Annotating Archival Recordings of Hocank (Winnebago)

Nancy Hall, Andie Niederecker, Elica Sue and Irene Orellana
California State University Long Beach

1 Introduction

This paper describes a new set of annotations for an existing corpus of Hocank recordings, made in Wisconsin by Kenneth Miner in 1974-1975. Hocank (also spelled Ho-Chunk or Hoocąk) is a Siouan language spoken in Nebraska and Wisconsin. In older literature, it is frequently referred to by the exonym Winnebago (Pritzker 2000:475). The language is endangered; according to Helmbrecht & Lehmann 2010:1, there are fewer than 200 fluent speakers, almost all over age 60.

Our goal in annotating these recordings is to make this collection of rare primary data more accessible to scholars. This paper is a guide to understanding and using the annotations for linguistic research. The paper is structured as follows: Section 2 describes the existing documentation of Hocank phonetics and phonology, and some of the reasons that Hocank phonology has attracted linguists' interest. Section 3 describes the audio corpus, and Section 4 describes the annotation process. Section 5 summarizes the contents of each of the 28 tape reel. Section 6 discusses what linguistic uses the corpus is and is not suited to.

2 Documentation and analysis of Hocank phonology

Hocank has played a prominent role in phonological theory, due to several phonological characteristics that are typologically rare and/or particularly complex. One example of a rare pattern is the reported placement of pitch accent on the third mora of every word. While placing accent three moras from the *end* of a word is cross-linguistically common, counting three moras from the beginning is nearly unique to Hocank. Hocank syllable structure is also unusual in two respects: only obstruents may serve as codas (whereas cross-linguistically, sonorants are usually preferred as codas), and only obstruent-obstruent clusters are permitted as complex onsets (against the more typical preference for obstruent-sonorant clusters). Underlying obstruent-sonorant onsets are broken by an epenthesis process known as Dorsey's Law, which inserts between the consonants a copy of the following vowel (/kɾe/ → [keɾe]). Vowel epenthesis interacts opaquely with several other morphological and phonological processes, including reduplication, ablaut, vowel nasalization, and accent placement. The challenge of analyzing and explaining these patterns has spurred a long line of theoretical literature, including among others Miner (1979, 1981, 1989, 1993), Hale & White Eagle 1980, Hale 1985, Halle & Vernaud 1987, Steriade 1990, Alderete 1995, Hayes 1995, Heiberg 1995, Hall (2003, 2006), Broselow 2008, Davis & Baertsch (2011, 2012), and Stanton & Zukoff 2018.

The data cited in phonological analyses comes primarily from three sources. Amelia Susman's 1943 dissertation, based on her fieldwork from the late 1930's, was the first to present extensive accentual data. Kenneth Miner expanded the description of several aspects of the phonology with data from his fieldwork in the 1970's, presented in a series of articles (1979, 1981, 1989, 1993) as well as the unpublished but widely circulated *Winnebago Field Lexicon* (1984, hereinafter the *Field Lexicon*) and *Winnebago Grammar*

* Other contributors to the creation of this corpus include Stacey Jacobson, Miles Haisley, Joshua Lester, and Cameron Duval. This work was supported by the National Institute of General Medical Sciences of the National Institutes of Health under Award Numbers UL1GM118979, TL4GM118980, and RL5GM118978. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health. We also gratefully acknowledge the support of CSULB's Office of Research and Sponsored Programs.

Proceedings of *WECOL 2017*

(1992). Finally, Josephine White Eagle contributed examples from her own native knowledge of Hocank (Hale & White Eagle 1980)[1].

While Hocank phonology is in many ways well-documented, there is one major gap: a lack of any published acoustic phonetic data. This gap is unfortunate, because impressionistic descriptions of phonetics have strongly influenced some lines of phonological analysis. For example, Susman 1943 and Miner 1979 both describe epenthetic vowels as having a shorter duration than lexical vowels. Their descriptions of the vowels as "fast" have been cited as evidence that epenthetic vowels have an unusual surface representation, perhaps not forming a full syllable (Alderete 1995, Hall 2003, 2006). Miner 1979 also describes epenthetic vowels as having a special secondary accent not found on lexical vowels, although he adds "I am not wholly convinced of the secondary accent…pending instrumental studies". The existence of this secondary accent has been cited as evidence that epenthetic vowels are subject to special prosodic constraints (Stanton & Zukoff 2018). However, the supporting instrumental studies are still pending 40 years later.

3 The recordings

The recordings consist of 28 ¼ inch audio reels, most around one hour in length. They are archived at the University of Wisconsin-Milwaukee Libraries as Tapes 108–135 in the Wisconsin Native American Language Project collection. The copyright is held by the Great Lakes Inter-Tribal Council. The tapes were digitized in 2008, in part due to concern over the deterioration of the audio recordings, which had reached the end of their expected 30-year lifespan. The library also holds photocopies (not originals) of Miner's notebooks, archived as UWM Manuscript Collection 20. There are 11 folders, each of which contains 80-150 1-sided sheets of paper (personal communication from Michael Doylen, Head of Archives department, 2008).

There is limited metadata on the recordings. The most complete description comes from Miner 1979:25: **"**My data are from Winnebago as spoken in Wisconsin and were obtained in 1974-75 under the auspices of the Wisconsin Native American Languages Project, funded under Title IV-B of the Indian Education Act. I am deeply indebted to Robinson Johnson (Xíiguga), Lavina Thorud (Mąąxiánąžįwíga), and Dora Topping (Mą́ąjiĭjewíga), for patiently helping me to understand the workings of their language." In the introduction to the *Field Lexicon*, Miner clarifies that Topping contributed "to a lesser extent". The recordings and field notes contain no information about the speakers, but there are indeed three Hocank voices distinguishable. One woman, presumably Ms. Thorud, provides most of the words. There are about 400 words in a man's voice, presumably that of Mr. Johnson, and a few words in a second female voice, presumably that of Ms. Topping. All of the speakers sound somewhat elderly, and all are highly fluent in English.

The notes largely match the tapes, but sometimes include additional items that were apparently not recorded. The tapes do not include nearly all the items in the *Field Lexicon*, and there are some recorded words that we could not locate in the *Field Lexicon* (although some entries may well have been missed due to deficiencies in the authors' understanding of Hocank morphology).

4 Annotations

After preliminary work by Stacey Jacobson in 2008, phonological annotation commenced in 2017. Elica Sue was responsible for the bulk of phonological transcriptions, with significant contributions from Miles Haisley, Irene Orellana, and Nancy Hall. The morphological annotation effort began in Fall 2018, headed by Andie Niederecker.

[1] There has been an additional major documentation project in recent years: "Documentation of the Hocak language", funded by the Volkswagen Foundation in 2002-2008 and headed by Johannes Helmbrecht. The outputs of this project have focused primarily on lexical, morphological and syntactic analysis rather than phonology.

Using Praat software (Boersma & Weenink 2017), the annotators created textgrids for each recording. A textgrid is a plain text file that records interval boundaries and labels. Although designed to be used in Praat, the .TextGrid files can be opened in any text editor, and the information extracted for use with other software. Praat itself allows the recordings and textgrids to be manipulated in ways that allow quick access to lexical items. For example, one can use a Praat script to extract each labeled sound interval to an individual file, titled according the interval label. (Such scripts can be obtained from various online repositories.)

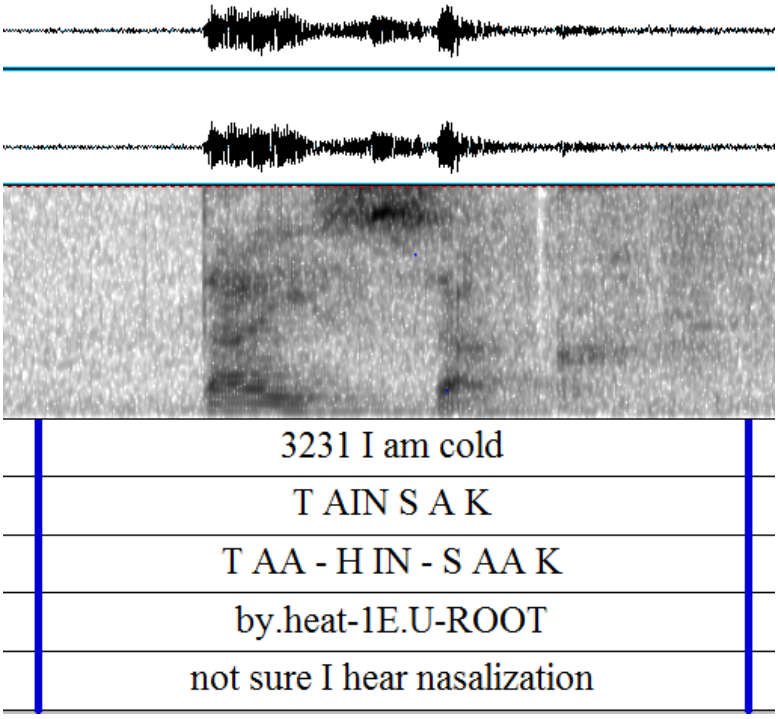

Figure 1. Sample spectrogram and textgrid

The textgrids contain five interval tiers. **Tier 1** contains an English translation of each word, along with the entry number in the *Field Lexicon*. If the item could not be located in the lexicon, it is preceded by the code "XX". If it is produced by the male speaker, the number is preceded by "M". Where words are produced as a phrase, they are included with the same interval and separated by "+". **Tier 2** contains a broad phonetic transcription of the Hocank word as pronounced, in a phonetic alphabet we adapted from ARPABET, described below. **Tier 3** contains the underlying forms of each morpheme in the word (as best as we can determine), in the same transcription system. **Tier 4** contains a gloss of each morpheme. **Tier 5** is used for notes and commentary when needed. A sample spectrogram and textgrid is shown in Figure 1. In this example, we see that the underlying form has undergone several phonological processes: deletion of intervocalic [h], creation of a diphthong from the juxtaposed vowels, and shortening of the root vowel. The nasality of the resulting diphthong is inferred from the fact that one of the underlying morphemes is standardly nasalized; as noted in tier 5, nasality is not acoustically clear in this token, perhaps due to the low amplitude of the waveform.

Over 8400 Hocank word tokens have been annotated, including nearly 4000 different word forms. This includes tokens in isolation, in short Hocank utterances, and embedded in English sentences, as often happens when discussing a word's meaning or usage. For example, in a discussion of words for *blizzard*, Ms. Thorud explains "sometimes you hear thundering in the air, it's blizzarding real hard and kind of yellowish-like, the color, little bit tint, they call that *uʒinũ̃ba* and, and *u:ʒi* means *ass*, *nũ̃ba* is *two*, sort of double" (reel 109c). We have not transcribed the English conversation, but plan to do so at a later stage.

Ms. Thorud and Mr. Robinson sometimes give interesting explanations of etymology, as in the example above, or discuss issues such as dialectal or gender variation in speech.

4.1 *Phonetic transcriptions* Phonetic transcription of the Hocank words was based on the field notes, the *Field Lexicon,* Helmbrecht & Lehmann 2010, and the annotator's ear. Not infrequently, a word is transcribed differently in the field notes than in the published sources, and the published sources may also disagree. For example, the word for 'Sioux' is transcribed with three different vowel length patterns: as šahą́ [ʃahą̃] in the field notes (reel 117b), but as šą̄hą̄ [ʃã:hą̃:] in the *Field Lexicon* and as Šą̨ahą́ [ʃã:hą̃] in Helmbrecht & Lehmann 2010. The most common discrepancies concern vowel length and, less often, vowel nasalization (also seen in the above example). Vowel length was often particularly hard for annotators to determine, in part because many of the utterances are slow and hyperarticulated. There are also discrepancies among notes and published sources in accent placement, but we did not transcribe accent in the corpus. In the case of disagreements where the annotator had no strong intuition as to which was correct, we gave more weight to the *Field Lexicon*, as it presumably reflects conclusions Miner made after reflection (and perhaps with more data). However, if the annotator thought the word clearly sounded unlike the transcription in the *Field Lexicon*, they followed their ear.[2]

We phonetically transcribed words using a system based on ARPABET, a phonetic alphabet popular in computational studies of speech. Each phoneme is represented by one or a group of symbols, and phonemes are separated by spaces.

For vowels, phonemic length is indicated by doubling, and nasality is indicated by a final N. Table 1 shows correspondences between the corpus transcription of vowels, Miner's transcriptions, and IPA.

	Corpus	**IPA**	**Miner**
Short oral	A E I O U	a e i o u	a e i o u
Long oral	AA EE II OO UU	a: e: i: o: u:	ā ē ī ō ū
Short nasal	AN IN UN	ã ĩ ũ	a̧ i̧ u̧
Long nasal	AAN IIN UUN	ã: ĩ: ũ:	ā̧ ī̧ ū̧

Table 1. Simplex vowels

Hocank has a large number of diphthongs. We transcribed these by combining the symbols for the vowels that constitute the diphthong, concluding with an N if any member of the diphthong is nasalized. Only [i u a] can be nasalized, so when these appear in a diphthong, the diphthong is reported to be only partially nasalized.

	Corpus	**IPA**	**Miner**
Oral	IO AI OA	io ai oa	io ai oa
Nasal	ION AIN OAN	ĩo ãĩ oã	i̧o a̧i oa̧

Table 2. Diphthongs (examples)

The following consonants are transcribed the same (except for capitalization) in the corpus, Miner, and IPA: [p b t k g s z x m n w h]. Other consonants symbols are listed in Table 3.

[2] Given that Hocank accent placement crucially relies on vowel length, it was interesting to find that vowel length may not always be easy to identify. As noted by Helmbrecht & Lehmann 2010, the official alphabet of the Ho-Chunk Nation does not indicate vowel length.

Corpus	IPA	Miner
SH	ʃ	š
CH	t͡ʃ	č
ZH	ʒ	ž
J	d͡ʒ	ǰ
Q	ʔ	’
GH	ɣ	ǧ
NR	ɾ̃	ň (an allophone of ɾ after nasal vowels)
Y	j	y
R	ɾ	r

Table 3. Consonants

Miner’s *Winnebago Grammar* posits one additional consonant phoneme, [ɲ], which is not listed in Helmbrecht & Lehmann 2010 or in Susman 1943. We assigned this the symbol NY, but have not found any examples of it.

The transcriptions mostly ignore allophonic distinctions, except that, following the *Field Lexicon*, we showed the predictable nasalization of /ɾ/ to [ɾ̃] following nasal consonants. We did not transcribe the non-phonemic schwas that occur in heterosyllabic obstruent-sonorant clusters, as in [wanĩgənĩk] ‘little bird’. These schwas, which can be acoustically quite distinct, are often transcribed in the field notes but not the *Field Lexicon*. Following the *Field Lexicon*, we did not transcribe the allophonic voicing of /t/ to [d] before vowels, but did transcribe the contextual neutralization of phonemic voicing contrasts in other obstruents, as in [wanĩ**k**] ‘bird’ versus [wanĩ**g**ənĩk] ‘little bird’. In a departure from the *Field Lexicon,* we chose not to transcribe the location of accent at this stage. We made this choice because the location of accent is one of the most important questions in Hocank phonology, is subject to some disagreement in the literature, and was often difficult for us to hear (due to slow and hyperarticulated speech, and a lack of understanding of the phonetic correlates of accent).

4.2 *Morphological analysis* Morphological analysis is still underway at the time of writing, and the examples given here should be seen as preliminary. The analysis is largely based on Helmbrecht & Lehmann 2010, as well as Miner’s *Winnebago Grammar*. Where possible, morphemes are glossed using Helmbrecht & Lehmann’s codes; some additional codes were created for morphemes found only in Miner. We have so far identified about 230 grammatical morphemes and allophones. Additionally, there are a few apparent morphemes (or allomorphs) that we have so far not been able to identify from previous sources.

The morphological analysis has in many cases clarified the phonological transcriptions. For example, some sounds originally transcribed as N [n] were changed to NR [ɾ̃] when it became clear that the phone derived from underlying R [ɾ], which regularly changes to [ɾ̃] after a nasalized vowel. Similarly, some vowels originally transcribed as oral were changed to nasal when we realized that they belonged to a morpheme that generally contained a nasal vowel.

A challenge for morphological transcription is the frequency of phonological elision, which may largely obscure certain morphemes. Phonological processes can often be inferred through comparing the underlying and surface forms; we plan at a later stage to add a tier that explictly identifies the application of phonological rules.

5 Contents of the recordings

This section provides a brief overview of the contents of each tape reel, pointing out where certain topics are covered at most length. Some elicitation sessions focus on words of a particular semantic or phonological pattern, but in many it is not clear what the words have in common.

Most words are elicited in isolation. There are several hundred multi-word sentences, and a few short narratives. There are no examples of spontaneous or naturalistic discourse in Hocank. There are about 30

short pre-scripted social dialogues, which the speaker reads aloud in English and then translates to Hocank. These dialogues are generally four turns, as shown in the samples below.

He has a pipe	I looked for a house	Isn't that a cute little bird
Give him tobacco	Whereabouts	That's a house wren
He is an old man	Everywhere	Wonder what they eat
He is poor too	Why don't you look farther	Probably worms and seeds

Table 4. Examples of short dialogs

Ms. Thorud speaks in all reels. Mr. Johnson speaks extensively in reels 123, 124, and 133, and less in reels 122, 125, 127, 128, 132, and 134. There are a few words from a second female speaker in reel 130.

Reel 108
Assorted nouns, including animals, foods, colors, clothing, body parts, time expressions, and people. Words are not grouped by semantics; translations are in reverse alphabetic order in English, suggesting that these were items marked off in a dictionary as needing verification.

Reel 109
Numbers (1-12, tens, hundreds, thousands); assorted nouns, adjectives, and verbs; a narrative (contents unknown) which apparently does not appear in the notes.

Reel 110
Assorted nouns, verbs, adjectives; paradigms of talk [hitʔe], sing [nãːwã], swim [hiːɾa]

Reel 111
People; Indians; colors; paradigm of see [had͡ʒa], visit [horad͡ʒe]; positionals, vehicles, time expressions

Reel 112
Forms of smoke [taanĩ hĩː], positionals, family members (forms depending on gender of speaker), playing cards

Reel 113
Dialectal forms from Nebraska/Wisconsin; fishing

Reel 114
Paradigms for ask [higiwãx], know [hipeɾes], place names and locations (mostly in Wisconsin), assorted nouns (some bird names, shapes), body parts, assorted verbs/phrases

Reel 115
Assorted phrases

Reel 116
Assorted words, paradigms of love [woːgixete], tell [hoɾak], hate [honĩpaʃeɾe], see [had͡ʒa]

Reel 117
Paradigms of ask [higiwãx], eat [waɾut͡ʃ], be tired [hĩit͡ʃge], be lazy [woːɾuʃʔake], be old [ʃʔaak], be blind [hiʃd͡ʒaɾa nĩk], be lost [xawanĩ], work [waɾe], play cards [biːk ʃgaːt͡ʃ], parts of a house, days of the week

Reel 118

Berries; animals, tools; paradigm of ask about something/someone [hiwãx]

Reel 119
Paradigms of kick [nãːxd͡ʒak], pound [hobo͡tʃãˀ], to do something to damage/hurt/correct an object [giʃgã], push [hawad͡ʒɑ̃], knock over [boːkã], kill [tʔeːhi], cut with knife [mãːt͡ʃe], squash [waxiɾi], step on [hãnãʒĩ], open [ɾuːhas], peel [mãːxoro], break [ɾuːʒe], tear [ɾuːgas], pull [ɾuːti], carry [ɾuːʔã], bend [ɾiːd͡ʒiɾe]

Reel 120
Paradigms of lasso [hoid͡ʒe], help [waːɣot͡ʃ], kiss [joːkiwãk], burn [taːxu], hit by slugging [giːʃaɾat͡ʃ], to hit by socking [gisak], catch [hoxeɾe], whip [gipsĩːt͡ʃ], shot [guːt͡ʃ], paint [hogiha], accept [d͡ʒihuhi], add up [gikaɾap], admit [hid͡ʒoːwiɾehi], permit [d͡ʒoːwaiɾehi], announce [hid͡ʒad͡ʒa], answer [haːkd͡ʒoː giɾak], believe [hisge ɾanãʔĩ], bring [hanĩgu], understand [nãːkixguːnã]

Reel 121
Paradigms of confess [kikuɾuʃd͡ʒãɾeːhi], bring down [mãːɾowaɾehi], choose [giːt͡ʃã], bring with [rasaːnĩgu], bring up [wãːgɾoːwahuhi], bear in mind [hamãke], think about [wewĩːnã], agree with [nãːgiʒĩ], adopt [niɣd͡ʒĩ], count on [hinãʒĩ]

Reel 122
Paradigms of decide [kaɾagi], bother [waːweːske]. Extended family members (in laws, children by birth order), addressing family members depending on speaker gender/status; trees

Reel 123
Trees; large mammals; paradigms of be dancing [waʃĩ], jump [hatʔãptʔãp], sleep [nãː]; counting rabbits

Reel 124
Counting rabbits; social greetings; small mammals; turtles; insects

Reel 125
Paradigms of feed [waɾut͡ʃgigi], cover up [haɾukã], be proud of [hitoʔĩ], meet [hikipa], wake up [ɾuːxĩk], worry about [nãːt͡ʃgewoːt͡ʃĩ], wait for [hagipe], scare [nãːɣiɾe], make happy [woːgiʒawa], take hold of [haɾukos]

Reel 126
Paradigms of get mad at [woːgitek], disagree with [nãːgixd͡ʒak], insult [ɾahod͡ʒa], run away from [gigias], notice [howesĩwĩ], notify [honãxgun], guard [hiɾakaɾa], gossip about [waʒĩigege], look for [honĩ], feel sorry for [nãːd͡ʒogid͡ʒã]

Reel 127
Paradigms of feel sorry for [nãːd͡ʒogid͡ʒã], beat [woːhi], imitate [hokiʔũ], run away from [tʔũːnãːk], live with [hakit͡ʃĩ], make up with or fix [pĩːkikʔũ], agree with [gigiːpĩːnã], defend [kaɾaʃik], praise [ɾat͡ʃãk], suspect [hiɾanãʔĩ]

Reel 128
Months, seasons; paradigms of dance moving [waʃĩ], sing along [nãːwãk], sleep moving [nãːhak], jump moving [tʔãtʔãːp], cry moving [ɣaːk]; professions

Reel 129
Professions; snakes; birds; fabrics

Reel 130
Foods; weather; corn; tools; paradigm of kick moving (positional) [nãxd͡ʒak]

Reel 131
Paradigms of kick sitting [nãxd͡ʒak], kick standing [nãxd͡ʒak], hold standing [ɾuʔã], hold sitting [ɾuʔã], hold moving [ɾuʔã], chew sitting [ɾat͡ʃop], hide [nũːxãwãk], cook for [waɾut͡ʃ giʔũ], chew moving [ɾat͡ʃop]

Reel 132
Paradigm of pass by [hahiowe], have [niːn], say [eː], chew [ɾat͡ʃop], be Indian [wãkʃ̃i kĩ], want [roːgũ], crave [nãːʔĩ] , start out [d͡ʒikere], arrive [hid͡ʒaː hiː], arrive coming [d͡ʒiːn], start going back [kaɾahe], be on the way [guhen]; verbs of motion

Reel 133
Assorted verbs with positionals; nouns; monosyllabic words with some minimal pairs

Reel 134
Social dialogues

Reel 135
Social dialogues; nursery rhymes based on English ones: Child's Praying Song, Tommy Tucker, I had a Cow, One Two Buckle my Shoe, Four and Twenty Blackbirds

6 Potential uses of the corpus

The most fruitful use of the corpus, for linguists, is likely to be phonetic analysis. As noted above, the corpus consists primarily of words produced in isolation. The lack of naturalistic conversation, and limited amount of narrative material, will make the corpus less useful for studies of syntax or discourse. As far as cultural material, the few texts are mostly translations of English nursery rhymes, rather than stories from Hocank culture. There is obviously a wealth of lexical material, as well as a fair number of verbal paradigms, but we doubt that these data go significantly beyond what is already documented in existing grammars and lexicons of Hocank.

For phonetic analysis, however, this is a rich new data source. These recordings allow us to verify and further analyze phonetic phenomena that have previously been described only impressionistically. While more recent recordings might offer better sound quality, the 1974-1975 corpus represents a period when the language had more speakers. As language attrition is known to affect phonological and phonetic structure, older recordings could well reflect phonetic or phonological distinctions that have since been lost. For example, Miner reports an allophonic process whereby ɾ → ɾ̃ / Ṽ __ . Miner describes the resulting phone as 'a weakly nasalized flap'. Helmbrecht & Lehmann 2010 use a special letter for this phone, but state that this "does not represent any sound different from the one represented by <n>." This suggests that there may have been a diachronic merger of [ɾ̃] and [n], a question we plan to examine using older and newer recordings.

Although there is some background noise and reverberation, the recordings are generally clear enough to allow confident measurements of vowel formants, vowel and consonant durations, and voice onset time in stops. Pitch variations are also typically clear, allowing studies of accentual phenomena. Ms. Thorud often repeats the same word several times (apparently trying to help Miner as he writes it down), and this sometimes gives the chance to see the same word with different intonational contours. Figure 2, for example, shows two immediately subsequent productions of [eːnãːʔĩ] 'he craves". The first token ends on a high pitch (the slight final dip in the track is illusory), while the second token has a clear final fall. Such pairs may allow us to see how intonational tones interact with lexical pitch accent.

The nature of the data does have some drawbacks for phonetic analysis, however. The fact that most words are produced in isolation means that most do have a final intonational fall, which may obscure other accentual phenomena. Many of the words are quite slow and hyper-articulated; this is part of the reason that vowel length is not always easy to determine.

Nevertheless, we hope that this corpus will help bring the analysis of Hocank phonology and phonetics to a new stage, moving beyond impressionistic descriptions. Our lab is also currently engaged in the

annotation of a second set of Hocank recordings, created by Gerd Fraenkel in 1959, which contain more elicitation of sentences and narratives.

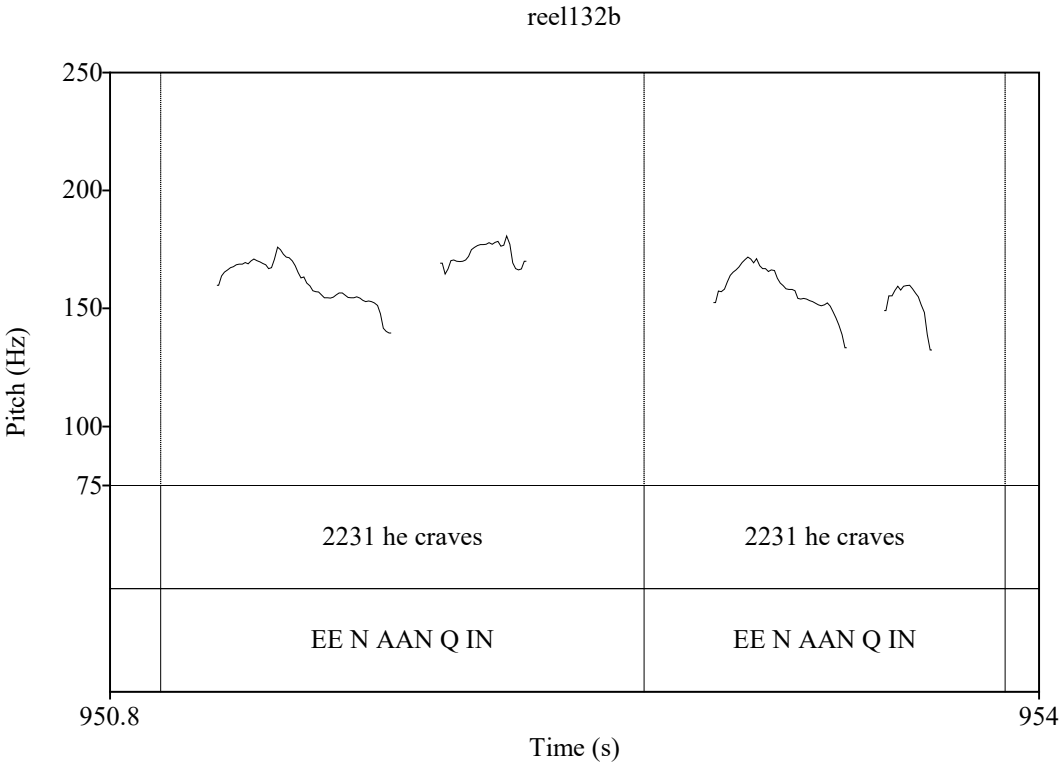

Figure 2. Pitch tracks of a word produced with two intonational contours

7 Future directions

As noted above, morphological analysis of the corpus is currently underway. We also plan to transcribe the English conversations between the participants, as these sometimes shed light on semantic nuances, dialect differences, and other topics of interest.

When annotation is complete, we plan to deposit the annotations in the same archive that holds the original recordings. Until then, scholars wishing to access the draft annotations for academic research are welcome to contact the first author.

References

Alderete, John (1995). Winnebago accent and Dorsey's Law. In *University of Massachusetts Occasional Papers in Linguistics 18: Papers in Optimality Theory.* Amherst, MA: Graduate Linguistic Student Association.

Boersma, Paul & Weenink, David (2017). Praat: doing phonetics by computer [Computer program]. Version 6.0.36, retrieved 11 November 2017 from http://www.praat.org/

Broselow, Ellen (2008). Stress-epenthesis interactions. In Bert Vaux & Andrew Nevins (Eds.), *Rules, constraints, and phonological phenomena,* 121–149. Oxford: Oxford University Press.

Davis, Stuart, & Baertsch, Karen (2011). On the relationship between codas and onset clusters. In *Handbook of the syllable*, 71-98. Brill.

Davis, Stuart, & Baertsch, Karen (2012). Formal Versus Functional Explanation for a Universal Theory of Syllable Structure. *Journal of Universal Language, 13*(2), 7-34.

Hale, Kenneth (1985). A note on Winnebago metrical structure. *International Journal of American linguistics*, *51*(4), 427-429.

Hale, Kenneth & White Eagle, Josephine (1980). A preliminary metrical account of Winnebago accent. *International Journal of American Linguistics*, *46*(2), 117-132.

Hall, Nancy (2003). *Gestures and segments: vowel intrusion as overlap*. PhD dissertation, University of Massachusetts Amherst.

Hall, Nancy (2006). Cross-linguistic patterns of vowel intrusion. *Phonology, 23*(3), 387-429.

Halle, Morris & Vergnaud, Jean-Roger (1987). *An essay on stress*. MIT press.

Hayes, Bruce (1995). *Metrical stress theory: Principles and case studies*. University of Chicago Press.

Heiberg, Andrea (1995). A non-derivational approach to Winnebago stress. In *Annual Meeting of the Berkeley Linguistics Society 21*(1), 152-161

Helmbrecht, Johannes & Lehmann, Christian (Eds.) (2010). *Hocąk Teaching Materials, Volume 1: Elements of Grammar/Learner's Dictionary*. SUNY Press.

Miner, Kenneth (1979). Dorsey's law in Winnebago-Chiwere and Winnebago accent. *International journal of American linguistics*, *45*(1), 25-33.

Miner, Kenneth (1981). Metrics, or Winnebago made harder. *International journal of American linguistics*, *47*(4), 340-342.

Miner, Kenneth (1989). Winnebago accent: The rest of the data. *Anthropological Linguistics*, 148-172.

Miner, Kenneth (1984). *Winnebago field lexicon* (Unpublished ms) Lawrence: University of Kansas.

Miner, Kenneth. (1992). *Winnebago grammar*. (Unpublished ms) University of Kentucky.

Miner, Kenneth (1993). On some theoretical implications of Winnebago phonology.

Pritzker, Barry (2000). *A Native American Encyclopedia: History, Culture, and Peoples*. Oxford: Oxford University Press.

Steriade, Donca (1990). Gestures and Autosegments: Comments on Browman and Goldstein's Paper. In John Kingston and Mary Beckman (Eds.), *Papers in Laboratory Phonology 1: Between the Grammar and Physics of Speech.* 382–397.

Stanton, Juliet, & Zukoff, Sam (2018). Prosodic identity in copy epenthesis. *Natural Language & Linguistic Theory*, *36*(2), 637-684.

Susman, Amelia (1943). *The accentual system of Winnebago*. Columbia University.