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THE PRODUCTION AND COMPREHENSION OF TONE IN INNU

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RESUME

Plusieurs auteurs ont attesté l'emploi de *pitch* contrastif en innu, une langue qui fait partie de la branche centrale des langues algonquiennes. Il n'y a pourtant que trois études acoustiques de ce phénomène prosodique (Rochette et Guay 1975, Martin 1980 et Malo 1981), qui portent toutes uniquement sur des formes flexionnelles verbales du dialecte de Mingan et qui ont produit des résultats contradictoires. Jusqu'à maintenant, on a porté très peu d'attention aux autres emplois des tons dans cette langue. Seuls les travaux de Drapeau (1979 et 2006) et Drapeau et Mailhot (1989) rendent compte de ce phénomène et de son origine dans le dialecte de l'Ouest, mais les analyses acoustiques restent à venir. Dans le but de fournir des données phonétiques synchroniques, qui permettraient de confirmer l'existence et l'emploi des tons dans le dialecte de l'Ouest, et pour connaître les éléments phonétiques qui jouent dans la production de ce phénomène, nous avons choisi d'effectuer un test de production et un test de compréhension auprès de plusieurs locuteurs natifs de deux communautés innues (Betsiamites et Sept-Iles). Nos résultats démontrent l'existence d'un ton bas sur la syllabe finale des mots qui ont subi le processus d'apocope ou celui de dégemination des consonnes en finale de mot.

MOTS CLÉS: phonétique, ton, pitch, innu

RESUME

The use of contrastive pitch in Innu, a Central Algonquian language, has been documented by several authors. There are, however, only three acoustic studies of this prosodic phenomenon (Rochette and Guay 1975, Martin 1980 and Malo 1981), all of which uniquely address certain flexional forms of verbs in the Mingan dialect, and which have produced contradictory results. Until now, very little attention has been paid to other uses of tone in this language. Only works by Drapeau (1979 and 2006) and Drapeau and Mailhot (1989) acknowledge this phenomenon and its origins in the Western dialect, but the acoustic analyses remained to be carried out. In order to provide synchronic phonetic data, and in order to identify the phonetic elements that play a role in the production of this phenomenon, we carried out a production test and a comprehension test with several native speakers from two Innu communities (Betsiamites and Sept-Iles). Our results indicate the presence of a low tone on the final syllable of words that have undergone a process of apocope or degemination of consonants in word-final position.

KEY WORDS: phonetics, tone, pitch, Innu

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CHAPTER I

INTRODUCTION[1]

The use of contrastive pitch in Innu has been documented in several sources (Mailhot, 1975; Rochette and Guay, 1975; Ford, 1976, 1983; Drapeau, 1979; Martin, 1980; Malo, 1981; Cowan, 1983; Drapeau and Mailhot, 1989; Drapeau, 2006). In an attempt to add to our understanding of the production and perception of tone in the Western dialects, this research examines Innu tones in their various phonetic, phonological, morphological, and grammatical contexts by way of acoustic analyses facilitated by the Praat computer program. We will also examine the comprehension of these tones by native speakers in order to better illustrate that it is indeed a case of tones and not only the larger context that enables speakers to discern between certain lexical, phonological and morphological forms.

First, we will begin with an overview of the terms necessary to discuss tonology and its associated phonetic analyses. Next is a survey of prior studies of tone production and perception (sections 2.1 to 2.4), followed by the outline of previous work done specifically on tone and the Innu language and how this present study hopes to further contribute to our understanding of tone in Innu (chapter 3). The following chapter will explain the methodology employed for the production test, the perception test, and the analysis of the data obtained during these two tests (chapter 4). This is followed by the results themselves (chapter 5), a discussion of the implications of these findings (chapter 6) and the conclusion (chapter 7).

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1.1 Brief Overview of the Innu Language

Innu, also known as Montagnais or Innu-Montagnais, is a member of the Algonquian language family spoken in Central and North-Eastern Quebec. Following Drapeau (2006), Innu is spoken by the following bands (cf. the map in Appendix A):

- *Mashteuiatsh* situated close to Roberval (Lac St-Jean);
- *Betsiamites* situated between Forestville and Baie Comeau along the St-Lawrence River;
- *Uashat* (Sept-Iles) and *Malioténam*;
- *Matimekosh* (Schefferville);
- *Ekuantshit* (Mingan) on the Lower North Shore of the St-Lawrence River;
- *Natuashkuan* (Natashquan) on the Lower North Shore of the St-Lawrence River;
- *Ulamen-Shipit* (La Romaine) on the Lower North Shore of the St-Lawrence River;
- *Pakau-Shipit* (St-Augustin) on the Lower North Shore of the St-Lawrence River;
- *Sheshatshit* (North West River band) in Labrador, close to Goose Bay.

The dialects of Betsiamites, Sept-Iles, Schefferville and Mashteuiatsh may be referred to as the Western dialects and dialects from the other bands (i.e. from the Lower North Shore) may be referred to as the Eastern dialects. The research presented herein relates to the Betsiamites and Sept-Iles dialects only, although they will be referred to generally as 'the Western dialects' unless it is necessary to refer to them separately.

Although the dialects of Betsiamites and Sept-Iles may both be categorized as Western dialects, there are nevertheless differences among them. For one, the Betsiamites dialect retained the distinction between /n/ and /l/ from Proto-Algonquian (PA), whereas the Sept-Iles dialect has merged PA **l* and **n* to simply /n/ (Drapeau, 1979). For example, the word for 'raspberry' in the Betsiamites dialect is pronounced [lu:ʃkən], whereas in Sept-Iles it is pronounced [nu:ʃkən].

Many sound changes set the Western dialects apart from the Eastern dialects. One of the innovations of the Western dialects is apocope, so that while a speaker from a Western dialect would say /màt_/ ('if he cries'), a speaker from an Eastern dialect would say /ma:ti/ (Drapeau and Mailhot, 1989).

1.2 Innu Grammar

Tone in Innu is associated with many grammatical forms. A complete list may be found below (section 3.3), but a bare-bones overview of Innu grammar is necessary, especially for those who are unfamiliar with Innu, in order to follow along with the subsequent discussions.

1.2.1 Gender

Algonquian languages assign one of two genders to nouns: animate or inanimate (cf. Bloomfield, 1946; Wolfart, 1973). The term "inanimate" designates, in general, something that is inert, and "animate" designates something alive. However, as Drapeau (1979) specifies, the assignation of these terms is largely arbitrary. Drapeau (1979: 50) notes that [u:ʃ] 'canoe' is inanimate while [əpwi] 'paddle' is animate; [utejmənan] 'strawberry' is inanimate but [luʃkən] 'raspberry' is animate. The singular form of nouns is unmarked and the plural is marked, both forms depending on the gender and obviation of the noun.[2]

1.2.2 Verb Classes and Orders

In keeping with the above gender distinction, verbs must agree with their associated arguments, be they subject or object. Thus, an animate intransitive (AI) verb agrees with its animate subject; an inanimate intransitive (II) verb agrees with its inanimate subject; a transitive animate verb (TA) agrees both with its animate subject and animate object; and finally, a transitive inanimate (TI) verb agrees with its animate subject. There are a few exceptions to this general categorization, but they are not relevant to the present discussion (cf. Wolfart, 1973).

These four classes of verbs are then inflected based on three possible orders: independent, conjunct, and imperative. Generally speaking, the independent order forms are used mainly in declarative sentences, the conjunct order mainly in subordinate constructions and the imperative order for commands (Drapeau, 2006). As Drapeau explains, "This characterization is far from systematic and the distribution of the independent order forms and the conjunct order forms is a complex one to describe in [Innu]. But for the present

[2] Obviation is discussed below.

purposes, it is important to keep in mind that verb inflections come in different sets of paradigms depending on the 'order' of forms mandatory in a given morpho-syntactic context."

Drapeau (2006) also mentions that "all TI verb stems end with a theme sign, the shape of which depends on the cell in the inflectional paradigm. The theme sign is /-a-/ in the imperative 2 form. As it is not clear just what the TI theme sign[3] signals, one may best describe it as a class marker attached to a specific class of verb stem finals."

1.2.3 Obviation

A further dichotomy in Algonquian grammar is that of obviative and proximate. "Whenever two 3rd person arguments are found in the same sentence one of them will be proximate (the unmarked form in [Innu]) and the other will be marked for obviation. By and large, it seems accurate to say that the proximate element is in focus and the obviate is not (see Wolfart 1973). Contrasts in obviation are found in nouns, pronouns, and verbs" (Drapeau, 2006).

[3] Some authors however (see Ellis, 1971) appear to construe the TI theme as part of the inflection of the verb, but Drapeau (2006) does not favour this analysis.

CHAPTER II

BACKGROUND AND OVERVIEW

In order to partake in a discussion of prosodic phenomena, one needs a clear idea of what exactly separates one phenomenon from another, such as pitch, pitch-accent, accent, stress, stress-accent, intonation and tone. While many terms associated with pitch differences were once used as synonyms in some of the literature relating to this topic, authors have steadily moved towards more precise distinctions in the light of newer research. As we will see, the difference between these terms is not always crystal clear and some define one term by means of another, creating somewhat circular explanations. This chapter is intended to clarify (a) how the following terms will be used throughout this study; (b) how they relate to the question of contrastive pitch in Innu; and (c) why it is justifiable to conduct a phonetic study of tone in Innu using only measurements of pitch.

2.1 Fundamental Frequency and Pitch

Fundamental frequency (F_0) is a purely phonetic term, indicating "how many pulses per second [the signal contains], measured in Hertz (Hz) where one Hz is one cycle per second" (Yip, 2002: 5, 289 (among many others)). Traditionally, the primary *acoustic* correlate of pitch is maintained to be F_0, as assert authors such as Yip (2002), Gandour (1978: 41) and Bolinger (1958: 110, 111), among many others. One way of expressing the relations between the two is to say that as the F_0 of an utterance changes, so does its *measurable* pitch. Nevertheless, a distinction between F_0 and pitch in general is necessary because a change in F_0 does not automatically constitute a change in *perceived* pitch. As Nooteboom (1997, p. 642) states, "pitch is the *perceptual* correlate of F_0, the fundamental frequency or repetition frequency of a sound. One should be aware, however, that rather often the notion "pitch" is used to refer to F_0 or the repetition frequency itself."[4] In the present work we will only

[4] Emphasis on "perceptual" added.

distinguish between "measured pitch" and "perceived pitch" where necessary; otherwise, the term "pitch" is used in order to include both these meanings, as is common in the literature.

2.2 Tone, Pitch-Accent, Accent, Stress, Stress-Accent and Intonation: Phonetic Criteria

Since this is primarily a phonetic study of contrastive pitch in Innu, let us first begin by distinguishing in phonetic terms those phenomena associated with pitch, namely tone, pitch-accent, accent, stress, stress-accent and intonation. Pitch is the common denominator of all these phenomena, present in every phonetically-based definition, as we will see below, and so may be considered to be an ineffective criterion when trying to differentiate between them. In keeping with Hyman (1978: 2), we agree that "if pitch is of equal importance in the realization and perception of both stress and tone, the two clearly cannot be distinguished on the basis of the phonetic correlates alone. Apparently this also applies to secondary features such as glottalization, breathiness, stoppedness, etc., which also have been known to characterize both tone and accent." Stress-accent, pitch-accent and intonation could also be added to the list. However, Hyman (ibid.) maintains that "pitch remains the general acoustic signal for what we refer to as tone (or tones) [...]" This is consistent with more recent sources that also associate pitch with tone, as indicated by every phonetic study about tone of which we are aware, which inevitably bases its findings in measured differences of F_0 (cf. for example Hombert et al., 1979; Gandour, 1978; Gandour and Harshman, 1978; Martin, 1980, etc.). In short, it is still reasonable to look specifically at F_0 with regards to tone.

Still from a phonetic point of view, pitch is also the most reliable cue for stress (Hyman, 1978: 2) following duration and intensity[5] (in that order), as established by the classic studies of English stress in Fry (1955; 1958). Bolinger (1958: 112) claims that "it is not pitch RISE, but rather pitch PROMINENCE, that is essential to what we react to as stress." "[The] primary cue of what is usually termed STRESS in the utterance is pitch prominence" (Bolinger, 1958: 149). Bolinger defines "prominence" as "a rapid and relatively wide departure from a smooth or undulating contour" (p. 112), and qualifies "pitch" by saying "Pitch has only one ingredient, the fundamental frequency of the voice" (Bolinger, 1958: 110). Bolinger is essentially stating that it is the "departure from a smooth or undulating contour" of the

[5] Intensity is "the physical term for the amplitude of sound waves, rather than *loudness*, the psychological impression that varies directly with amplitude" (Bolinger, 1958: 113).

fundamental frequency that indicates stress. Reprising these findings, Gussenhoven (2004: 17) summarizes that "[...] when it was first realized that stress is not correlated with overall intensity, it was on the basis of a demonstration that the most powerful cue for the perception of stress is F_0. [...] In addition, duration had an effect, while listeners were more confident if the quality of the stressed vowel was less schwa-like." According to Gussenhoven (2004), Bolinger (1958) "[demoted] intensity and duration to the role of quality-enhancing helpers, equating stress directly with fundamental frequency inflections. [...] Bolinger concluded that since stress is perceived predominately as a result of fundamental frequency obtrusions, and since intensity is such an ineffectual cue, the fundamental frequency obtrusions must themselves be stress." This is in keeping with Bolinger's definitions provided above.[6] Gussenhoven agrees with Bolinger in stating that it is a misconception that "stress amounts to a louder pronunciation of the word or syllable it is found on," but differs from Bolinger by adding, referring to Fry's experiments, that "A second misconception, one which originated with the above perception experiments, is that stress is realized by F_0. While *it is true that F_0 patterns provide powerful cues to the location of stressed syllables in many languages*, the presence and shape of these F_0 contours are independent of a word's stress pattern and instead depend on the intonational grammar of the language (Hayes, 1995; Sluijter 1995; Ladd 1996)" (Gussenhoven, 2004: 12-14).[7] He further remarks (p. 19) on the interplay between stress and intonation: "Clearly, native speakers [of English] do not perceive stress in terms of some invariable F_0 feature; rather, their perception amounts to a hypothesis about the complete prosodic structure of the utterance, which includes a choice of intonation pattern." Gussenhoven (2004: 14) then finds the phonetic attributes of stress to be: (1) that "vowels in stressed syllables have even intensity distribution across the frequency spectrum"; (2) "unstressed vowels are more schwa-like"; and (3) "consonants and vowels tend to be longer in stressed syllables." In summary, Gussenhoven appears to support authors such as Hyman, Bolinger, Beckman and Fry in saying that amplitude and intensity *alone* do not indicate stress, but differs (or perhaps is merely more precise) in saying that while F_0 does indeed

[6] See also Beckman (1986: 54) for a discussion of Bolinger.
[7] Italics added.

provide powerful cues, as upheld by the authors just mentioned, these are in turn dependent on the intonation of a given language and so F_0 is not a reliable indicator of stress on its own.[8]

Stress is often confused with accent due to these same phonetic attributes (i.e. pitch, intensity and duration). However, it seems extremely difficult to distinguish these two phenomena phonetically speaking, and so the vast majority of descriptions of accent that can be found call on phonological differences in order to compare it with stress (phonological aspects of these phenomena will be discussed in more detail in the following section). It is not just stress that can be confused with accent, but other prosodic phenomena as well, such as intonation. As Beckman puts it (1986: 5), "The organizational definition of accent rejects phonetic criteria for differentiating accent from intonation because the experimental literature on intonation and accent has shown the two systems to be inextricably linked together in the prosodic patterns of utterances." This echoes Gussenhoven's conclusions about the effect of intonation on stress, given above.

This brings us to intonation, which is inextricably linked to pitch, which has an acoustic correlate - F_0 - as explained above. T'Hart *et al.* (1990: 10) define intonation as "the ensemble of pitch variations in the course of an utterance." Gussenhoven (2004: 22) further remarks on the link between intonation and accent drawing from Pierrehumbert (1980) and Pierrehumbert and Beckman (1988): "Intonational tones appear either on (or near) accented syllables, in which case they are (intonational) pitch accents, or at the edges of prosodic constituents, like the intonational sentence, in which case they are boundary tones."[9] As mentioned above, Gussenhoven (2004: 14) does not see stress "in terms of some invariable F0 feature" - intonation will have an effect on its production and perception. As Gussenhoven says, there is no one phonetic criterion that can be singled out to differentiate intonation from stress or from accent; the perception and production of the pitch fluctuations of one will immediately affect the others.

The term 'pitch-accent' was first introduced by Bolinger (1958), who seems to view it as a certain sub-category of accent: "Listeners are therefore willing to accept the downward

[8] The importance of this will become evident later on with regards to why our analysis claims to have found tone, and why stress in the Western dialects of Innu does not factor into our analysis.
[9] We will return to the structural role of intonation further on.

syllabic prominence, but not always to interpret it as something 'stressed.' What emerges from this is that while prominence as such gives the accent, accents are of more than one kind. It is best then to speak of pitch accents, in the plural, and to look for kinships and differences" (p. 136). For Bolinger (1958), stress and pitch-accent are separate although linked, saying in his conclusion, "To avoid unwanted associations, it is better to speak of PITCH ACCENT and to leave the term STRESS to the domain of word stress. In the latter domain, one possible kind of phonemic stress is POTENTIAL FOR PITCH ACCENT" (p. 149).[10]

Pitch-accent should not be confused with stress-accent, a term introduced by Beckman (1986). According to Beckman's (1986) principal hypothesis, "stress-accent differs phonetically from non-stress accent in that it uses to a greater extent material *other than pitch*" (p. 1).[11] Further on, Beckman (1986: 4) remarks that "[in one sense], the stress-accent hypothesis is a trivial statement, since stress accent is obviously an accent system that uses stress levels *rather than pitch* to contrast words."[12] As we have seen, pitch is the primary correlate for stress, and is also related to accent, and so phonetically speaking, "stress levels," "accent" and "pitch" are inseparable, making this statement contradictory in terms of the work that preceded it. Gussenhoven's (2004: 47) interpretation of Beckman (1986) attempts to clarify this somewhat: "The term 'stress accent' was introduced by Beckman (1986) to refer to the situation in which the F_0 features co-occur with durational and other features to create prominence of a syllable, as in English. Beckman opposed it to 'pitch accent', which refers to the situation that exists in Japanese, where the F_0 features alone are responsible for signalling prominence. 'Accent' in this usage is thus equivalent to 'phonological prominence,'[13] and the labels 'stress' and 'pitch' indicate the way in which the prominence is achieved phonetically [...]"

These last few statements exemplify the danger inherent in defining one pitch phenomenon by means of another. If we are to understand that *only* F_0 features indicate the location of a "pitch accent," and Bolinger defines "pitch accent" as being a type of accent,

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[10] As Gussenhoven (2004: 17) parasentences Bolinger: "a stressed syllable is a syllable that has the *potential* for being pitch-accented."
[11] Italics added.
[12] Italics added.
[13] Not to be confused with Bolinger's use of "prominence," given above.

and accent shares the same phonetic criteria as stress, as shown above, then F_0 fluctuations must indicate all three, i.e. pitch accent, accent and stress. However, Beckman defines "stress accent" as "an accent system that uses stress levels rather than pitch to contrast words," but if we understand correctly that stress levels *and* accent are *primarily* indicated through various pitch manipulations, then Beckman's statement does not hold up.

It then appears that *phonetically* speaking, there is no obvious distinction between stress, stress-accent and accent, since, as we have seen, all three appeal to the use of pitch *in conjunction* with other criteria such as duration and intensity. Furthermore, if we are to believe that pitch-accent relies solely on F_0 in order to signal prominence, then, phonetically speaking, there is essentially no difference between pitch-accent and tone, according to the definitions of tone provided at the beginning of this section. Putting aside all the finer points of the terms defined in this section, it would appear that, generally speaking, the authors cited herein agree that the main acoustic correlate of all these phenomena is F_0, with other cues such as intensity and duration, should they present themselves, playing a secondary role. If they all share F_0 as a primary acoustic correlate, it can only be concluded that the significant distinction among all these prosodic phenomena must lie elsewhere. We therefore posit that this distinction can be found in their respective structural roles, i.e. within the phonology, morphology, and ultimately within the grammar of a given language.

2.3 Tone, Pitch-Accent, Accent, Stress, Stress-Accent and Intonation: Phonological and Morphological Criteria

There is an enormous amount of literature regarding the phonology of prosodic phenomena, and while it would require a copious amount of paper to do justice to all that has been written, we will presently attempt to ascertain the essential characteristics that will permit the differentiation of the same prosodic phenomena described in the previous section.

Both Yip (2002: 4) and Gussenhoven (2004: 38) draw on Hyman (2001) for their definition of a tone language, and we will follow suit: a language has tone if "an indication of pitch enters into the lexical realization of at least some morphemes." In a broader sense, Yip (2002: 1) defines a tone language as being one in which "the pitch of the word can change the meaning of the word," and later (p. 5) continues to say that "[tone] refers to a phonological

category that distinguishes two words or utterances, and is thus only a term relevant for language, and only for languages in which pitch plays some sort of linguistic role." The specification of the morphemic relation to tone in Hyman's definition is especially pertinent because as we will see later on, pitch contrasts in Innu may be used for grammatical purposes. We adopt the definition of Anderson for what is deemed to be a "grammatical purpose" (1978: 252): "By **grammatical assignment** of tone, I mean the morphological placement of a tone on a particular word or morpheme as the marker of a particular grammatical meaning. Many languages differentiate verb tenses/aspects in this way." As we will see, Innu is such a language.

So how does tone distinguish itself phonologically from the other prosodic phenomena described above? Beckman (1986: 1-2) posits that "Contrastive vowel length and tone seem to function primarily to distinguish one word from another that could have occurred in the same place. Their salient function is, in Trubetskoy's terminology, the distinctive one." She opposes this to *accent* which, "by contrast, seems to function less as a distinctive feature than as an organizational feature." She further remarks that in some languages, "accentual patterns can fill the distinctive function as well as the organizational function. Because of this possibility, it is not always easy to separate accent from tone." However, Beckman (1986: 32) later provides a phonological means to distinguish tone from accent:

> "[Tonal] contrasts as a rule develop when the pitch perturbations universally accompanying various consonants are exaggerated and then reinterpreted as the primary cues in a particular phonological opposition (see Ohala, 1974, 1978; Hombert et al. 1979).
>
> This generalization, however, is not true of accentual contrasts. I know of no instance in which an accentual contrast has developed historically from the phonological reanalysis of a segmental opposition."

Yip (2002) presents accent as a type of tone, phonologically speaking. She states "Accentual languages typically have a lexical contrast between tone and no tone, with each morpheme having a maximum of one tone or tonal complex whose location must be lexically specified, and even morphologically complex words often allowing only one tone to surface" (p. 258). She later puts forward her assumption that "'accentual' is a convenient descriptive term for a particular type of language in which tone is used in a rather limited way, with one (or perhaps two) tone melodies, either lexically linked to particular [tone-bearing units] or

perhaps attracted to a syllable selected as prominent by rhythmic principles" (p. 260). Gussenhoven (2004: 36), in keeping with his predecessors,[14] offers a different level of subtlety, using the term 'accent' to mean "a place marker for the insertion of tone or word melody." To summarize what we have seen thus far, "accent" may have an organizational role or a lexical role in a given language, although if its role is lexical, it may still be distinguished from tone (which is lexically specified) by way of a historical derivation of its origins. Furthermore, accent may indeed be a "place marker for the insertion of tone" but tone does not have such an *organizational* function; its role is purely distinctive.

Hayes (1995: 8) brings up the "lexical specification vs. organisational role" dichotomy in order to differentiate tone from stress, nicely tying their phonetic and phonological aspects together: "[Stress] is the linguistic manifestation of rhythmic structure. That is, in stress languages, every utterance has a rhythmic structure which serves as an *organizing framework* for that utterance's phonological and phonetic realization. [...] Stress, then, is essentially positional in nature. Its phonetic realization is extremely variable, including duration, loudness and pitch. Because pitch is one possible reflex of stress, it may be an important part of the final utterance, but it is not lexically specified." This distinction is again critical to separating out tone from the other pitch phenomena: *tone must be lexically specified.*

Beckman (1986: 1) also calls upon the absence of lexical specification to identify stress and accent. Following the statement of her initial hypothesis,[15] she specifies that accent and stress are phonological categories:

> "In the statement of the hypothesis, 'accent' means a system of syntagmatic contrasts used to construct prosodic patterns which divide an utterance into a succession of shorter sentences and to specify relationships among these patterns which organize them into larger phrasal groupings. And 'stress' means a phonologically delimitable type of accent in which the pitch shape of the accentual pattern *cannot be specified in the lexicon* but rather is chosen for a specific utterance from an inventory of shapes provided by the intonation system."[16]

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[14] For example: Hyman (1978) and Goldsmith (1976), as mentioned in Gussenhoven (2004: 36).
[15] "Stress accent differs phonetically from non-stress accent in that it uses to a greater extent material other than pitch" (Beckman, 1986: 1).
[16] Italics added.

This may entice us to pay unnecessary attention to the intonation of a given sentence when analysing its F_0, but as Pike (1957: 59) states, "Intonation contours are not confined to single syllables, and the same contour may at one moment spread over one syllable and at the next moment spread over half a dozen." Its variability would force intonation to be analyzed on a case-by-case basis.

Beckman (1986: 29), paraphrasing Chang (1958: 70), offers a more elegant way to distinguish tone, accent and intonation:

> "[...The] tones, like segmental phonemes, are integral to the morphemes; they 'affect the lexical value of words'. Hence they are easy to separate from intonation, which 'only adds' those parts of the meaning that are determined by the utterance's context rather than by its morphemic content.
>
> Accent, on the other hand, shares in the context-dependent, added-on quality of the rest of intonation. An accent pattern can be abstracted away from any specific utterance within which the pattern might fill its organizational capacity. But it is extremely difficult for the native speaker (and the linguist) to perform this abstraction completely."

2.4 Merging the Phonological, Morphological and Phonetic Criteria

Tone may be identified by its necessary lexical specification in at least some morphemes of a given language and by its lack of organizational function which is fulfilled by accent, stress and intonation. Tone can also be used grammatically in the morphology of a given language, and while accent may be lexically specified in some languages, and may indeed serve as a "place-holder" for tone, the development of accent will most probably never derive from underlying or historical phonological processes.

Hyman (1978: 4) puts stress-accent into a more concrete context, and points out the phonetic implementation of a given prosodic phenomenon will depend on the other structures present in a language: "Stress-accent implies that it is the 'intonational' features associated with a given utterance or utterance type [...] which solely account for the realization of the abstractly marked syllable. That is, in a stress-accent language, the accent has no physical properties of its own. In a tonal or pitch-accent language (like Japanese), in addition to the abstract accent, there is a constant physical property associated with the accent and which is distinct from (though possibly influenced by) intonational features." This resolves some of

the apparent confusion witnessed above in Beckman's definitions of stress-accent. Most languages exhibit accent, but we must keep in mind that it will be phonetically realized in different ways depending on the other prosodic phenomena it has to compete with. The same applies to all prosodic phenomena.

Along these lines, tone may also be picked out of the tangle of pitch fluctuations. One thing that is implied in the body of work dedicated to phonetic analyses of tone, and should not go unmentioned, is that there is always a *shape* associated with a given tone. Tones are most frequently described by the relative direction of pitch: rising, falling, level, high, low, etc. Although these are phonological categorizations and not phonetic descriptions, these labels are typically reflected in the measurable pitch contours realized during their production.[17] While stress, accent, stress-accent and intonation may be realized by varying pitch contours, the production of pitch changes associated with tone must be systematic and consistent. This shape, most often expressed by directionality, is implicit in the phonetic descriptions of tone languages since most of these have the advantage of already having been analysed morphologically and phonologically. Since the speakers of these languages (such as Mandarin, Yoruba, etc.) and the linguists who study them already take it for granted that there are tones, it is a relatively straight-forward task to focus on either a phonetic analysis or a morpho-phonological one. However, it is only thanks to the previous linguistic analyses that the phonetician already knows that the pitch phenomenon being measured is indeed tone. The challenge presented to us with Innu is that pitch phenomena in this language have not yet been fully categorized and analysed, phonetically or otherwise, and so we must first correctly ascertain if the pitch phenomena observed by certain authors (discussed in chapter 3) are cases of tone or some other phenomenon. Only then will we be able to correctly categorize measurements of F_0 and pitch patterns.

While contrastive pitch has been noted in various contexts in Innu, there has never been a study dedicated to describing its tonal inventory. In fact, Innu is not typically noted as a tone language, and the use of contrastive pitch has been largely overlooked except by a handful of

[17] Exceptions to this manifest in various tone sandhi, such as downstep, where a high tone may be phonetically produced at a lower pitch than a low tone due to the gradual decent in pitch over an utterance.

authors. Therefore, extra attention must be paid to identifying true pitch contrasts in this language before tackling the task of describing them, which is why the phonological criteria outlined in this section will play an important role in identifying actual cases of tone (according to the definitions herein) before continuing on to describe and analyse these contrasts phonetically. However, once we can say with certainty that a particular pitch shape is lexically specified in at least some morphemes of this language, we will be justified in looking only at measurements of F_0, as the phoneticians listed above have done when analysing other tone languages, even though F_0 may also be associated to other prosodic phenomena.

2.5 Factors Affecting the Production of Tone and Other Prosodic Phenomena

There are several factors simultaneously in play which affect how a tone may be produced and perceived. Any F_0 fluctuations may be a result of any combination of the following factors:

1. Intrinsic pitch or vowel quality: "Other things being equal, a high vowel such as /i/ or /y/ will have a higher F_0 than a low vowel such as /a/ (Peterson and Barney, 1952; Ladd and Silverman, 1984; Steele, 1986)." (Noteboom, 1997: 642)

2. Consonantal context: a vowel preceded by a voiceless consonant will have a higher F_0 than a vowel preceded by a voiced consonant (cf. Hombert et al., 1979).

3. Gender: for example, a high tone produced by a man can have a lower measured pitch than the low tone of a woman.

4. Age: for example, a young boy will have a higher pitched voice than a man.

5. Relative pitch: downdrift is a good example of how any given tone is relative to other levels of F_0 within a sentence. In a two-tone system, downdrift is essentially when a high tone after a low tone is produced at a lower measured pitch than preceding high tones. While the second high tone is indeed produced at a lower measured pitch than the first, it is nevertheless perceived as a high tone. It is the pitch of one tone-bearing unit (TBU) relative to the pitch of another that will indicate the appropriate type of tone to the listener.

6. Direction of slope: the difference between F_0 at the beginning of a vowel and F_0 at the end of a vowel determines whether a tone will be produced as a rising, falling, contour, or level.

7. Steepness of slope: this factor influences languages that make a distinction between tones that rise from low to mid (measured and perceived) pitch and tones that rise from low to high pitch, for example. Both would be produced as a rising tone, starting at more or less the same low pitch but with different final (high) measured and perceived pitch.

8. Length: the length of the tone-bearing unit may affect the realization of a given tone.

9. Amplitude: F_0 contours may be mirrored in amplitude, but as discussed above, there is not necessarily a direct correlation between the two.

10. Rapidity of change in F_0: the speed at which a speaker alters the F_0 of a given tone-bearing vowel will either facilitate the perception of that tone or make it more difficult. To my knowledge, there is no language that distinguishes between, say, "rapid tone" and "slow tone," but this factor still needs to be taken into account by a speaker when producing a tone so that it is not pronounced so quickly that the person with whom they are communicating cannot understand or perceive the tone.

11. Quality of voice: For example, the production of tone could be affected by creaky voice, breathy voice or harsh voice, among other types of phonation.

12. Temporal alignment of tone: a difference in "the time alignment of fundamental frequency excursions in relationship to segmental and syllable boundaries" (House, 2004: 1) may indicate the difference between a simple high tone and a rising tone. For example, a rise in pitch would have to begin closer to the onset of the tone-bearing unit and take less time to rise in order to indicate a high tone.

13. Sentence type or intonation: for example, interrogative sentences may exhibit raised pitch at the end of a sentence while declarative sentences tend to gradually lower in pitch towards the end (known as *declination* or *downdrift*).

2.6 Comprehension of Tone

Many of the factors listed above also influence the auditory discrimination of tones. In no particular order, they are: relative pitch, length, steepness of slope, direction of slope, amplitude, voice quality, rapidity in change of F_0, and vowel quality. We will not enter into a factor-by-factor discussion of the effects on perception here, but there are a few generally appropriate observations worth mentioning.

"The perception of tone must be dependent in whole or in part on pitch production, and thence on fundamental frequency" (Yip, 2002: 289), which is to say that F_0 is considered to be the most important cue to tone for tone *perception*, as well as production. The studies

surveyed in Gandour (1978) examining Thai, Mandarin Chinese, Yoruba and Swedish, all indicate that F_0 is the primary cue to recognising tone. Gandour and Harshman's (1978) cross-language study of Thai, Yoruba and English also maintain that the dimension of "average pitch" is the most important for the three languages when it comes to perception of tone. Yip (2002: 292) adds that "F_0 is indeed the primary cue for the discrimination of tones in natural languages [...]"

CHAPTER III

CONTRASTIVE PITCH AND INNU: MOTIVATIONS FOR THIS STUDY

To my knowledge, there have been only three acoustic and/or perceptual studies of pitch phenomena in Innu: Rochette and Guay (1975),[18] Martin (1980) for the Mingan and Natashquan dialects, and Malo (1981) for the Mingan dialect. Besides these sources, there are several others that mention contrastive pitch in several dialects of Innu: Mailhot, 1975; Ford, 1976, 1983; Vaillancourt, 1978; Drapeau, 1979; Malo, 1981; Cowan, 1983; Drapeau and Mailhot, 1989. Drapeau (2006) will constitute another significant study, since it will be the first and only of these studies to examine the emergence of tonal phenomena, or *tonogenesis*, across several Innu dialects, in all their morphological and grammatical aspects. However, to date, there is no phonetic description of pitch phenomena in the Western Dialects of Innu.

It is generally agreed that in the Western dialects of Innu, word stress occurs on the final syllable (e.g. Mailhot, 1975; Drapeau, 1979; MacKenzie, 1980; Martin, 1980; Malo, 1981; Cowan, 1983; Drapeau, 2006). This has sometimes been described with reference to a lengthening of the final syllable (cf. Ford, 1976; Mailhot, 1975). As we saw above (section 2.1.2), it is in fact pitch that is the primary acoustic correlate of stress, and so while length may very well play a (secondary) role in word stress in Innu, as it does in many other languages, the placement of word stress has caused some confusion with regards to the role of pitch contrast in Innu, which is also to be found in word-final position (e.g. Ford, 1976). As Cowan (1983) rightly points out, "[A] simple statement of stress is inadequate to characterize this since all words in Montagnais are stressed on the final syllable, whether they are inflected nouns or not." It is evident that clarification is needed with regards to word-final pitch fluctuations: is it a question of vowel length, word-stress, intensity, or indeed a proper tone?

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[18] This study will not be discussed further due to is inconclusive results.

3.1 Description of This Study: Main Research Objectives

The primary goal of this study is to provide a phonetic description of tone in all its various grammatical uses in the Western dialects of Innu. This was done using the Praat program to analyse the speech of six native speakers from the Western dialects. Measurements of the F_0 of vowels found in purportedly tone-bearing syllables were extracted, and while we have argued that F_0 alone is not evidence enough to unequivocally demonstrate a manifestation of tone (in any language), it will be shown through phonological and morphological criteria that the measured changes in F_0 in the Western dialects of Innu coincide with differences in meaning, and these changes in F_0 do indeed constitute a tone in the proper sense of the word.

The main questions to be answered by our research relate chiefly to the production of tone in the Western dialects: (1) Does a difference in F_0 between the final vowel of an utterance and the preceding vowel (belonging either to the same word or to a different word) signal a difference in meaning between words that are otherwise phonologically identical, as it is claimed? (2) If there is indeed a change in F_0 associated to these differences in meaning, is it a case of high tone, low tone, or some combination thereof? (3) What factors or traits of the production of tone in the Western dialects contribute to the distinction of these contrastive forms (for example, average F_0, degree of slope, direction of slope, etc.)?

In order to answer these questions, we needed to provide an accurate acoustic description of tone in Innu. Two studies of pitch contrasts in particular (Martin, 1980; Malo, 1981) provide acoustic analyses of the phenomenon for certain verb forms in the Mingan dialect. Martin (1980) examines the contrasts between the singular and plural forms of transitive animate (TA) and animate intransitive (AI) in the imperative mood with regards to 2-1 direct forms (p. 178);[19] Malo (1981) discusses Martin's work, noting both a rising and a falling tone in utterance-final position in the Mingan dialect (pp. 73, 79, 93) limited to the accented final syllable of certain morphological expressions. However, there is no complete inventory of grammatical uses of tone accompanied by phonetic analyses for each use in any one dialect,

[19] See above (section 1.2) for a brief description of relevant Innu grammar. "2-1" indicates who is implicated in the verb; for the imperative, "2-1" indicates the speaker addressing somebody in the second person, while the object is in the first person, e.g. "make (thou) me drink."

and all previous attention to pitch phenomena in Innu has been concentrated on the Eastern dialects. Our own production test (described in further detail in *Methodology*, chapter 4) will then serve to phonetically verify or falsify the stipulated uses of tone in the Western dialects as attested by Drapeau (2006) and other authors mentioned above. To paraphrase Martin (1980, p. 180), we want to know if there is truly phonological opposition between certain forms in Innu, and, whether there is or not, we want to know the phonetic parameters responsible for any purported pitch distinctions.

Once it can be determined that a change in F_0 is systematic and consistent with marking semantic contrasts, this change in F_0 will be described phonetically, namely in terms of relative pitch, direction of slope and degree of slope. We will attempt to ascertain whether the tone(s) are high, low, rising, falling, or other, by way of an acoustic analysis of the interior of a given potential TBU. As attested by Martin (1980) and Drapeau (2006), the said change in F_0 is expected to be found on the final vowel of a given word, and so the data ensuing from our analysis will either confirm or deny these observations.

Finally, once a satisfactory phonetic description has been provided for the phenomenon, it should be possible to determine which factors in the production of these tones are most vital to producing the (phonetic) distinction between contrastive forms.

In terms of perception of tone in the Western dialects, our main objective is simply to demonstrate that native speakers of these dialects are able to perceive a difference between the tone-bearing form and the toneless form of a given word. Perception and production are intimately connected because one would expect that those who are capable of producing tones are also able to perceive them, especially when choosing between two minimal words where the only distinctive feature present is the tone.[20] In other words, if native speakers do not use tone to distinguish between what would otherwise be a minimal pair, then they would be less likely to be able to perceive such distinctions in their own speech. To this end, a small comprehension test was carried out with the same six participants of the production test, in order to confirm that speakers can indeed distinguish between a tone-bearing form and a toneless form of a given word.

[20] See, for example, the quote from Yip (2002: 289) in section 2.2 above.

3.2 Secondary Research Objectives

Other information may also fall out of our analysis while answering the above questions. Among other things, we should be able to compare Martin's (1980) claims on the use of tone in the Mingan dialect of Innu. We will also be able to develop a clearer picture of the developing role of tone in the Western dialects. Is tone in these dialects purely phonologically motivated, or has it been morphologized, automatically occurring in specific grammatical contexts regardless of (and even in conjunction with) an already-present segmental morpheme? Is there any variation in terms of the use, the production or the perception of tone between dialects? These issues will be addressed in our *Discussion* (chapter 6).

3.3 Hypotheses

According to Drapeau (2006) a low tone in the Western Dialects is purported to indicate:

- "Plural in inanimate nouns and demonstratives as well as in inanimate intransitive (II) verbs (present indicative and present indirect mood forms of the independent order)
- Obviation in animate nouns and pronouns as well as obviation in animate intransitive (AI), transitive animate (TA) and transitive inanimate (TI) verbs (present indicative and present indirect mood forms)
- Duration in compounds indicating a measure of time (e.g. "during one month" as opposed to the same form in its non durative sense, "one month")
- Plural in II verbs in the conjunct order, in preterit forms of the independent indicative and indirect moods, and in the dubitative and subjective moods of the independent order
- Obviation in AI, TA and TI verb forms other than the independent order (present indicative and present indirect mood forms)
- Subjunctive mood (as opposed to the neutral conjunct forms)
- TA immediate imperative 2-1 (as opposed to TA immediate imperative 2-3 forms)
- AI and TI 2 immediate imperative forms"

Drapeau (2006) also lists several examples of words bearing lexical tone. These have no corresponding forms without tone and so are not contrastive. Many of these words are monosyllabic and must occur at the end of a sentence to be grammatical, which is subject to sentence-final lowering, and so do not readily lend themselves to an acoustic study of pitch, and therefore will not be discussed in the present study. The use of tone to indicate duration will also not be addressed in this study.

In terms of production, it is expected that the F_0 of the final vowel of a tone-bearing form will be systematically lowered in the grammatical contexts listed above, resulting in a low tone. In cases where a segmental allomorph is in free variation with a tone-bearing form, we expect that the allomorph will not bear tone. We also expect that 'low tone' will contrast with 'no tone,' as opposed to high, rising, falling or other types of tone, although it should be understood that these are relative terms and we do not suppose that there is an absolute low tone or a specific pitch target associated with low tone. It is also expected that the slope direction of the tone is less of a contributing factor when producing a tone. In terms of perception, or comprehension, we expect the speakers to be able to distinguish between forms bearing tone and those without tone.

CHAPTER IV

METHODOLOGY

According to Ladefoged (1997: 137-138), "There are four basic tasks in making a description of the phonetic structures of a language. First, one must decide what to describe; second, suitable speakers must be found; third, [...] the necessary phonetic data must be recorded and analyzed. Lastly the results must be written up as a coherent whole[...]" With these four tasks in mind, we will begin with a phonetic description of tone in two of the Western dialects of Innu: the Betsiamites and Sept-Iles dialects (i.e. the objects of the description). The selection of speakers is described below. The phonetic analysis of the data from a production test will serve as a basis for comparing tones found in their corresponding phonological and morphological contexts; and finally, the results and their analysis will be described and discussed, and these results will either support or contradict predictions made by the aforementioned authors as to the location of these tones, as well as our hypotheses.

4.1 Speakers

The data discussed in this study were generously provided by one man and two women of the Betsiamites dialect and one man and two women of the Sept-Iles dialect (six speakers in all). Speakers from these dialects were chosen specifically because the Western dialects tend to use tones in more contexts than the Eastern dialects, based on Drapeau's observations (2006). These six native speakers were chosen in part due to their more advanced age, ranging from 49 to 60 years of age, in the hopes that the homogeneity of an older age group would help rule out extraneous factors that could be suspected of influencing the data, and provide a sampling of speakers who were more fluent in the Innu language than younger generations. These particular speakers were also chosen due to their ability to speak both French and Innu fluently. Furthermore, all are literate in both French and Innu.

4.2 Production of Tones

In order to verify the purported uses of tone outlined in our hypotheses (section 3.3) and to explore our various research questions, the six speakers participated in a production test.

4.2.1 Description of Experiment

The list of sentences used in this production test, formulated by Lynn Drapeau and cross-checked by a native speaker,[21] was composed with several specifications in mind.[22] The sentences were intended to exemplify the various grammatical contexts in which tones are purported to be found in the Western dialects, and so only sentences deemed to occur in natural speech were chosen, avoiding any nonsensical or ungrammatical sentences. Attention was paid to the position of the tone in the sentence so that most do not have a TBU in a sentence-final position. This is to avoid confusing a low tone with the natural descent in pitch associated with a terminal prosodic boundary (e.g. the end of a sentence).[23] Several tones were kept in sentence-final position, nevertheless, in order to compare the frequency of a low tone in that position to the said natural lowering of pitch that usually accompanies the end of a statement. Some "unnaturalness" could not be avoided, however, in that, in some cases, a word that did not contain a tone had to be at the end of the sentence precisely to keep the tone-bearing word from ending a sentence.[24]

By way of a PowerPoint® presentation, participants were shown one sentence from the sentence list at a time with both Innu and French displayed on the computer screen. Both were written in their standard orthographies, except the Innu spellings were also marked for vowel length, which is not usually indicated in the standard orthography. This was done to facilitate the participants' reading. They were then instructed in French to read the Innu sentence out loud a total of five times, stopping for a few seconds between each reading, and for as long as they liked between each sentence. It was strongly emphasised that the participants should speak as naturally as possible, as they would when talking to friends or

[21] This native speaker is not among the six participants.
[22] The complete list can be found in Appendix B.
[23] Pike (1967: 57) mentions this phenomenon, as does Yip (2002), for example.
[24] Several speakers commented, for example, that *shâsh* 'already' sounded "odd" at the end of the sentence and would be more naturally found at the beginning, even though it was technically grammatically correct.

family. As with most interviewer-interviewee situations, the participant usually began hesitantly but became more relaxed as the experiment progressed. Reaction time is not an essential factor in this experiment and so participants were allowed to control the "slide show" rate themselves with the computer mouse or keyboard arrow keys. The sentence list consisted of 73 sentences and a "pause" slide was included every 25 sentences, although it was stipulated that participants could take a break whenever they felt the need to do so. Upon recording three of the participants, it was discovered that several contrastive sentences were not included in our list, and so they were added before testing the final three participants. These are sentences 72-75 inclusively. The complete list is provided in Appendix B as it was presented to the participants, except the words retained for analysis are underlined and the number of the contrastive sentence is indicated at the right. Any discussion of a certain sentence will be in agreement with the numbering in this list for ease of reference.

This method of presenting the sentence list was chosen for several reasons. For one, eliciting a response with the correct word order needed would have been rather hit-and-miss. Furthermore, asking the participants to repeat a sentence provided orally would have yielded unnatural pronunciations on their part, and may have suggested emphases that they would not have otherwise employed. Finally, the speakers may not necessarily have been comfortable enough with grammatical terminology to be asked, for example, "Please pronounce a transitive inanimate verb in the conjunct order with a third person plural subject," and then provide an immediate answer. It was decided to simultaneously provide the French translation along with the Innu sentence in an attempt to avoid ambiguous interpretations; for example, certain words are spelled the same way, the only difference in pronunciation being the presence or absence of a tone; without the French definition, the participant would not know which of the two forms to pronounce.

(1)	natutu mâ alu	natutu mâ alu
	[ndədu ma lu]	[ndədù ma lu]
	'listen to him already'	'listen to me already'

In this case, the sentence on the right bears a low tone on the final [u] of [ndədu] in order to distinguish it from the other form, but this is not expressed in the standard Innu orthography. The French translation proved to be a useful cue as to the desired form in Innu, and several speakers upon reading the French would comment aloud that they suddenly realized they had

been pronouncing an alternate form, and then proceeded to correct themselves, all without input from the interviewer. It was particularly difficult to find native speakers who could read both French and Innu well, and the standard orthography for Innu is far from transparent. While the participants did an admirable job of deciphering the nuances between sentences, there was, nevertheless, some misreading which could not be used in our analysis. The participants were only asked to repeat a sentence a sixth time should one of the other five repetitions contain superfluous background noise or a performance error such as stuttering or hesitation. The unwanted repetition was then excluded from our analysis and the sixth repetition kept in its place.

By presenting the sentences in this way, the speakers could not determine the goal of the experiment, and in doing so perhaps exaggerate certain pronunciations in order to create a clear yet unnatural contrast. In the interest of facilitating our analysis, we used minimal pairs wherever possible; however, in an effort to provide Innu sentences that were as natural as possible, it was necessary to occasionally modify the sentence containing a contrasting form in order to have an intelligible sentence.

4.2.2 Instrumental Methodology

The speakers were recorded using an *Audio-Technica* Pro24 table-top stereo microphone and a *TASCAM* DAT (digital audio tape) recorder, model DA-P1. Recordings were then transferred into a computer using Goldwave (version 5.10), an audio recording and editing program, running on a Windows XP platform, at a sampling rate of 22050 Hz and saved under a 16-bit PCM signed wave (.wav) file. The Praat speech analysis and synthesis computer program was then used to read these .wav files in order to generate spectrograms, segment the sounds, and to run the script[25] that was used to extract the pitch measurements in hertz (Hz).

[25] Thanks to Gérôme Aubin and Lucie Ménard for writing this invaluable tool.

4.3 Comprehension of Tone

In order to show that the contrastive forms verified in the production test were indeed understood and used by native speakers, a small comprehension test was carried out with the same six participants mentioned above.

4.3.1 Description of experiment

Participants listened to 17 sentences as pronounced in Innu by a 35 year-old woman from Betsiamites.[26] This woman was, however, aware of the goal of this test and we acknowledge the methodological oversight that this speaker may have exaggerated certain pronunciations. The participants only heard one of two contrasting forms so that they could not compare it to any other sentence in the test and therefore perhaps guess a correct response by process of elimination. The participants then circled one of two answers on a sheet that corresponded to the French equivalent of what they heard (see Appendix C for a list of the questions, with answers circled). A small pre-test was performed in November of 2005 with several speakers from various dialectal backgrounds. This included a third option ("(c) other") where participants could write what they heard if they heard something other than the two choices provided. This proved to be problematic as participants, if they wrote anything, would usually try to correct the translation of French from the Innu based on their own dialect. Thus, the test done with the six participants contained just two options.

Another limitation of this test was the difficulty in finding strict minimal sentence pairs. This task lent itself more to certain grammatical forms than others, for example, singular vs. plural inanimate forms. Some forms are marked directly by a suffix and so there would be no way to test whether comprehension was due to the presence or absence of a tone, or due to other markers in the sentence or on the word. Compare the following two examples:

(2) apu petâkanit ûsh eshk^{u}
[abu pedagən uʃ ɛʃk^{w}]
'we have not yet brought the canoe'

[26] This woman was not among the six speakers who participated in the production and comprehension tests.

(3) apu petâkaniht ûta eshk^{u}
[abu pedagən ut ɛʃk^{w}]
'we have not yet brought the canoes'

The presence of [t] or [ʃ] (in conjunction with [u-]) is sufficient to indicate the difference between the singular and plural forms for "canoe" ([uʃ] and [ut] respectively) without the presence of the tone on the [u-].[27]

"Klatt [(1973)] showed that pitch is easier to discriminate on a steady-state vowel than on a non-steady vowel, such as a diphthong, where formants change during the vocalic portion of the syllable." (Yip, 2002: 290). This may be pertinent should comprehension test results reveal any difficulty in perceiving a tone on, for example, two coarticulated vowels or semi-vowels, which often occurs in Innu.

4.4 Data Analysis For the Production Test

Each of the six speakers read between 71 and 75 sentences from the sentence list described above, repeating each sentence five to six times (totalling approximately 355-375 individual sentences), making for an approximate total of 2130-2250 pronunciations recorded. In other words, one sentence gives six individual sentences (one per speaker) which in turn are pronounced five times per speaker, so one sentence normally yields thirty pronunciations. Eight of these sentences were subsequently removed for various reasons, such as redundancy or not easily lending itself to analysis. Despite both the French and Innu translations of a given sentence being simultaneously presented to the speakers, it still happened on occasion that a speaker would misread what was on the screen and pronounce a grammatically different sentence than what was written. These misread sentences were omitted from the analysis. In addition to this, unfortunately, some recordings contained too much background noise thus rendering the signal too unclear to be measured for pitch by the Praat program, which was used to extract the formant values, and so these were also omitted from the analysis. 47 sentences were analyzed for all six speakers (282 individual sentences); 13 sentences were analyzed for just five speakers (65 individual sentences); 4 sentences were

[27] These pronunciations are of the Betsiamites dialect, Speaker 3. It should be noted that [ʃ] and [t] are not morphemes unto themselves.

analyzed for just four speakers (16 individual sentences); 2 sentences were analyzed for just three speakers (6 individual sentences); the grand total of sentences analyzed is 66, comprised of 369 individual sentences and approximately 1845 pronunciations. Of the 1845 pronunciations, some were removed when Praat was unable to correctly extract a value for F_0, so the total number of pronunciations is somewhat less than 1845.

Upon extracting the values of the fundamental frequencies and the duration of the desired phones, all data were put into Microsoft® Office Excel (2003) for ease of organization and analysis. The duration of a given segment as well as the F_0 at its beginning, centre and end were retained for analysis. However, the measurements of the duration of a given segment are somewhat unreliable due to the way the sounds had to be segmented in order to obtain accurate pitch measurements. In addition, as discussed in chapter 2, duration is not an essential cue to tone, making its analysis only of secondary interest. Furthermore, Martin's (1980) acoustic analysis showed that, at least for the Mingan and Natashquan dialects under study, neither vowel nor syllable length played any role whatsoever in the contrasts that are associated with word-final pitch changes:

> "Il ressort de l'étude qui a été faite de la durée des sons que celle-ci ne peut rendre compte de l'opposition significative entre les énoncés. En effet, ni la durée de la voyelle en syllabe finale, ni la durée entre la voyelle en syllabe finale et la (ou les) voyelle(s) précédente(s), ni le rapport de durée entre la syllabe finale et la (ou les) syllabe(s) précédente(s), ni le rapport de durée entre la voyelle en syllabe finale et la consonne précédente, ni le rapport de durée entre la consonne initiale de la syllabe finale et la consonne initiale de la syllabe précédente, ne constituent de facteurs de différenciation significative [...]" (p. 192).

We do not assume that the Mingan and Natashquan dialects necessarily behave in the same way as the Western dialects, but we believe that a statement of length is insufficient to account for contrastive pitch in Innu. Based on the arguments presented in chapter 2, we also believe that since F_0 is the primary acoustic correlate of tone, measurements of F_0 alone will be sufficient to examine this phenomenon in the Western dialects.

All values of F_0 were first obtained in Hertz (Hz) and then converted into semitones above 100 Hz in order to facilitate comparisons of pitch between speakers. The formula used for this is as follows: $12 \ln (x/100) / \ln 2$, where 'x' is a value of F_0 in Hz. As t'Hart et al. (1999: 23-24) explain:

> "Although the internationally recommended unit of frequency is the Hertz, for a number of reasons we prefer to convert the data as obtained in the F_0 measurement algorithm into logarithmic units. The main reasons are that, with a view to the perception of pitch, we are more interested in frequency distances than in the absolute frequencies themselves, and that we want to express the magnitudes of these distances independently of the incidental frequency. This makes it possible to compare F_0 curves from different speakers, with different ranges of voice."

Since semitones are relative values, they measure the differences between two values of F_0; they do not represent absolute values of Hz. For example, if a female speaker were to lower the pitch of her voice from 227 to 215 Hz, a difference of 12 Hz, this would represent a drop of one semitone; for a male speaker, a drop from 124 to 117 Hz, a difference of 7 Hz, is also equal to a drop in pitch of one semitone.

Once these differences in pitch were converted into semitones, an arbitrary threshold value of 0.5 semitones (i.e. one quarter tone) was chosen as a point of reference against which to compare the difference between the beginning, centre and end values of each sound, as segmented with Praat. This was done to see if, within a given vowel, the pitch rose, fell, or stayed comparatively level and to group together pitch variations into like intonational shapes. For example, if the beginning value for the F_0 of a vowel was less than 0.5 semitones apart than the F_0 of the centre of the vowel, it was determined that they were pronounced at approximately the same pitch ($\approx$); if it was greater than or equal to 0.5 semitones apart, the value was labelled either "less than" (<) or "greater than" (>). All possible combinations of these three relative measurements combined with the three F_0 values per sound (i.e. beginning, centre, and end) were assigned a label summarized below in Table 4.1 (where L = "low" and H = "high"):

Table 4.1 Possible Pitch Patterns
and Corresponding Labels

Pattern	*Label*
≈ ≈	Nul
≈ <	LLH
≈ >	HHL
< ≈	LHH
< <	Rising
< >	LHL
> ≈	HLL
> >	Falling
> <	HLH

For example, if the beginning of a vowel was approximately of the same pitch as the centre of the vowel, and the pitch from the centre rose over 0.5 semitones by the end of the vowel, it was labelled as "low-low-high" (LLH); this translates to a rise occurring later in the vowel. Again, these are all arbitrarily assigned values designed to give a rough approximation of what is occurring within a given vowel. A threshold of 0.5 semitones was chosen because it represents a reasonable range below which changes in F_0 are not likely to be perceived. However, should the threshold of 0.5 prove to be too sensitive and no pattern is discernable from such a classification, then these values can still be easily regrouped into larger categories (if, for example, just the "Rising" and "Falling" labels are shown to be relevant). Our principal interest, as already stipulated, is in the final vowel of a (purported) tone-bearing word. However, in the interest of thoroughness, every single segmented sound underwent the same analysis in order to assess overall prosodic trends that may occur in conjunction with (or independently of) the occurrence of tone in a given sentence.

The five pronunciations of a given individual sentence were averaged together into one value in order to pick out the general trend of these pronunciations. If a pronunciation had to be omitted for a certain reason, the average was calculated for the remaining pronunciations (i.e. for four or three pronunciations). The standard deviation of the five values of each sound was also calculated in order to give an indication of the consistency in pronunciation. In short, the larger the standard deviation, the more inconsistencies between pronunciations. Conversely, a smaller standard deviation indicates a more consistent pronunciation across the

five pronunciations. From these averaged values of F_0, the centre of the tone-bearing vowel was compared with the centre of its preceding vowel in order to verify the hypothesis that the change in pitch between these two vowels is semantically significant. The centre of the vowel was specifically chosen as the basis for these comparisons because it is more reliable than measurements taken at the outer edges of the vowel. As explained in Hombert, Ohala and Ewan (1979), among many others, and briefly mentioned above (section 2.5), the surrounding consonants can have an effect on the edges of the vowel. This may seem to conflict with the methodology for our analysis of the interior of the vowel described above. If the edge of the vowel is so unreliable then why bother including two measurements taken from the edges of each vowel? Again, the standard deviations taken from these measurements would indicate any blatant inconsistencies, and any erratic results would naturally prevent one from making any over-generalized conclusions. If, however, these measurements indicate the same pattern being repeated consistently, then one could suppose the analysis of the interior of that vowel to be significant. As Martin (1980: 193) rightly points out, where the measurements of F_0 are taken may affect the interpretation of the results: "Évidemment, si nos mesures de fréquence avaient été prises quelque peu différemment, par exemple, au premier tiers et au deuxième tiers de la durée de la voyelle, il nous a semblé qu'il pourrait s'agir alors dans les deux cas d'une variation haut-bas" (instead of rising-falling or high-falling). Our analysis is also guilty of the same shortcoming.

In view of this potential "hazard" in identifying tones, we first looked to potentially tone-bearing syllables in similar phonetic surroundings to rule out the possibility of mistakenly classifying phonic conditioning as tone. Once this is done, as Pike (1957: 55) explains (with reference to "dissyllabic" words), "Provided the researcher has previously investigated and rejected the possibility [...] that the pitch differences between these two groups are caused by nonphonemic modification of the pitches by the sounds of the respective words or by the pitches of the frame, the pitches of the second syllables in the representative words are in unconditioned contrast and constitute distinct tone phonemes [...]." The majority of sentences in our sentence list contain minimal pairs in order to facilitate such a comparison. All else being equal in terms of phonic environment, the principal method employed in verifying the presence of a tone in this study is to compare the pitch of a supposedly tone-

bearing syllable - i.e. the final syllable of a word - with the pitch of its preceding vowel. This difference in pitch, measured in semitones, is then compared against the corresponding difference in pitch occurring in the contrastive form of the same utterance. If the difference in semitones of one form was at least 0.5 semitones apart then it was classified as either bearing a low tone, or as having no tone. Again, this threshold was arbitrarily chosen but is easily modified in a post hoc manner if it proves to be too sensitive or not sensitive enough.

Monosyllabic words pose somewhat more of a challenge in terms of analysis. Since they consist of only one syllable, one is forced to compare this against syllables outside the domain. According to Pike's recommended methodology (1967: 56), "the monosyllabic item may be considered in conjunction with a neighbouring frame syllable and the tonemes compared in this fashion." He continues to warn the researcher that "there is the hazard that the general height of the speaker's voice may change between utterances of the words, and thus upset the comparison between specific syllable height and general voice height."

A further complication with monosyllabic words is that if they occur at the beginning of a sentence, there is no preceding vowel with which to compare it. Unfortunately, the sentences containing sentence-initial monosyllabic words had to be omitted from our analysis. One might suggest that if an analysis can be done from "left to right," following the order in which the sounds were produced by the speaker, that it should be possible to make a comparison in the opposite direction, i.e. with a purportedly tone-bearing syllable and its *following* syllable. This is not the case, however, since a low tone in the Western dialects of Innu, as we will show, is relative to the pitch of its preceding vowel; the pitch of the following vowel is unspecified and so may be produced with less attention by the speaker. Furthermore, we will show that a low tone may be produced either with rising pitch or falling pitch and so the direction of the pitch gradient between the supposed tone-bearing unit and its following syllable cannot necessarily confirm or disprove the presence or absence of a tone.

One additional complication in our analysis is that some sentences in our list do not have minimal contrastive forms, or any contrastive forms whatsoever. The following analysis was then carried out in an attempt to classify these non-contrastive forms. First, the corpus was tagged and each syllable that could be confirmed as bearing a low tone with the above

methodology (i.e. those with minimal contrastive forms) was coded as '1' and each syllable that could be confirmed as not bearing low tone was coded as '2.' Each syllable that appeared to be pronounced in the same way as its supposedly contrastive form was coded as '3'; each form that was omitted was coded as '4'; each syllable that was pronounced contrary to what we expected according to our hypotheses (outlined above in section 3.3) was coded as '5' and was put aside for further analysis; each syllable that did not have a contrastive form and could therefore not be categorized was coded as '6'; all sentences that were omitted from our analysis were coded as '7.' Note that in order to classify *one* syllable as bearing low tone or not, the difference between *two* syllables was calculated. Recall that it is the difference in pitch between a word-final syllable and its preceding syllable that indicates the presence or absence of tone; it is in fact this value obtained by subtracting the F_0 (in semitones) of one syllable from the other that was coded, and by extension the word-final syllable (i.e. the syllable of interest). The mean value and standard deviation (in semitones) was then calculated for all syllables coded 1 and 2. Next, the Z scores were calculated for all syllables coded as 6 (the syllables that could not be classified based on our initial analysis). A "Z score" is the answer to the question "How many standard deviations is this sample from the mean?" It indicates "how far and in what direction that item deviates from its distribution's mean, expressed in units of its distribution's standard deviation."[28] This basically converts the mean of a given set of values to 0 and the standard deviation of that to 1. In this way we can normalize and compare the data from two different sets of values by comparing their Z scores. The Z scores of all '6s' were then used to calculate how far from the mean of all '1s' and '2s' and in what direction was a given syllable pronounced for a given speaker in order to ascertain if it was pronounced more like a 1 (a low tone) or a 2 (not a low tone). Two Z scores were then calculated for each value categorized as a '6' because it was compared against the mean of group '1' and the mean of group '2.' If the Z score of the '6' using the mean of the low tones was closer to 0, it was recategorized as '1'; if the Z score using the mean of the "not low" tones was closer to 0, it was recategorized as '2.'

This methodology is not without its faults. For one, it is not possible to classify values that are just as close to one mean as the other. This was relatively rare, however: of 102 total

[28] Source: http://www.animatedsoftware.com/statglos/sgzscore.htm

individual sentences that had to be classified with this method, only 5 remained unclassifiable (or 4.90%). Furthermore, a mean is by definition calculated with values that vary from one extreme (the maximum value) to the other (the minimum value). Therefore if we calculate the Z score of a value that is closer to one extreme or the other than to the mean, it may be erroneously classified. There were, regardless of these inherent flaws, some striking consistencies in the results obtained through this analysis, which will be discussed in the following section where it is applicable. This method of analysis will be referred to as the "Z score method."

CHAPTER V

Results and Analysis

In this chapter we will present and discuss the data provided by six participants, obtained from the production and comprehension tests. In the presentation of our results, the "best" example of a given grammatical use of tone was chosen to be discussed in detail, which we then compare against the other speakers for a given sentence, as well as the other sentences that belong to the same grammatical paradigm.

The graphs used herein are a visual representation of the pitch curve in a given sentence from vowel to vowel. The Y axis represents the average F_0 in semitones above 100 Hz, using values taken from the middle of the vowel (for reasons described above in *Methodology*) and the X axis lists the individual vowels of the graphed part of the sentence. The error bars represent the standard deviation of the five repetitions of each sound. Basically, the smaller the error bar, the more closely grouped the individual pronunciations.

For the graphs regarding one participant only, one of the two lines will represent the unmarked form and the other the form bearing a low tone. The participant number (P1, P2, etc., up to P6) will be noted in the title, followed by the numbers of the contrasting sentences in question, followed by a brief grammatical note of the forms being compared; e.g.: "P1: 01 (singular) vs. 16 (plural)." The pronunciation of the portion of the sentence depicted in the graph will be transcribed below the graph in the International Phonetic Alphabet (IPA).

For some of the graphs included in the appendices, each line in the graph represents one participant, labeled P1 through P6, and the number next to the transcribed sentence in the title of the graph shows its order in the test. Below the graph, the part of the sentence represented in the graph is transcribed in IPA. In the event of several accepted pronunciations, these are all transcribed to facilitate dialectal comparisons.

We have chosen to incorporate our discussion of the results as we present them in order to reduce the amount of page-turning required to follow our analysis. A more general discussion providing a global view of the body of our results may be found in chapter 6.

5.1 Tones Resulting from Apocope of Word-final Short Vowels

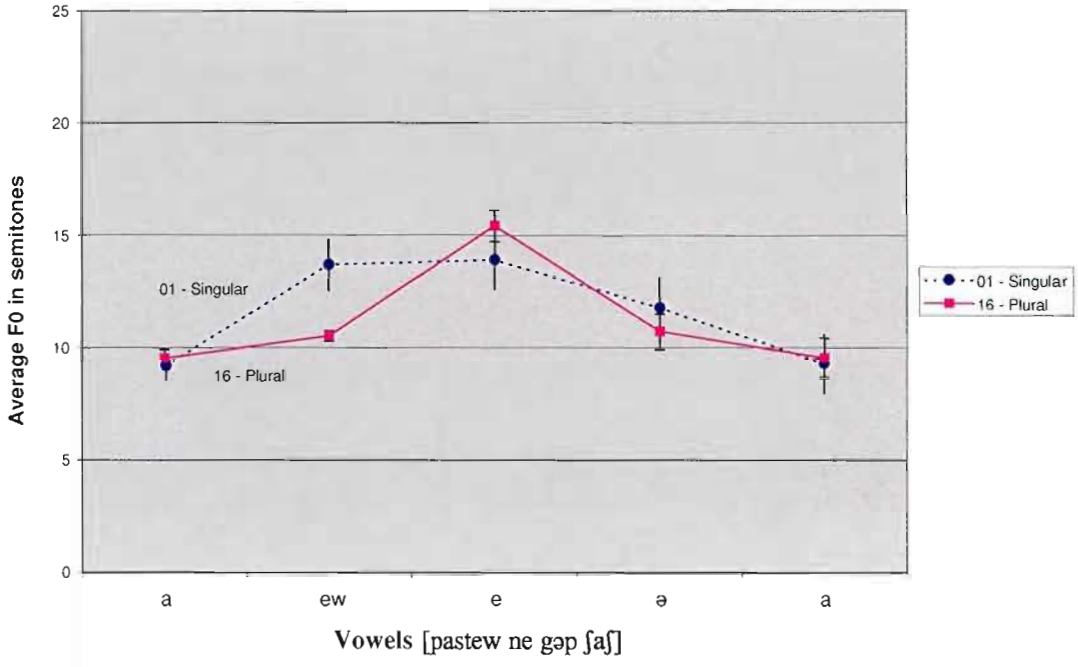
As mentioned in our introduction, the Western dialects of Innu frequently apply a rule of apocope on certain grammatical forms. As we will show, this is then compensated for by a low tone on the resulting final vowel.

5.1.1 Cases of Apocope Where the Deleted Final Short Vowel is an Inflectional Morpheme

5.1.1.1 Plural Inanimate in Nouns and Verbs

One purported case of tone, according to our hypotheses, is to be found in the plural forms of inanimate nouns and verbs. Figure 5.1 is a representation of P1's pronunciation of sentences 01 (*pâshteu ne akup shâsh* 'this dress is dry already') and 16 (*pâshteua ne akupa shâsh* 'those dresses are dry already') which contain the inanimate noun *akup(a)* 'dress(es)' and the inanimate intransitive verb *pâshteu(a)* 'it is/they are dry.'

Figure 5.1 P1: 01 (singular) vs. 16 (plural)



The two sentences in question are minimal pairs in terms of phonic content, the only significant difference being the change in pitch between the last two vowels of the noun ([e] and [ə]), which exhibits a distinct drop between the schwa of *akup* 'dress,' and the previous vowel of *ne* 'this/these.' The same goes for the verb, with the significant difference being the difference in pitch between [a] and [ew]. Looking at the pitch curve in the above graph, we can see that the overall intonation of sentence 01 is clearly different from that of sentence 16, and it is tempting to suspect that speakers compensate for the tone or absence thereof in the general intonation over the course of an utterance, perhaps providing cues as to the intended meaning elsewhere than on the final syllable of the tone-bearing word. However, this appears to depend greatly on the sentences in question and, of course, on the speaker as well, and as we will demonstrate, the only predictable consistent difference is the lower pitch of the ultimate vowels in the tone-bearing form of a given lexeme.

One could say, however, that (in this case) the singular form of the noun also exhibits a drop in pitch, so why do we not suppose that this is also significant? This is because the

gradient of the pitch slope between the last two vowels in the plural form is so much more pronounced than the equivalent positions in the singular form. Similarly, both the singular and plural forms of the verb both rise in pitch, but as with the noun, the pitch of the final syllable in the plural form is significantly lower. As we will see in the data that follow, this is a recurring pattern and not an isolated occurrence nor mere coincidence.

We obtained results similar to those of P1 from the other five speakers for sentences 01 and 16. Table 5.1 (below) shows the difference in semitones between the vowel of the monosyllabic nouns *akup(a)* 'dress(es)' and the preceding value of the monosyllabic word *ne* 'this/these' (the vowels in question are underlined in the IPA transcription) comparing the same two forms as seen in Figure 5.1 (above) for all six speakers. A negative value indicates a drop in F_0; a positive value indicates a rise in F_0.

Table 5.1 Differences in semitones between the ultimate and penultimate syllables of the plural and singular forms of 'dress'

	Difference in semitones	
Speaker	**01 [*ne gəp*] singular**	**16 [*ne gəp*] plural**
P1	-2.11	-4.70
P2	-3.70	-6.36
P3	-0.51	-1.82
P4	-2.30	-5.40
P5	-1.06	-4.07
P6	3.25	-2.18

We can see in Table 5.1 that despite the drop in pitch between the two vowels in question in the singular form, the drop in pitch for the equivalent vowels in the plural form is significantly more pronounced. These data suggest that all six speakers use pitch to mark the differences in number between the words analyzed in the two sentences in question. In fact, the same pattern is repeated in the other sentences tested in this paradigm; in other words, speakers consistently use low tone to mark the plural form of inanimate nouns and verbs. For

the words *ishkuâtem(a)* ([ʃkwadɛm]: 'door(s)') in sentences 64 and 69, six out of six speakers exhibit the same pattern; for the words *umassin(a)* ([uməsən]: 'shoe(s)') in sentences 71 and 37, the same pattern again presents itself for all six of the speakers; and once again, the words *ishkuâtem(a)* ([ʃkwadɛm]: 'door(s)') in sentences 27 and 30 show the same pattern for six out of six speakers. For the words *utâpânuâu(a)* [udaban(w)o] 'their car(s)' in sentences 26 and 66, only five out of six speakers appear to make the pitch distinction for the nouns. The results of the one inconsistent speaker (P3) that do not fit this pattern may be attributed to confusion on the speaker's part, or perhaps technical error involved in extracting the measurements, since the same speaker maintains the pitch distinction in all other sentences contrasting inanimate singular and inanimate plural nouns.

The verbs in these same sentences also appear to exhibit pitch differences. The reader is again referred to the above Figure 5.1 which represents the results obtained for P1. The verbs in question, *pâshteu* ('it is dry') and *pâshteua* ('they (inan.) are dry'), are both segmentally pronounced [pastew].[29] With respect to pitch however, as can be seen in Figure 4.1, the pitch gradient between [a] and [ew] in the plural form is much more pronounced than in the singular form.[30] Once more, the same holds true for all six speakers (see Figures D.1 and D.2 in Appendix D). In fact, all speakers use pitch to distinguish the otherwise identical forms of the verbs in the sentences of this paradigm with the exception of P3's pronunciation of the verb in sentence pairs 26-66 and 71-37. It is difficult to explain why P3 would make the pitch distinction on some verbs yet not on others, so again, these exceptions are most probably attributable to technical error or speaker error.

5.1.1.2 Plural Inanimate Nouns with Stem Allomorphy

A handful of inanimate nouns exhibit stem allormorphy in their plural form. For example, the plural of *miûsh* [mjuʃ] 'box' and *ûsh* [uʃ] 'canoe' were historically (and still are in the Eastern dialects) *miûta* [mjuta] and *ûta* [uta] respectively. We tested these to see if the plural forms also bear a low tone in the dialects under study. According to our hypothesis, they

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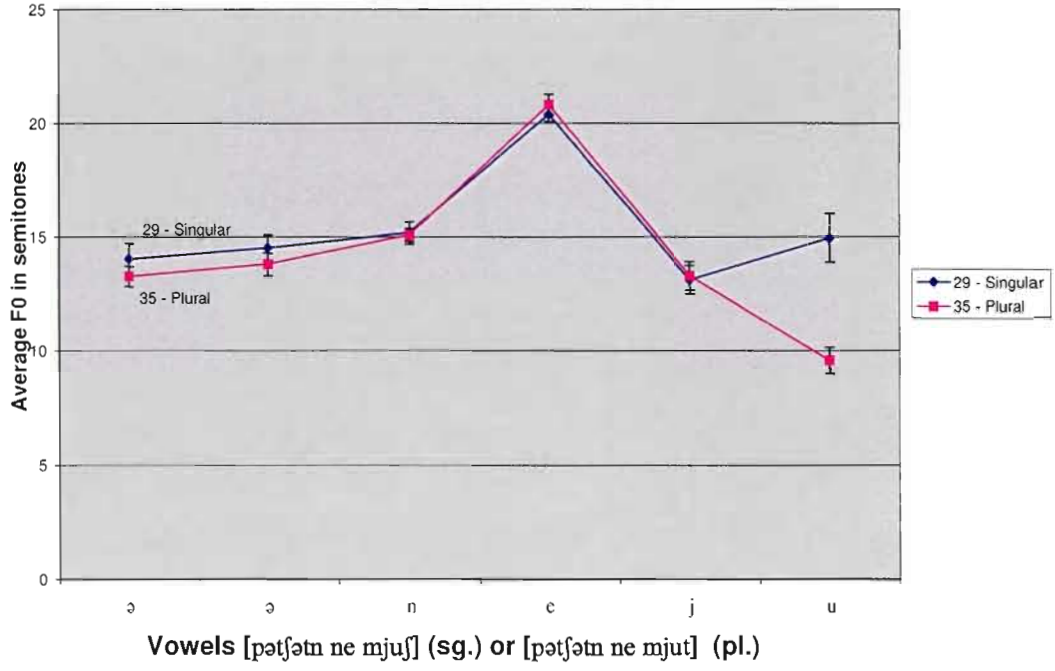
[29] Also pronounced as [paʃtew].

[30] These verbs end with a diphthong. We chose to analyse the [ew] sequence as one unit because there was no significant difference in pitch to be found between the [e] and the [w].

should bear low tone if the plural forms undergo apocope of the plural marker /-a/. Figure 5.2 is a representation of P2's pronunciation of sentence 29 (*patshitin ne miush tuiet*, 'drop that box right away') and sentence 35 (*patshitin ne miûta tuiet*, 'drop those boxes right away').[31]

Figure 5.2 P2: 29 (singular) vs. 35 (plural)



None of the six speakers pronounced the segmental allomorph in the plural form, and so a pronunciation such as [mjuta] did not occur. For these sentences, four out of six speakers appear to make the pitch distinction, with P4 and P6 pronouncing the opposite of the expected pattern (i.e. with a "low tone" on the singular form). Perhaps these two exceptions simply did not double-mark the noun for plurality since the stem allomorphy is already indicative of the plural.

[31] P2's pronunciation is remarkable in its regularity: the lines representing the two sentences in the graph, occurring six sentences apart in the test, overlap almost perfectly one on top of the other, indicating that the speaker's pitch was the same for both sentences right up until the last vowel of *miûta* where the pitch clearly falls.

Despite the minor inconsistency of the two speakers, the pattern found throughout the paradigm is consistent enough to be interpreted as significant. It is reasonable to say that all six speakers make the distinction between inanimate singular and plural nouns and verbs by way of a low tone on the plural form.

5.1.1.3 Low tone on the segmental allomorph of the inanimate plural morpheme?

The rule of apocope does not apply when the word ends in a fortis consonant or in a consonant cluster such as /-ʃk/ (Drapeau, 2006). In the Betsiamites dialect, the surface plural segment is [e], while it remains [a] in the Sept-Iles dialect. We thus find the following surface forms:

(4) Singular 'log': [mət]

(5) Plural 'logs': Betsiamites [mətte]; Sept-Iles [mətta]

It would appear that some Sept-Iles speakers also keep the final short vowels in other contexts as well. Some speakers in our tests have pronounced *ûta* [uta] for the plural of *ûsh* 'canoe' for example, even though it contains no geminate consonant. This may be due to hypercorrection in a reading context since the final vowels are written in the standard orthography, or it may be due to the fact that the rule of apocope is a variable rule.

If the occurrence of a low tone depends purely on the application of a regular process such as apocope, then one would expect no low tone on the final syllable of words such as /mətte/ 'logs' or /uta/ 'canoes.' If, however, there is still a low tone on the final short vowel when it is pronounced, this would indicate that the tone occurs whenever the plural-singular distinction is made, and has become morphologized, i.e. its distribution would always coincide with number. In order to investigate this, we have included in our test some inanimate nouns where apocope may not apply.

It would appear that in this case, the argument is made for the phonological motivation of tone, as would indicate the results from sentences 18 (*peikᵘ mukᵘ mit takuan shash*, 'there is only one single log left') and 12 (*mita mishta-alema takuana nânitam*, 'there are always many logs'), and 63 (*apu petâkanit ûsh eshkᵘ*, 'the canoe has not yet been brought') and 59 (*apu petâkaniht ûta eshkᵘ*, 'the canoes have not yet been brought'). P1 and P4 were omitted

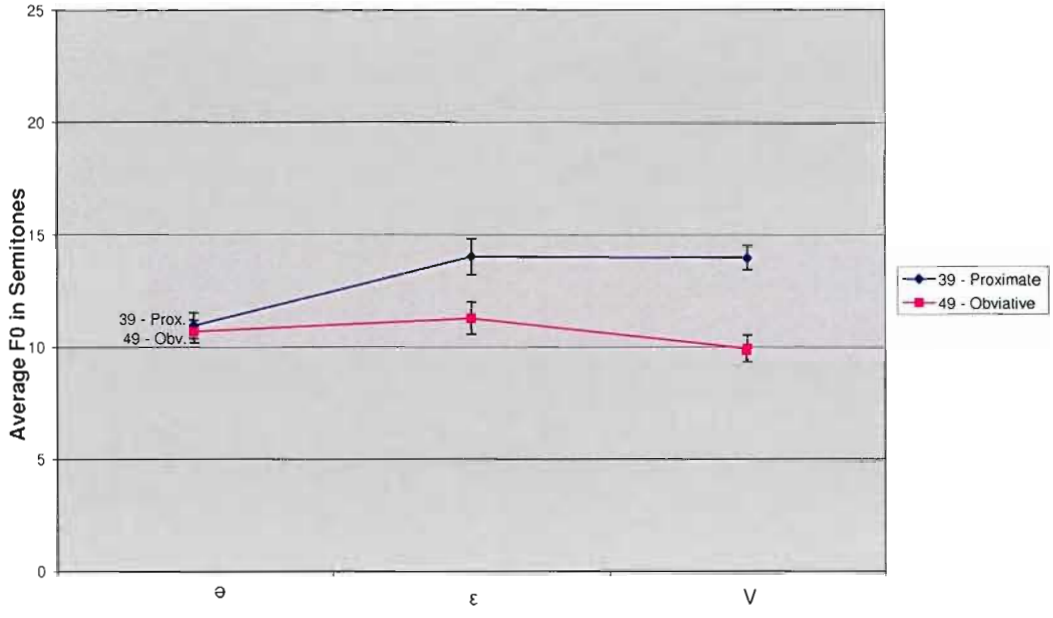
from the analysis of sentences 18 and 12 due to erroneous pronunciation and poor recording. Because there are no minimal contrastive forms for these sentences, an analysis was done using the Z score method on the remaining four speakers. Our results indicate that speakers do not produce a low tone on the plural form of 'logs,' [mətte] or [mətta], and that the low tone does not occur when there is no apocope.

P4 and P6 were omitted in the analysis of sentences 63 and 59 due to poor recording quality and erratic pronunciations. P1, P3, and P5 pronounced *ûta* ('canoes': [ut]) without realizing the final vowel, therefore applying the rule of apocope, while P2 pronounced the full form [uta]. Comparing the contrastive forms [uʃ] and [ut] indicates that speakers P1, P3 and P5 do produce a low tone on the plural form. The plural form of 'canoes' pronounced by P2 was then analyzed with the Z score method since there is no minimal contrastive form for [uta], and the results indicate that P2 does not produce a low tone on the final [a]. This then agrees with the other results we have seen thus far: when the process of apocope is applied, we find a low tone, and when the segmental allomorph is realized, it does not bear tone. This would suggest that tone in the Western dialects is phonologically motivated. This also agrees with what we have seen thus far in terms of the realization of the plural form of inanimate nouns: the plural forms (which undergo apocope) have significantly lower pitch than their corresponding singular forms.

5.1.2 Obviative Animate Forms of Nouns and Verbs

Another purported use of low tone in the Western dialects is to mark the obviative animate forms of verbs and nouns. Figure 5.3, below, is a representation of the animate proximate noun *namesh* ([nəmɛʃ] 'fish') and its obviative equivalent as spoken by P5.

Figure 5.3 P5: 39 (proximate) vs. 49 (obviative)



Vowels [nəmɛʃ abu] (prox.) and [nəmɛʃ mwebən] (obv.)

This graph illustrates sentence 39 (*namesh apu kutak shâsh*, 'the fish is not biting any more') where *namesh* is proximate, and sentence 49 (*namesha muepan utâkushît*, 'he ate fish yesterday') where *namesha* is obviative. The above graph shows that the pitch *rises* between the ultimate and penultimate vowels of the word [nəmɛʃ] in both sentences, unlike in the first graph where the pitch fell over the penultimate and ultimate vowels for the noun in the two sentences in question. When we look at the data shown below in Table 5.2, we can see that despite the fact that the pitch invariably rises between the first and second vowels of the word [nəmɛʃ] for all six speakers, it will always be a less pronounced rise in the obviative form than in the proximate form, which we interpret as being due to the presence of a low tone. For example, a closer look at the data for P1 in Table 5.2 shows that the pitch rises by 5.26 semitones in the proximate form and by 2.62 semitones in the obviative form, a difference of 2.64 semitones. In other words, the pitch in the proximate form rose about twice as much as it did in the obviative form for this speaker.

Table 5.2 Differences in semitones between the ultimate and penultimate vowels in the obviative and proximate forms of 'fish'

	Difference in semitones	
Speaker	**39 [nə̱mɛ̱ʃ] proximate**	**49 [nə̱mɛ̱ʃ] obviative**
P1	5.26	2.62
P2	5.88	4.59
P3	4.37	1.89
P4	4.96	--*
P5	3.03	0.58
P6	6.13	4.82

* P4 obviative form excluded due to incomparable pronunciation: [nəmehe]

Since a speaker's intonation overlays all other present pitch phenomena of a given sentence, influencing their production one way or another, it is apparently not pitch direction which indicates the difference in meaning in the Western dialects of Innu. We have seen that the low tone may be realized by a measurable rise in pitch or by a fall. As mentioned above, production and perception do not always perfectly correspond, and the example above clearly demonstrates how a tone may not necessarily be realized by a descent in pitch and yet may still be perceived as being low. It may be deduced that what is more (if not *most*) significant in the production of tone in the Western dialects is the difference in pitch of the tone-bearing unit relative to its previous syllable.

In sentences 36 (*peikᵘ mukᵘ alûshkan nimuâtî*, 'I ate one single raspberry') and 32 (*alûshkana muepan ûtâkushît*, 'he ate raspberries yesterday'), we compared the proximate animate form *alûshkan* 'raspberry' with the obviative animate form *alûshkana*. We expect to find a low tone on the obviative form in 32 due to apocope. Five out of six speakers (with the exception of P5) make the proximate-obviative distinction by means of low pitch. The words in question are found in different places in the sentence, which does indeed have an effect on

the results (see Appendix E for a demonstration of this effect). However, their positioning is such that the obviative form of the word, the tone-bearing form, is found at the beginning of the sentence, which normally gives the first vowel a lower starting pitch, and therefore a less pronounced fall between the penultimate and ultimate vowels. Conversely, the proximate form (*alûshkan*) is found in the middle of the sentence, which normally gives the first vowel a higher starting pitch, and therefore a more pronounced fall between the penultimate and ultimate vowels. However, the fall in pitch between these two vowels is still more pronounced in the obviative form, confirming the presence of a low tone.

The last sentence pair in this paradigm is sentences 42 (*nutâuî âkushu anutshîsh*, 'my father is sick now') and 44 (*utâuîa âkushilua anutshîsh*, 'his father is sick now'). In 44, both the verb (*âkushilua*, 'is.sick') and the noun (*utâuîa*, 'his.father') are marked as obviative. Four out of six speakers appear to make the pitch distinction for the obviative noun, with speakers P3 and P6 pronouncing both forms in the same way. For the verb, five out of six speakers appear to make the pitch distinction, with P6 pronouncing both forms the same way.

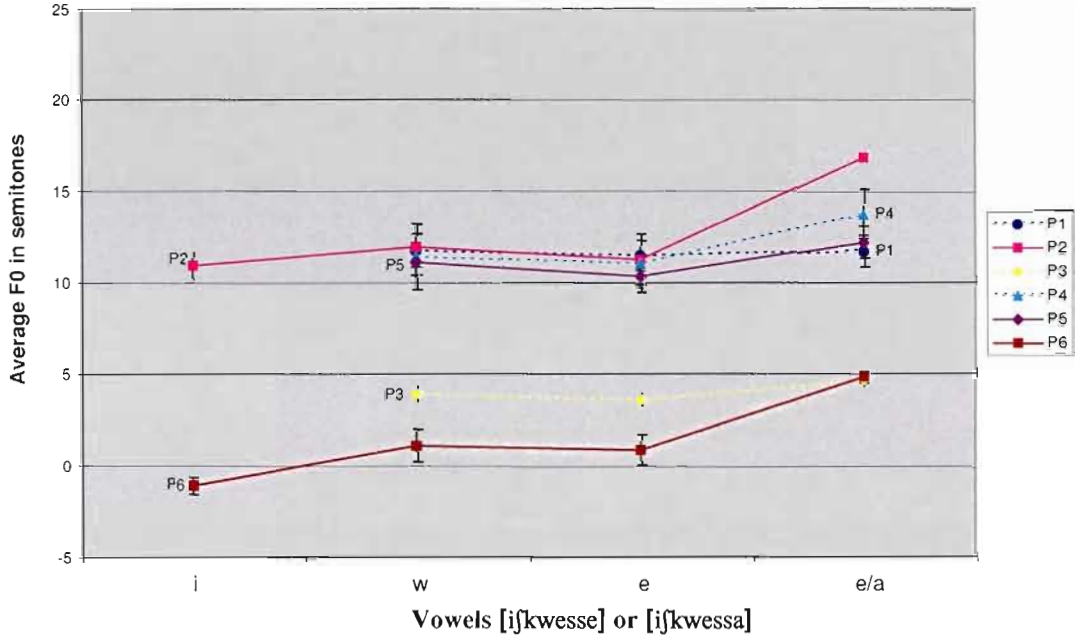
The overall results of the three sentence pairs discussed above suggest that speakers generally use low tone to mark the obviative in animate nouns and verbs. One can only speculate as to the origin of the discrepancy when it comes to the few exceptions. It may have to do with dialect differences, or it may have to do with the function of tone in animate obviatives. In inanimate plural forms, only a low tone signals the plural, whereas in the case of the animate obviative marker, the low tone is redundant since other elements in the sentence allow to predict the obviative status of the noun and the verb: the presence of the 3rd person /u-/ prefix on the noun and the presence of the /-lu/ suffix on the verb. The behaviour of the informants who do not perform a low pitch in these contexts may indicate an additional, perhaps emergent, factor in the production of low tone in the Western dialects, namely "contrastiveness." If the low tone is redundant, a speaker may chose not to use it (Drapeau, personal communication).

5.1.2.1 Low tone on the segmental allomorph of the obviative animate?

As mentioned earlier, the rule of apocope does not apply if the preceding segment is a fortis consonant or a consonant cluster. Thus the obviative form for the animate noun

ishkuess ('girl') will be pronounced [iʃkwesse] in Betsiamites and [iʃkwesse] in Sept-Iles. Nevertheless, we wanted to check whether the segmental allomorph /-e/ or /-a/ would be pronounced with or without a low tone. As discussed above, a low tone would indicate morphological motivations, while the absence of a low tone would suggest phonological motivations.

Figure 5.4 He saw a young girl yesterday
ishkuessa uâpamepan utâkushît



Because there is no contrastive form for 'girl' in sentence 4 (*ishkuessa uâpamepan utâkushît*, 'he saw a girl yesterday') shown above in Figure 5.4, we attempted to verify the presence or absence of a low tone on the final long vowel of the word by way of the Z score method. The results of this analysis indicate that P1 appears to produce a low tone, but the other five speakers do not. This is not surprising because there is no process of apocope, the final vowel being pronounced; there should be no compensatory low tone.

5.1.2.3 Singular-plural distinction in the obviative animate forms?

In the course of preparing the tests, there was much consultation with native informants. One insisted that she heard and produced a pitch difference between the animate obviative singular and the animate obviative plural forms. This was quite surprising given that there is normally no singular/plural contrast in obviative animate forms. We thus decided to include sentences that would allow us to test her claim. Since the distinction between the plural and singular are normally neutralized in the animate obviative forms, the noun *utauâssîma* [udwasim] in sentences 7 (*pâpatâlitshe(ni) utauâssîma*, 'his/her child must have arrived') and 15 (*pâpatâlîtsheni utauâssîma shâsh*, 'his/her children must have arrived') were both expected to bear low tone on the noun as both undergo apocope. The Z score method was used to determine whether or not the final realized vowel /i/ in this lexeme bore low tone.

For sentence 15, we found that five out of five speakers produce a low tone on the final vowel (excluding P4 whose recording yielded erroneous measurements for these sentences). The results for sentence 7 indicate that all six speakers appear to produce low tone on the final vowel of the noun. Although the noun in sentences 7 and 15 was tested in different places in the sentence (the noun occurs at the end of sentence 7 where declination has an effect on the pitch), we conclude that, as expected, the animate obviative forms do not exhibit a contrast between singular and plural obviative forms, and that speakers produce low tone to mark both the singular and obviative in animate nouns.

5.1.2.4 Animate Obviative ending in /-i/

A comparison of the verb in sentence 58 (*eshk^{u} apu takushik nitauâssîm* 'my child has not arrived yet') and sentence 34 (*eshk^{u} apu takushinliti utauâssîma* 'his child has not arrived yet') is shown in Table 5.3 below.[32] Note that in Betsiamites, the stem final /-n/ is pronounced [k] in 3rd person conjunct forms, whereas it is pronounced [n] in Sept-Iles. Table 5.3 summarizes the different pronunciations for each contrastive word for each speaker, as well as the difference in semitones between the final two vowels (underlined) of each form. A positive value indicates a rise in F_0; a negative value indicates a fall in F_0.

[32] P4 was omitted for sentence 58 due to poor recording quality.

Table 5.3 Summary of results for sentences 58 and 34

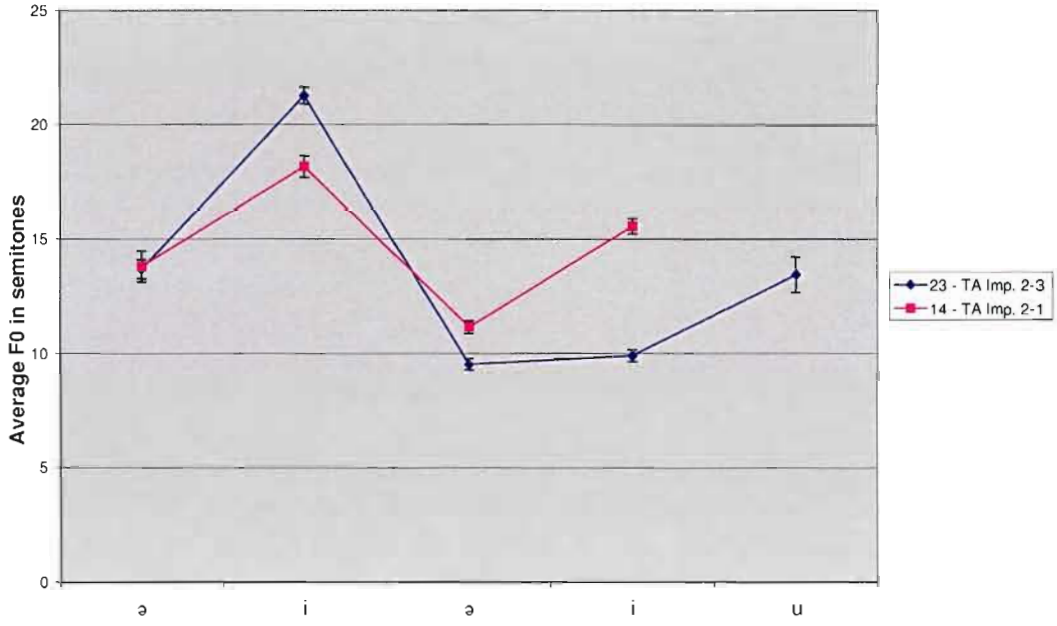
	Differences in pronunciation		**Differences in semitones**	
Speaker	**58** *takushik*	**34** *takushinliti*	**58** *takushik*	**34** *takushinliti*
P1	[tə̲kx^{w}ə̲k]	[təgʃə̲lə̲l]	0.66	-1.30
P2	[tʌg^{w}ə̲xə̲n]	[təg^{w}ə̲xə̲nə̲t]	-0.72	0.87
P3	[tə̲kx^{w}ə̲k]	[təg^{w}ə̲xə̲lə̲t]	1.10	-0.19
P4	**Omitted**	[təg^{w}ə̲xə̲lI̲l]	--	-1.21
P5	[təg^{w}ə̲xə̲n]	[təg^{w}ə̲xə̲nə̲t]	0.71	-0.86
P6	[təgʌ̲ʃə̲k]	[təgəʃI̲lI̲t]	3.06	1.69

As before, we expect the pronunciations that have undergone apocope of the final vowel (sentence 34) to have low tone, and that is what happens for four out of five (retained) speakers, where the exception is P2. Note that the different forms of the verbs in question are also marked by means other than low tone. It is entirely possible that P2 simply chooses one form or another instead of double marking the verb.

5.1.3 Imperative TA Verbs

For imperative TA forms, the 2-3 form is unmarked using just the bare TA stem, while the 2-1 forms historically added /-i/ to the stem. The rule of apocope should yield a low tone on the 2-1 forms. The representation of P2's pronunciation of sentences 23 (*minî nipîlu* 'make him drink water') and 14 (*minî nipî* 'make me drink water' (historically /məni: + -i/) is shown in Figure 5.5.

Figure 5.5 P2: 23 (TA Imp. 2-3) vs. 14 (TA Imp. 2-1)



Vowels: 23 [məni nəpinu]; 14 [məni nəpi]

These sentences constitute a near minimal pair except for the words [nəpi] and [nəpinu],[33] the latter being the obviative form of the former, meaning 'water.' Our attention turns to the first two vowels of these utterances, the imperative forms of the TA verb *minî* [məni]. As shown in Figure 5.5, P2 pronounces the 2-1 form of the verb (in sentence 14) with a lower pitch on the ultimate vowel, as do all other speakers for this sentence, indicating the presence of a low tone. The use of low tone in the imperative TA verbs appears to be consistent among all speakers. For sentences 2 (*natutu mâ alu*, 'listen to him already')[34] and 19 (*natutu mâ alu*, 'listen to me already'), six out of six speakers follow this same pattern of lower pitch in the 2-1 form of the direct imperative TA verbs. For sentences 21 (*pûshî mâ alu*, 'take him on board already') and 33 (*pûshî ma alu*, 'take me on board already'), P6 was omitted due to incorrect pronunciation but the remaining five speakers produce the pitch distinction for the 2-1 form of the verb *pûshî*.

[33] Or [nəpilu]. The n/l alternation for *nipîlu* 'water.OBV' depends on the dialect, as mentioned in the introduction.

[34] There is no exact word in English to translate the expletive 'mâ alu,' so we have chosen the term 'already,' as in "Hurry up already!" This may also be translated by "donc" in French.

Our test did not contain a contrastive form of the 2-3 imperative TA verb *natutut* in sentence 22 (*natutut mâ alu*, 'listen to them already') and so could not compared to a minimal counterpart, and while the 2-3 verb in sentence 68 (*minîht nipîlu*, 'make them drink water') was tested against a near-minimal counterpart (sentence 70: *eshkᵘ apu miniht nitauâssîmat*, 'my children have not yet drunk'), the results were inconclusive in terms of the presence or absence of a low tone for reasons discussed in more detail below. Therefore we used the Z score method to analyse the verbs in sentences 22 and 68. It would appear that six out of six speakers do not use low tone on the verb *minîht* ([mənit]), and for the verb *natutut* ([ndədut]), the Z score method only yielded indeterminate results with three out of six speakers - P3, P4 and P6 - producing this form without a low tone. The difference in semitones between the two vowels of *natutut* appear to be pronounced by P1 and P5 as close to the mean of low-tone-bearing syllables as to that of toneless syllables, making their results unclassifiable, whereas P2 appears to produce a low tone on the to P3, P4 and P6. On the other hand, if this verb is compared to the verb which bears low tone in sentence 19 (*natutu mâ alu* [ndədu ma lu]), which is a near-minimal pair, we obtain somewhat different results: P1, P3 and P6 appear to produce no tone on the final vowel of [ndədut], while P2 and P4 appear to produce a low tone, and P5 appears to produce no distinction between these forms. In other words, between these two methods, the results of only three out of six speakers can be agreed upon: those of P2, P3, and P6. Based on these results, we cannot make a conclusion as to the presence or absence of a low tone on the TA imperative 2-3 form of the verb *natutut* ([ndədut]). However, when we take the results of sentences 23 and 14 (discussed above) into account, the fact that speakers do not use low tone on the 2-3 forms in those sentences suggests that the results for P2, P3 and P6 for sentence 22 are accurate.

The imperative TA 2-1 forms were also tested by Martin (1980) for the Mingan and Natashquan (Eastern) dialects. Of the three acoustic studies about tone in Innu (listed above), Martin (1980) is the most complete analysis-wise, even though carried out with only two participants (both women), one from each dialect. His study bore on "l'impératif, deuxième personne du singulier et du pluriel, au niveau de formes directes du type 2 sur 1 et au niveau de certains verbes T.A. et A.I." Martin (1980) found not only a fall in pitch in some cases, but

also a rising-falling contour tone, as well as a high-falling tone. We will now address his findings one by one and compare them to our own.

> "...au singulier, les formes 'fais-le boire', 'parle-lui', et 'embarque-le' se distinguent acoustiquement des autres formes verbales par une chute brutale et non graduelle de la fréquence et de l'amplitude au niveau de la voyelle finale." (Martin, 1980: 190)
> "Or, pour toutes les formes avec 'moi', la fréquence du fondamental croît du début à la fin de la voyelle." (Ibid., p. 193)

In the Western dialects, we have found that our results disagree with those of Martin; this discrepancy had also been noted in Drapeau (2006) and it first led Drapeau and Stevenson (2006) to propose that the development of tones in the Eastern and the Western dialects were headed in different directions. As we have shown in the above discussion, it is the 2-1 form that bears a low tone in the Western dialects investigated in the present study, whereas the 2-3 forms bear no tone and exhibits a sharp rise in pitch between the penultimate and ultimate vowels, an example of which is shown in Figure 5.5 However, if we look within the purported tone-bearing vowel, we get a different picture. As can be seen for the 2-1 form from sentence 14 (*minî nipî*, 'make me drink water') in the Table F.1 of Appendix F, the pitch rises over the course of the vowel for all speakers, giving the appearance of a rising tone. On the other hand, if we look at the other 2-1 forms tested (see Table F.2 in Appendix F), we see that this is not always the case. This indicates that our method of measuring pitch differences yields results contrary to those of Martin.

For the 2-3 forms, Martin remarks on a singular-plural distinction, finding a falling pitch on the singular 2-3 forms and a rising pitch on the plural 2-3 forms:

> "Pour les formes verbales avec 'lui', les variations de fréquence sont toutes descendantes lorsqu'il s'agit du singulier et toutes montantes lorsqu'il s'agit du pluriel." (p. 193)

By contrast, our results for sentence 23 (*minî nipîlu*, 'make him drink water') show that the TA 2-3 singular form is produced with no low tone, as discussed above. Sentence 68 (*minîht nipîlu*, 'make them drink water') poses a problem to our analysis because when compared to sentence 23, it would appear that [mənit] bears low tone on the final vowel, but when compared to sentence 70 (*eshk^{u} apu miniht nitauâssîmat*, 'my children have not yet drunk' – see section 5.3.2) and according to the Z score analysis, it would appear to *not* bear

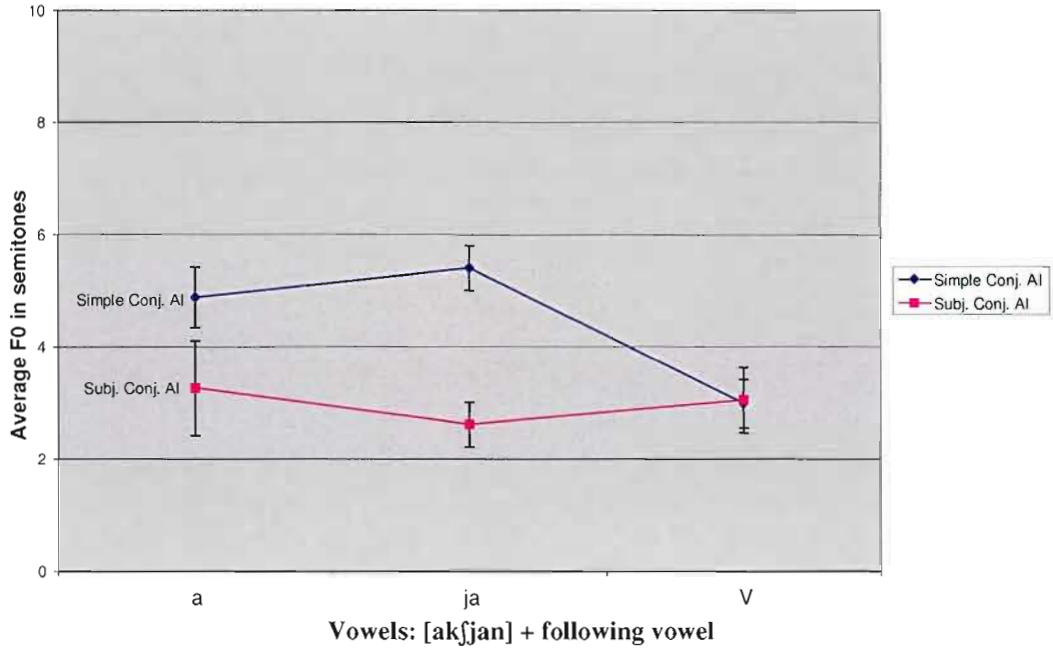
low tone. Our analysis of the interior of the vowel of this same form is in agreement with Martin's findings for the plural 2-3 forms (see Table F.1) with the pitch of the final vowel rising from its onset to its end. However, for the singular form, the pitch is either rising (labelled 'LHH' or 'Rising'), or rising and then falling (labelled LHL), depending on the speaker. (The tables in Appendix F summarize these results.) This suggests that the regularity in rising pitch in the plural 2-3 forms is not significant, contrary to Martin's findings for the Eastern dialects.

In summary, the analysis of pitch in the interior of the vowel, as first used by Martin (1980), does not yield consistent results. Our own methodology whereby we compare two separate syllables, on the other hand, permits us to pick out the pitch patterns present in the Western dialects, and these indicate that a low tone is used to mark the 2-1 imperative TA forms, while there is no tone present on either the 2-3 singular or plural forms. This may be due to the fact that the two methodologies are based on different assumptions of how tone is realized in the different dialects of Innu. While we cannot confirm or deny Martin's findings for the Eastern dialects, it would appear that the pitch of the interior of the vowel is not taken into account by speakers of the Western dialects when producing tone. The distinctive feature in the Western dialects is the low tone present in the 2-1 forms, while the 2-3 forms, both singular and plural, bear no low tone.

5.1.4 Subjunctive AI Verbs

Figure 5.6 is a representation of P3's pronunciation of the subjunctive AI verbs in sentences 60 (*apu âkushiân kâshikât* 'I am not sick today') and 13 (*ekâ âkushiâni uâpati, tshika natshi-uapamitin* 'if I am not sick today, I will come see you').

Figure 5.6 P3: 60 (simple conjunct AI) vs. 13 (subjunctive conjunct AI)



We can see a drop in pitch in the subjunctive form, which we have come to associate with low tone. It would appear that four out of six speakers make the pitch distinction, producing a low tone for the subjunctive AI form of the verb (*âkushiâni* [akʃjan]), with P4 and P5 pronouncing the two forms the same way, as is shown below in Table 5.4.[35]

[35] Although the final vowel is a diphthong, the two segments were analyzed as one due to the extremely short duration of each if taken separately, and the fact that there was no significant pitch difference between these two vowels if analyzed separately.

Table 5.4 Conjunctive vs. Subjunctive: Average values of F_0 of vowels and semi-vowels in TI verbs (in semitones)

	Speaker	**Average values of F_0 (semitones)**			**Internal F_0 of tone-bearing vowel**		
		V1	V2	Diff. V1-V2	V2		
60 conjunctive AI [akʃjan] or [agəʃjan]	1	12.72	11.44	-1.28	NUL	-0.01	0.11
	2	12.63	16.31	3.68	HHL	0.10	-0.86
	3	4.88	5.40	0.52	HLL	-0.73	-0.27
	4	15.56	12.02	-3.55	NUL	0.09	0.27
	5	14.16	12.05	-2.11	NUL	0.00	0.01
	6	6.81	7.24	0.44	HHL	0.49	-0.51
13 subjunctive AI [akʃjan] or [agəʃjan]	1	14.25	10.48	-3.77	LLH	0.13	0.76
	2	12.28	13.94	1.66	Rising	1.41	1.17
	3	3.26	2.61	-0.65	HLH	-1.32	0.64
	4	15.10	11.25	-3.85	LLH	-0.11	0.62
	5	12.77	10.35	-2.42	LLH	0.29	0.73
	6	4.71	3.93	-1.51	Rising	0.91	0.72

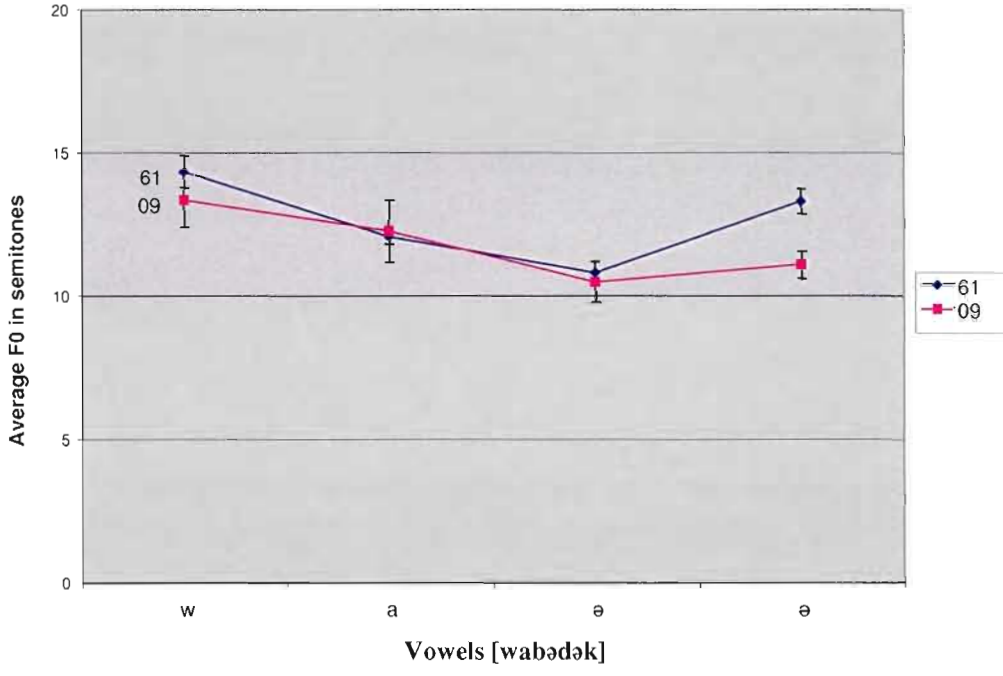
While the two forms depicted in the above graph for P3 appear to differ only slightly, when viewed in comparison to the other results in Table 5.4, we can see that the pattern is consistent with the other three speakers (P1, P2, P6) who make the pitch distinction, producing low tone on the subjunctive form.

For sentences 72 (*apu âkushitâu kâshikâlit*, 'they are not sick today') and 65 (*ekâ âkushitâui kâshikalit, nika nâtshi-uâpamâuat*, 'if they are not sick today, I will go see them'), only two out of the three speakers tested for these sentences, P1 and P2, appear to make the pitch distinction for the verb *âkushitau/âkushitaui* [agəʃədɔ] while P5 does not. Based on the two sentence pairs tested in this paradigm, we see that the majority of speakers use low tone to mark the subjunctive AI. Once again, this use of low tone coincides with apocope of the final vowel.

5.1.5 Subjunctive TI and TA Verbs

For sentences 61 (*apu uâpatak utâpânlu* 'he does not see the car') and 09 (*ekâ uâpataki utâpânlu, tshika tshishuâpu* 'if he does not see the car, he will be angry') five out of six speakers make the pitch distinction for the TI verb *uâpataki* [wabədək] 'see,' just as depicted in Figure 5.7 for P5, with only P1 apparently pronouncing both forms the same way.

Figure 5.7 P5 - 61 (simple conjunct TI) vs. 09 (subjunctive conjunct TI)



For sentences 10 (*apu uâpamishk shâsh*, 'he doesn't see you any more') and 11 (*eka uâpamishk, tshika tshishuâpu*, 'if he doesn't see you, he will be angry'), four out of six speakers make the pitch distinction for the TA verb *uâpamishk*. These exceptions are easily attributed to recording error and/or speaker confusion.[36] Since the majority of speakers make the pitch distinction, we conclude that low tone is used to indicate subjunctive TI and TA forms, which also undergo apocope.

[36] This is somewhat surprising considering these two particular sentences were shown one immediately after the other and so one would expect the difference between the two forms to have been more apparent to the participants.

5.2 Tones Resulting from the Apocope of the Stem Vowel

The examples we have seen up until now have been the result of apocope of a suffix. In certain verb forms, however, the final vowel of the stem itself can undergo apocope, also resulting in a low tone.

5.2.1 Imperative AI

Sentences 74 (*eshkᵘ apu minit nituâssîm* 'my child has not yet drunk') and 20 (*min ne nipî* 'drink this water') contain the contrastive verbs *minit* and *min*, both pronounced [mən], in different places in the sentence, one at the beginning of the sentence, one in the middle. Unfortunately, the imperative AI verb in sentence 20 is at the beginning of the sentence, making it impossible to analyze by way of our methodology.[37] We therefore used the Z score method to analyze the form in sentence 74. P4 and P6 were not tested for this sentence, but our results show that the remaining four speakers produce a low tone on the vowel of [mən], supporting our earlier findings that low tone results from the phonological process of apocope.

5.2.2 Imperative TI

Imperative TI forms are composed using the bare form of the stem. All TI stems bear a theme sign and the form of the theme sign used in the imperative is /-a/. This /a/ is expected to fall, undergoing apocope, and a low tone is expected on the resulting final vowel.

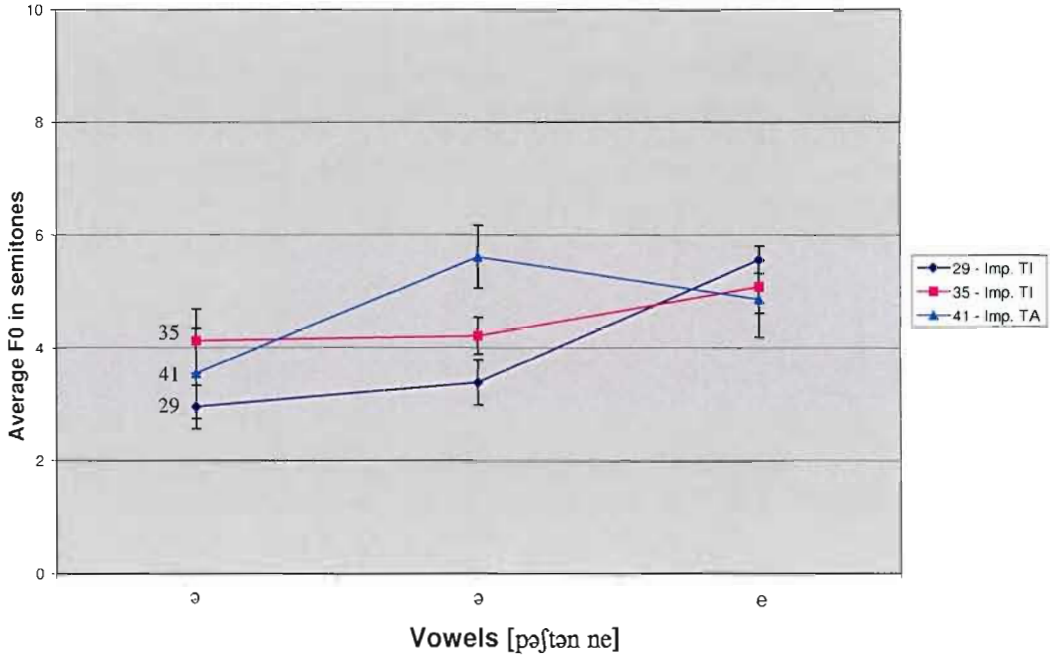
Figure 5.8 is a representation of P3's pronunciation of the TA imperative 2-3 verb *patshitin* 'drop' from sentence 41 (*patshitin ne auass* 'drop that child') compared with the TI imperative form of the same verb taken from sentence 29 (*patshitina ne miush tuiet* 'drop that box right away) and 35 (*patshitina ne miuta tuiet*, 'drop those boxes right away').[38]

---

[37] Observations expressed by native speakers do suggest that they can hear a low tone on the form attested in sentence 20.

[38] There are few contrastive forms that can contrast with TI imperative verbs, but in this case, we can compare this form of the verb 'drop' with its TA imperative form, which does not bear a tone.

Figure 5.8 P3: 29 + 35 (imperative TI) vs. 41 (imperative TA)



As can be seen in Figure 5.8, the pitch gradient rises more steeply for the TA imperative form of [pəʃtən], whereas the pitch of the TI imperative forms is raised only slightly, bearing a low tone. Five out of six speakers appear to make this pitch distinction for both sentences 29 and 35, with P4 as the exception in both cases.

The other verbs tested in this paradigm in sentences 27 (*tshipaî ne ishkuâtem*, 'close this door'), 30 (*tshipaî ne ishkuâtema*, 'close those doors'),[39] 67 (*natuta ma alu*, 'listen already') and 28 (*pûshtishke tshitakup*, 'put on your coat'), do not have contrasting verb forms, and so we once again used our Z score method of categorization. Sentence 67 has been eliminated because the verb in question ([ndət]) is at the beginning of the sentence and is monosyllabic, and so we cannot compare its pitch to a preceding syllable. The results of the recategorization of the other verbs through this method are summarized in Table 5.5 below, with the sentence

[39] The verb *tshipaî* in sentences 27 and 30 is the same form in both sentences. We analyzed both separately as a control in our methodology, since they should yield identical results. The same is true of the verb *patshitina* in sentences 29 and 35 above.

number on the left, and the results of each speaker (P1 through P6). A '1' indicates the presence of a low tone while a '2' indicates absence of a low tone.

Table 5.5 Z score results for imperative TA verbs

Sentence Number	P1	P2	P3	P4	P5	P6
27 [tsə̲bi̲] (BETS) or [tsə̲be̲j̲] (SI)	2	2	1	2	2	1
30 [tsə̲bi̲] (BETS) or [tsə̲be̲j̲] (SI)	2	2	2	2	2	2
28 [pustə̲xe̲] or [pustə̲ʃke̲]	2	2	2	2	2	2

The results indicate that there is no low tone present on the verb in sentences 27, 30 and 28. This was expected of [pustəxe] in sentence 28 because there is no process of apocope. This is consistent with the findings reported above concerning the absence of a low tone on the inflectional segment /-e/ or /-a/ when apocope does not apply. The results for sentences 27 and 30, on the other hand, are somewhat surprising because one would have thought that they would pattern as other TI imperative 2 forms do (as in sentences 29 and 35 above). However, if we turn to the Eastern dialect, where, as mentioned in the introduction, the process of apocope does not apply, we find that the imperative 2 forms in that dialect is [tsəbej]. Probably for historical reasons, the theme vowel /-a/ does not surface in those TI forms (Drapeau, personal communication) and therefore, there is no reason to posit a process of apocope. It follows then that these verbs do not bear low tone, as is indicated by our results.

To conclude on this point, the Z-score procedure does allow us to correctly identify cases where there is no tone. Moreover, the absence of a low tone in forms that do not undergo apocope means that the process is still very closely linked to apocope and has not become morphologized, as is indicated by the fact that TI imperative verbs do not automatically bear low tone, but a distinction in pitch exists where the verb undergoes apocope (as in sentences 29 and 35) and no pitch distinction exists where the verb does not undergo apocope (as in sentences 27, 28 and 30).

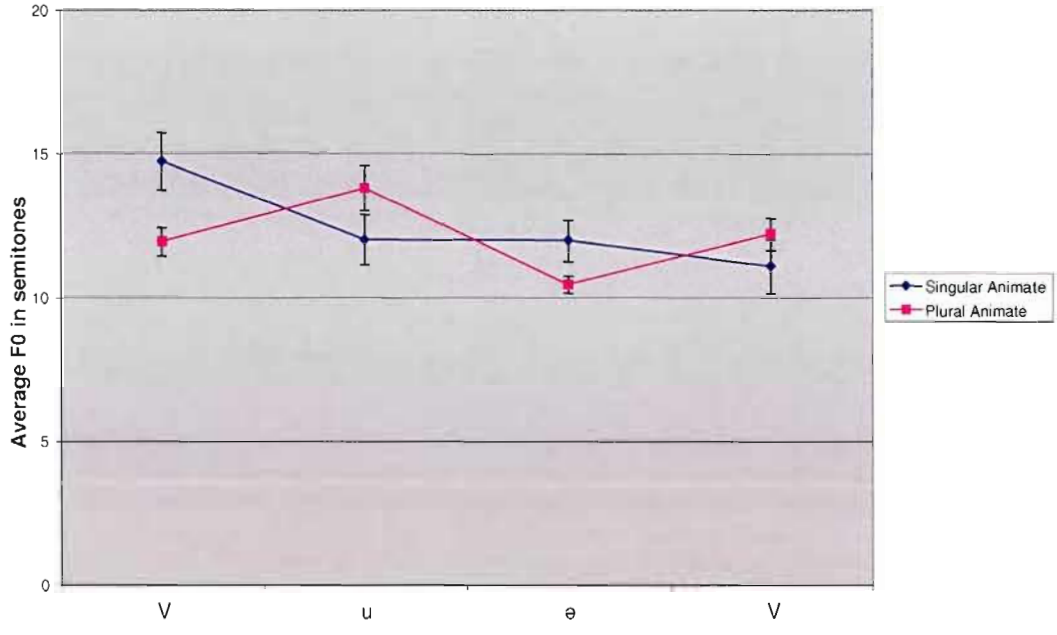
5.3 Tones Resulting From the Contraction of Groups of Final Syllables

Apocope may not be the only phonological process that yields low tone in the Western dialects. The forms in this section were included to test whether or not speakers produced low tone resulting from final consonant degemination. In this case, there are in fact two phonological processes in play. First, the vowel in the final syllable of a given form undergoes syncope, resulting in a final geminate consonant or consonant cluster, which is followed by the degemination of the subsequent final consonants. For example, the final syllable of *alûshkanat* [luʃkənət] would undergo syncope, yielding [luʃkənt], which would then become [luʃkən].

5.3.1 Plural of Animate Words Ending in /n/

Figure 5.9 represents P5's pronunciation of the words *alûshkan(at)* [luʃkən] 'raspberry(-ies)' from sentences 36 (*peikʷ mukʷ alûshkan nimuâtî*, 'I ate just one raspberry') and 43 (*mishta-alema alûshkanat nimuâtît*, 'I ate many raspberries').

Figure 5.9 P5: 36 (singular animate) vs. 43 (plural animate)



Normally the plural of animate forms ending in /n/ is marked by the suffix *-at* [-ət]. When this final syllable is contracted, a low tone is found on the ultimate syllable of the noun, as indicated above. The best examples of low tone in this paradigm are found in sentences 36 and 43 with all six speakers making the distinction by way of pitch, just as in Figure 5.9. The results obtained from sentence pairs 36 and 40 (*alûshkana muepanat ûtâkushît*, 'they ate raspberries yesterday'), and 24 (*nitshîtâpamânân ne auâss*, 'we look at this child') and 3 (*nitshîtâpamânânat anitshenat auâssat*, 'we look at these children'), show that five out of six speakers appear to make the pitch distinction on the verb as well (underlined) in both cases.[40] Upon comparing sentences 32 (*alûshkana muepan ûtâkushît*, 'he ate raspberries yesterday') and 40 (*alûshkana muepanat ûtâkushît*, 'they ate raspberries yesterday'), we find that five out of six speakers produce the pitch distinction marking the plural animate verb *muepanat* with a low tone. We therefore conclude that speakers produce a low tone to distinguish the plural of animate nouns and verbs.

5.3.2 Simple Conjunct: 3rd person plural vs. 3rd person singular of AI verbs

Figures G.1 and G.2 in Appendix G represent each speaker's pronunciation of [mənit] and [mənət] from sentences 68 (*minîht nipîlu*, 'make them drink water') and 70 (*eshk" apu miniht nitauâssîmat*, 'my children have not yet drunk') respectively. This example is not quite a minimal pair since there is no contrastive form for the 3rd person plural conjunct (in sentence 70) and the placement of the word in the sentence has a bearing on how the tone is realized; however, the segmental difference between the two forms is not significant, while the difference in pitch between the two forms is significant enough to indicate the presence of a low tone in the plural conjunct form. All six speakers appear to use low tone on the verb in sentence 70.

When this is compared to the other results in this paradigm, we obtain similar findings. Table 5.6 below summarizes the results of the AI verbs tested for the 3rd person conjunct plural. '1' indicates the presence of a low tone; '2' indicates the absence of a low tone; '4' indicates an exclusion. For example, P1 mispronounced the form for four out of six sentence pairs and so had to be excluded from the analysis.

---

[40] It is not the same speaker that does not make the distinction in these two sentence pairs.

Table 5.6 Classification of 3rd person plural conjunct AI verbs

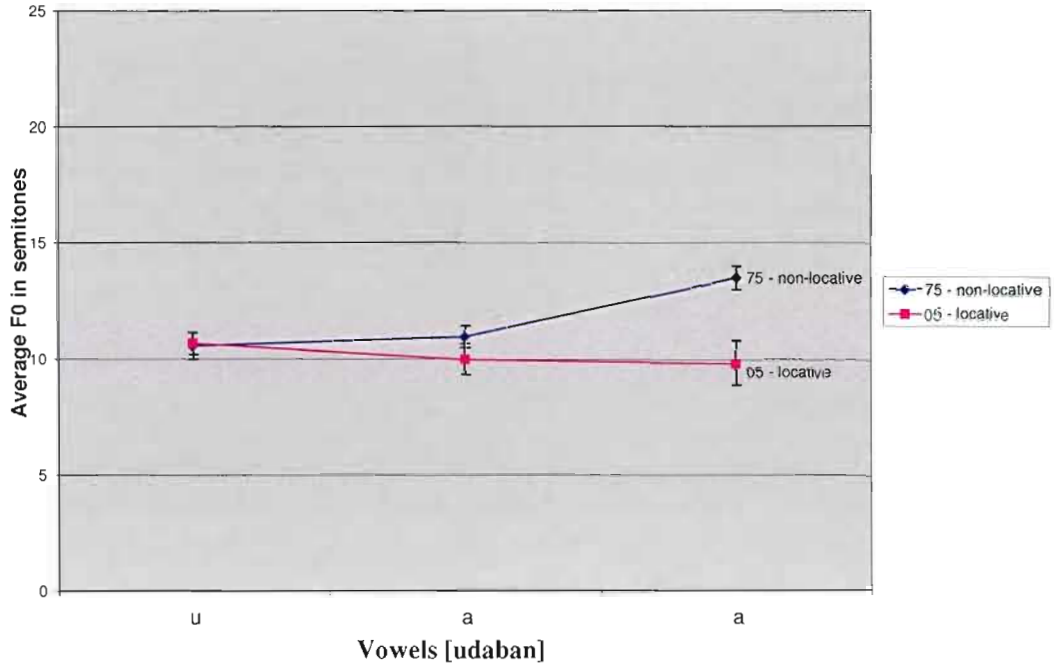
Sentence pairs	P1	P2	P3	P4	P5	P6
8 (âkushit) - 62 (âkushiht)	4	2	1	1	1	1
39 (kutak) - 48 (kutaht)	4	4	1	1	1	4
58 (takushik) - 45 (takushiniht)	1	2	1	4	1	1

According to these results, we conclude that speakers generally produce a low tone on the plural conjunct forms of these verbs (in sentences 62, 48 and 45), although it is unclear why P2 does not produce a low tone. The forms analysed in sentences 68 and 70 (above) are consistent with our findings for the rest of the paradigm, and we conclude that the plural conjunct bears low tone in the Western dialects.

5.3.3 Locative of Nouns Ending in /n/

For the locative form of nouns ending in /n/, only one pair of sentences was tested, and then only with three speakers. All three speakers (one from Betsiamites, two from Sept-Iles) appear to make the pitch distinction in keeping with P5's pronunciation of the word *utâpân(it)* [udaban] 'car,' from sentences 75 (*utâpân nipiûn anutshîsh*, 'the car is wet now') and 05 (*utâpânit apu nitauâssîm*, 'my child is in the car'), represented in Figure 5.10.

Figure 5.10 P5 - 05 (non-loc.) vs. 75 (loc.)

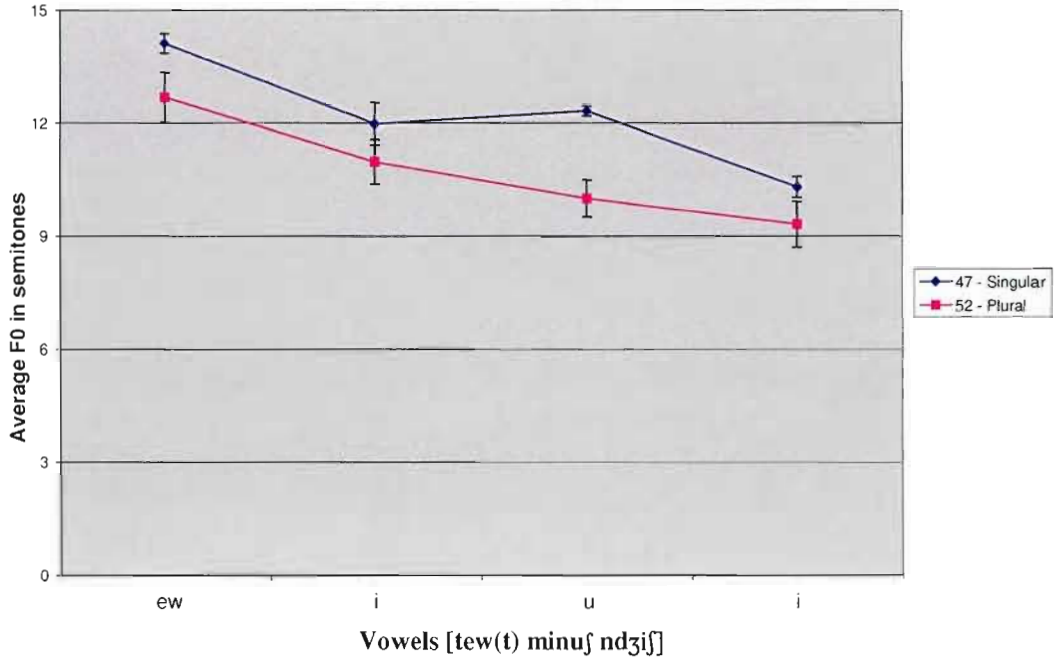


This example clearly shows the same pattern we have seen throughout these results: the locative form for 'car' is produced at a lower pitch by the three speakers tested and we may conclude that a low tone is used to mark the locative form in this context.

5.3.4 Plural of Animate Nouns Ending in /-ʃ/

Figure 5.11 is a representation of P5's pronunciation of *minûsh(at)* 'cat(s)' of sentences 47 (*miûtit teu mînûsh anutshîsh*, 'the cat is in the box now') and 52 (*miûtit teuat mînûshat anutshîsh*, 'the cats are in the box now').

Figure 5.11 P5: 47 (singular) vs. 52 (plural)



Through degemination of the final syllable /-ət/ of the plural form (underlyingly /minuʃət/) we arrive at the same pronunciation for both the singular and plural forms: [minuʃ]. As we can see in Figure 5.11, the pitch drops between the [i] and [u], and this drop in pitch indicates the plural form. P4 was omitted from the analysis for this sentence pair, but four out of five remaining speakers produced the same pitch distinction, with P6 producing no difference in pitch between the two forms. This is possibly due to speaker confusion, as it seems the same form was pronounced in both instances. The majority of speakers produce the pitch distinction, and so we conclude that a low tone is used to distinguish this otherwise minimal pair.

5.4 Comprehension Test Results

In order to verify that the pitch distinctions exposed in our production test results were also perceived, the same six speakers also undertook a comprehension test using some of the same forms that occurred in the production test. This test, comprised of one example question

and 17 questions, consisted of circling the French translation of an Innu phrase played for the speakers. (See chapter 4, *Methodology*, for more details.) The list of questions as the participants heard them but marked with their correct answers can be found in Appendix C. Sentences 2, 3, 4, 6, 8 14 and 16 tested the plural inanimate form; the example question (which we include in our analysis) and sentence 9 tested the TA imperative form; questions 1 and 10 tested plural animate form of verbs ending in /n/. All these sentences are minimal according to our production test results in that their corresponding contrastive forms are only distinguishable by a difference in pitch. Only one of two contrasting forms for each sentence pair was tested so that participants could not deduce a correct answer by process of elimination. The other sentences in our test (5, 7, 11, 12, 13, 14, 15 and 17) were not completely minimal, and it is possible that the participants may have based their answers on cues other than pitch; therefore, these were not considered in our analysis.

Our results show that all six speakers answered every question correctly. This would indicate that, even without any larger context, speakers are able to distinguish between a tone-bearing form and a toneless form. While it was not possible to test every form in our production test due to a lack of strict minimal pairs, the forms tested in the comprehension test support the findings of our production test: all forms that proved to be strictly minimal in the production test were successfully understood by participants whether the form in the comprehension test bore tone or not.

CHAPTER VI

DISCUSSION

We have seen evidence of pitch discrimination in many different grammatical contexts in the Western dialects of Innu. The clearest cases of this are to be found in the plural forms of inanimate nouns, imperative TA forms, the locative forms of nouns ending in /n/, the animate obviative form of nouns and verbs, the plural forms of proximate animate nouns, the 3rd person conjunct plural and the subjunctive forms of TI and AI verbs. The discrepancies in the results of the TI and AI imperative forms and the obviative of animate verbs ending in /i/ may indicate that speakers do not always employ low tone when the verb is otherwise marked for a given form, although our results indicate that low pitch is to be found on these forms in the majority of cases.

While some authors (namely Martin, 1980) may have found a recurring pitch pattern within the tone-bearing vowels of the Eastern dialects, our study has found no such pattern. We have seen that it is not the pitch fluctuations in the interior of a given vowel (or sonorant which occupies a nuclear position) which indicate tone or absence thereof; the tone is realized by the difference in pitch between the ultimate and penultimate vowels of plurisyllabic words, or the vowel of a monosyllabic word and the syllable which precedes it. Cases of monosyllabic words with no preceding vowel (e.g. at the beginning of a sentence) could not be classified by means of our methodology and will have to be the subject of future study.

According to our analysis, it is the presence of a *low* tone which indicates the difference in meanings between forms, and not another type of tone. While a low tone may be realized by a rise in pitch as well as by a fall in pitch, the one consistency in the production of tone in the Western dialects is that the tone-bearing form will always be produced at a lower pitch than the contrastive toneless form. We posit that the pitch dichotomy in the Western dialects

is that of "low tone vs. no tone" because there is no particular meaning associated to, for example, "high tone"; there is only the tone-bearing form, and the unmarked form.

Because a low tone may be realized by either a rise or fall in pitch, we can deduce that it is not the direction of the pitch change (higher or lower) that is most essential to the realization of tone in the Western dialects of Innu. Degree of slope appears to play a significant role in differentiating tone-bearing and toneless forms (does it rise or fall a little or a lot?). In other words, relative pitch appears to play a role with regards to the preceding syllable, affecting how the tone (or absence thereof) is realized. The overall intonation of a given sentence will affect the realization of a low tone and its surrounding syllables, but conversely, it is not impossible that speakers compensate for the presence of a tone in the pitch levels of the surrounding syllables by, for example, pronouncing the penultimate syllable of a tone-bearing word at a higher pitch in order to make the ultimate syllable stand out as being low.

When we compare our findings to those of Martin (1980), we find that they do not agree. For example, Martin found a rising tone in imperative TA 2-1 forms, while we found a low tone; he found a falling tone on the 2-3 forms, while our results indicate no tone. This is most likely due to the differences in methodology, and perhaps also due to the simple fact that there are two different sets of dialects under study and they do not use pitch fluctuations in the same way or to mark the same differences in meaning. Whether the case is more predominantly the former or the latter, the different uses of tone in these two dialects merits a more in-depth investigation, with the possibility of including other dialects closely related to Innu such as Naskapi and East Cree.

We have shown that low pitch is the systematic correlate of short vowel apocope. Since the apocope of short vowels (although a phonologically motivated process) only occurs in inflectional contexts, the ensuing low pitch on the root of a given lexeme has morphological status. In other words, the tone is an allomorph of the otherwise realized final vowel. Diachronically speaking, the development of pitch contrasts is spreading to other contexts with the progression of consonant degemination in word final position. It will remain to be seen with younger generations if tone in Innu will continue to spread to other contexts.

CHAPTER VII

CONCLUSION

This study aimed at documenting the state of contrastive pitch in the Western dialects of Innu. We first needed to prove that there were indeed tones in the Western dialects and that any systematic differences in pitch were associated with very specific meanings. This was done by way of a production test whereby speakers were recorded and these recordings underwent phonetic analyses in order to extract pitch measurements and compare the minimally contrastive forms found in our corpus. The difference in pitch between the penultimate and ultimate vowels of two given forms proved to be the element that enable the distinction in meaning between the two.

Once we established that all of the speakers tested were systematically using low pitch to mark differences in meaning between otherwise minimally contrastive forms, we were able to pick out the grammatical contexts marked by low tone, and we were able to establish the phonological processes that give rise to this low tone: apocope of a final vowel and contraction and degemination of a final syllable systematically lead to low tone occurring on the final realized syllable of a given form in the Western dialects. This low tone then becomes the marker for whatever form it is replacing, thereby taking on the meaning of the replaced morpheme. In this way, we are dealing with a tone proper, since it is specified in some of the morphemes of the language, as per the phonological and morphological criteria outlined in chapter 2. Our results showed that a low tone may indicate the following grammatical forms *where the phonological processes of apocope and contraction of the final syllable apply*:

- plural inanimate of nouns and verbs
- obviative animate of nouns and verbs (with no distinction between plural and singular in the obviative forms)
- imperative TA, TI and AI verbs
- subjunctive TA, TI and AI verbs

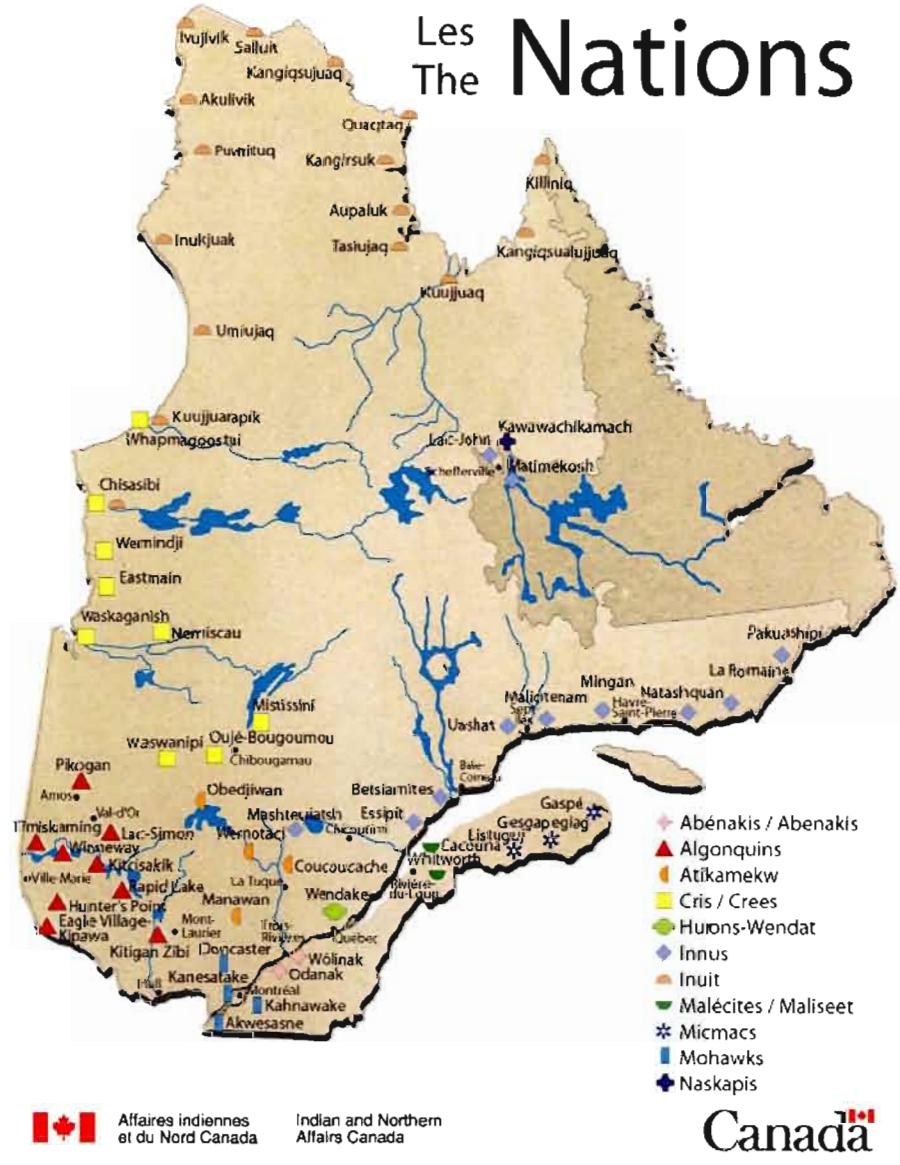
- plural animate of words ending in /-n/
- 3rd person plural conjunct
- locative of nouns ending in /-n/
- plural of animate nouns ending in /-ʃ/

Our methodology diverged in terms of the work that has come before. Martin's (1980) methodology did not prove to be useful in our analysis, yielding no consistencies, and so we were led to conclude that low tone in the Western dialects of Innu is marked by a difference in pitch between the penultimate and ultimate vowels of a given form, and not within the final syllable. In view of the successful identification of tone in the Western dialects of Innu in the grammatical contexts listed above, it would be of interest to investigate further into the use of tone in the Easter dialects, employing our methodology and comparing new findings to those of Martin's study. This would show if the differences in our findings are due purely to methodological causes or if there is a difference between these sets of dialects that can only be accounted for linguistically. Our method of analysis was also not without its faults, and knowing what we know now, it would be interesting to extend our production test to include different contexts for the lexemes we were not able to test due to positioning within a given sentence, thus providing more evidence for the cases of tone for which we did not have sufficient examples.

Necessity being the mother of invention, we were not sure in the beginning if our Z score method of analysis would prove to be fruitful. Indeed, at first we assumed it was not because we obtained results that differed from what we expected. Upon deeper analysis of these results, we saw a pattern emerging whereby the use of low tone was purely phonologically motivated, thereby proving that it was not a matter of faulty analysis, but rather of misinterpretation of the results. The Z score method is, of course, not without its faults. We were still unable to classify syllables that were as near to a syllable bearing a low tone as to a syllable with no tone, but these cases account for only 4.9% of the total of sentences classified with this method. Perhaps with a slight modification to our threshold, we would be able to obtain even more accurate results, but in terms of this study, this method of analysis still provided consistent results and so was an effective tool for analysis.

The findings of our production test were further supported by the results from the comprehension test undertaken by the same six speakers. When presented with only one of two possible contrastive forms (i.e. one part of a minimal pair) that differed *only* in terms of pitch, all six speakers were able to correctly identify the form presented in *every single question*. This perfect score would indicate that these speakers are consistently able to distinguish orally between pitch differences without the aid of context, and that pitch differences are indeed used to mark certain grammatical forms in the Western dialects of Innu.

Appendix A: Map of Aboriginal Reserves in Quebec



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Appendix B: Sentence List

1. cette robe est sèche là pâshteu ne akup shâsh	vs. 16
2. écoute-le donc natutu mâ alu	vs. 19
3. nous regardons ces enfants nitshîtâpamânânat anitshenat auâssat	vs. 24
4. il a vu une jeune fille hier ishkuessa uâpamepan utâkushît	No contrastive form
5. mon enfant est assis dans l'auto utâpânit apu nitauâssîm	vs. 75
6. des fois il y a beaucoup de monde nanikutini alema ilnuat teuat	Omitted
7. son enfant doit être arrivé pâpatâlitshe utauâssîma	No contrastive form
8. il n'est pas malade aujourd'hui apu âkushit kâshikâliti	vs. 62
9. s'il ne voit pas l'auto, il sera fâché ekâ uâpataki utâpânlu, tshika tshishuâpu	vs. 61
10. il ne te voit plus apu uâpamishk shâsh	vs. 11
11. s'il ne te voit pas, il sera fâché eka uâpamishk, tshika tshishuâpu	vs. 10
12. il y a toujours beaucoup de bûches mita mishta-alema takuana nânitam	vs. 18
13. si je ne suis pas malade demain, j'irai te voir ekâ âkushiâni uâpati, tshika natshi-uapamitin	vs. 60
14. fais-moi boire de l'eau minî nipî	vs. 23

15. ses enfants doivent être arrivés déjà pâpatâlîtsheni utauâssîma shâsh	No contrastive form
16. ces robes sont sèches déjà pâshteua ne akupa shâsh	vs. 1
17. embarque les enfants pûshîht anitshenat auâssat	Omitted
18. il ne reste plus qu'une seule bûche peik^{u} muk^{u} mit takuan shash	vs. 12
19. écoute-moi donc natutu mâ alu	vs. 2
20. bois cette eau min ne nipî	vs. 70
21. embarque-le donc pûshî mâ alu	vs. 33
22. écoute-les donc natutut mâ alu	No contrastive form
23. fais-lui boire de l'eau minî nipîlu	vs. 14
24. nous regardons cet enfant nitshîtâpamânân ne auâss	vs. 3
25. PAUSE	
26. leur auto est mouillée déjà utâpânuâu nipiûnlu shâsh	vs. 66
27. ferme la porte tshipaî ne ishkuâtem	vs. 30
28. mets ton manteau pûshtishke tshitakup	No contrastive form
29. lâche cette boîte tout de suite patshitina ne miush tuiet	patshitin vs. 41, miush vs. 35

30. ferme les portes — vs. 27
tshipaî ne ishkuâtema

31. lâche-moi donc — vs. 41
patshitini mâ alu

32. il a mangé des framboises hier — alûshkana vs. 36, muepan vs. 40
alûshkana muepan ûtâkushît

33. embarque-moi donc — vs. 21
pûshî ma alu

34. son enfant n'est pas encore arrivé — vs. 58
eshk^{u} apu takushinliti utauâssîm

35. lâche ces boîtes tout de suite — miut vs. 29, patshitin vs. 41
patshitina ne miut tuiet

36. il a mangé une seule framboise — vs. 40, 43
peik^{u} muk^{u} alûshkan nimuâtî

37. ses souliers sont mouillés déjà — vs. 71
nipiûnlua umassina shâsh

38. lâche ces enfants — vs. 41
patshitinat anitshenat auâssat

39. le poisson ne mord plus — namesh vs. 49, kutak vs. 48
namesh apu kutak shâsh

40. ils ont mangé des framboises hier — alûshkana vs. 36, muepanat vs. 32
alûshkana muepanat ûtâkushît

41. lâche cet enfant — vs. 29, 31, 35, 38
patshitin ne auass

42. mon père est malade maintenant — vs. 44
nutâuî âkushu anutshîsh

43. j'ai mangé beaucoup de framboises — vs. 36
mishta-alema alûshkanat nimuâtît

44. son père est malade maintenant utâuîa âkushilua anutshîsh	vs. 42
45. mes enfants ne sont pas encore arrivés eshk^{u} apu takushiniht nitauâssîmat	vs. 58
46. nous avons mangé tous les poissons hier nameshat nutam nimuâtânat ûtâkushît	nameshat vs. 39, nimuâtânat Omitted
47. le chat est dans la boîte maintenant miûtit teu mînûsh anutshîsh	vs. 52
48. les poissons ne mordent plus nameshat apu kutaht shâsh	vs. 39
49. il a mangé du poisson hier namesha muepan utâkushît	vs. 39
50. PAUSE	
51. il y va de temps en temps mani ituteu	Omitted
52. les chats sont dans la boîte maintenant miûtit teuat mînûshat anutshîsh	vs. 47
53. vas-y, cours shuk uîtshâuî	Omitted
54. voilà, j'ai fini shâsh nitshîshtân	Omitted
55. je n'aime pas beaucoup ça apu shuk miluataman	Omitted
56. mes enfants doivent être arrivés déjà pâpatâtshenat nitauâssîmat shâsh	No contrastive form
57. mes enfants ont dû être malades hier âkushîkupanat nitauâssîmat utâkushît	vs. 73
58. mon enfant n'est pas encore arrivé (à pied) eshk^{u} apu takushik nitauâssim	vs. 34, 45

59. on n'a pas apporté les canots encore — vs. 63
apu petâkaniti ûta eshk^{u}

60. je ne suis pas malade aujourd'hui — vs. 13
apu âkushiân kâshikât

61. il ne voit pas l'auto — vs. 9
apu uâpatak utâpânlu

62. ils ne sont pas malades aujourd'hui — vs. 08
apu âkushiht kâshikâlit

63. on n'a pas encore apporté le canot — vs. 59
apu petâkanit ûsh eshk^{u}

64. on n'ouvre pas la porte en ce moment — vs. 69
apu shenakanit ishkuâtem anutshîsh

65. s'ils ne sont pas malades aujourd'hui, j'irai les voir — vs. 72
ekâ âkushitau kâshikaliti, nika nâtshi-uâpamauat

66. leurs autos sont mouillées déjà — vs. 26
utâpânuâua nipiûnlua shâsh

67. écoute donc — No contrastive form
natuta ma alu

68. fais-les boire de l'eau — vs. 70
minîht nipîlu

69. on n'ouvre pas les portes en ce moment — vs. 64
apu shenikaniti ishkuâtema anutshîsh

70. mes enfants n'ont pas encore bu — vs. 68
eshk^{u} apu miniht nitauâssîmat

71. son soulier est mouillé déjà — vs. 37
nipiûnlu umassin shâsh

72. ils ne sont pas malades aujourd'hui — vs. 65
apu âkushitau kâshikâlit

73. mon enfant a dû être malade hier — vs. 57
âkushîkupan nituâssîm utâkushît

74. mon enfant n'a pas encore bu vs. 20
eshk^{u} apu <u>minit</u> nituâssîm

75. l'auto est mouillée maintenant vs. 05
<u>utâpân</u> nipiûn anutshîsh

Appendix C: Comprehension Test Answer Key

Nom : _____
Date : _____

ENCERCLEZ la lettre qui correspond à la traduction française de la phrase que vous entendez.

Question d'essai : (a) écoute-moi donc (b) écoute-le donc

1.	(a) nous regardons ces enfants	(b) nous regardons cet enfant
2.	(a) nous perdons nos autos parfois	(b) nous perdons notre auto parfois
3.	(a) parfois mes souliers sont mouillés	(b) parfois mon soulier est mouillé
4.	(a) cette robe est sèche déjà	(b) ces robes sont sèches déjà
5.	(a) bois cette eau	(b) fais-moi boire de l'eau
6.	(a) leur auto est mouillée maintenant	(b) leurs autos sont mouillées maintenant
7.	(a) fais-les boire de l'eau	(b) fais-lui boire de l'eau
8.	(a) ferme la porte	(b) ferme les portes
9.	(a) embarque-le donc	(b) embarque-moi donc
10.	(a) ils ont mangé des framboises hier	(b) il a mangé des framboises hier
11.	(a) les poissons ne mordent plus	(b) le poisson ne mord plus
12.	(a) les chats sont dans la boîte maintenant	(b) le chat est dans la boîte maintenant
13.	(a) mon enfant a dû être malade	(b) mes enfants ont dû être malades
14.	(a) on n'ouvre pas la porte en ce moment	(b) on n'ouvre pas les portes en ce moment
15.	(a) mon enfant n'a pas encore bu	(b) mes enfants n'ont pas encore bu
16.	(a) ses souliers sont mouillés déjà	(b) son soulier est mouillé déjà
17.	(a) son enfant doit être arrivé	(b) ses enfants doivent être arrivés

Appendix D: Inanimate Plural

Figure D.1 01 This dress is dry already
pâshteu ne akup shâsh

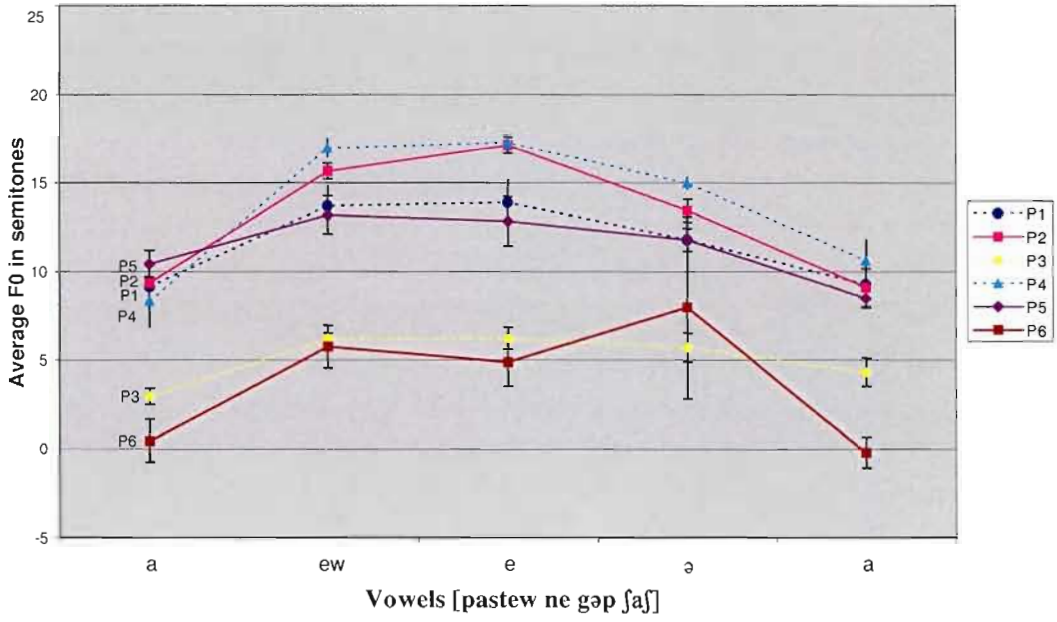
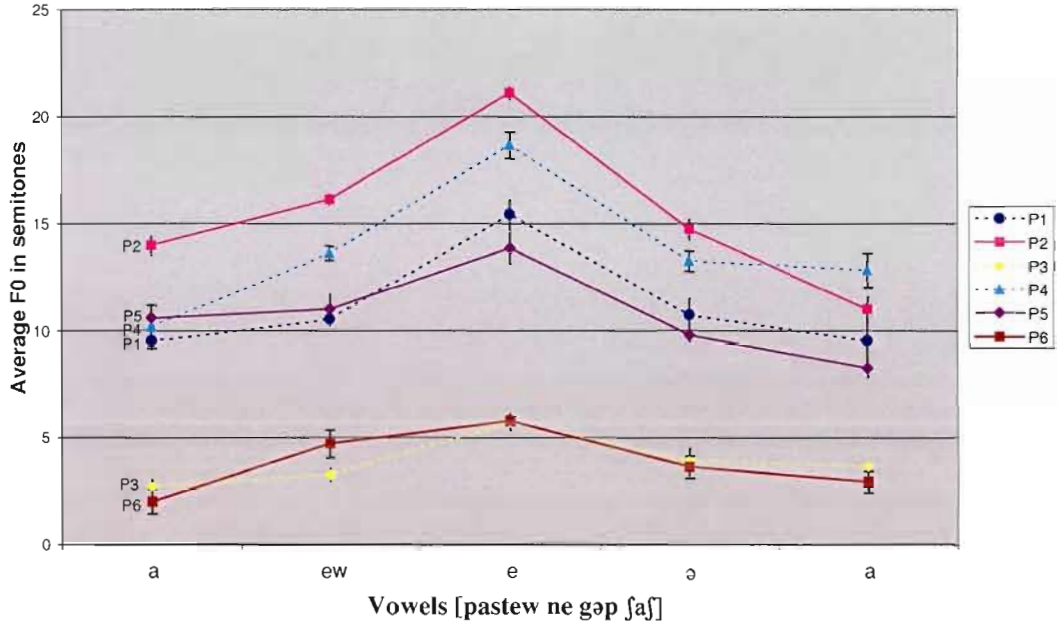


Figure D. 2 16 These dresses are dry already
pâshteua ne akupa shâsh



Appendix E: Demonstration of the effect of word position within the sentence on pitch*

Figure E.1 "Our cars": beginning of phrase vs. mid phrase

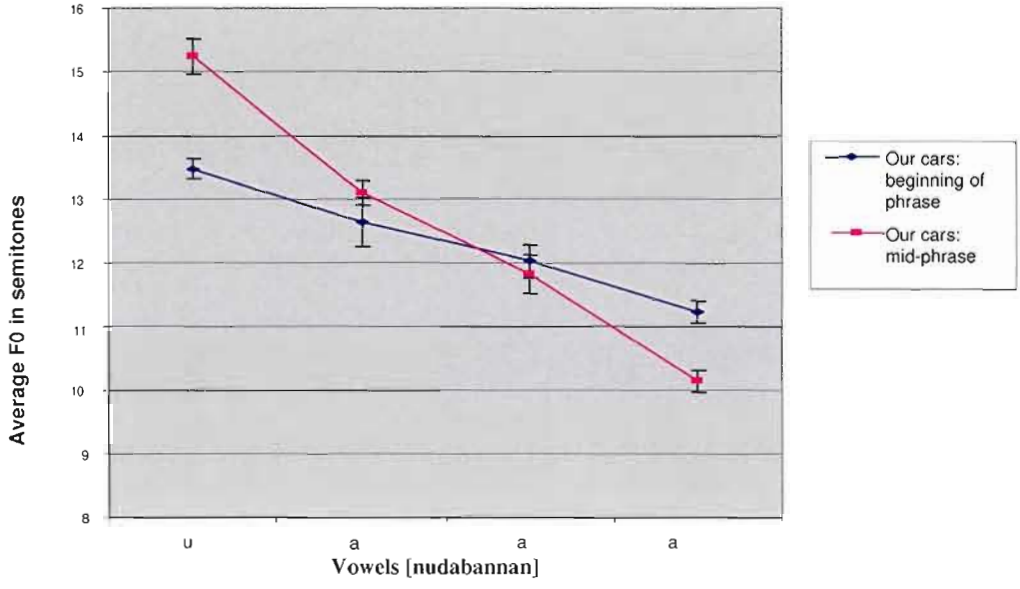
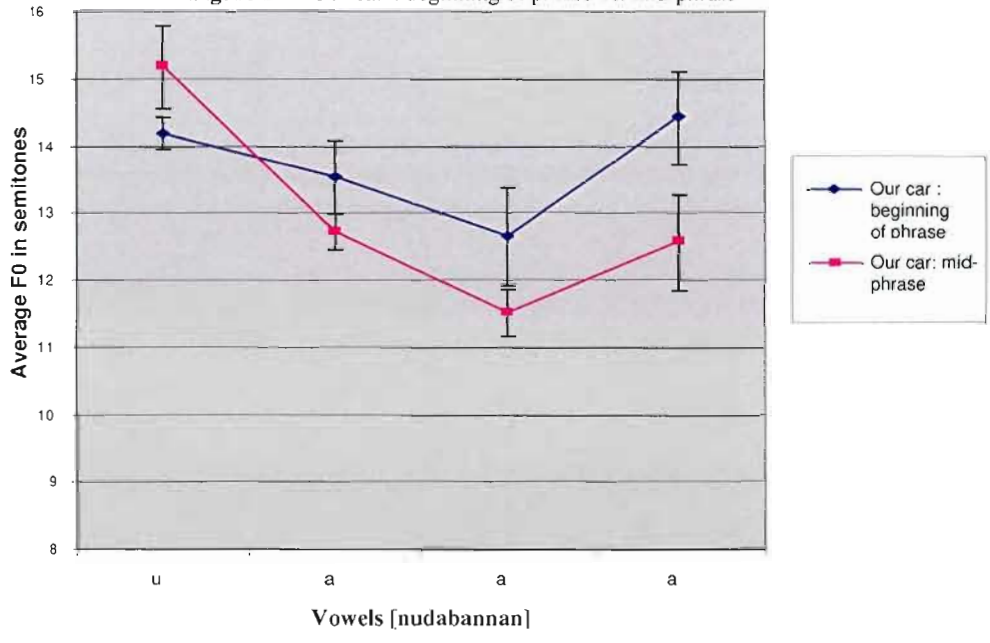


Figure E.2 "Our car": beginning of phrase vs. mid-phrase



*Source: Stevenson (forthcoming). These results, obtained during a test of P3 in the present study, show how if a word occurs mid-sentence, it has a tendency to start at a higher pitch and drop more drastically than the same word occurring at the beginning of a sentence.

Appendix F

Table F.1 Imperative TA: Average values of F_0 from the centre of vowels and their differences (in semitones)

Sentence	Speaker	**Average values of F_0 (semitones)**			**Internal F_0 of tone-bearing vowel**		
		V1	V2	Diff. V1-V2	V2		
Sentence 23: 2-3 singular [mən̲i̲ nəpilu] [mən̲i̲ nəpinu]	1	11.17	15.09	3.93	LHH	1.98	0.23
	2	13.68	21.27	7.59	LHL	2.63	-2.92
	3	2.56	5.21	2.65	Rising	1.50	1.01
	4	11.07	17.89	6.82	Rising	2.21	0.54
	5	11.47	14.35	2.88	LHL	1.67	-1.48
	6	2.79	8.20	5.41	LHL	1.60	-0.95
Sentence 68: 2-3 plural [mən̲i̲t nəpilu] [mən̲i̲t nəpinu]	1	9.92	11.58	1.66	Rising	1.24	0.93
	2	12.69	16.58	3.90	Rising	2.37	2.93
	3	3.03	4.10	1.07	Rising	0.65	1.24
	4	11.25	15.38	4.13	Rising	1.56	0.89
	5	11.25	12.06	0.80	Rising	0.72	1.46
	6*	3.72	7.79	4.25	Rising	2.18	1.52
Sentence 14: 2-1 [mən̲i̲ nəpi]	1	10.33	11.39	1.06	Rising	1.04	1.82
	2	13.80	18.18	4.37	Rising	3.81	0.63
	3	2.93	4.17	1.24	Rising	1.02	1.32
	4**	10.63	13.74	3.11	Rising	1.39	2.03
	5	11.00	11.91	0.91	Rising	0.79	1.97
	6***	1.64	4.96	3.32	Rising	1.82	1.50

*1st repetition omitted; **4th repetition omitted; ***5th repetition omitted.

Table F.2 Comparison of 2-1 TA imperative forms

	Speaker	Average values of F_0 (semitones)			Internal F_0 of tone-bearing vowel		
		V1	V2	Diff. V1-V2	V2		
Sentence 19: 2-1 form /(na)ndə̲du̲/	1	10.45	10.29	-0.15	HLH	-1.19	1.27
	2	13.59	16.05	2.46	Rising	1.77	1.88
	3	2.85	3.36	0.50	Fall.	-0.63	-0.92
	4	11.83	15.04	3.21	Rising	1.54	0.91
	5	10.53	10.74	0.21	HLH	-1.68	2.11
	6	9.35	5.33	-4.02	NUL	0.43	-0.11
Sentence 33: 2-1 form /puxi malu/ /puʃi manu/	1	9,37	11,25	1,88	NUL	-0,08	0,39
	2	13,32	16,39	3,07	Rising	2,44	2,26
	3	3,12	3,45	0,33	LLH	0,08	0,94
	4	13,22	15,83	2,61	Rising	1,49	0,50
	5	11,21	12,01	0,80	HLL	-0,77	0,47
	6	3,59	6,74	3,15	LLH	0,37	1,12

Appendix G

Figure G.1 70 My children have not yet drunk
eshku apu miniht nitauâssîmat

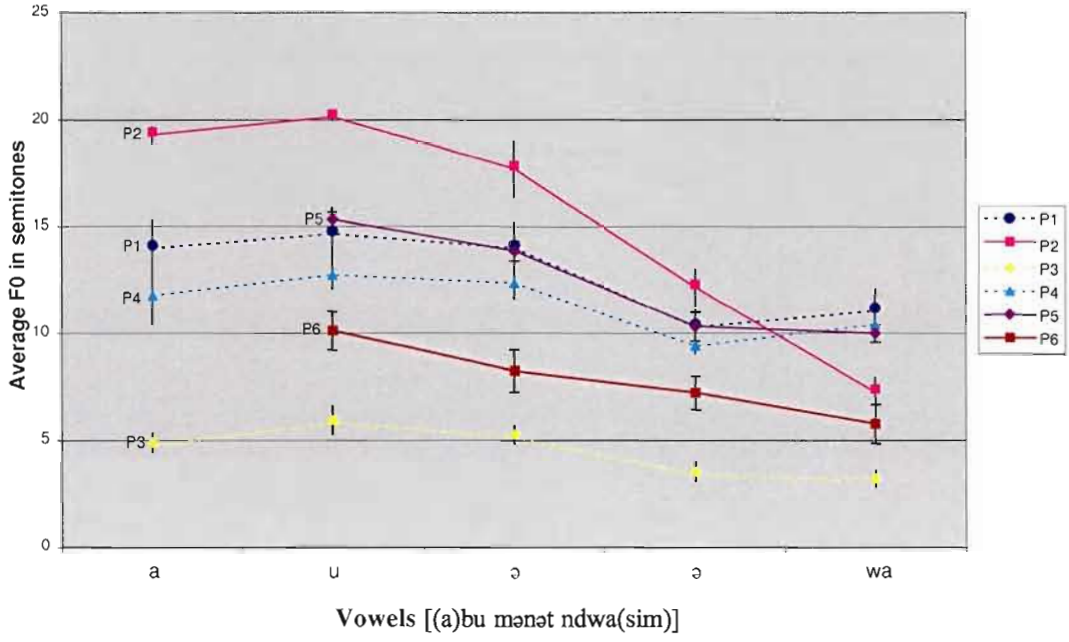
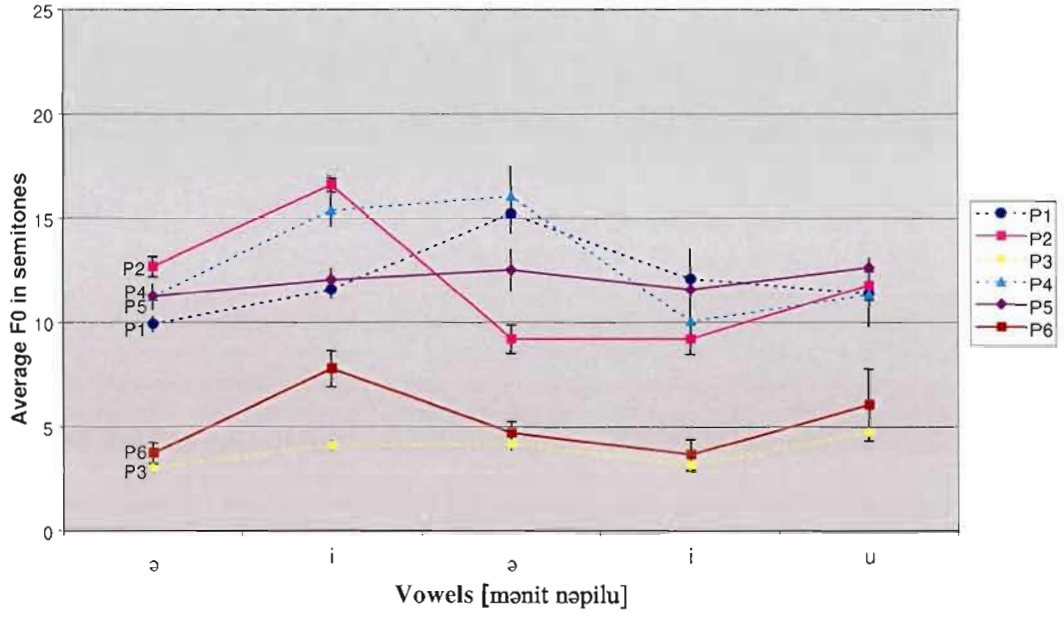


Figure G.2 68 Make them drink water
minîht nipîlu



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