-finality. It is argued that in these contexts – even if the lexical tone of these particles is unclear – a high phrase accent H- is present, accounting for unexpectedly high pitch on these particles. The focus particle *laa* and the particle *zǫ* belong to those particles that are always low in pitch. They are assumed to have a low lexical tone and they co-occur with -HL and the expansion of pitch range. They follow the constituent in focus and because of their low pitch accentuate this constituent, which is marked by a fall and the expanded pitch range.

As mentioned above, for wh-questions, a low falling tune was analyzed as LL% and associated with the last syllable has been found. In yes-no questions, no special pitch marking is used. The yes-no question final particle *laa* is lexically low, while the initial particle in yes-no questions *gǫ́ǫ́* is lexically high, additional intonational tones are not found. A third question particle *gúláé*, which is used in guessing questions or in alternative questions, is accompanied by a high plateau due to its lexical tones. Again, no pitch movements are added by intonation. Particle-less questions were not observed, since truly natural dialogues are missing from the corpus. Nevertheless, the two cases of the rising tune LH%, used for the expression of uncertainty and on requests for repetition, might be an indication that particle-less questions, if they exist in Beaver, may be marked by intonation. In table 6.1, a summary of intonational prosodic events in the corpus is given together with typical contexts.

Summing up, Beaver makes use of intonation to encode certain functions, even though it also has lexical tones. This may be related to the fact that the tonology of Beaver is comparatively simple so that there is still room for

Events	Typical Contexts
%reset	quoted speech
%expansion	focal
%compression	post-focal
L%	finality
devoice%	finality of larger unit
LL%	wh question
LH%	request for repetition
%H	new paragraph
H-	non-finality, lists
L-	non-finality, lists
-HL	contrast

Table 6.1: Prosodic events found in Beaver and typical contexts.

intonational tones to mark aspects of utterances, in addition to expansion of pitch range and raising of the pitch level which are used in a gradient way.

Chapter 7

The Prosodic Expression of Information Structure

Utterances are usually composed of two parts: a topic – or something that the utterance is about – and a comment – new information that is added to what is already known about the topic. In the domain of information structure, a great number of distinctions have been made and a good deal of confusion exists as to what valid categories are (cf Levinson 1983: x). A definition of the complex concept of information structure is offered by Lambrecht (1994):

> "Information structure: That component of sentence grammar in which propositions as conceptual representations of states of affairs are paired with lexicogrammatical structures in accordance with the mental states of interlocutors who use and interpret these

structures as units of information in given discourse contexts."
(p. 5)

This chapter will be concerned with cues used in Beaver to mark information structure. Only a small part of functions that are related to information structure will be dealt with, namely contrast and the distinction between new and given information within a NP. The following should be viewed as a first investigation into the realm of information structure in Beaver in a very controlled context.

The remainder of the chapter is organized as follows. We will summarize prosodic mechanisms that have been described for other tone languages as being cues to information structure. Beginning in chapter 7.1, we will report on a study of some mechanisms used in Beaver to signal information status, beginning with the introduction of the data collected and the processing thereof, continuing with hypotheses, results and their discussion.

One of the typical functions of intonation found in languages of different prosodic types is the signalling of information structure. A number of prosodic mechanisms have been identified as cues to information structure that occur in languages, sometimes in addition to other devices, such as word order, particles or morphological structure.

Although the possibilities of highlighting constituents in tone languages may be more limited than in prototypical intonation languages, there are several ways to mark information structure in tone languages. As has been described in non-tonal languages, for example in Korean (Jun 2005c) or West-Greenlandic (Arnold 2007), phrasing can be used as a device for identifying focused items. The use of phrasing is also found in tone languages, in Chichewa and Xhosa (e.g. Downing 2003) and generally in Bantu languages (e.g. Kanerva 1990, Truckenbrodt 1999). Hyman (1999b) provides a survey of focus mechanisms in Bantu languages, where he shows that the manipulation of phrasing for focus marking has an influence on the realization of lexical tones. Leben et al. (1989) report for Hausa that a lexical H is raised on a focused constituent which is an example of a local intonational effect on tone.

Effects of pitch range have been shown to be used for signalling focus, not only in the prototypical intonation languages but also in tone languages: pitch range is expanded on focused items and sometimes compressed after the focus, as in Mandarin (Xu 1999, Peng et al. 2005). Xu et al. (2004) describe the domain of a narrow focus as divided into three "temporal zones", each with a different pitch range adjustment, i.e. pre-focally pitch range is not manipulated, in the focal zone it is expanded, then it is compressed post-focally.

Another possibility concerning cues to information structure is the complete absence of prosodic marking as has been claimed by Rialland & Robert (2001) for the non-tonal language Wolof, by Kügler & Skopeteas (2007) for the tone language Yucatec and, more interestingly in this context, by McDonough (2003b) for Navajo, an Athabaskan tone language, remotely related to Beaver (cf ch. 2.3.3 for a more detailed discussion of her analysis). McDonough (2003b) claims that Navajo does not make use of intonation for several reasons: First, the fact that there are three lexical tones in Navajo (H, M and L) leaves little room for postlexical manipulations of pitch. Second, a large range of discourse particles is used to express functions typically expressed through intonation in other languages. Finally, according to her argumentation, some syntactic features, in this case being a pronominal argument language, make the use of intonation less likely.

This raises the question if Beaver, like Navajo, relies on its particles and on the rather free word order for the expression of information structure, or if it also exploits intonational mechanisms as cues. It has been shown above, that Beaver can mark contrast with an initial phrase accent -HL (cf section 6.3.5) that is accompanied by an expansion in pitch range and a subsequent compression. In the following sections, the interrelationship of focus and pitch range in Beaver will be investigated based on the analysis of controlled recordings.

7.1 Material & Method

The stimuli used to elicit the data for this study are comparable to the stimuli in the experiment in Swerts et al. (2002) which compared Dutch and Italian strategies for signalling the information structure in a NP. The stimuli used here were the pictures from the "Animal Game" in Skopeteas et al. (2006), with some adaptations[1]. The adapted stimuli set can be found in the appendix (cf A.4.2). The pictures show animals, varying in colour, the size and the number of animals depicted. There were six different animals, four colours, numbers went up to four, and the sizes were either large or small. A sample is given in fig. 7.1.

In the first dataset, only single speakers were recorded; they were presented with the stimuli on a computer screen or on cards and asked to name what they saw. Occasionally, in the beginning, speakers only said the name of the animal in the picture so that they had to be asked to e.g. also name

[1]For later recordings, the colour green was eliminated from the set and brown was substituted, since the Beaver colour terminology has one word for blue-green, and, if forced to disambiguate, a compound will be used for green. This caused some speakers to hesitate in reaction to stimuli containing green, sometimes causing disfluent speech or false starts.

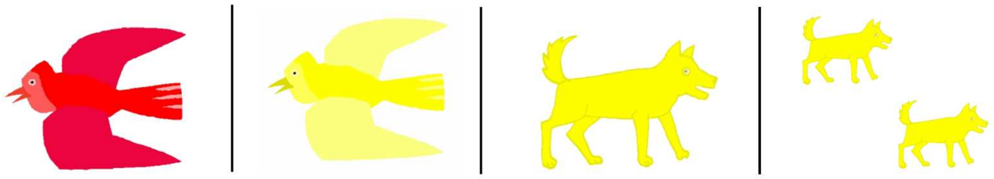

Figure 7.1: Examples of stimuli used in this experiment, each picture was presented individually, either on cards or on a computer screen. The complete set in the order in which it was presented can be found in the appendix.

the colour in order to get a complete description of the picture. Even though the dataset was very large (fifty stimuli) and the task somewhat monotonous, the speakers did not use list intonation, which was possibly prevented by the slow presentation of the tokens. A typical set of responses is shown in the following:

(44) łuuge daníítl’adze nachá’
fish yellow big
“Big yellow fish”

(45) łuuge daníítl’adze nats’ádle
fish yellow small
“Small yellow fish”

(46) łuuge danííbéédze nachá’
fish blue big
“Big blue fish”

Even though this set-up allows for a rather natural production of controlled items in the desired order, it is somewhat artificial and it would be wrong to assume that all the contrasts theoretically occurring in the combination of items are actually realized by speakers as such. Rather it is a matter of the speaker choosing to highlight a certain item that she conceives as prominent or important in the given situation, so that even in a careful

No.	Beaver	Translation	No.	Beaver	Translation
1	tłįį chuk dadale	red horse	27	ǫ́k'eety'ii tłįį chuk daníîbéédze	two blue horses
2	tłįį chuk dyek'ázhi	black horse	28	ǫ́k'eety'ii tłįį z̲aa daníítl'adze	two yellow dogs
3	chwą́ą dzek'ázhi	black bird	29	dyęęty'ii tłįį z̲aa daníítl'adze	four yellow dogs
4	łuuge daníítl'adze	yellow fish	30	ǫ́k'eety'ii tłįį z̲aa dadale	two red dogs
5	łuuge dadale	red fish	31	ǫ́k'eety'ii chwą́ą dadale	two red birds
6	tłįį z̲aa dadale	red dog	32	tááty'ii chwą́ą dadale	three red birds
7	tłįį z̲aa dzek'ázhi	black dog	33	tááty'ii chwą́ą daníîbéédze	three blue birds
8	tłįį z̲aa daníítl'adze	yellow dog	34	tááty'ii łuuge daníîbéédze	three blue fish
9	chwą́ą dadale	red bird	35	įłááty'ii łuuge daníîbéédze	one blue fish
10	chwą́ą daníítl'adze	yellow bird	36	dyęęty'ii łuuge daníîbéédze	four blue fish
11	chwą́ą daníîbéédze	blue bird	37	tłįį chuk daníîbéédze nat̲s̲ádle	small blue horse
12	łuuge daníîbéédze	blue fish	38	tłįį chuk daníîbéédze nachíi	big blue horse
13	tłįį chuk dadale	red horse	39	tłįį chuk dadale nachíi	big red horse
14	tłįį chuk dadale nat̲s̲ádle	small red horse	40	łuuge daníítl'adze nachíi	big yellow fish
15	chwą́ą dadale nat̲s̲ádle	small red bird	41	łuuge daníítl'adze nat̲s̲ádle	small yellow fish
16	chwą́ą dadale nachíi	big red bird	42	łuuge daníîbéédze nachíi	big blue fish
17	łuuge dadale nat̲s̲ádle	small red fish	43	tłįį z̲aa daníítl'adze nat̲s̲ádle	small yellow dog
18	tłįį z̲aa dadale nachíi	big red dog	44	tłįį z̲aa dadale nat̲s̲ádle	small red dog
19	ghaji dadale nachíi	big red duck	45	tłįį z̲aa dadale nachíi	big red dog
20	ghaji dadale nat̲s̲ádle	small red duck	46	tłįį z̲aa daníîbéédze nachíi	big blue dog
21	tyehk'ázi dadale nat̲s̲ádle	small red frog	47	chwą́ą daníîbéédze nachíi	big blue bird
22	tyehk'ázi dadale nachíi	big red frog	48	chwą́ą dadale nachíi	big red bird
23	łuuge dadale nachíi	big red fish	49	tłįį dyek'ázi nachíi	big black horse
24	łuuge dadale nat̲s̲ádle	small red fish	50	łuuge daníítl'adze nachíi	big yellow fish
25	tłįį chuk dadale nachíi	big red horse	51	chwą́ą dyek'ázhi nachíi	big black bird
26	ǫ́k'eety'ii tłįį chuk dadale nachíi	two red horses			

Table 7.1: Pictures included in the stimuli set, based on the Animal-Game in QUIS, colours adapted. The word order varied throughout the task. The orders given here were the more frequent ones.

design the naïve speaker cannot be "forced" to realize the stimulus exactly as expected. For example, in (46), it is likely that *daníībéédze* "blue" is highlighted in one way or another, in some cases *nachá'* "big" is highlighted.

In total, five speakers were recorded for the monologue task (four female, one male)[2], two of them twice on different fieldtrips giving a total of seven recording sessions. An additional recording was made with one speaker who was asked to use the NP's with the verb *z̲éexwį* "I killed" forming responses like:

(47)	įłááty'ii	chwą́ą	dadale	z̲éexwį.
	one	bird	red	I.killed
	"I killed one red bird."			

On the one hand, we hoped to gain some insights into phrasing differences between a mere NP and a NP in a sentence. On the other hand the added verb was always in the final position preventing all of the other items from ending up IP finally, where an overall weaker articulation sometimes accompanied by non-modal voice quality renders measurements of pitch impossible. Later however, these recordings were analyzed together with the others because no difference in pattern was observed.

The recordings were made at the consultants' homes or in a hotel room using a Marantz PMD 660 Solid State Flash recorder and directional condenser microphones. The recordings were segmented into IP's and transcribed and translated using Elan[3]. The transcript was exported to a praat-TextGrid and several annotations were added in praat (Boersma & Weenink 2008). The

[2]Only one male speaker was recorded, because of the very small number of speakers, and because not all speakers would have been good candidates for this task – be it because they would be bored quickly or not at all willing to perform such an artificial task, be it because they do not use the language on a daily basis and thus would have to pause often within responses to seek for a missing word.

[3]www.lat-mpi.eu/tools/elan.

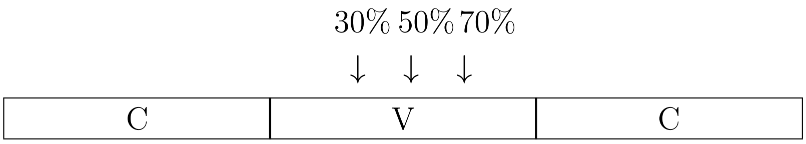

Figure 7.2: Points of F_0-measurement.

annotations included word boundaries, segments, word glosses, information status (new and given) and minimum and maximum pitch per word and per phrase. Even though there are scripts that allow for automatic extraction of highest and lowest pitch per label in praat, manual labelling was preferred because of the many voiceless segments and ejectives which cause too much pitch pertubation that would lead to many errors in automatic measurements. Thus it is hoped that by manual labelling microprosodic disturbances have been reduced as far as possible. A second method for analyzing pitch height was used in which F_0 values were extracted from three points in the vowel, at 30%, 50% and 70% of the total duration[4], compare fig. 7.2. The recordings were cut into single IP's using a praat script and converted to an EMU database[5] with additional annotations and a hierarchy that allows for specific searches.

The information structure was annotated distinguishing only new versus given information. The criterion for given was if the item was present in the preceding utterance. If it had not occurred in the previous utterance it would be labelled as new. This is basically what is suggested in Skopeteas et al. (2006) and what is used in Swerts et al. (2002) for a different set-up and

[4] A similar method was used by Pan (2007), even though more points in the duration of the vowel were used since shapes of contour tones were investigated. The use of different points in the vowel has also been employed by Julia Colleen Miller, p. c.

[5] www.emu.sourceforge.net.

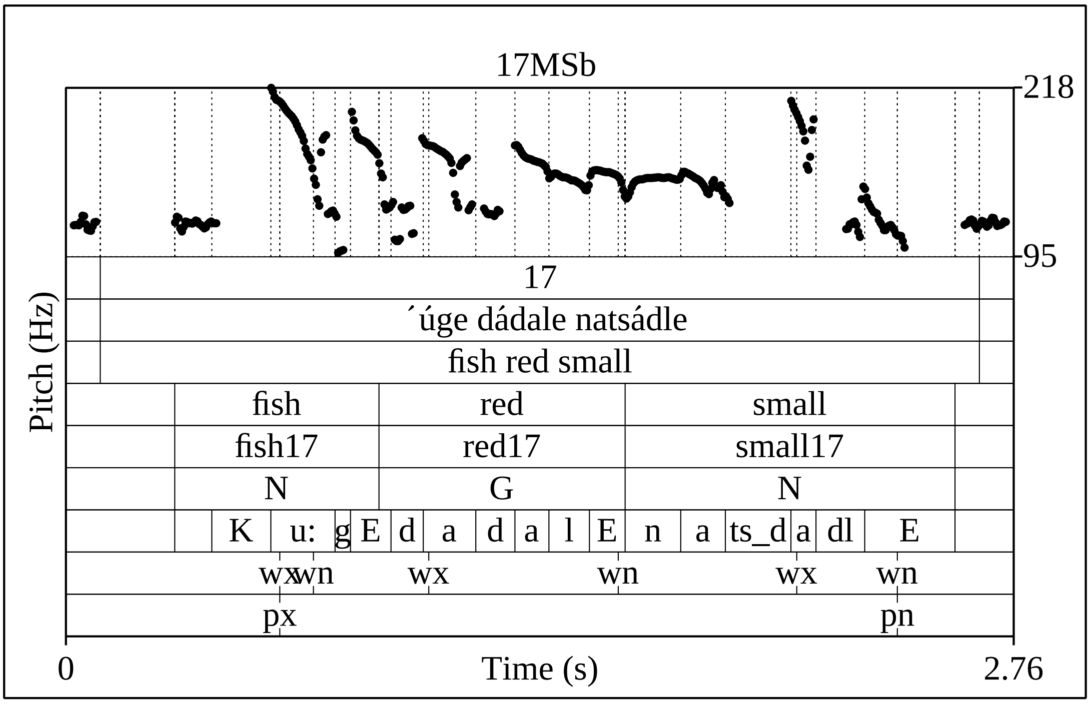

Figure 7.3: An example of a labelled file in praat, the tiers are (from top to bottom): number of stimulus, orthographic, translation, word1, word2, information structure, CV, word maxima/minima and phrase maxima/minima. (17MSb)

with the labels being given and new/contrastive. These labels were chosen because of the simple classification as a first basis.

All pitch measurements were conducted using the EMU-R-interface and the Emu query language to extract the desired information from the EMU corpus. The statistical analyses and most of the plots were produced in R. Pitch was measured in Hz. Where appropriate the data was normalized using the following two different techniques:

First, z-scores were used to normalize pitch data (for a detailed discussion cf Rose 1991):

$$z = \frac{x - \bar{x}}{s}$$

Where z is the standardized value, x is the original value, $\bar{x}$ is the mean value and s is the standard deviation.

For a better comparison across speakers, especially across male and female speakers, the distance of two tones was calculated in semitones (Nolan 2004) using the following formula:

$$dist[st] = 12 * \log_2 \left(\frac{x[Hz]}{y[Hz]} \right)$$

Here x is the higher F_0 value, y the lower one, and dist is the resulting difference between these two values in semintones.

7.2 Hypotheses

Based on expectations from other (tone) languages and preliminary measurements in Beaver, new/contrastive information is expected to be marked by an expanded pitch range. Generally new/contrastive information is expected to be salient and to be produced by higher pitch, greater intensity, a greater pitch range and greater duration compared to given information.

Thus, our hypothesis for Beaver is the following: New/contrastive information will be produced with a greater pitch range than given information, possibly accompanied by increased duration.

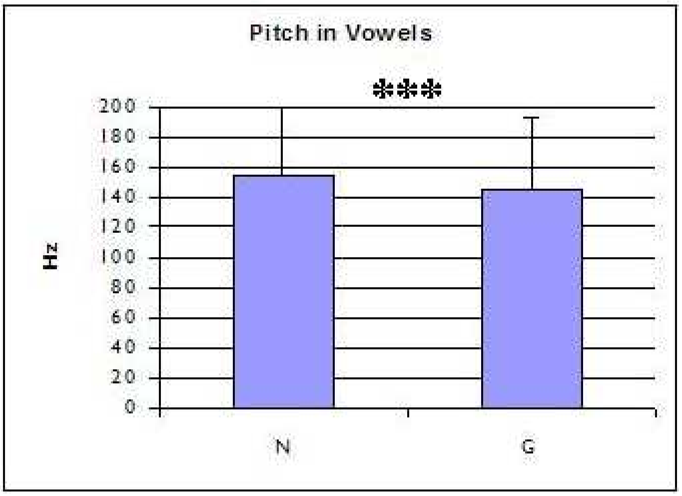

Figure 7.4: Mean pitch (Hz) for all vowels compared in new (N) and given (G) contexts. The difference between mean pitch values is highly significant.

7.3 Results

7.3.1 Global pitch measurements

First of all, measurements of F_0 were undertaken to compare words that were labelled as “New” with values extracted for “Given” words across all speakers, regardless of lexical tones.

An analysis of global trends for F_0 in given versus new words was conducted, comparing the F_0 for all vowels in both contexts. F_0-values were extracted from three points in the vowel, at 30%, 50% and 70% of the total duration, and averaged to obtain pitch measures that are not affected by microprosodic mechanisms caused by the adjoining consonants. In figure 7.4, the averaged F_0-values are juxtaposed for new and given items. The mean value for vowels in new words is 154.36 Hz (sd=44.99), while the mean for vowels in given words is 144.75 Hz (sd=48.54). The large standard deviation arises from the fact that all speakers and all lexical tones where compared.

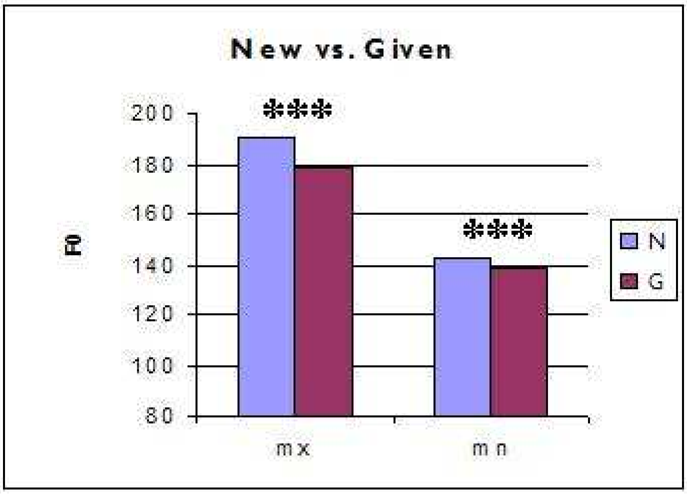

Figure 7.5: Mean pitch (Hz) for word maxima (mx) and minima (mn) compared in new (N) and given (G) contexts. The difference between mean pitch values is highly significant.

Still, the difference between given and new was significant in a two-tailed t-test ($p<0.001$).

A second analysis of global trends comparing the labelled minima and maxima per word showed F_0 measurements in the dataset to be higher for new information than for given information ($p<0.001$). In figure 7.5, pitch maxima and minima for words labelled new are compared to those measured in words labelled given. The mean values for word maxima are 190.23 Hz (sd=29.5) for new contexts, 178,85 Hz (sd=29.66) for given contexts; the minima for new are 142.68 Hz (sd=28.66) and 138.93 Hz (sd=31.68) for given contexts. In both cases, the mean pitch values for new words are significantly higher than those for given words. The standard deviation is smaller than for the measurements of all vowels, since the groups compared are more homogenous, including only the highest and the lowest points of the pitch curve. The difference is greater for maxima than for the word minima, showing a tendency for the maxima to be more affected by information structure

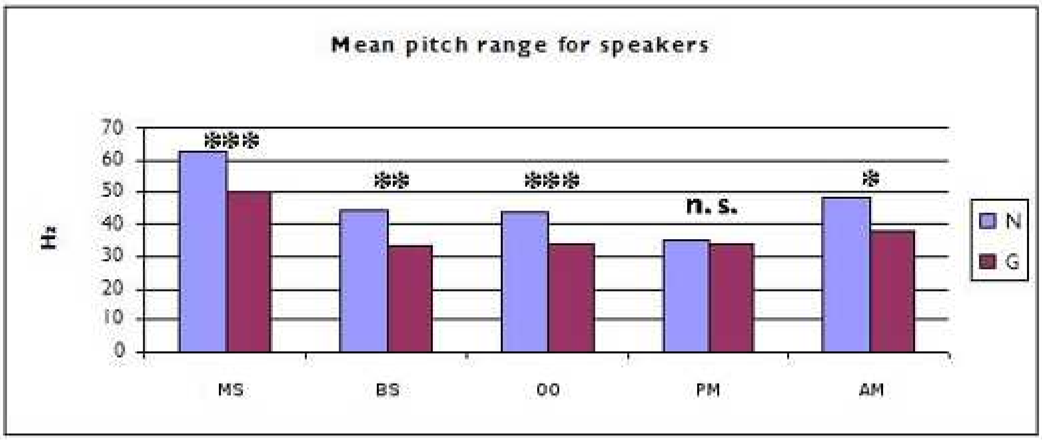

Figure 7.6: Differences in pitch range for speakers, comparing new and given words. For the male speaker PM the difference was not significant.

– but this trend has to be validated in more detailed pitch range measurements. Interestingly, the minima are higher for new information than for given, which means that pitch range expansion may not be symmetrical, but rather the topline will be raised while the baseline stays the same or is even slightly raised, too.

The two surveys of pitch height for new and given items both showed a tendency for new information to be produced with a higher pitch than given information. These findings have implications for the expectations for the pitch range measures, namely that maxima and minima may be affected differently by an expansion of pitch range.

7.3.2 Measurements per speaker

The effects of pitch range expected to be associated with information structure are analyzed in this section for each speaker. Using the labelled minima and maxima of all words, pitch range was compared for each speaker for new and given items. The results were significant in all but one case, as can be seen in figure 7.6. For speakers MS and OO the difference was highly sig-

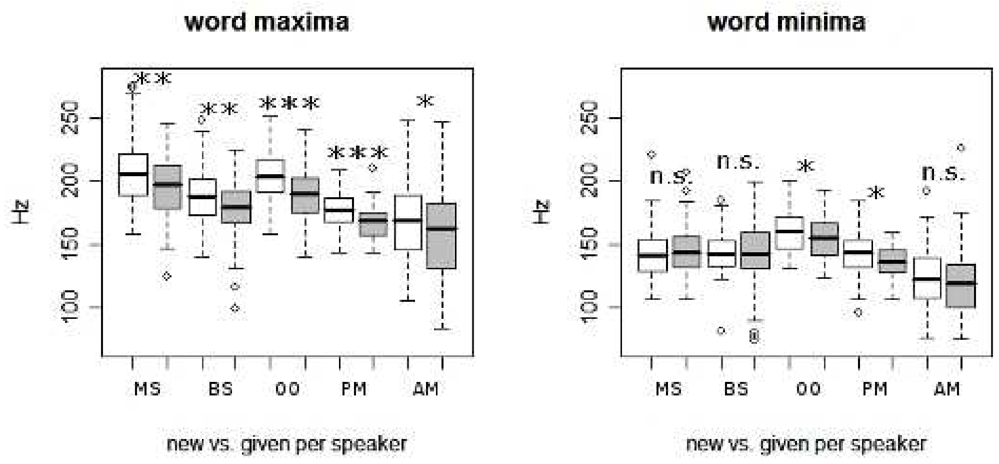

Figure 7.7: Measures of word maxima and minima for new (white boxes) and given (grey boxes) across speakers with levels of significance.

nificant (p<0.001), for speaker BS very significant (p<0.01), for speaker AM significant (p<0.05), for the only male speaker PM, the difference was not significant (p>0.05). Four out of five speakers seem to mark new information with greater pitch excursions than given information.

Addressing the question of whether maxima and minima are equally affected by the pitch range expansion, measures were compared for all speakers in new and given contexts.

In figure 7.7, the results are plotted: On the left panel, the maxima are significantly different, that is higher, for all speakers: for speakers OO and PM at p<0.001, for MS and BS at p<0.01 and for AM at p<0.05. On the right panel, the results for the minima are plotted: for three of the five speakers, the minima were not significantly different in new versus given contexts. However, for the two speakers OO and PM, they are different (p<0.05). Interestingly, for these two speakers, the minima in new contexts are higher than the minima in given contexts, seemingly contradicting the expected expansion of pitch range. However, taken together the results for word maxima and minima show that the observed expansion of pitch range does not equally affect the baseline and the topline, but rather means that the level is raised and the span increased (Ladd 1996: 262). So for speakers MS, BS and AM, the baseline roughly remains the same and the peaks are raised for new information, while for speakers OO and PM, the baseline is slightly raised and the peaks are significantly higher for new than for given information. For OO, the pitch span is also significantly different, as opposed to speaker PM. In all cases, except for speaker PM, the pitch span is expanded for new information.

7.3.3 Normalized Pitch Measurments

The pitch range in the following analyses was calculated by again using the manually labelled minima and maxima per word. Here, different normalization methods were used to factor out speaker specific features (Nolan 2004, Rose 1991). First, z-scores will be considered, and later, measurements in semitones will be discussed. A two sample t-test comparing z-normalized values of pitch range for new and given words was conducted, showing that the two groups were significantly different ($p<0.001$).

In fig. 7.8, z-scores of the pitch range for individual speakers have been plotted, which is a different visualization of findings already displayed in fig. 7.6 and discussed above: Only in the case of PM, is the pitch span not significantly different in new than in given contexts, for the other speakers different levels of significance were observed.

Following up on the question of the nature of the pitch range expansion, word maxima and minima were compared, this time using z-scores. The results of these normalized measures painted the same picture as the results per speaker above: the maxima were significantly higher ($p<0.001$) for new

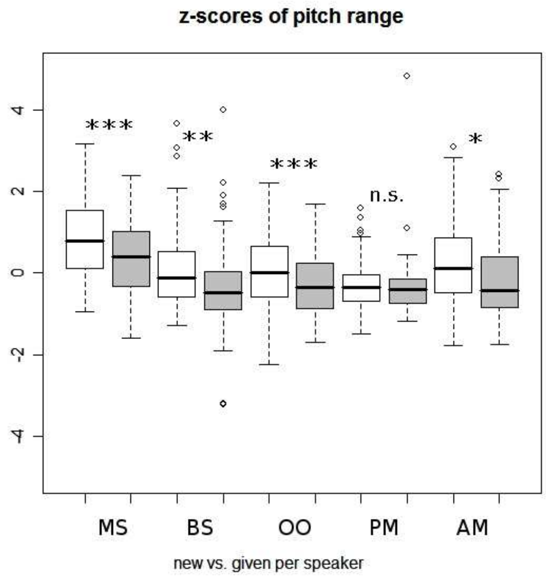

Figure 7.8: Z-scores of measurements of pitch span for speakers comparing new (white boxes) vs. given (grey boxes) contexts.

than for given words, while the minima showed a mild tendency to be lower for given words, but here the difference was not significant.

Another way of factoring out speaker specifics is to measure the different pitch spans in semitones and thus make it easier to compare male and female voices (Nolan 2004). This is especially interesting because for the only male speaker in the recordings the difference in pitch span between new and given was not significant while for the female speakers it was.

On this data in semitones, a two-sample t-test comparing overall distances in semitones for new versus given information was significant at $p<0.001$. In fig. 7.9, pitch ranges for new and given items (new in white and given in grey boxes) are plotted for all speakers. Again for the male speaker PM, the difference in pitch span is not significant while for the female speakers varying significance levels were calculated.

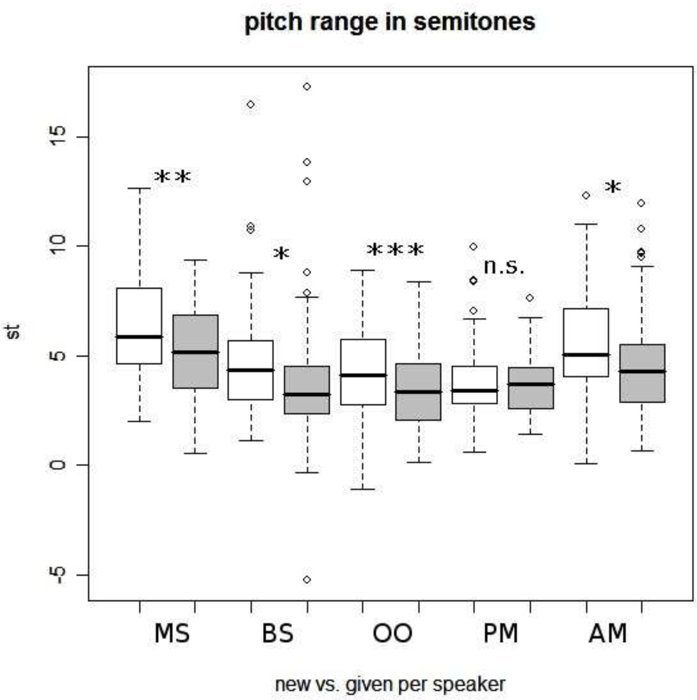

Figure 7.9: Pitch range for new (white boxes) and given (grey boxes) information in semitones for all speakers.

	V	VV
New	145 (73)	234 (79)
Given	135 (74)	225 (85)

Table 7.2: Vowel duration of short (V) and long vowels (VV), in given and new contexts, with the standard deviation in parenthesis.

7.3.4 Measurements of Duration

In order to verify whether words in given and new contexts will also differ in duration, in addition to the differences in pitch height and span, the duration of vowels was compared across contexts. In a general comparison, all given vowels (mean=165.77 ms) were significantly shorter than all new ones (174.81) in a two-tailed t-test with $p<0.5$. Then, when separating long and short vowels, we found that the difference was significant for short vowels ($p<0.01$), while it was not found to be significant for long vowels in a two-tailed t-test. The mean durations for the long and short vowels are displayed in table 7.11 with the standard deviations.

In fig. 7.10, it can be seen that the difference in duration for given and new contexts was significant for short vowels (v) at $p<0.01$ and for long nasal vowels (vnvn) at $p<0.05$ in two-tailed t-tests.

In fig. 7.11, the durations of all the vowels in the corpus are plotted. A general tendency for vowels in new contexts to be longer can be observed, even if hardly any of the individual differences reach significance. This is possibly due to the small numbers of tokens in some cases and to the fact that syllable structure was not taken into account here.

Summing up, the duration of vowels is longer in new contexts than in given contexts. Different vowel classes behave differently, but a general trend can be observed in most vowels.

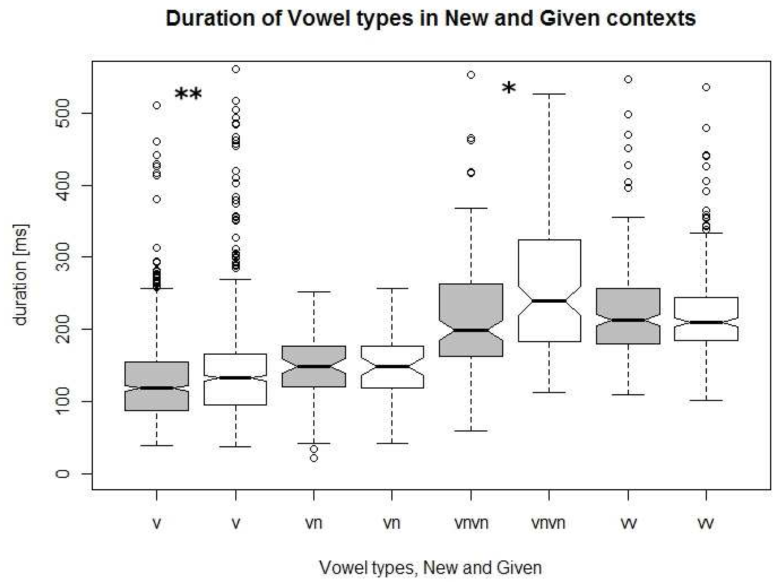

Figure 7.10: Duration of vowel types in given (grey boxes) and new (white boxes) contexts, for short oral vowels (v), short nasal vowels (vn), long nasal vowels (vnvn) and long oral vowels (vv).

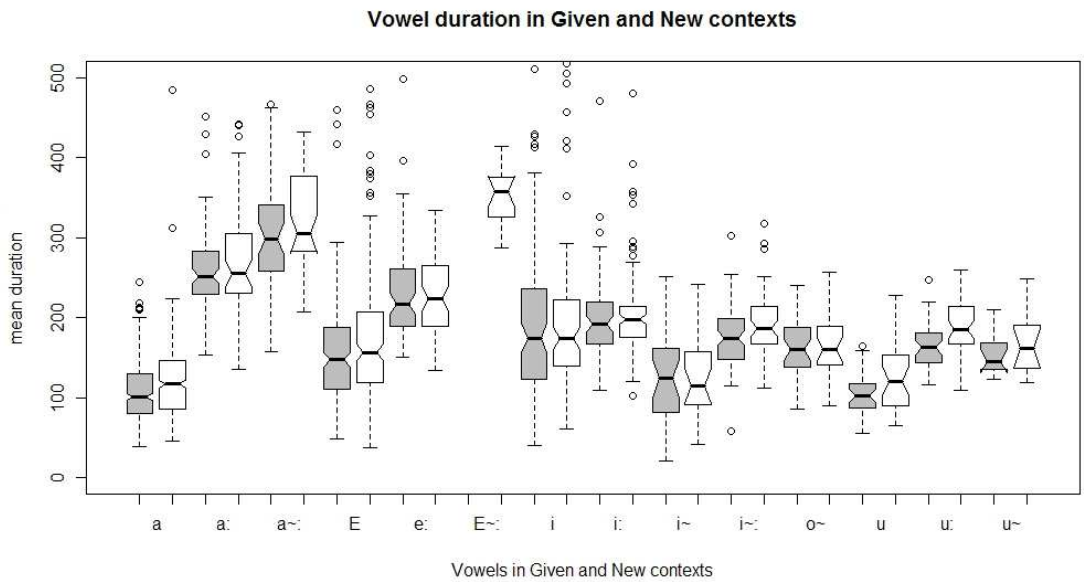

Figure 7.11: Duration of vowels in the corpus in given (grey boxes) and new (white boxes) contexts.

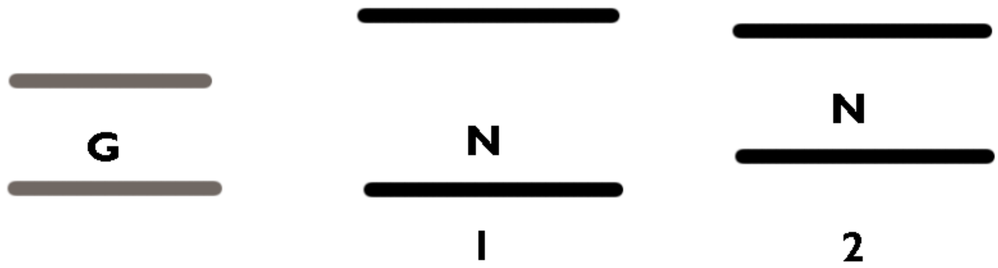

Figure 7.12: Schematic diagram of two strategies of pitch range expansion for new (N) versus given (G) information. Strategy (1) is used by four out of five speakers.

7.4 Discussion & Conclusion

The results in the previous section show – at least for the female speakers – that new information is marked by a wider pitch span. The raw and normalized measurements displayed the same tendencies. Analyses of the effects on local minima and maxima show that this expansion does not systematically lower the minima, but instead only affects the maxima by raising them significantly for all speakers. In fig. 7.12, this is depicted schematically, the grey lines show the pitch range for given information and the black lines in (1) show the expanded range for new information, with the base line remaining roughly the same while the top line is higher. For two speakers (OO and PM), the baseline was slightly raised as well.

Turning to the difference in pitch range, it was found to be significant for all female speakers but not significant for the only male speaker PM, although the maxima for PM were significantly different in new as compared to given information ($p<0.001$). He may be employing a slightly different strategy for marking information structure together with speaker OO: their baseline is slightly higher in new contexts ($p<0.05$) and their maxima are also significantly higher ($p<0.001$); this is shown schematically in fig. 7.12 in

(2). Thus, it would be possible that for speaker PM the overall raised level is the major cue to information structure, while for the other speakers it is the increased span and the raised maxima. Speaker OO uses a combination of both strategies: her pitch span is expanded, and the baseline is a little higher for marking new information. Another possible explanation is that the only relevant cue is for the maxima to reach the top of the speakers' range, while the behaviour of the minima is not used in perception and can thus vary in this context[6]. This interpretation unifies the strategies of all speakers.

Measurements of duration showed the tendency for new information to be longer than given information. The detailed results for different vowel types were mixed and did not reach significance levels.

So, unlike its relative Navajo, Beaver does make use of fine-grained prosodic cues to mark information structure: For new information, the pitch range is expanded by raising the maxima, additionally with a slightly raised baseline for two speakers. Furthermore, in general, durations are longer in new contexts than in given contexts.

[6]I wish to thank Frank Kügler for pointing this possibility out to me.

Chapter 8

Conclusion

8.1 Recapitulation of Main Findings

The previous chapters have been a first investigation into intonation and prosodic structure of Beaver. The analysis of the intonation system is aimed at contributing to intonational typology by supplementing our knowledge with data from a North American polysynthetic tone language.

Firstly, we found that prosodic strengthening can be attested for Beaver as in many other languages. However, it interacts with other mechanisms present in the language, such as stem initial strengthening and intervocalic lengthening. All three factors influence the phonetic realization of plosives and nasals in this language.

Then, in our investigation of intonational tones, an inventory of phrase accents and boundary tones, both simple and complex was analyzed, which is large compared with what is generally expected for a tone language. It is hoped that the analysis within the Autosegmental Metrical framework will facilitate cross linguistic comparisons, also with reports on lesser known languages.

Lastly, we found that within an NP, information structure can be signalled in Beaver by the manipulation of pitch range and duration. The expansion of pitch range and the following compression has been reported for other tone languages, and is comparable to the post focal deaccentuation in European languages.

8.2 Discussion

The discussion of findings will be split up into different perspectives: First we will summarize implications of the findings for Athabaskan linguistics, then briefly discuss topics in intonational typology that have been raised by this study and lastly, we will provide a note on areal linguistics of the North American continent.

8.2.1 Implications for Athabaskan Linguistics

First of all, we add a report on intonation in an Athabaskan language to the small, yet since Rice & Hargus (2005a) steadily growing, body of studies on this topic. Unlike Navajo, at least some Northern Athabaskan languages make use of intonational tones. For Beaver quite a number of intonational tones have been found. Here, it proved useful to also analyze narrative data and other less controlled data, even if this resulted in a ragged pitch contour due to the many voiceless and ejective segments. It is hoped that this will inspire more researchers to investigate intonation in other Athabaskan languages. Especially in those cases of tonal flip-flop, it will be interesting to see whether intonational tones are effected by the value of the marked tone in a language. As for other linguistic domains, Athabaskan languages provide a fruitful area for the analysis of intonational features and the question of variation between those related languages.

Furthermore, we provided evidence for domain initial strengthening in Beaver, where VOT in plosives was longer at boundaries of larger prosodic domains than at smaller boundaries. However, two other effects that have been described for Athabaskan interact with this prosodic strengthening: Stem initial strengthening and intervocalic lengthening. All three mechanisms could be established for Beaver, however targeting different phases or properties of segments or affecting nasals differently from plosives. In general, the findings show that contrasts specific to this language family, such as the difference between stems and prefixes, interact with universal tendencies, such as prosodic strengthening.

The prominence of stems in Athabaskan can now be described in more detail for Beaver. In Beaver, stem initial strengthening was observed in nasals and for VOT in the aspirated alveolar plosive /t/ as well. In addition, for the aspirated alveolar plosive /t/, we found that stem initially the velar variant of aspiration, which also occurs in many other Athabaskan languages, is much more frequent. While in prefixes the plain glottal aspiration was found more frequently. This is in line with reports on other manifestations of stem prominence in Athabaskan.

However, there is a feature that runs contrary to the expectation for the stem syllable to be the most prominent in a phrase, that is the utterance final devoicing that has been found for Beaver. This final devoicing has been attested but not studied for other Athabaskan languages. In Beaver it marks finality in discourse. In dialogues, it signals the listener that the turn is over, while in narratives, it marks places in the story where feedback, laughter and back channelling are appropriate. It is possible that for other Athabaskan languages final devoicing may have similar functions. In any case, it is an indication that a discourse analytic study of this phenomenon may prove useful in other languages as well.

Now, how does the devoicing of the last syllable, which naturally is the stem syllable in Athabaskan, go together with the assumption that the stem syllable is the most prominent? It is possible to reconcile these two contradictory factors by assuming the point of view of the listener (cf Rice 2005). Two points can be put forward here: Firstly, in many verbs in Athabaskan, the constellation of the prefixes will provide a lot of information about the type of stem that may follow, e.g. motion verbs are very uniform so that even if a hearer cannot understand the stem syllable at all, still a large amount of information can be retrieved. For example, if a number of people is coming back here again – information that can be encoded in the prefix chain – the information that the stem provides – on foot, by boat, swimming – may be less important and aspectual information which can be represented by the codas of the stems is often predictable from the prefix. Secondly, the onset of the stem syllable, which is phonetically strengthened, carries more (lexical) information than e.g. the vowel, and especially in Beaver, the coda consonants. Thus if the stem syllable is devoiced the main information which is often encoded in the onset consonants is still retrievable.

Lastly, investigation of strengthening effects on segments in Beaver may be relevant in the discussion raised by McDonough & Wood (2008) on whether the aspirated plosives /t/ and /k/ should be analyzed as complex segments.

The findings from Beaver suggest that a study of these two plosives should take prosodic position, morphological category (stem vs. prefix, possibly stem vs. conjunct prefix vs. disjunct prefix) and intervocalic position that might lead to gemination into account. In Beaver, there are indications that /t/ and /k/ pattern differently, so that alternatively, it could be hypothesized that only /t/ is to be analyzed as a complex segment while /k/ is a simplex segment.

8.2.2 Implications for Intonational Typology

An interesting question is what the nature of the relationship between lexical tone and the intonation system of a language is. That is, can universal tendencies be made out, such that the number of tones, the nature of the tones (contour vs. level) or the functional load of the tones in a language could predict whether a language will make use of tonal intonation or whether it will rather employ other mechanisms. This study contributes a discription of a comparatively simple tone language, and opens the path for further work on other dialects of Beaver with the opposite marked tone. It is hoped that the findings for Beaver will encourage more research in the area of intonation in tone languages that has been neglected compared to the study of lexical tonology.

It still is not clear what other features in a language may be related to its intonational system. For example, what influence does basic word order have, and are all pronominal argument languages characterized by an absence of intonational focus marking, as has been proposed by McDonough (2003b)? To answer these question, we need a larger body of intonational studies in languages of varied types and geographic areas.

8.2.3 Areal Linguistics on the North American Continent

Concerning the study of North American languages, it is hoped that this investigation into Beaver intonation will be one of many others on the languages of the Americas which are of yet somewhat underrepresented in the area of intonational phonology. It will be interesting to be able to test the idea put forth by Ladd (1996) that this might be a linguistic area where intonation is restricted to phrase accents and boundary tones, lacking pitch accents that figure prominently in the intonation languages of Europe.

Moreover, the final devoicing may be a feature that lends itself to borrowing by contact, since it seems to be present in other languages of the subarctic.

8.3 Future Investigations

During the course of this study, a number of points for future research have emerged. First of all, an important issue will be the investigation of intonation in Halfway River Beaver and West Moberly Lake Beaver and the question how intonation and lexical tone are interrelated. That is, how can differences or similarities in intonation between the high marking NAB and the low marking Halfway River Beaver be set into relation with the lexical tones.

Furthermore, it may be worth investigating the encoding of information structure in complex verb forms. If we expect that the division of an utterance into topic and focus is related to the information content in it which needs to be divided into simplex units, we might expect that complex verb words in Beaver have a different status than e.g. long nominal compounds in German. It may be interesting to explore whether it is possible to focus parts of the verb such as e.g. a preverb. In the corpus, we observed some cases where a preverb was produced with an expanded pitch range. A question would be if the phrase accent -HL could be employed on parts of the verb as well.

Many of the findings in this study would greatly benefit from additional perception experiments, however, it seems difficult to find set-ups that will be accepted by speakers.

Another promising area for future research is the discussion of the status of the aspirated plosives, in relation with effects of prosodic strengthening, stem initial strengthening and intervocalic lengthening. A further feature that could be taken into account here is the historical dimension, i.e. are unaspirated plosives that evolved from reconstructed nasals phonetically different from those that come from reconstructed plosives[1]?

A question raised by McDonough (2003b) concerns the relationship between the presence or absence of intonational marking and other features of a language. These features include basic word order, and the question whether the language is a pronominal argument language. Again, the Athabaskan languages provide ideal data for the investigation of this question.

Lastly, of course, it will be interesting to broaden the scope and move on to conversational studies in Beaver, now that a rough concept of the intonational tones has been developed. However a more controlled set of studies had to be undertaken to clear the road for the investigation of free conversation.

[1]I wish to thank Dagmar Jung for pointing this aspect out to me.

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Appendix A

Appendix

A.1 Orthography

The orthography for Northern Alberta Beaver used in this study is presented below with equivalents in IPA. Even though it has once been discussed with the elders at Child's Lake and Boyer River, it might be subject to revisions in the future.

Orthography	IPA	Phonetic Description
a	ɐ	short open-mid centralized vowel
ą	ã	short nasal open-mid centralized vowel
aa	a:	long front open vowel
ąą	ã:	long nasal front open vowel
b	p	voiceless bilabial plosive

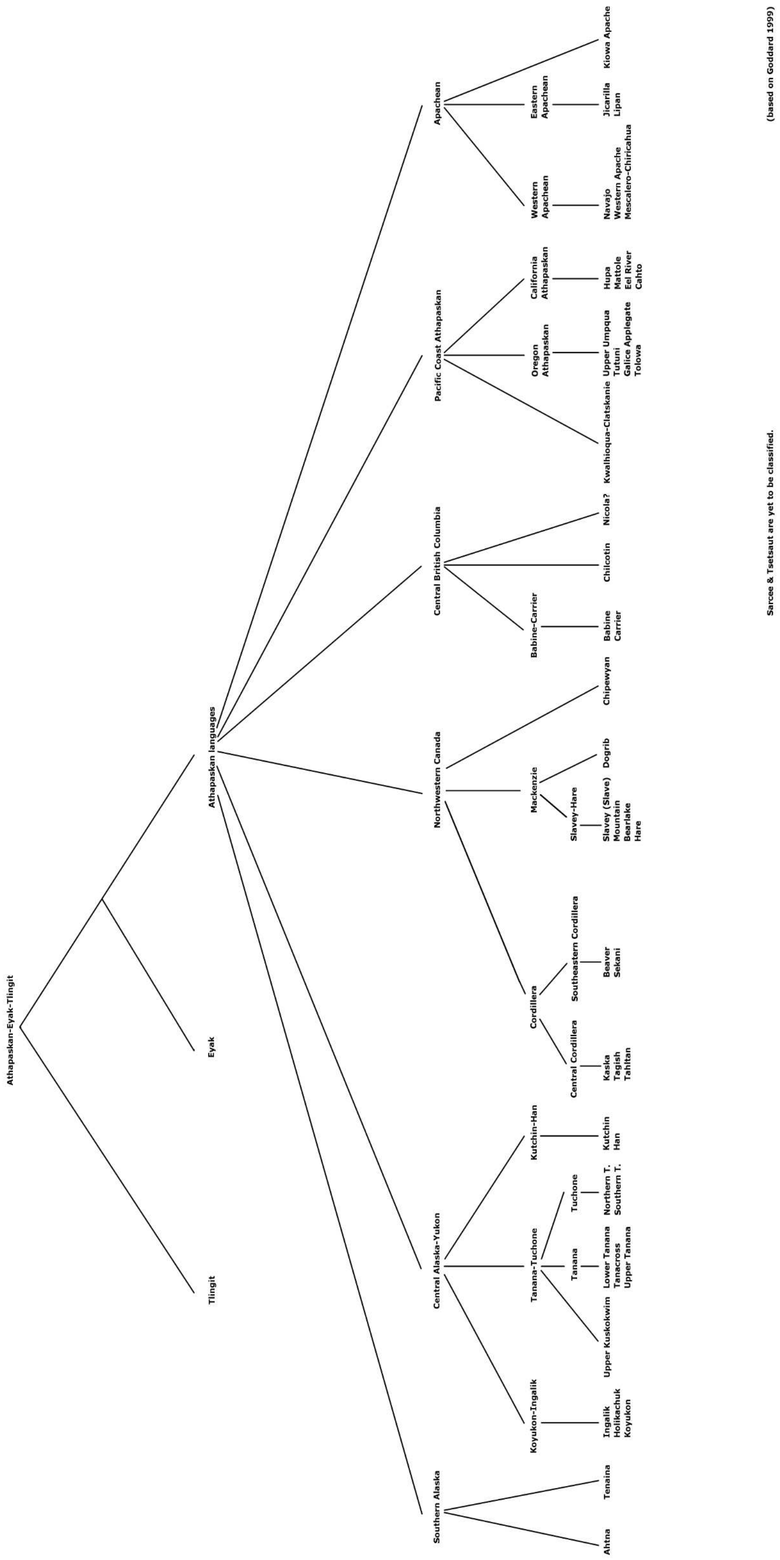
Orthography	IPA	Phonetic Description
d	t	voiceless alveolar plosive
dz	d͡z̺	voiced (apico-)alveolar affricate
d̲z̲	d͡z̪	voiced (lamino-)dental affricate
e	ɛ	short open-mid front vowel
ę	ɛ̃	short nasal vowel
ee	eː	long close-mid front vowel
ęę	ẽː	long nasal close-mid front vowel
g	k	voiceless velar plosive
gh	ɣ	voiced velar fricative
h	h	voiceless glottal fricative
i	ɪ	short centralized closed front vowel
į	ɪ̃	short nasal centralized closed front vowel
ii	iː	long closed front vowel
įį	ĩː	long nasal closed front vowel
j	d͡ʒ	voiced post-alveolar affricate
k	k^{h}	voiceless aspirated velar plosive
k’	k’	ejective velar plosive
l	l	lateral approximant
m	m	bilabial nasal
n	n	alveolar nasal
o	ɔ	short open-mid back vowel
ǫ	ɔ̃	short nasal open-mid back vowel
oo	oː	long close-mid back vowel
ǫǫ	ɔ̃ː	long nasal open-mid back vowel
s	s̺	voiceless (apico-)alveolar fricative
s̲	s̪	voiced (lamino-)dental fricative

Orthography	IPA	Phonetic Description
t	tʰ	voiceless aspirated alveolar plosive
t’	t’	ejective alveolar plosive
ts	t͡s̺	voiceless (apico-)alveolar affricate
ts’	t͡s̺’	ejective (apico-)alveolar affricate
t̲s̲	t͡s̺	voiceless (lamino-)dental affricate
t̲s̲’	t͡s̻’	ejective (lamino-)dental affricate
u	ʊ	short centralized closed back vowel
uu	uː	long closed back vowel
w	w	bilabial approximant
x	x	voiced velar fricative
y	j	palatal approximant
yh	ç	voiceless palatal fricative
z	z̺	voiced (apico-)alveolar fricative
z̲	z̻	voiced (lamino-)dental fricative
’	ʔ	glottal plosive

Note that high lexical tone is marked by the acute accent (á), while low lexical tone is not marked in the orthography. Falling lexical tone is marked by an acute and a vowel without diacritic (áa) on long vowels or by a circumflex on short ones (â).

A.2 Family Tree

A family tree showing the whole Athabaskan family with all subbranches is shown here, following Goddard (1996).


Athapaskan-Eyak-Tlingit
Athapaskan languages
Eyak
Tlingit
Apachean
Eastern Apachean
Western Apachean
Kiowa Apache
Jicarilla
Lipan
Navajo
Western Apache
Mescalero-Chiricahua
Pacific Coast Athapaskan
California Athapaskan
Oregon Athapaskan
Hupa
Mattole
Eel River
Cahto
Upper Umpqua
Tututni
Galice Applegate
Tolowa
Kwalhioqua-Clatskanie
Central British Columbia
Nicola?
Chilcotin
Babine-Carrier
Babine
Carrier
Northwestern Canada
Chipewyan
Mackenzie
Dogrib
Slavey-Hare
Slavey (Slave)
Mountain
Bearlake
Hare
Cordillera
Southeastern Cordillera
Beaver
Sekani
Central Cordillera
Kaska
Tagish
Tahltan
Central Alaska-Yukon
Kutchin-Han
Kutchin
Han
Tanana-Tuchone
Tuchone
Northern T.
Southern T.
Tanana
Lower Tanana
Tanacross
Upper Tanana
Upper Kuskokwim
Koyukon-Ingalik
Ingalik
Holikachuk
Koyukon
Southern Alaska
Tenaina
Ahtna
(based on Goddard 1999)
Sarcee & Tsetsaut are yet to be classified.

A.3 Abbreviations

A list of abbreviations used in the present study iv fiven below, with general abbreviations on the left and glosses from the examples on the right.

AM	Autosegmental Metrical Theory
asp.	Aspirated
BI	Break index
CB	Central Beaver
DRB	Doig River Beaver
G	Given
H	High
HRB	Halfway River Beaver
Hz	Hertz
IP	Intonational phrase
ip	Intermediate phrase
L	Low tone
LB	Low marking Beaver
ms	Milliseconds
N	Nasal (in ch. 5)
N	New (in ch. 7)
NAB	Northern Alberta Beaver
PA	Proto-Athabaskan
SB	Southern Beaver
sd	Standard deviation
T	Tone
TBU	Tone bearing unit
unasp.	Unaspirated
V	Vowel
VOT	Voice onset time
VTT	Voice termination time
YNQ	Yes-no question

1	First person
2	Second person
3	Third person
clf	Classifier
dem	Demonstrative
dim	Diminutive
dir	Directional
fut	Future
impers	Impersonal
incep	Inceptive
interj	Interjection
lex	Lexical prefix
neg	Negation
opt	Optative
perf	Perfective
poss	Possessive
ptcl	Particle
rec	Reciprocal
sg	Singular

A.4 Stimuli

Most of the stimuli were created by the author, for others, stimuli kits were used, or for yet others, existing stimuli were adapted and reassembled. In the following, materials used in recording data is presented.

A.4.1 Maps

For the maptasks two sets of simple maps were created with only seven and eight items on them. The set-up was as described in e.g. Anderson et al. (1991), but the participants were told beforehand that the maps would differ in some points as to limit confusion. The item on the maps, together with their translation are listed below.

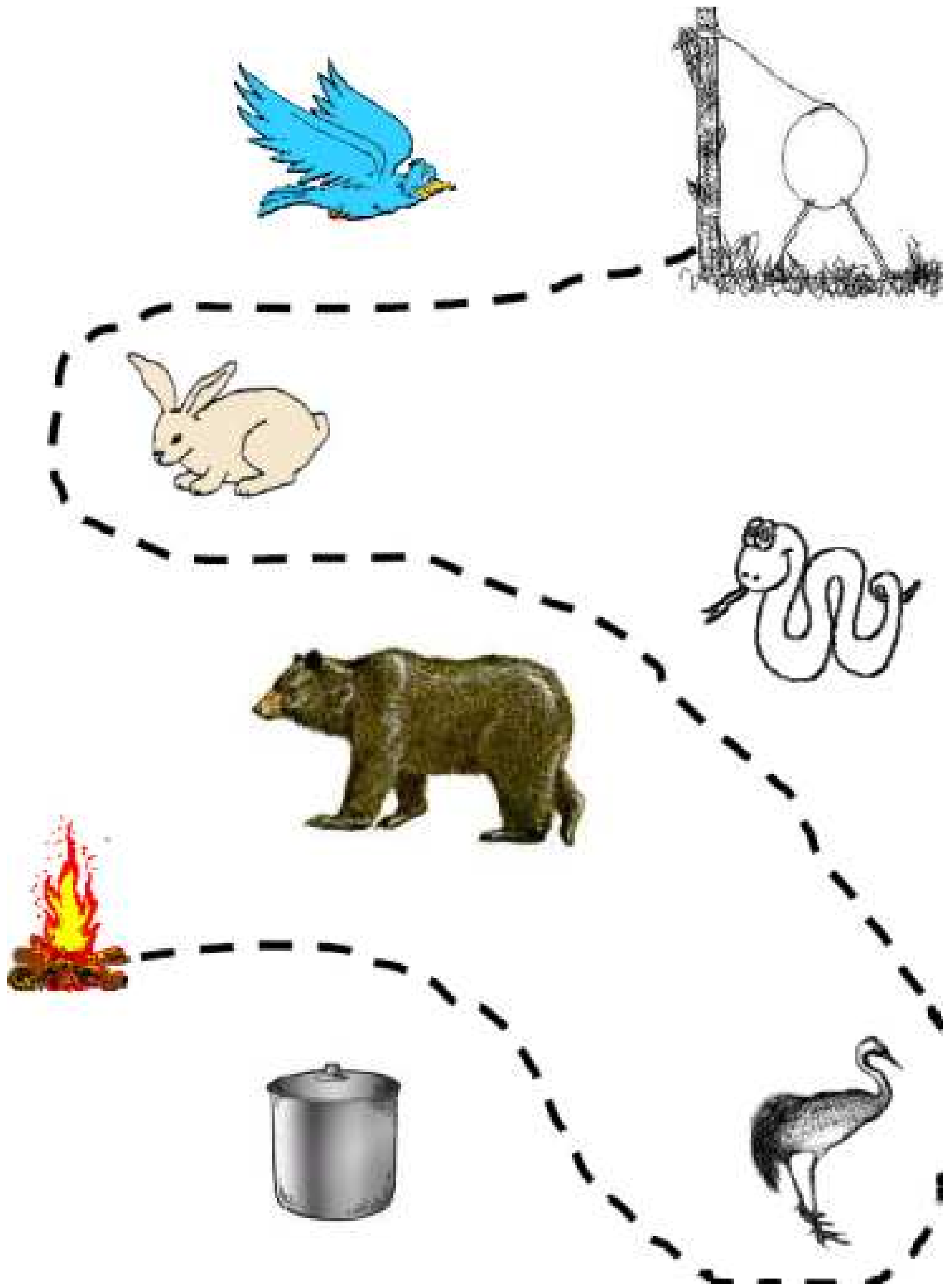


Figure A.1: Map for the maptask for the giver with the path.

Figure A.2: Map for the maptask for the follower without the path, some items are different.

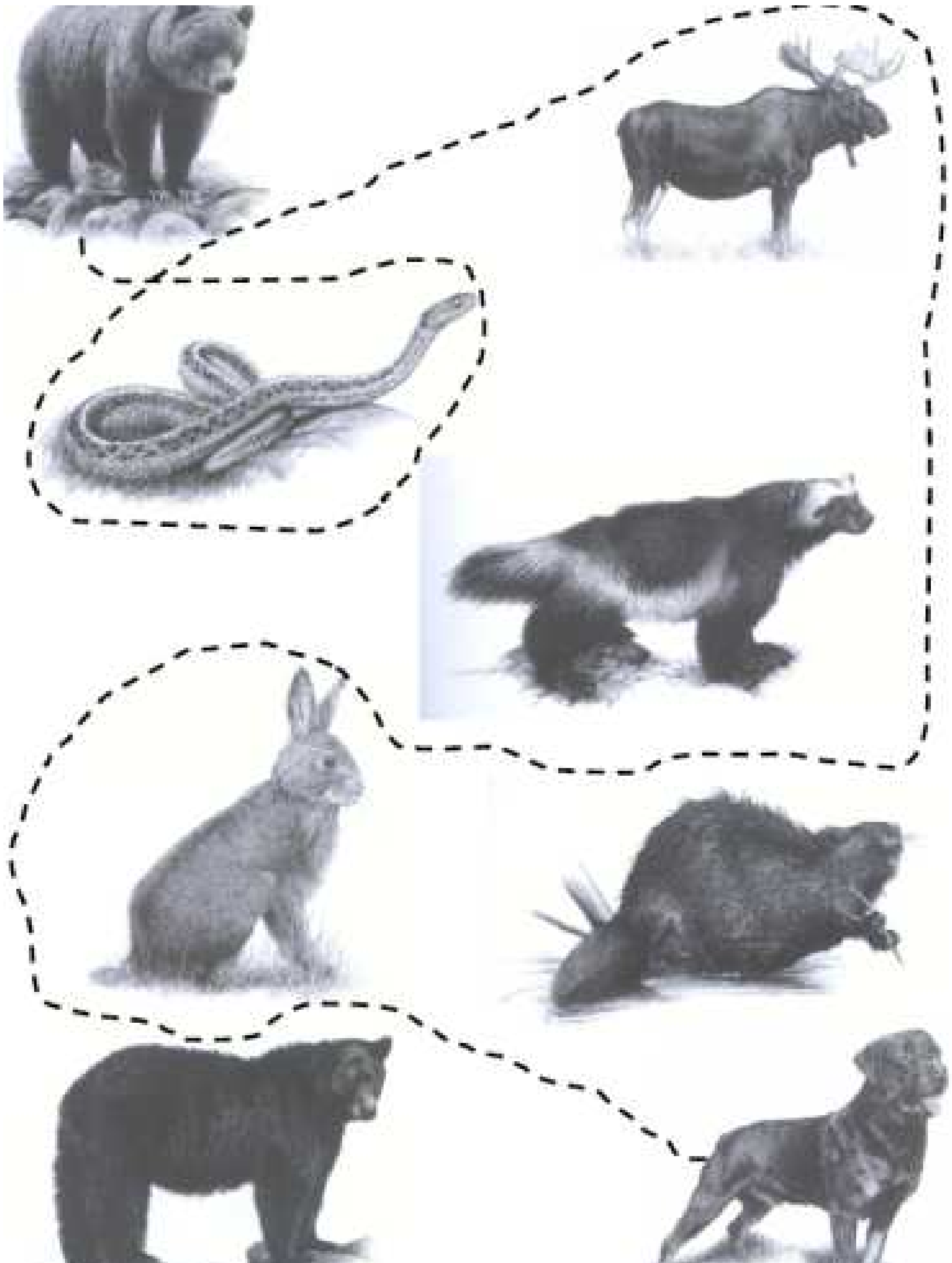


Figure A.3: Map for the second maptask for the giver with the path.

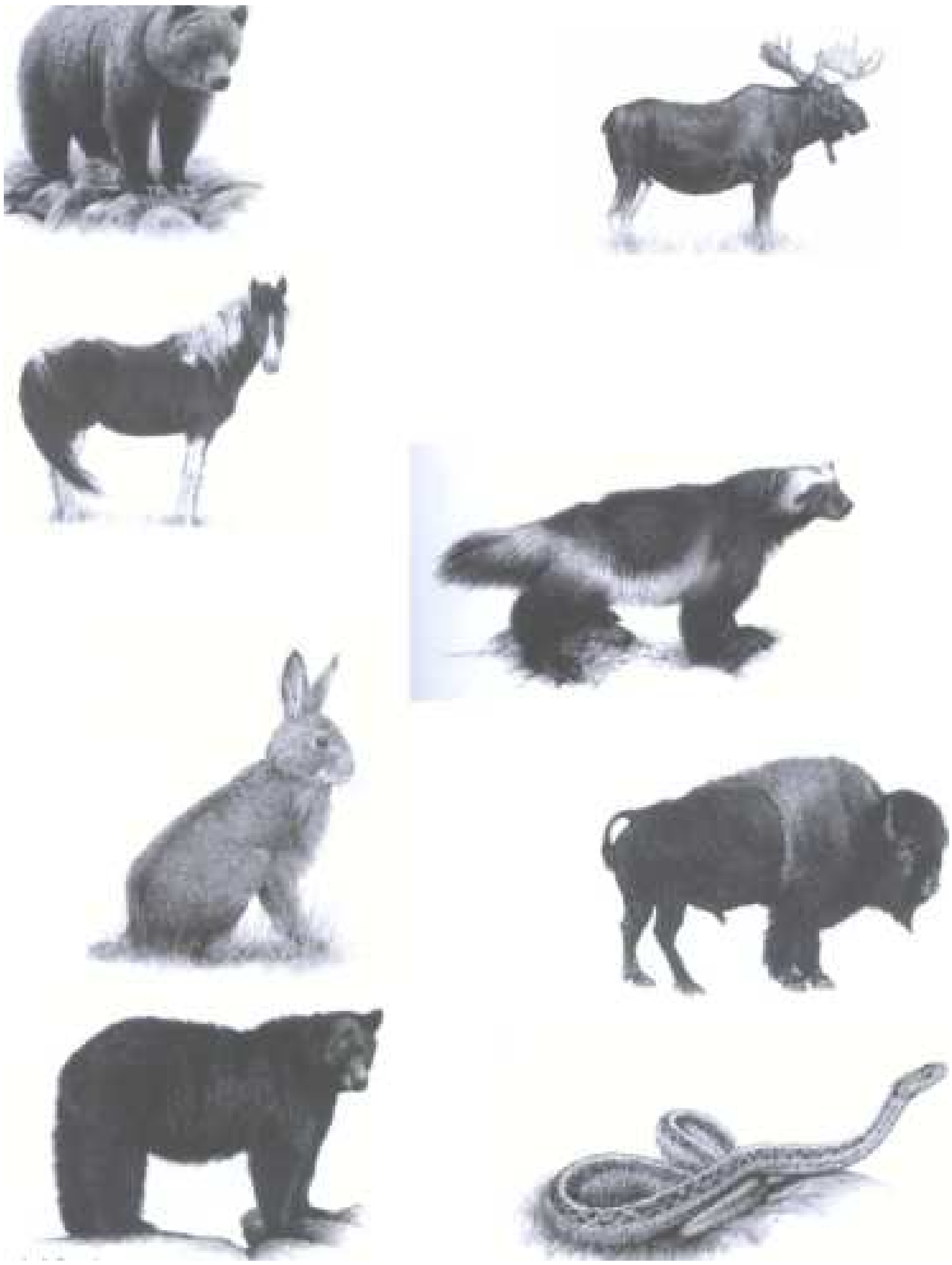


Figure A.4: Map for the second maptask for the follower without the path, some items are different.

A.4.2 Animals

For all the “Animals” tasks, pictures from the QUIS manual were used, for some adapted or rearranged. In the first task the procedure was used as described in the manual, the others are inspired by other sources.

A.4.2.1 Animals for Monologic Tasks

For the monologic animal task pictures from the QUIS manual were taken and used as described there (Skopeteas et al. 2006). The animal pictures were slightly adapted since the color terminology in Beaver lead to some complications with green items, because traditionally, there is only one word for blue/green. A compound that has probably been introduced later as a result of contact with French and English wich means “like a leaf”, i.e. “green” and not blue can in addition be used. Speakers tended to hesitate when they had to disambiguate, so that the colour green was eliminated from the set-up and instead some black animals were added.

The speakers were presented with the stimuli either on individual cards or on a laptop screen, and asked to describe what they saw. For the first items, sometimes a more detailed description had to be asked for, since speakers would only name the animal and did not also spontaneously include colour and size.

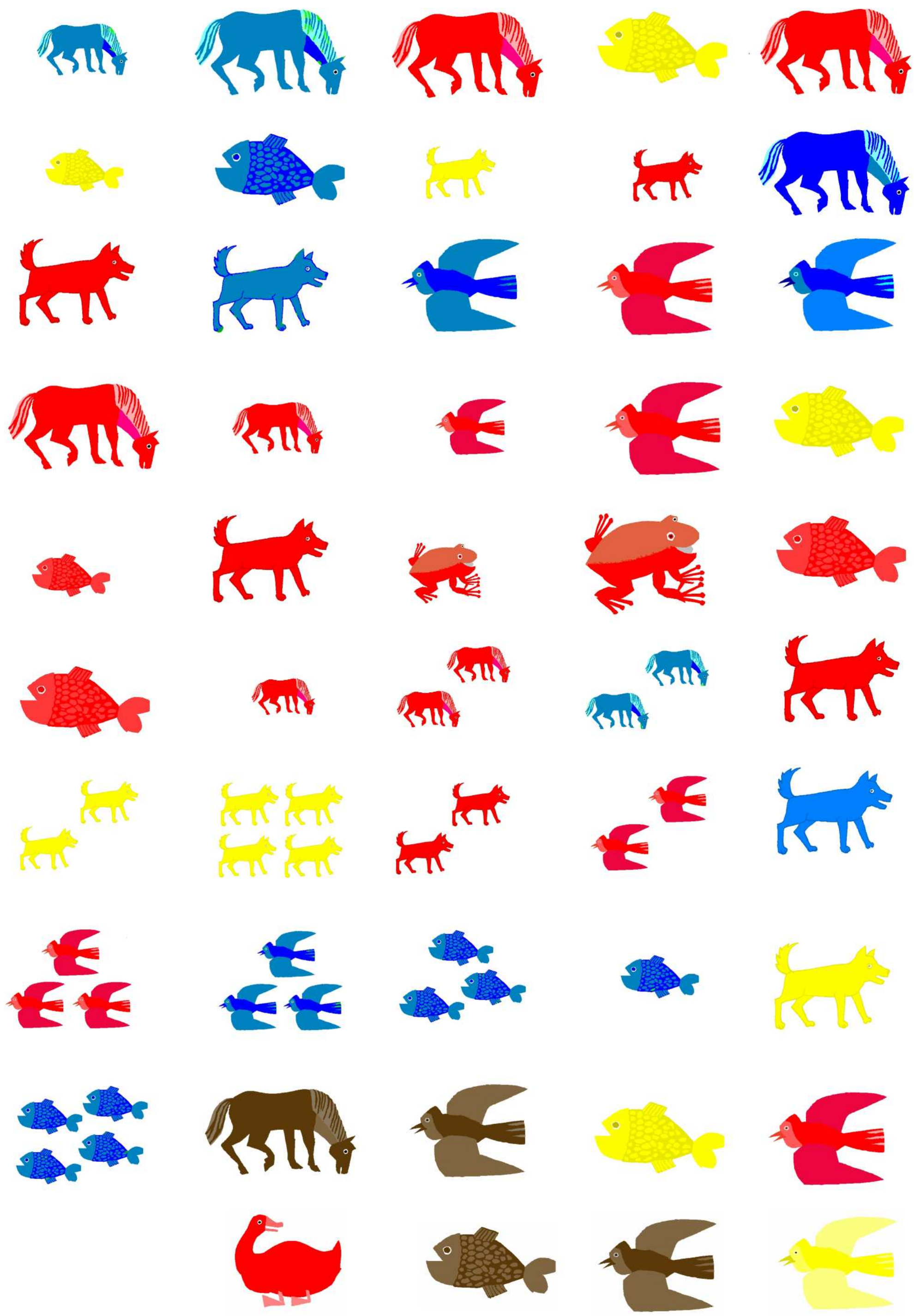


Figure A.5: All pictures included in the adapted animals set-up. The original pictures were taken from Skopeteas et al. (2006) and modified for color.

A.4.2.2 Animal-Bingo

The “Animal-bingo” set-up was created using some of the pictures from the Animals set-up and arranging them into a bingo grid. Some pictures were doubled. These charts were printed out and one speaker was asked to cross out the pictures that were announced by the other speaker. The other speaker was supplied with the set of cards from the above adapted animal game and asked to announce which picture he was seeing just like the numbers are announced in a bingo-game. This set-up created some interaction between the speakers since the follower needs detailed information if she is to know what to cross out.

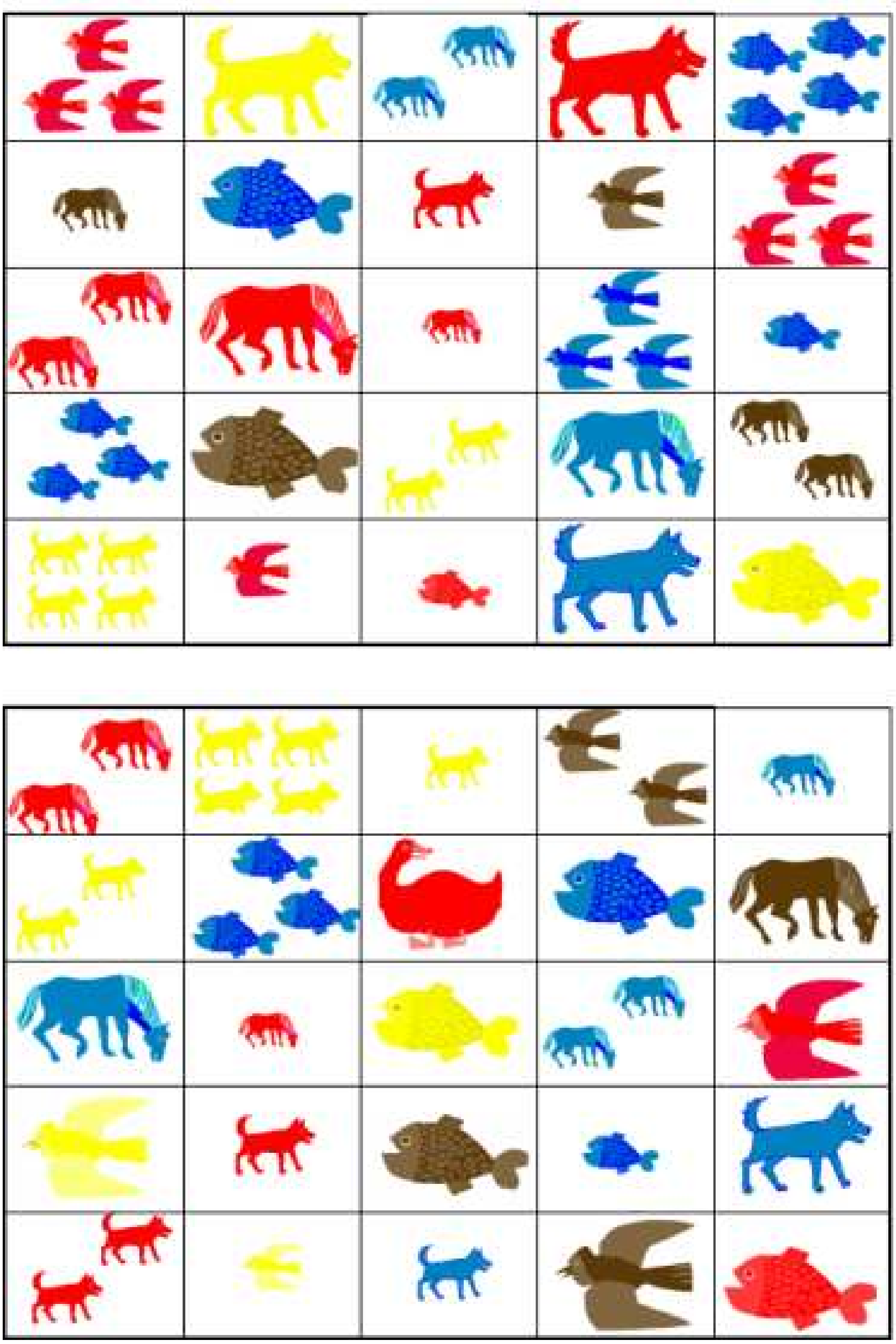


Figure A.6: Animals bingo.

A.4.2.3 Locations

This set-up was inspired equally by the traditional maptasks and by the "static localization" task in the QUIS manual (Skopeteas et al. 2006). One is using the adapted colored animals from the games above, the other is using a different set of pictures. For each game, there is a map with a river with lots of other pictures arranged around it and there is a map with nothing but this river. The giver has the map with all the information, i.e. all the pictures on it while the follower has the empty map and a set of cards with possible candidates that could be included in the map. The follower takes a card from the stack and asks the giver if it is in the map and if yes, where. According to the directions, she either places it on her map or discards it.

Figure A.7: A static location map with the animals for the giver.

Figure A.8: A static location map without any animals for the follower.

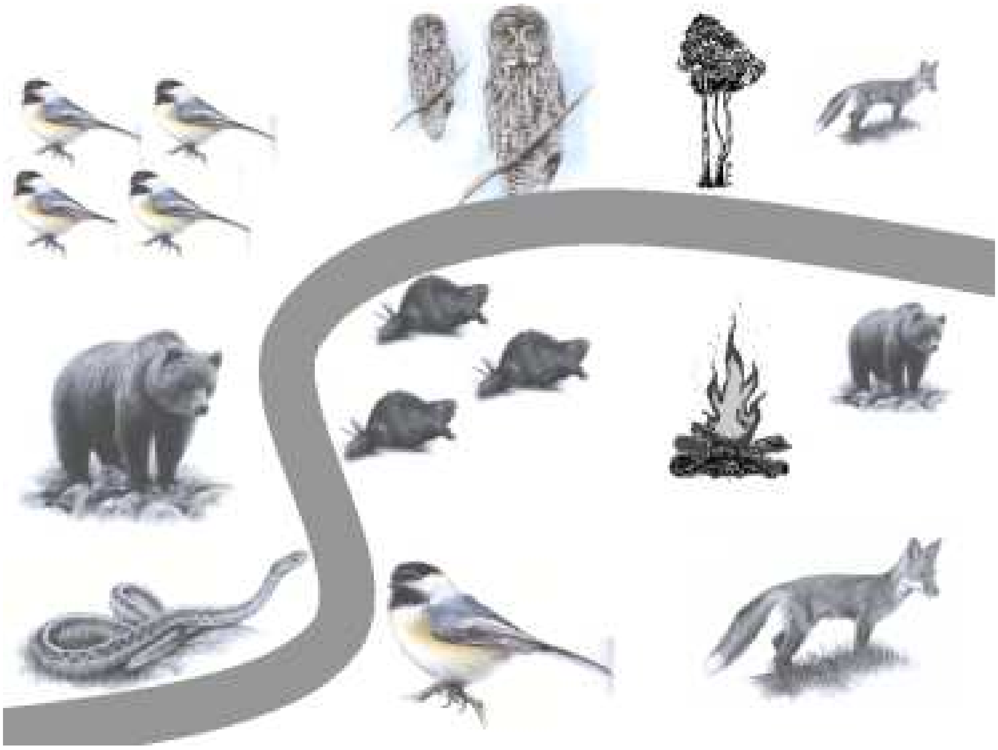


Figure A.9: A static location map with the items for the giver.

Figure A.10: A static location map without any items for the follower.

A.5 Media Access

On the CD accompanying this thesis, the wave-files of the examples used can be found together with a TextGrid-file which can be opened in praat to listen to the sound together with the annotations. The files are saved under the names found on top of the figures, such as e.g. “MSfisher31”.

All media-files are archived in the Beaver Documenation (Jung et al. 2004–present) in the DoBeS-archive where the uncut and cut files will be made available under the following link:

http://corpus1.mpi.nl/ds/imdi_browser?openpath=MPI580331%23
The persistent identifier for this node in the archive is:
1839/00-0000-0000-0008-DAEB-5
This can be accessed via:
http://hdl.handle.net/1839/00-0000-0000-0008-DAEB-5

Transcripts of the used files are also accessible in the DoBeS-archive. They can be found under the same links as the media above. All media used in this study have been collected by the DoBeS-project for the documentation of Beaver. Most of the data were recorded by the author, the ones recorded by other members of the team were used with their permission and are indicated below:

Dagmar Jung recorded or was present at the following recordings: PMstars, *MSfrogstory, *BGworld, MSfisher, and *JDlife.

Olga Lovick recorded or was present at the following recordings: *MSbear, *MSsun, PMmudhen, *JDbannock, and MSfisher.

The stories marked by the star were transcribed by Dagmar Jung or Olga Lovick respectively, or by one of them together with the author. I want to thank them both for letting me use these data in this thesis.

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Die von mir vorgelegte Dissertation ist von Prof. Dr. Martine Grice betreut worden.

(Gabriele Müller)