

Prosodic Prominence in Karuk

by

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Abstract

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This study focuses on word-level prosodic prominence in Karuk (kyh), a Hokan isolate of Northern California. Prosodic prominence in Karuk is made up of sparse tone and stress, and there are two main influences on its placement: the alignment of high tone and certain syllable structures, and the use of prosodic prominence to mark stem edges. These influences are at times in conflict, with the resolution depending on criteria specific to particular sets of morphology. The study is based on analysis of a corpus combining recent fieldwork and historical data. Specific findings include: 1) the placement of prominence in a Karuk word is largely dependent on CV-skeleton syllable structure and far more predictable than previously thought; 2) while one tone-syllable alignment is the unmarked output of constraints, a different tone-syllable alignment on the input blocks its surfacing; 3) various sets of morphology interfere with the basic placement of prominence by triggering stem-final prominence; and 4) the predictable placement of basic prominence only applies within the prosodic stem, from which certain morphemes are excluded.

The prosodic system of Karuk bears some striking resemblances to those of other languages known as accent languages, but has important differences and added complexities. An unmarked high-tone-before-long-vowel alignment in Karuk is typologically unusual, as is a dispreferred high-tone-on-CVC alignment. Although tone and stress generally coincide, reference to both tone and metrical structure is required in defining preferred and avoided structures.

The complexity of Karuk word prosody poses a challenge for approaches which seek to limit the role of morphology to either the phonology or the syntax, as well as for those which seek to implement a wholly parallel or a wholly derivational model of the phonology-morphology interface. The Karuk case shows that phonology and morphology must be interleaved, and I find that a cophonology approach best accounts for the complex patterns seen. Other challenges for an Optimality Theoretic approach raised by the Karuk data are opacity in a non-surface-apparent constraint driving placement of prosody, and the need for special faithfulness to account for the protected status of a particular tone-syllable alignment.

To the memory of my father

Stephen M. Sandy

(1933–2016)

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Abbreviations

Morphological abbreviations

The following abbreviations are used in interlinear glosses in examples.

Abbreviation	Definition
1>2s	first person acting on second person singular
1/3>2pl	first or third person acting on second person plural
1pl(>3)	first person plural intransitive or acting on third person
1s(>3)	first person singular intransitive or acting on third person
1plPOSS	first person plural possessive
1sPOSS	first person singular possessive
2/3>1pl	second or third person acting on first person plural
2pl(>3)	second person plural intransitive or acting on third person
2pl/3pl>1s	second or third person plural acting on first person singular
2s(>3)	second person singular intransitive or acting on third person
2s/3s>1s	second or third person singular acting on first person singular
2plPOSS	second person plural possessive
2sPOSS	second person singular possessive
3>2s	third person acting on second person singular
3pl(>3s)	third person plural intransitive or acting on third person singular
3pl>3pl	third person plural acting on third person plural
3s(>3)	third person singular intransitive or acting on third person
3plPOSS	third person plural possessive
3sPOSS	third person singular possessive
AGT	agentive
ANC	ancient
ANT	anterior
BENE	benefactive
DENOM	denominalizer
DET	determiner
DIM	diminutive
DUR	durative
ESS	essive

Abbreviation	Definition
EVID	evidential
INSTR	instrumental
INTS	intensifier
INV	inverse
IRR	irrealis
ITER	iterative
NEG	negative
NOMZ	nominalizer/subordinator
OPT	optative
PAST	past
PERF	perfective
PL	plural
pl.	plural
PLURACT	pluractional
PRETENSE	pretense
PROSP	prospective
RED	reduplication
two	two, dual

Data sources

Data sources for examples are listed using the following codes. The initial(s) of the speaker are listed first, followed by the source text identifier or publication reference, as shown in the sample below. If no initials are listed, the speaker is not known. It should be noted that the linguistic example words and sentences used are taken from a wide variety of contexts, including stories and elicitation, and do not necessarily represent the speakers' own thoughts or intentions.

Samples of data sources given in linguistic examples

[JS WB_KL-04:2] Sentence 2 of text 1 published in Bright (1957), spoken by Julia Starritt.

[Y JPH_KT-01b:2] Sentence 2 of text 1b published in Harrington (1930), spoken by Yaas.

[VS VS-01:2] Sentence 2 from an unpublished audio recording of Vina Smith.

[LA LA-VS-01:2] Sentence 2 from an unpublished audio recording of Lucille Albers and Vina Smith, spoken by Lucille Albers.

[NR WB_LA78.1-004b:2] Sentence 2 from an unpublished, archived audio recording made by William Bright, spoken by Nettie Ruben.

[PM JPH_PHM-24-343a:2] Sentence 2 from an unpublished, archived audio recording made by Franz Boas, spoken by Phoebe Maddux.

Key to speakers

CP	Chester Pepper	MH	Margaret Harrie
CT	Charlie Thom, Sr.	MO	Mamie Offield
DJ	Daisy Jones	NR	Nettie Ruben
ED	Emily Donahue	PM	Phoebe Maddux
JS	Julia Starritt	SD	Sonny Davis
LA	Lucille Albers	VS	Vina Smith
LB	Lottie Beck	VSu	Violet Super
MC	Maggie Charley	Y	Yaas
MD	Madeline Davis		

Key to text identifiers

[**D: *x***] Dictionary entry for *x*; either *x* itself or a related form displayed in an audio example under the entry for *x*. Can be found at <http://linguistics.berkeley.edu/~karuk/> under *Search: Dictionary Search* for *x*.

[**D: *x* (reference code)**] Example sentence displayed within the dictionary entry for *x* that is not found elsewhere in the text corpus. Reference code refers to the original source for the lexicon entry example. Can be found at <http://linguistics.berkeley.edu/~karuk/> under *Search: Dictionary Search* for *x*.

[**Bright 1957:#**] Example found in the text of the grammar portion of *The Karok Language* (Bright 1957) only, with page number given.

[**Other code:#**] Text corpus; code refers to the text identifier, with sentence number given. The complete text and reference information can be found in Appendix A, or at <http://linguistics.berkeley.edu/~karuk/> under *Sentences & Texts* with this identifier.

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Part I

Setting the stage

Chapter 1

Introduction

1.1 Introduction

Prosody is the tune or rhythm of an utterance. Different languages utilize prosodic features to different ends. Prosody can differentiate between lexical items, delineate words or phrases, or express pragmatic information. Higher pitch, a dramatic pitch change, longer vowels or consonants, and greater intensity can all be heard as more prominent than their counterparts. Prosodic prominence can be alternating (as in prototypical stress systems), or can pick out a single location in a word or phrase (often referred to as accent). Placement of prosodic features in a word can be completely unpredictable and lexically determined, as in a prototypical tone system, in which these features express lexical content. It can be completely regular and predictable, based on word edges, as in a system where prosody is used only to signal word boundaries. Placement of prosodic prominence can also be sensitive to phonological factors such as syllable weight, to the morphological makeup of the word, or to some combination of phonological, morphological, and/or lexical factors.

Karuk (kyh), a Hokan isolate of Northern California, is a language in which the factors determining the placement of prosodic prominence are not straightforward. Locations of prominence in a word are highly variable, yet there is too much regularity in the system for it to be considered wholly lexically determined. Furthermore, a complex system of verbal morphology appears to affect the placement of prominence to some degree. Karuk's word-prosodic system shares features of tone systems and of stress systems, and some of the prosodic structures and patterns which arise are typologically unusual for either. For these reasons, the prosodic system of Karuk is a particularly interesting and important one to study. The aims of this dissertation are 1) to understand and demonstrate the overarching regularity in the patterns of placement of prominence in the language, 2) to determine how best to model the word prosody of Karuk, including what should be considered tone, what should be considered stress, and how the two interact, and 3) to determine how much of the system can be explained by regular, surface, phonological constraints, and how much must make reference to morphology. The primary goal is to make sense of the system in its own right; the outcomes of which have important ramifications for our understanding of word-prosodic typology, as well as how to model the interaction of phonology and morphology.

1.1.1 Word-prosodic typology

The terminology for word-prosodic typology can be confusing because same or similar terms are used to refer to quite different concepts, and there is disagreement among phonologists as to which of these concepts are useful, which of them are in opposition to one another, and whether they are gradient or binary. I will begin by defining terms, beginning with less controversial and moving towards more controversial.

Stress Stress is by definition metrical, associated with syllables, and culminative. Its acoustic correlates can vary (pitch, intensity, quantity, vowel quality), but it has to do with alternating prominence of syllables, that is, stress characterizes the strong syllable of a foot (Selkirk 1980; Hayes 1995). Some phonologists (Gussenhoven 2004) claim that all languages have some stress in that all languages have feet, even though alternating prominence is not always strong or even detectable. Others (Hyman 2006, 2009) hold that stress is a prosodic feature which a language may or may not make use of. Languages which make regular and extensive use of stress (e.g., English) have traditionally been classified as stress languages, but it may be more useful to talk about stress as a particular feature rather than a whole-language typology (Hyman 2006, 2009).

Tone Tone is an abstract system of pitch used for lexical or intonational purposes. Languages that are classified as tone languages (e.g., Chinese, many African languages) use pitch for lexical distinctions. Numbers of tones in a language can vary from a binary contrast to five levels or more, even up to ten contrasts (Gussenhoven 2004). Tone associates with a tone bearing unit (TBU), typically a vowel mora but can be a consonant in some cases. Tonal languages can be dense, with most TBUs in a word lexically specified for tone, or sparse, with few specified, such as Dutch. Less canonical uses of tone include morphological and syntactic functions. Intonation is different from tone proper, in the sense of lexical tone, as it is used to convey phrasing and discourse meaning, rather than lexical or grammatical distinctions. However, similar pitch oppositions and patterns are used for the purpose of intonation as for lexical tone. Again, in light of languages which combine tone and stress, it may be more useful to talk about tone as a particular feature rather than a whole-language typology (Hyman 2006, 2009). In languages with both, stressed locations are attractive locations for tone, both lexical and intonational (Inkelas & Zec 1988; Gussenhoven 2004).

Accent Gussenhoven (2004) provides a good overview of the various terminology used for the multifaceted concept of accent. He defines accent as a *location* for a lexical or intonational tone contrast, whereas pitch accent is a tone *itself* or a complex of tones occurring in an accented location (Pierrehumbert & Beckman 1988). Accent in this sense is conventionally marked by a star notation. Sparsely tonal languages (e.g., Japanese, Somali) can be just as easily described using accent or tone. Pitch accent is used to refer to what could also be described as lexical tones in these languages. It is also used to refer to the intonational patterns in the intonational context. I avoid the term pitch accent and refer to tones.

Accent can also refer to a more general contrastive location in a word, which can have either pitch or stress as a correlate. In this case, pitch accent is used to refer to the former (Beckman 1986), and stress accent is used to refer to the latter. Some languages with culminative prominence (e.g., Nubi [Gussenhoven 2006]) behave neither like stress nor tonal languages. Some phonologists find this type of “accent” a useful third category in opposition to stress and tone (e.g., Hulst 2011). Others do not (e.g., Hyman 2009), and see it as a hodgepodge of languages which are not prototypically stress or tonal, but do not form a coherent class and are better described by a factorial typology of presence/absence of tone and presence/absence of stress (stress-accent). Hualde (2012) defines accent as a feature of lexical word-headedness, thus grouping together stress-accent, which is culminative, and non-stress-accent (aka pitch-accent), which may be absent, and casts this supercategory in opposition to lexical tone. The presence of unaccented words (i.e., non-culminativity) is a characteristic but not necessary property of pitch-accent languages (Itô & Mester 2016).

I follow Gussenhoven here, in that, like Hyman, I doubt the usefulness of “accent language” as a typological category. Also following Gussenhoven, and in contrast with Hyman, I do find the term “accent” (in the sense of a location in a word for a tone contrast which may coincide with, but is analytically distinct from, stress) a useful term in describing word prosody in certain languages. I use “accent” in this specific sense, and not as a catchall for stress and/or tone, and specify “tone” and “stress” whenever relevant.

Form and function As I have alluded to, an issue in word-prosodic typology is determining the parameter space, and just as importantly, whether these are categories of languages as a whole, or of properties of sub-systems of languages, i.e. non-mutually-exclusive features which a language can have. From the perspective of linguistic typology, it is a worthy aim to refine our typology of word prosody for its own sake. In addition, in the interests of complete and accurate description of languages, it is not enough to simply state that a language is a stress language, or a pitch accent language. Because so many languages combine elements of stress, tone and/or accent in different and often nuanced ways, it is necessary to be much more specific and delineate what the correlates of stress are, how tone behaves, and so forth. Languages which combine elements of more than one canonical system are interesting and important to describe accurately. It is also these cases which will help us refine our typology and push analytic models of how tone and stress function and interact.

These questions about word-prosodic typology are fundamentally questions about what prominence is, that is to say, its form. There are equally compelling questions about its function, that is, what prominence marks or is driven by. These could be phonologically or morphologically strong positions in a stem, which have been described in detail for many stress systems. Systems which combine prosodic types and different functions of prominence, raise the question of whether there is any regularity in the alignment of form and function.

1.1.2 Theoretical framework

In the generative tradition of linguistics (Chomsky & Halle 1968; Kiparsky 1982a,b, 1985; Mohanan 1986), linguists have assumed derivations, that is, a step-by-step building up of

a word from its component parts with phonological changes possible at each step. These changes may be cumulative by the end of the derivation, thus accounting for phonological contrasts in words with different morphological makeup.

With the advent of Optimality Theory (OT) (Prince & Smolensky 1993/2004), a paradigm shift occurred, and the aim became to evaluate all possible linguistic outputs in parallel, with an assumption that each language is defined by a unique ranking of universal constraints, resulting in the particular patterns seen in that language. This had the great advantage of capturing generalizations and conspiracies that were missed using rules. However, it immediately became clear that not all phonological phenomena could be accounted for in this fashion, and that it was necessary to incorporate morphology in some way. This could be done retaining a parallel structure in many cases, e.g., using indexed constraints (McCarthy & Prince 1995a; Pater 2000, 2009; Itô & Mester 1999b; Alderete 1999, 2001; Smith 1997). Certain patterns, such as those which display opacity or ranking reversals, however, were still problematic. To deal with these types of situations, various attempts have been made to re-introduce some derivational aspects to OT, e.g., Stratal OT (Kiparsky 2000, 2008; Bermúdez-Otero 2014); Harmonic Serialism (McCarthy 2010), etc.), which use constraint rankings in place of rules, but retain a way to build up a derivation.

Different views also hold on the role of morphology and its degree of integration with phonology. Distributed Morphology (Harley & Noyer 1999; Embick & Noyer 2007), holds that there is no morphology separate from syntax. In this approach, abstract structures of words are assembled directly by syntax, while their phonological content is filled in once at spell-out. At the opposite end of the spectrum are views that morphological and phonological structure must be built up simultaneously, and are interleaved (e.g., Booij & Lieber 1993; Inkelas 2014).

The cophonology approach (Orgun 1996; Anttila 1997, 2002; Inkelas & Zoll 2005, 2007), in which each morphological construction can carry its own ranking, divorces the idea of constraint rankings from a single ranking for a language entirely. A master partial ranking for the language is assumed (the “Master Ranking”), and each morphological construction or set of constructions specifies relative rankings for constraints left unranked with respect to each other in the Master Ranking. All cophonologies for a language are linked together in what is termed a grammar lattice.

In keeping with the recent orientation towards constraint-based explanations for surface representations, I purposely begin with surface patterns of prominence in Karuk, rather than assuming underlying structure. I posit underlying accentual patterns, and further abstraction and derivation, only when it becomes necessary or presents the most parsimonious explanation for the data. Throughout, I utilize standard OT constraints and tableaux to formalize analytical proposals. A strictly parallel approach is not sufficient to fully account for the data in this complex system, however. In my discussion of morphology, I utilize levels as an organizing principle because the data lends itself to such an organization, but my analysis is not wedded to a stratal approach. I find a cophonology/grammar lattice the most appropriate to the complexity and the nature of the phenomena seen in Karuk. My goals here are a clear presentation of the patterns present in the language, including the broadest generalizations, and to point out what is of typological and/or theoretical interest,

but not necessarily to solve all theoretical problems raised.

1.1.3 Findings

There are two main influences on the placement of prominence in Karuk: the alignment of H tone and certain syllable structures, and the use of prosodic prominence to mark stem edges. These influences are at times in conflict, and the resolution depends on criteria specific to particular sets of morphology.

Syllable structure plays an important role in the placement of prominence throughout the Karuk grammar, but different syllable-tone alignments are considered marked at different levels of the grammar. At the root level (Chapter 4), syllable structure, in combination with non-finality, determines whether verb roots can underlyingly bear H tone or not. In this case, the syllable-tone alignment in question is the markedness of H tone on a short, closed CVC syllable. The most widespread pattern of accentuation in inflected words, which I call basic derived accentuation (Chapter 5), is also dependent on syllable structure, in particular, on the presence and location of long vowels. Here, however, the most optimal prominence results in a H tone on a CVC syllable followed by a L on a following syllable with a long vowel in its nucleus. Finally, a specific tone-syllable alignment (HL realized over two moras without an intervening coda) constitutes an input structure that blocks application of basic derived accentuation (Chapter 6). Thus the alignment of tones with C and V units of syllable structure is key to predicting the placement of prominence in Karuk, although the constraints that are active in dictating optimal and marked alignments vary from one portion of the grammar to another. In a corpus with 6627 verb tokens, basic derived accentuation accounts for prominence in 50% of inflected verbs, and the protected HL structure accounts for prominence in 35% of inflected verbs. Known minority patterns comprise approximately 9-10% of the verbs, leaving only 5-6% unaccounted for under the current analysis.

Regarding the typological implications of these findings, the prosodic system of Karuk bears some striking resemblances to those of other languages known as accent languages, but has some important differences and added complexities. The high-before-long tone-syllable alignment in Karuk is typologically unusual. Reference to both tone and metrical structure is required in defining both preferred and avoided structures. Thus while tone and stress generally coincide, it is still important to refer to both of them in the word-prosodic typology of the language.

In addition to the phonological factors noted above, prominence in Karuk is also used to mark the edge of a stem (Chapters 7–8). It is not surprising for prosodic prominence to be driven by syllabic properties, nor is it surprising for prominence to be used to mark morphological edges. But the complexity of the interaction of these two factors in Karuk has interesting implications. These interactions can be seen throughout, but are particularly focused on in Chapters 6 and 8.

The complexity of Karuk word prosody poses a challenge for approaches which seek to limit the role of morphology to either the phonology or the syntax, as well as for those which seek to implement a wholly parallel or a wholly derivational model of the phonology-morphology interface. Different parts of the Karuk system lend themselves to a constraint-

based approach, levels, as well as morphology-specific effects. A great deal of prosody can be accounted for by relatively surface-level phonology, but a major class of exceptions provides evidence for some serial derivation. There is evidence for the role of morphosyntax in determining the behavior of certain sets of morphemes, but lexical specification is still needed to account for their inclusion in the prosodic stem. The Karuk case shows that phonology and morphology must be interleaved, and I find that a cophonology approach best accounts for the complex patterns seen, in which each level (and in some cases, subcomponents of levels) has a sub-grammar associated with it. Other challenges for an Optimality Theoretic approach raised by the Karuk data are opacity in a non-surface-apparent constraint $*(C)\acute{V}C$ driving placement of prosody at various points in the grammar, and the need for special faithfulness to account for the protected status of the HL structure.

1.2 Language background

Karuk is a highly endangered indigenous language of Northern California. The traditional territory of the Karuk is along the middle Klamath River, including the modern towns of Orleans and Happy Camp. The approximate extent of the traditional territory is shown shaded in the map in Figure 1.1. Today, many Karuk people live in the larger town of Yreka, just outside of the traditional territory, as well as further afield. Karuk is an isolate within the Hokan stock, a contested grouping itself (Bright 1954b; Bright & Sherzer 1976; Sherzer 1976; Goddard 1996; Campbell 1997; Mithun 1999). Golla (2011) considers the grouping meaningful and a correlation of ancient Hokan speakers and archeological culture of a time depth of eight thousand to eleven thousand years plausible, but finds little evidence to elucidate the particular prehistory of Karuk. Karuk has been in close contact with genetically unrelated languages, especially Yurok (Algic) and Hupa (Athabaskan), for centuries (Conathan 2004). Other historically neighboring languages are Tolowa (also Athabaskan), and Shasta and Chimariko (both Hokan).

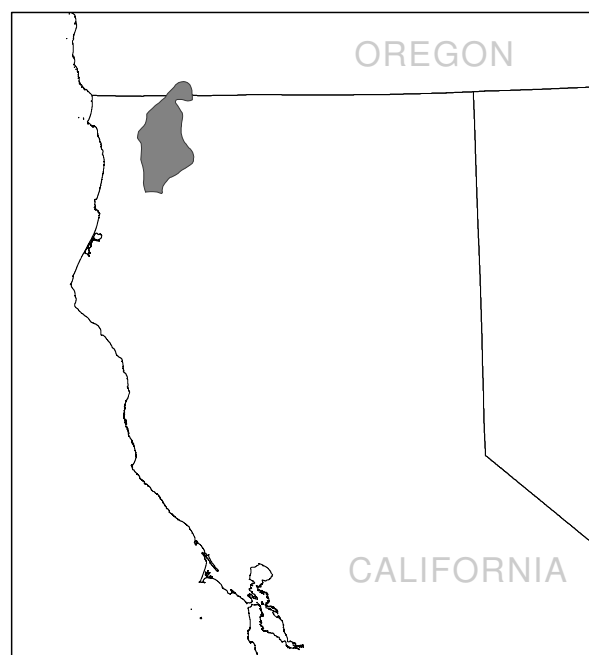
1.2.1 Vitality

At the time of European contact, around 1848, the aboriginal Karuk population has been estimated at 2700 (Cook 1956:98). By 1950, only approximately 100 speakers remained (Bright 1957). The language was spoken as a first language by fewer than a dozen elders as of 2011 (Golla 2011), and this number has dropped to fewer than a half dozen at present. A revitalization effort is currently ongoing within the Karuk Tribe, and there are 20-50 learners and second-language speakers of varying degrees of fluency, several of whom use the language in the home with their children, and/or teach in schools, camps or other community gatherings.

1.2.2 Documentation

The earliest written records of the Karuk language date from the late 19th century, in the form of vocabulary lists and ethnological notes recorded by George Gibbs et al. in the

Figure 1.1: Location of traditional Karuk territory



1850s (Gibbs 1853; Powers 1877), and vocabulary and texts recorded by Jeremiah Curtin in 1889 (Curtin 1889a,b,c). At the turn of the 20th century, A.L. Kroeber recorded texts and prepared a grammatical sketch (Kroeber 1911; Kroeber & Gifford 1980), and Samuel Alfred Barrett recorded vocabulary and verb morphology in 1904-1905 (Barrett 1904-1905). C. Hart Merriam recorded vocabulary and natural history in 1910 and 1921 (Merriam 1898-1938).

In the late 1920s and 1930s, several linguists recorded texts and notes: J.P. Harrington, Jaime de Angulo and L.S. Freeland, Hans Jørgen Uldall, Ursula McConnel, and Homer Barnett. Of these, the J.P. Harrington materials are the most extensive, and include published texts (Harrington 1930, 1932a,b), thousands of pages of field notes, texts, and notes for a grammar archived at the National Anthropological Archives (Harrington ca. 1925-1933), and the earliest surviving audio recording of Karuk texts, spoken by Phoebe Maddux (Harrington 1926, 1929; Maddux 1929). Additional recordings of Karuk singing were made by Harrington in collaboration with Helen Heffron Roberts (Roberts 1926). De Angulo and Freeland published a collection of texts with grammatical notes (1931). Notes from Uldall and McConnel are archived at the Survey of California and Other Indian Languages (Uldall n.d.; McConnel 1932) and from Barnett at the National Anthropological Archives (Barnett 1937-1938).

William Bright, working from the late 1940s to the early 2000s, published the grammar *The Karok Language* in 1957, as well as articles on various aspects of the language ranging from linguistic innovations and areal features to ethnopoetics (Bright 1952, 1954b,

1958; Bright & Bright 1965; Bright & Sherzer 1976; Bright 1979, 1984b). Bright's grammar contains the most comprehensive description of Karuk phonology and morphology to date. Bright archived numerous recordings, transcriptions, and fieldnotes at the Survey of California and Other Indian Languages and at the American Philosophical Society (Bright 1949, Bright 1949–1950, Bright 1950–1952a, Bright 1950–1952b, Bright 1950–1952c, Bright 1950–2000, Bright 1989). Additional linguistic documentation from the mid- to late-20th century includes notes by Mary Haas, George Grekoff, Eero Vihman, and Robert Louis Oswalt (Grekoff 1992–1999; Haas n.d.; Oswalt ca. 1970s–1980s; Vihman 1964, 1966, n.d.), as well as notes and recordings by Susan Gehr, Karuk tribal linguist, and Monica Macaulay. Macaulay has published several articles on the language, including aspects of its phonology, morphology, and syntax, which represent the most important recent work on these topics (Macaulay 1989, 1990, 1992, 1993, 1996, 2000, 2005).

Current work by the Karuk research group at University of California, Berkeley since 2010, including the author's fieldwork, has resulted in over 200 hours of recordings, including elicitation, texts, narrated sequences, and conversations. Recordings are archived with the California Language Archive (cla.berkeley.edu), and are in the process of being parsed and digitized for inclusion on the Ararahih'urípih website at <http://linguistics.berkeley.edu/~karuk/> (Garrett et al. 2017).

1.3 Data and methodology

This project reanalyzes the word-level prosodic system of Karuk utilizing modern computational methods on a comprehensive, integrated corpus which is comprised of available historical and modern written and audio language documentation, including text and elicitation data. The data in this dissertation come from my field notes and from the dictionary and text corpus, which I accessed both via the web interface and by manipulating the underlying data structures directly. The analysis in this dissertation is based on the spring 2016 version of the corpus, which contains 180 texts and collections of elicited sentences (listed in Appendix A); comprising 4973 sentences and 6627 verb tokens. The corpus continues to be expanded as more materials are transcribed and/or digitized.

1.3.1 Sources of data

The work in this dissertation represents a synthesis of historical data and fieldwork with current speakers. Reasons for this are to make the most of the resources available for a highly endangered language which is relatively well documented (in comparison with other Native Californian languages), and still has a few remaining first-language speakers. Language data used in the analysis come from: published material (in particular, Bright 1957; Bright & Gehr 2005; Harrington 1930, 1932a,b), historic, archival sources (in particular, Harrington ca. 1925–1933; Bright 1949, 1950–2000), and recent fieldwork carried out by myself and others as part of the Karuk research group at the University of California, Berkeley.

Karuk research group

The Karuk research group is made up of several faculty and students at the University of California, Berkeley who work in collaboration with members of the Karuk tribe to document and revitalize the language, digitize and make existing documentation available for scholars and language learners, and discuss topics of theoretical interest. As part of this work, the Karuk research group has built a morphologically parsed text corpus which is integrated with the *Karuk Dictionary* (Bright & Gehr 2005) and is available through the *Ararahi'urípih* online interface, as described in the forthcoming paper by Garrett et al. (2017). The corpus includes both recent and historical audio recordings, as well as published and unpublished texts from various time periods. Other work has included linking each complex dictionary entry to its morphological subcomponents, allowing word derivation and derivatives to be included in the searches and dictionary display. As part of the research group, I have carried out fieldwork with Karuk speakers over the course of five years, and I have conducted archival research and worked with current speakers to transcribe and translate legacy recordings, as well as participating in transcription, parsing, digitization, and lexicon maintenance and improvement.

The Karuk lexicon database is a MySQL database maintained by the Linguistics department at the University of California, Berkeley. It is built on a Toolbox database maintained by Susan Gehr that was used in the production of the print *Karuk Dictionary* (Bright & Gehr 2005). The Karuk text corpus is stored in XML format, and is also maintained by the Linguistics department at the University of California, Berkeley. XML markup of elicited sentences and recorded texts includes morphological parsing and tagging that allows each morpheme to be linked to its corresponding dictionary entry in the web interface, and tagging of each sentence to associate it with a corresponding audio clip. Historic texts without associated audio are digitized in the same way using morphologically parsed XML.

Treatment of historical data

Historical data are included in the analysis because linguists in the last century were able to work with a greater number of speakers and more fluent speakers than is possible today, and it seems probable that present-day speakers have had some level of change in the accent system in their speech, either due to attrition, English interference, or both. It is important in the context of language attrition to describe the prosodic system in its fullest possible version. However, prosodic transcription can be particularly error-prone, so historical transcriptions of accent and vowel length have not simply been taken at face value.

William Bright's descriptions and transcriptions are taken as the point of departure for the analysis herein. It is clear from the descriptions in Bright (1957) that he was not, in fact, conflating intonation, pitch, stress, and/or vowel length, a common source of inaccuracies in transcriptions of prosody. Where possible, Bright's descriptions of tone and stress in Karuk have been confirmed with analysis of modern phonetic data. There are few useful recordings with accompanying transcriptions from Bright's time, but those that exist have been evaluated and found to be consistent and accurate to a high degree. J.P. Harrington used a different system of transcription from that of Bright, but thanks to an extant recording

with accompanying transcription, I was able to translate his prosodic transcriptions into the current notation and evaluate them for accuracy (Sandy 2014b). I found Harrington’s transcriptions to be highly accurate, and consistent both internally and with those of Bright (with some difference in the level of phonetic detail recorded, but surprisingly few significant differences relating to describing the accentuation of words).

For these reasons, material without accompanying audio recordings transcribed by either Bright or Harrington have been considered to be accurate for the purposes of evaluating prosodic prominence. Historical transcriptions by others have not been able to be confirmed for accuracy in this way, so while they may be considered useful for, e.g., affix combinatorics, transcriptions of accent and vowel length are viewed as potentially inaccurate and are excluded from the present study.

1.3.2 Methodology

Documentary methods

Data was obtained from recorded elicitation sessions with first-language speakers of Karuk. My primary language consultant was elder speaker Vina Smith (1925–2015), with additional work with elder speakers Charlie Thom, Sr. (1928–2013), Lucille Albers (1930–2014), Sonny Davis, and Alvis “Bud” Johnson. These speakers grew up speaking primarily Karuk as young children, but shifted to speaking primarily English at various points in their youth. All have been active in linguistic and cultural preservation and revitalization in recent years. The oldest of these speakers have phonology comparable to that of speakers of previous generations for which recordings exist, and command over basic morphology. Highly complex morphology was not often produced spontaneously, but was understood and translated. The somewhat younger speakers seem to have more English features in their phonology, but are very fluent and generally retain the accentual patterns in question here. I have also worked and collaborated with several younger second-language speakers who are involved with language revitalization, and who are able to converse competently with elders.

Elicitation sessions were conducted primarily in English, with as much interaction in Karuk as possible. Multiple elicitation methods were used, with as many consultants as possible, to minimize any effects that the presence of the linguist, the form of the questions asked, and individual variation had on the data collected. Recording natural texts such as personal narratives, spontaneous speech, and conversation between consultants was prioritized, as an important source for natural Karuk forms. More structured elicitation was used to obtain recordings of particular word forms for phonetic analysis, and grammaticality judgments on forms less commonly found in everyday speech, as well as negative data for grammaticality.

Sessions were comprised of a variety of activities, including translation tasks and grammaticality judgments such as eliciting vocabulary items in isolation and in sentences, translation of verb forms from Karuk to English and from English to Karuk, and testing of morphological combinations for grammaticality and meaning. Other activities included conversation or individual narratives on a free or prompted topic, and narrating picture book stories and describing other visual prompts, in order to avoid translating from English. As

many of the recordings as possible were transcribed, primarily by Karuk research group linguists, with the assistance of Karuk consultants. Recordings of historic Karuk speech were also transcribed and translated into English. Untranscribed and untranslated historic material with no associated field notes were prioritized for transcription with consultants. Transcriptions were done either by hand or using ELAN software.

Best-practice methodologies for language documentation were used (E-MELD n.d.; Gipert et al. 2006). Elicitation sessions were recorded using a digital audio recorder, professional quality microphones, and lossless digital audio file format (.wav). All audio files had metadata logged and backups made daily. Copies of recordings were distributed to language consultants and to the Karuk Tribe. Recordings, field notes, and transcriptions are archived with the California Language Archive (cla.berkeley.edu).

Phonetic analysis methods

I performed phonetic measurements on a subset of data for preliminary basic phonetic descriptions of Karuk prominence, and to evaluate transcription accuracy for historical material. Phonetic measurements, including segment durations, pitch, and intensity, were taken using Praat with a small subset of audio recordings. Measurements were extracted manually or via a Python script, and were analyzed and visualized using R.

For historical representations of accent, I checked samples of written transcriptions against matching extant recordings, to make sure that the phenomena I was interested in were comparable across transcribers. For words of various syllabic shapes, I compared audio examples with each of the accentual behaviors predicted in my distillation and simplification of the rules laid out in Bright (1957). These comparisons were done to see whether the accentual predictions were backed up by actual examples, and if so, how consistent they were, and whether any patterns could be identified in words which did not follow the expected behavior.

Computational methods

My research seeks to quantify accentual patterns which have previously been described in the abstract. To this end, I used SQL queries and Python scripts to extract and integrate data contained within the Karuk lexicon database and the XML Karuk text corpus. I then used Python and R scripts to manipulate datasets of roots, compound nouns, and inflected verbs and to sort the data in various ways. These included filtering by particular morpheme combinations, extracting CV skeletons, counting and grouping words by accent type, accent position, syllable and long vowel count, and comparing root and surface forms. Specific details on how verb forms were placed into the different accentual categories are provided in Appendix B.

To assist in OT implementation, I have used the OT-Help 2.0 software (Staubs et al. 2009).

1.4 Organization of following chapters

The dissertation is organized as follows. In Part One, background information on the language useful for understanding the accentual analysis which follows is provided. Chapter 2 provides a brief overview of Karuk segmental phonology and various phonological processes, the effects of which will be seen in examples given here, but which will not be analyzed in depth, and an introduction to the morphology and prosody of the language. Chapter 3 provides an analysis of phonological processes which result in the addition or deletion of tone bearing units.

In Part Two, the most common accentual patterns in Karuk are described and analyzed in terms of the alignment of tone with particular syllable structures, independent of morphology. Chapter 4 describes underlying root tone patterns, which are limited by syllable structure. Chapter 5 analyzes the most prevalent surface accentual pattern in inflected nouns and verbs. Chapter 6 details the major exception to the basic accentual pattern based on a particular tone-syllable alignment in the input.

Part Three focuses on prominence in verbs, which is more variable than that in nouns. In this part, I demonstrate the ways in which morphology affects the placement of prominence in Karuk verbs, and how conflicts between stem-alignment criteria and tone-syllable alignment criteria for placement are resolved. Chapter 7 describes the effects of each level of derivational morphology on stem tone and syllable structure in turn. Chapter 8 describes inflectional morphology, its effect on the extent of the prosodic stem, and the placement of prominence within that stem.

Finally, Chapter 9 provides a conclusion to the analyses presented, typological and theoretical implications of findings, and directions for future research.

Chapter 2

Overview of Karuk phonology and morphology

Basic aspects of Karuk phonology that will be helpful in understanding the data that follow are presented in this chapter. This includes a brief introduction to structures and building blocks of the language, and an overview of allomorphy that is present in examples in the following chapters, but not explained, as it is not part of the current analysis. For additional explanation and analysis of the phenomena presented here, see Bright (1957) and others as noted, below.

2.1 Basics

2.1.1 Phoneme inventory

The phoneme inventory for Karuk, following Bright (1957), is shown in (1) using the IPA. Throughout this dissertation, the practical Karuk orthography is used.¹ Where the orthography differs from the IPA, the orthographic representation is given in angle brackets.

(1) a. **Consonants**

p	t		tʃ <ch>	k	ʔ <'>
f	θ <th>	s	ʃ <sh>	x	h
β <v>	r <r>		j <y>		
m	n				

b. **Vowels**

<u>Short</u>	i	u	<u>Long</u>	i: <ii>	u: <uu>
				e: <ee>	o: <oo>
	a			a: <aa>	

¹With one exception: when the glottal stop phoneme is being discussed specifically, it may be written with the IPA symbol for maximal clarity.

Karuk's consonant inventory is not particularly large for a language of Northern California, or of California more generally (Haynie 2012; Golla 2011), but is notable in a series of five fricatives, including an interdental fricative. The fricatives *s* and *f* are almost in complementary distribution, but they are listed as separate phonemes as there are both lexical and morphological exceptions in which [s] occurs in an environment for [ʃ] (see §2.3.1).

Glottal stops also have a marginal phonemic status. In roots, they are rare other than in initial position. In initial position, their presence is almost entirely predictable. However, there are exceptions and words containing non-initial glottal stops, so the segment must be considered phonemic (see §2.4.1).

Voicing in obstruents is non-contrastive. All consonants undergo gemination in certain metrical contexts, with the exception of 'non-geminable' consonants (/ʔ h v r y/) (see §2.1.4) and certain lexical exceptions (see §2.3.8). Phonologically and morphologically conditioned alternations between /r/ and /n/ and between /v/ and /m/ occur (see §2.3.4).

2.1.2 Vowel length

A great deal of vowel length is morphologically conditioned (see, e.g., §7.3), but is also in many cases underlying and phonemic. Long vowels created synchronically when two vowels come together due to concatenation of morphemes or glide deletion (e.g., in §3.4) resist shortening processes and are considered truly double vowels. Diphthongs are not possible in Karuk, so when two short vowels of different heights come together in this manner, long mid vowels result. It seems very likely that all mid vowels were the result of vowel coalescence at some point, and that these vowels did not exist historically in Karuk. But because they are present in a number of lexicalized words at this point, these vowels are considered phonemes synchronically. Hamp (1958) analyzes the long mid vowels as underlying diphthongs.

Bright (1957:33-34) makes a distinction between two lengths of long vowels. All mid vowels, and all vowels resulting from coalescence are what he terms "double long" vowels, while long vowels resulting from morphologically conditioned lengthening are "half long" vowels (which he transcribes with a single length mark). High and low long vowels of both types are present in the lexicon. It is not clear that there is any phonetic length distinction between the two types. Rather, the category seems to be based upon its phonological properties. According to Bright, double long vowels resist shortening in morphological contexts where vowels are normally shortened (as the first member of a compound, or under stem vowel shortening conditioned by certain suffixes, as discussed in Chapter 7. Interestingly, if a compound word is used as the first element in a new compound, the long vowels that resisted shortening in the first round of compounding are then shortened (4).

(2) Vowel shortening in compound

a. *íshyav*

ísh yav
flesh good

'having a good body'

(Bright 1957:36)

b. *atrax'ípan*

atraax ípan

arm end

‘shoulder’

[D:atrax'ípan]

c. *pufichparámvaas*

púúfich parámvaas

deer soup

‘venison soup’

[D:pufichparámvaas]

(3) No vowel shortening in compound

a. *iheerahasípnuuk*

ihéèraha sípnuuk

tobacco storage basket

‘tobacco basket’

[D:iheerahasípnuuk]

b. *itroopa'átiv*

itróòpa átiva

five burden-basket load

‘five basket loads’

[JS WB_KL-75:4]

c. *úñpiit*

úñ píit

falls new

‘New Falls (placename at Sandy Bar)’

(Bright 1957:37)

(4) Double vowel shortening in double compound

a. *inpiitthuwuf*

inpiit

thúúf

New Falls (placename at Sandy Bar) creek

‘Sandy Bar Creek’

(Bright 1957:37)

Bright does not give any description of the resulting vowel when a long *ee* or *oo* undergoes double compounding. There is evidence from at least one noun that instead of becoming a short *e* or *o* (otherwise unattested in Karuk), it becomes one of the regular short vowels. In several compounds, the long *ee* of *ikxarééyav* ‘god’ (which is already a compound) becomes *i*, as in (5).² It is not known whether this is an anomaly specific to this lexical item, or a broader phenomenon.

²Thanks to Erik Maier for pointing this out to me.

(5) *ikxariya'árara*

ikxarééyav áraara
god person

'medicine man, priest'

[D:*ikxariya'áara*]

In the present study, I treat all long vowels the same, because I have not found evidence that they differentially affect the placement of prominence, aside from indirect effect of their ability to be affected by morphologically triggered lengthening and shortening. Their nature and representation remain a topic for future research.

2.1.3 Syllable structure

Normally allowable syllable structures in Karuk are CV, CVC, CVV, and CVVC. Onsetless syllables are present underlyingly, but are not permitted at the surface. If a word begins with a vowel, the vowel is either deleted (§2.4.2) or a glottal stop onset is supplied postlexically (§2.4.1). Complex onsets (CCV(V)(C)) are acceptable when a word-initial vowel is deleted (§2.4.2), but do not otherwise occur.

Karuk has somewhat typologically unusual syllabic preferences (see, for instance, Blevins (1995); Downing (1998a); Steriade (2003); Zec (1995, 2007) regarding syllable structure). Several phonological processes and affix allomorphy conspire to create closed syllables, especially ones with a long vowel in the nucleus (and/or to provide a long nucleus for a closed syllable), including: gemination (§2.1.4), word-final vowel deletion (§3.3.1), verbal derivational suffixes (§7.3.2), iterative allomorphy (§7.3.1), and other instances of allomorphy not described here in detail. Complex codas are not allowed. Thus, in Karuk, closed syllables are preferable to open syllables, while complex onsets are more acceptable than complex codas. Superheavy CVVC syllables are not avoided; on the contrary, they seem to be preferred to heavy CVV or CVC syllables. Karuk apparently does not have a strong prohibition against codas. Syllables with codas are very common in the language, and in the case of an accented vowel being followed by a single consonant, gemination occurs to supply that syllable with a coda on the surface. In addition, short vowels in open syllables at the end of words are deleted when possible (§3.3.1).

2.1.4 Suprasegmentals

Karuk uses both tone and stress to mark prominence. High tone and stress normally coincide on a single syllable per word, which can be considered the accented syllable in the word.

Tone

At most one high tone is found in a word (or, more precisely, in an accentual phrase, see §2.5.2). The placement of the high tone in a word is generally unpredictable overall, and must be considered lexical, although as I show in subsequent chapters, it is actually predictable in a number of contexts. Surface pitch in the rest of the word is predictable based on the

location of the tone-bearing syllable, boundary tones (see §2.5.2), and tone interpolation. See Bright (1957:11–13, 52–55) for details of phonetic realizations of pitch on stressed and unstressed syllables.

On short vowels, one tonal pattern is possible: a level high (H), represented by an acute accent mark, as in *ákah* ‘father’.³ On long vowels, two tonal patterns are found: a level H, represented by acute accent marks over both vowels, as in *ááma* ‘salmon’, or a falling high-low (HL) sequence, represented by an acute followed by a grave accent mark, as in *yáàmach* ‘pretty’.⁴ Word pairs showing examples of surface H and HL contrasts on non-final syllables are given in (6)–(7). Example (8) shows the contrast between (non-utterance final) word-final H and HL tones.

- (6) a. *púúfich* ‘deer’ [D:púúfich]
 b. *púúvish* ‘bag’ [D:púúvish]
- (7) a. *áápunmu* ‘know’ [D:áápunma]
 b. *áànaxus* ‘weasel’ [D:áànaxus]
- (8) a. *achnáát* ‘rat’ [D:achnaat]
 b. *ahtúùn* ‘oak bark’ [D:ahtúùn]

I follow Macaulay (1990) in representing both H and HL surface tones with an underlying H tone linked to a single bearing unit (TBU), that is, a vowel mora underlyingly. Macaulay’s schema is reproduced here in (9), with the current tone terminology.

- (9) a. Underlying

HL	H	H
long vowel	long vowel	short vowel
H	H	H
μ μ	μ μ	μ
∨	∨	
V	V	V

³A HL contour tone on a short vowel is found exceptionally in two loan words: *físh* ‘fish’ and *prâms* ‘plums’.

⁴Accent in the practical Karuk orthography is represented by accent marks on the first orthographic vowel of a long vowel only, as in *áama* ‘salmon’, and *yâamach* ‘pretty’. I write it on both vowels here for clarity.

b. Surface

HL	H	H
long vowel	long vowel	short vowel
H L	H	H
	^	
μ μ	μ μ	μ
∨	∨	
V	V	V

A HL long vowel has a H tone linked to its first mora, and the L on the second mora is supplied by rule. A H long vowel has a H tone linked to its second mora, and the H spreads leftward by rule, creating a level H over the entire syllable. This results in one pitch pattern seen on short vowels (level high) and two pitch patterns seen on long vowels (level high and HL falling).

Stress

Karuk stress is culminative and obligatory, with one stress per word, which can fall on almost any syllable. Examples (10a)–(10d) show that stress (marked with underlining) can fall on the first, second, third, or fourth syllable of a word. Stress can also fall on the final syllable of a word, as shown in (10e). Alternations between high tone and no high tone in this word represent intonational phrase-medial vs. intonational phrase-final pronunciations (see §2.5.2).

- (10) a. *thúkinkunish* ‘blue, green, yellow’ [D:*thúkinkunish*]
 b. *yupsítanach* ‘baby’ [D:*yupsítanach*]
 c. *suvaxráxar* ‘drying rack’ [D:*suva xráhar*]
 d. *kuyrakinívkih* ‘eight’ [D:*kuyrakinívkih*]
 e. *kunpíúp ~ kunpiip* ‘they said’ [MO WB_KL-05:105,199]

Stress in Karuk is defined as greater intensity over a syllable, and in open syllables, gemination of a following consonant when possible.⁵ Consonant duration is not a common phonetic correlate of stress cross-linguistically, but is not unheard of (cf. Iquito [Michael 2011]). Because stress aligns with the syllable containing the high tone, and therefore the pitch peak in a word, stress is normally associated with high pitch as well. However, stress

⁵Some consonants in Karuk are ungeminateable, see §2.1.4.

occurs in the absence of high pitch in words which have high tone erased by a low phrasal boundary tone (detailed in §2.5.2). Since vowel length in Karuk is phonemic, independent of stress, and is typically associated with the unstressed syllable in a foot in the basic derived pattern, vowel duration is not considered a defining characteristic of stress either. The vowel lengthening processes triggered by certain morphology in Karuk (e.g., those in §7.3) cannot be identified with stress because they only affect closed syllables; no significant vowel lengthening occurs in stressed, open syllables.

Preliminary acoustic analysis confirms that coda consonant length and intensity are likely correlates of stress in Karuk (Sandy & Milbury 2015). We also found slightly longer vowel duration in short vowels is associated with stress, which may point to a reduction in duration in unstressed vowels. There is some indication that intensity and vowel duration might mark secondary stress in an alternating pattern in longer words, but this would need to be investigated systematically with a larger phonetic study.

Consonant duration

Bright (1957:9) states that two degrees of consonant lengthening in Karuk are detectable in his consultants' speech in the 1950s. The lesser length is phonetically predictable, and is not written in Bright's orthography. The longer length Bright considers phonemic, and is written as doubled consonants in his orthography. However, this gemination is considered phonemic only because these consonants contrast with those in a limited class of words which do not display gemination, and Bright suggests that gemination may have all been allophonic historically. J.P. Harrington writes at least one, but not all, of Bright's lesser lengths as geminate (e.g., following but not preceding a long accented vowel; cf. (11c) below). No gemination is written in the practical orthography. Bright notes that younger speakers during the 1950s often did not make any consonant length distinction. Nonetheless, the consultants I worked with did, for the most part, produce long consonants in the expected contexts.

The environments in which accent-driven consonant lengthening occurs are given in (11) ('double' indicates Bright's phonemic geminates; 'long' indicates Bright's phonetically long consonants).

(11) Accent-driven positions for gemination ('double'):

a. C following a short accented vowel: $\acute{V}\underline{C}V(V)$

Accent-driven positions for gemination ('long'):

b. C following a short accented vowel, $\{h\ v\ r\}$, and a short vowel: $\acute{V}\{h\ v\ r\}\underline{VC}$

c. C before or after a long accented vowel: $\underline{C}\acute{V}\acute{V}\underline{C}$, $\underline{C}\acute{V}\grave{V}\underline{C}$

d. C after a long vowel following an accented syllable: $\acute{V}(\acute{V})CV\underline{VC}$, $\acute{V}\grave{V}CV\underline{VC}$

In addition to the accent-driven positions for gemination described above, gemination (of the full, double sort) also takes place in initial consonants of monosyllabic stems when preceded

by another morpheme, as described in Bright (1957:38-39, 54), and also in the medial C in any word with the syllabic shape: (C)VCV(V)C. It is likely that these environments demonstrate a foot minimality requirement independent of tone.

(12) Minimality-driven positions for gemination (‘double’):

a. Medial C in any word with the syllabic shape: (C)VCV(V)C

b. Monosyllabic* root-initial C preceded by a V: V-[CV(V)(C)(a)]_{stem}

or V-[CV{h v r}V(C)]_{stem}

*or equivalent

The class of nongeminable consonants given in (13) are not ever lengthened in any position. These have been defined featurally as the natural class of non-nasal sonorants (Levi 2008).⁶

(13) Nongeminable consonants

? h v r y

All degrees of consonant length are conditioned by the accentual and syllabic structure of the word. I consider the full gemination in (11a) and (12) to be correlates of stress. The lesser consonant length may represent secondary stress, but this remains to be confirmed through phonetic study.

2.2 Morphology

Karuk has noun and verb categories, as well as other minor categories. Other categories include adjectives, adverbs, interjections, particles and other function words, which are not included in the present analysis.

2.2.1 Verbal morphology

Karuk is fairly polysynthetic, with around 90 individual verbal affixes plus reduplication, marking verbal morphological categories including direction, manner, number and pluractionality, person, tense, aspect, and negation. There is no noun incorporation. Most categories are non-obligatory, except person and number agreement marking. Agreement is marked with prefixes for various subject/object combinations. Separate but overlapping indicative, optative, and negative paradigms are found for these agreement markers, which are described in more detail in §8.3.2. A schematic template of the Karuk verb is given in Table 2.1, and examples of verbs displaying morphology from the various categories are given in (14).

⁶I suspect that the set of consonants in (11b) and (12b) should be the same as the set of nongeminable consonants, but that glides and glottal stops are rarely, if ever, in this position. This remains to be confirmed phonetically.

Table 2.1: Karuk verb template

INFL. PREFIXES	DERIV. PREFIXES	Level 1. ROOT/INNER SUFFIXES	Level 2. DERIV. SUFFIXES	Level 3. SEMI-DERIV. SUFFIXES	Level 4. INFL. SUFFIXES
Person/ number (13)	Iterative Mode Plurality	Reduplication Direction/ manner/ resulting state (9)	Direction (41) Manner/ motion (7) Valence (4)	Plurality Durative Diminutive	Tense/aspect/ modality (7) Optative Inverse Negative

(14) a. *kun'axaychákishrihtih*

kun-	áxay	-chak	-ishrih	-tih
3pl(>3s)-	take.away	closing.up	down/result	-DUR
INFL	ROOT	INNER	DERIV	SEMI-DERIV

‘they were grabbing it’

[NR WB_KL-57:94]

b. *kunsánpiithvutihānik*

nu-	iru-	kúùr	-piithvu	-tih	-avish
1pl(>3)-	PL-	sit	-around.PLURACT	-DUR	-PROSP
INFL	DERIV	ROOT	DERIV	SEMI-DERIV	INFL

‘we will sit around’

[LB WB_KL-23:62]

c. *ípmaahvunaavish*

i-	ip-	mah	-vunaa	-avish
2s(>3)-	ITER-	see	-PL	-PROSP
INFL	DERIV	ROOT	SEMI-DERIV	INFL

‘you will find them again’

[CP WB_KL-52:59]

Verbal morphology is organized into four levels based on position and accentual effects on and inclusion in the prosodic stem. Levels are noted for suffixes in Table 2.1. Level 1 consists of reduplication and a small set of derivational suffixes which are tightly integrated with the verb root. The bulk of derivational suffixes fall into Level 2. A small number of suffixes which seem to fall between derivation and inflection, positionally, semantically, as well as in their effects on the stem phonology are assigned to Level 3. Inflectional suffixes make up Level 4. Derivational prefixes can be considered to attach at Level 2, and inflectional prefixes can be considered to attach at Level 4. This organization of Karuk morphology collapses many of the position class distinctions made in Bright (1957). Differences between these levels and Bright’s position classes are noted in the appropriate sections in Chapter 7. Prosodic phenomena associated with Level 1, 2, and 3 are discussed in §7.2, §7.3, and §7.4,

respectively. Inflection and its relation to placement of prosodic prominence is discussed in Chapter 8.

Basic derived accentuation (Chapter 5) accounts for accentuation in a large portion of inflected verbs. Exceptions are discussed in subsequent chapters. There is a strong case to be made for serial derivations as the best if not only explanation for many of the complex interactions of Karuk morphology and phonology. However, other phenomena would require a wild proliferation of levels far beyond those presented here, which still could not satisfactorily explain all the interactions without becoming trapped in ordering paradoxes. While levels are a very useful organizing principle for thinking about Karuk morphology, a cophonology approach better able to explain the patterns, which must be linked to particular morphemes or groups of morphemes.

2.2.2 Nominal morphology

Nominal morphology is simpler than verbal morphology, and does not display the same morphophonological complexity when it comes to placement of prosodic prominence. Nominal morphology is far simpler than verbal morphology, and includes derivative suffixes (most of which do not co-occur), compounding, and possessive prefixes.

Basic derived accentuation accounts for nouns with prefixing-type morphology, that is, nouns with possessive prefixes, compounds, and “pseudo-compounds” (which function as derivational suffixes but which have the same phonological effects on a stem as being the first element of a compound would [Bright 1957:71-73]). Derivative suffixation in nouns has not been examined in the present analysis.

2.3 Various phonological processes

This section contains a listing of numerous phonological processes that take place in Karuk, most of which are morphologically conditioned to some degree. These are presented briefly here because the alternations, insertions, or deletions discussed are evident in some of the examples which follow in the following chapters. When they come up in subsequent chapters, they are presented without further explanation, to leave the analysis uncluttered. In this section, I do not add new analysis for the most part, but present analyses provided by Bright (1957) and others, except where noted.

2.3.1 Sibilant palatalization

In Karuk, [ʃ] occurs only after front vowels and the glide /y/, with or without an intervening consonant; [s] occurs elsewhere (Bright 1957:17). The palatalization is both a static alternation in the lexicon (with the exception of a very few lexicalized reduplicated forms/loans), and an active process (obligatory in verbal prefixation; variable in nominal prefixation and across word boundaries). Exceptions all consist of [s] occurring in an environment where [ʃ] is expected; [ʃ] is never found in an environment where [s] is expected.

This alternation can be seen in *i*-initial verbs with no prefix and the third person singular prefix, respectively, in (15a)-(15b).

- (15) a. *íkshuupki*
 ikshup -ku -i
 point -onto -OPT
 ‘Point at it!’ (Bright 1957:66)
- b. *víri vaa vúra yítha úksuupkuti pa’ípaha.*
 víri vaa vúra yítha u- ikshup -ku -tih pa= ’ípaha
 so so INTS one 3s(>3)- point -onto -DUR DET= tree
 ‘There is one pointing at the tree.’ [JS WB_KL-92:5]
- c. *tánéékshupih*
 ta= na- ikshup -ihi
 PERF= 2s/3s>1s- point -BENE
 ‘He made me understand.’ [VS VS-10:9]

The change is conditioned by the vowels of the inflectional prefixes, and not the underlying root-initial vowel that they replace. Note also that the change is conditioned by the resulting contracted vowel in the case of vowel contraction as in (15c).

Exceptional words in which the palatalization process does not take place include loan words, for example, *síkspich* ‘seventy-five cents’ (from English ‘six bits’), and *kééks* ‘cake’. These words must be considered lexical exceptions to the rule. Palatalization also fails to apply in reduplicated words in which the sequence expected to trigger palatalization only comes about as a result of the reduplication, for example *tasínsir* ‘to brush repeatedly’, and *símsiim* ‘knife, iron, metal’ and derivatives.

In addition, after possessive prefixes, palatalization is subject to individual speaker variation (e.g., *nanishára* ~ *nanisára* ‘my bread’) (Bright 1957:45).

2.3.2 *th + s* → *ch*

When /th/ and /s/ come together across a morpheme boundary, they are replaced by a singleton /ch/, as in (16a) (Bright 1957:45). This alternation also applies in words where we would expect palatalization of [s] to [ʃ], as seen in (16b).

- (16) a. *pááchuru*
 path -suru
 throw away
 ‘throw away’ (Bright 1957:45)

b. *ákichip*

ákith -sip
 handle.(soft.mass) -up

‘pick up a soft mass’

(Bright 1957:45)

This process is also reflected as a static alternation in the language, because while CC sequences are common within morphemes, there are no words containing the sequence *ths* or *thsh*. There are likewise no words containing either *sth* or *shth* sequences. It is unknown what would result when these sequences come together across morpheme boundaries, as there are no suffixes beginning with *-th*.

2.3.3 Diminutive consonant symbolism

Diminutive and ‘pretense’ suffixes (which apparently contain the diminutive) in Karuk trigger consonantal changes in stems they attach to (Bright 1957). Diminutive consonant symbolism such as this is an areal feature of Northwestern California (Haas 1970; Conathan 2004). The morphemes that trigger the consonantal changes are *-ach*, *-ich* and *-ish* DIMINUTIVE and *hiich(va)* ‘imitation’ on nouns, and *-ach* DIMINUTIVE and *-iichva* ‘in pretense’ on verbs. Two types of consonant changes are triggered. One resembles consonant harmony, in which every instance of *th* in a stem suffixed with one of these morphemes to *ch*, as shown in (17a). The other is a nasalization process, in which every *r* in the stem is changed to *n*, discussed further in §2.3.4). Haas (1970) notes that the consonant changes always take place with nominal *-ich* and *-ach*, but do not always occur with *-ish* alone (more than one diminutive suffix can co-occur).

(17) a. *xás mukunyúùchkamach úkrii*

xás mukun- yúth -kam -**ach** u- ikriv
 then 3plPOSS- downriver.across.stream -side -DIM 3s(>3)- live

‘And a man lived downriver across-stream from them.’

[LB WB_KL-35:3]

In nominal compounds where the second element contains a diminutive suffix, the first element normally undergoes the same consonant harmony, although Bright notes exceptions, especially with the *th* to *ch* change (Bright 1957:77).

2.3.4 Nasalization

Several distinct nasalization processes occur in Karuk, some of which are general phonological processes, others of which are morphologically conditioned. Nasals in Karuk are *m* and *n*, and the consonants that can be nasalized are their oral counterparts, *v* and *r*. Some processes target all instances of these oral sonorants, while others target a subset of them. Two types of *v* exist in Karuk: alternating and non-alternating (Bright 1957; Herman 1994; Levi 2004, 2008). Alternating *v* patterns with *r* in being subject to more of the nasalization processes

than is non-alternating *v*.⁷ The various nasalization processes are described in turn in the following sections.

General local nasalization

Two nasalization processes occur generally in Karuk. First, *r* changes to *n* following a nasal consonant (Bright 1957:39) (18).

(18) /r/ → [n] / C[+nasal] ____

An example is given in (19b), where the suffix *-riik* becomes *-niik* following an *m*. As can be seen in the example in (19c), alternating *v* triggers this change, the same as non-alternating nasal consonants do.

- (19) a. *pahípr̥iik*
 pahíp -riik
 pepperwood.tree -place
 ‘pepperwood grove’ [MO WB_KL-62:16]
- b. *tishrámn̄iik*
 tishraam -riik
 clearing -place
 ‘level place’ [JS WB_KL-78:2]
- c. *pamu’asímn̄aam*
 pa= mu- ’asiv -raam
 DET= 3sPOSS- go.to.bed -place
 ‘its bed’ [SD SD-VS-02:38]

Secondly, a word-final *v* or *r* is nasalized when the following word begins with *m* or *n*, respectively (Bright 1957:54-55) (20).

- (20) a. *v* → *m* / ____#*m*
 b. *r* → *n* / ____#*n*

Both alternating and non-alternating oral sonorants follow this rule. The sequence of identical consonants created by this process is exempt from the degemination that usually takes place when identical consonants come together across word boundaries.

⁷Non-alternating *v* patterns with *y* in processes targeting glides, while alternating *v* patterns with non-glide consonants and avoids those processes.

- (21) a. *utháánim mupîmach*
 utháaniy mupîmach
 he.lies next.to.him
 ‘he lies next to him’ (Bright 1957:54)
- b. *vîrusun nikúniihku*
 vîrusur nikúniihku
 bear I.shoot.it
 ‘I’ll shoot a bear’ (Bright 1957:55)

Local nasalization with alternating *v*, *r*

In addition to being subject to the general nasalization process, alternating *v* and *r* are nasalized in more contexts. In a lexically defined subset of Karuk verbs, stem-final *v* and *r* alternate with *m* and *n*, respectively. In the alternating stems, the nasal consonants occur before other consonants, while the oral consonants occur before vowels and stem-finally (Bright 1957:39-40). This alternation may be formalized by the rules in (22).

- (22) a. /v/ → [m] / ___ C
 b. /r/ → [n] / ___ C

Examples are given in (24-23).

- (23) Non-alternating *v*
- a. *kunváthiv*
 kun- vathiv
 3pl(>3s)- fight
 ‘they are fighting’ [SD SD-VS-01:36]
- b. *uváthivtih*
 u- vathiv -tih
 3s(>3)- fight -DUR
 ‘it is fighting’ [SD SD-VS-01:41]
- (24) Alternating *v*
- a. *nithátiv*
 ni- thitiv
 1s(>3)- hear
 ‘I hear (it)’ [SD SD-VS-01:41]

- b. *nithítiimtih*
 ni- thitiv -tih
 1s(>3)- hear -DUR
 ‘I hear (it)’ [SD SD-VS-01:24]

(25) Alternating *r*

- a. *tu’ákunvar*
 ta= u- ákunvar
 PERF= 3s(>3)- go.hunting
 ‘he would go hunting’ [NR WB_KL-70:8]
- b. *kun’ákunvava*
 kun- ákunvar -va
 3pl(>3s)- go.hunting -PLURACT
 ‘they went hunting’ [NR WB_KL-72:3]

Non-alternating stem-final *v*, *m* and *n* also all occur in Karuk, but stem-final *r* always alternates.⁸ Likewise, verbal suffixes ending in non-alternating *v*, *m* and *n* are found, but there are no non-alternating *r*-final suffixes. In addition, *v*, but not *r*, is found morpheme-internally preceding another consonant, that is, in coda position. Thus nasalization provides evidence for two phonologically distinct /v/ phonemes, but only one /r/.

While non-alternating versions of these consonants exist synchronically, Bright (1957:40) notes apparently frozen forms in which *v* and *r* are present before a vowel that can be related to other forms containing non-alternating *m* and *n* synchronically. This indicates that there was likely a more pervasive allophonic alternation between these sets of consonants at an earlier point in the history of the language. However, denasalization is not an active synchronic process any longer, as stem-final *m* and *n* remain nasal when suffixed with a vowel-initial suffix or followed by a vowel-initial word in a compound.

Another set of verb stems appear to end in a non-alternating *r* when unsuffixed and/or before a vowel-initial suffix. However, these stems actually have an underlying final vowel which surfaces before a consonant-initial suffix, so the environment for the nasalization of *r* never occurs in these words. All apparently *r*-final nouns follow this pattern.

⁸Only one potential example of a non-alternating stem-final *r* has been found: *áapuchur* ‘to collapse’, of which Bright says in the dictionary entry, “meaning and form uncertain; found only in T52.74”. In the text referenced, however, the verb occurs unsuffixed, so there is no evidence that it would not in fact follow the alternating pattern.

Nasal allomorph of optative

The optative⁹ in Karuk takes the form of nasalization of stem-final *-r* and *-v* with no overt suffix in verb stems ending in these consonants, as in (26).¹⁰

(26) a. $v \rightarrow m$

b. $r \rightarrow n$

Optative nasalization occurs in stems ending in both alternating and non-alternating *-v*. Optative nasalization also occurs in stems ending in alternating *-r* and those *-r*-final stems followed by a vowel when suffixed (the vowel does not surface in the optative forms) (Bright 1957:65-66). Nasalization in these cases is stem-final only; no other sonorants in the stem are affected. Examples are given in (27).

(27) a. *ípa kóó kunípeerat “ikvan!”*

ípa kóó kunípeerat ikvar̥ -N
PAST all they.told.him buy -OPT

‘everything they had told him to buy’

[JS WB_KL-66:11]

b. *chími nu’am!*

chimi nu- ay̥ -N
OPT 1pl(>3)- eat -OPT

‘let’s eat!’

[JS WB_KL-32:59]

Diminutive symbolic nasalization

A different nasalization process is triggered by the diminutive and ‘pretense’ suffixes as part of the diminutive consonant symbolism. Unlike the local nasalization processes, this is a consonant harmony process which changes every instance of *r* in a stem suffixed with one of these morphemes to *n* (as well as every *th* to *ch*, discussed in §2.3.3). A nominal example is given in (28a) and a verbal example is given in (28b).

(28) a. *sáàmvan̩ihich*

sáàm -var̩ih -ich
little.downhill -toward -DIM

‘a little downhill’

[MO WB_KL-17:55]

⁹I use the term *optative* in place of Bright’s *imperative*, after Campbell (2012), because it is used for persons other than the second person (the verb form has properties of both imperatives and optatives, see Payne 1997:245,303).

¹⁰The other optative allomorphs are a zero allomorph (following long vowels), and the suffix *-i* (the elsewhere case); see §3.4.3 and §8.3. No nasalization is associated with the other allomorphs of the optative.

b. *uxnánatihach*

u- ixrara -tih -ach
 3s(>3)- cry -DUR -DIM

‘he was crying a little’

[LB WB_KL-61:7]

In nominal compounds where the second element contains a diminutive suffix, the first element normally undergoes the same consonant harmony, although Bright (1957:77) notes exceptions, especially with the *th* to *ch* change.

Unlike the other nasalization processes, diminutive consonant harmony does not target *v* to the same extent as *r*. The example in (28a) shows a change in the *r* but not the *v* in the suffix *-varih*. Bright notes that a parallel *v* → *m* change only takes place irregularly, in certain words. For instance, *yav* ‘good’, which ends in a non-alternating *v*, forms *yâamach* ‘pretty’, with nasalization of the glide, and also *-yâach* an intensive suffix, with glide deletion (Bright 1957:78). Similarly, when the suffix *-vah* DISTRIBUTIVE is followed by *-ich*, its initial *v* is nasalized.

Irregular nasalization and denasalization

There are several instances of morpheme-specific nasalization or denasalization which do not follow the other more productive processes discussed above.

The suffixes *-mu* ‘to’ and *-math* CAUSATIVE are denasalized to *-vu* and *-vath*, respectively, following vowels (Bright 1957:99,109). This alternation is unexpected even if we assume they begin with an alternating *v*, because these segments normally are only sensitive to the following environment, not the preceding environment. Elsewhere in the language, *Cv* and *Vm* sequences are plentiful. Another *m*-initial verbal suffix, *-mara* ‘to finish Xing’ clearly does not follow this pattern, but has the unexpected form *-vara* in one lexicalized form *pamvara* ‘to finish eating’ (<*p*- ITER *av* ‘eat’ *-mara*). An *m*-initial nominal suffix and several *v*-initial suffixes do not display these behaviors.

When *-tih* DURATIVE is added to *-sipriv* ‘up (to height of a man or less)’, the final *v* optionally changes to *m* (Bright 1957:103). This is expected for a stem ending in alternating *v*, but with other suffixes, the *v* in *-sipriv* does not nasalize.

The verbal suffix ‘too much’ has two allomorphs, *-iruv* and *-inuv*, and triggers nasalization of *r* (but not alternating *v*) within stems it attaches to (Bright 1957:107). Bright states the reason for alternation within the suffix is unknown, but from the examples he provides, it appears that when there has been nasalization of *r* triggered in the stem, the nasalized form of the suffix is used. The nasalized suffix also appears in a stem in which there is no *r* to nasalize.

The plural action suffix *-va* has a *-na* allomorph that occurs when it follows certain suffixes. The suffixes that condition the *-na* allomorph must be lexically determined (they are all directional suffixes, and seem to all contain an *r* and/or a *v*, but there are other directional suffixes fitting this description that condition the *-va* allomorph). Nasalization of *r* occurs in certain preceding suffixes when *-va* (not *-na*) is attached to them (e.g., -

furuk ‘indoors’ → *-funuk*) (Bright 1957:92-93). Most stems containing an *r* do not undergo nasalization when this suffix is attached, however.

The suffix *-rav* ‘in’ combined with the *-a* DEVERBATIVE suffix usually becomes *-ram*. Bright surmises that this may be due to contamination with the affix *-ra(a)m* ‘place’ (Bright 1957:116). Both these suffixes are verbal suffixes with considerable possible overlap in usage. The nasalization does not occur when *-rav* is followed by other vowel-initial suffixes, e.g., *-ak* LOCATIVE.

2.3.5 Glide deletion

Intervocalic glide deletion

Glides in Karuk (*v* and *y*)¹¹ are normally deleted when between vowels in derived environments, as can be seen in the examples in (29).

- (29) a. *kári xás ààpun tóóyvésh paxuun.*
 kári xás ààpun ta= u- iyvay -ish pa= xuun
 and then on.the.ground PERF= 3s(>3)- pour -down DET= acorn.soup
 ‘Then she poured the acorn soup down on the ground.’ [MO WB_KL-33:16]
- b. *ipít íp îkam pa’ákviish ukrét.*
 ipít íp îkam pa= ákviish u- ikriy -at
 yesterday PAST outdoors DET= wildcat 3s(>3)- sit/stay -PAST
 ‘There was a bobcat outside yesterday.’ [VS VS-10:6]
- c. *xás mít vaa káán asiktávaan uhrót.*
 xás mít vaa káán asiktávaan u- ihruy -at
 then near.past so there woman 3s(>3)- use/hire -PAST
 ‘He hired a woman there.’ [ED WB_KL-88:2]

Some long vowels in roots appear to be the result of historic glide deletion and subsequent vowel coalescence, especially mid vowels and/or those with HL accentuation. However, quite a number of VGV sequences exist in roots, so a ban on intervocalic glides does not hold synchronically as a morpheme structure condition in the lexicon.

Stem-final glides are deleted consistently when a vowel-initial morpheme follows them, as in the examples in (29). Some glide-initial suffixes lose the glide when attaching to a vowel-final stem, but not some do not (Bright 1957:33-34). This variability could be due to a faithfulness to morpheme-initial segments, with a functional explanation of recoverability.

Bright (1957:33) stipulates that intervocalic glide deletion occurs only between short vowels, and the sparse evidence available supports this formulation. There are no examples

¹¹Alternating *v*, which counts phonologically as a full consonant rather than a glide, is exempt from this process.

of an underlying stem or suffixal long vowel participating in a glide deletion process. Only three roots end in long vowels, and the one which is found with various suffixes has a vowel-glide sequence pre-suffixal alternant (*ikriv* ~ *ikrii* ‘to live, sit, stay, be’), so its glide is never in a position to be elided. The only glide-final stem found with one of the few long vowel-initial suffixes does not undergo glide deletion (*ikyáv-íichva* ‘to work’).

Glide deletion between a vowel and consonant

A non-alternating *v* that comes to fall between *a(a)* or *oo* and a consonant in a derived form is deleted (Bright 1957:34). Alternating *v* is exempt from this process. If the vowel preceding the glide was a short *a*, it is lengthened, but its quality does not change. Other vowels do not cause a following *v* to drop out before a consonant, and the glide *y* is not deleted between any vowel and consonant. This suggests that constraints on syllable structure and glideability/deletability of vowels vary according to vowel quality. This glide deletion process does not occur in reduplication, even if both copies of the root are followed by consonants (Bright 1957:34). There are several words in the lexicon containing an *avC* sequence that are not reduplicated. Most appear to be polymorphemic, at least diachronically. This is somewhat puzzling, because if these words contained an alternating *v*, we would expect it to nasalize before another consonant, but neither process has applied.

Glide deletion with *-avish*

As expected, the suffix *-avish* PROSPECTIVE (§8.3) triggers glide deletion in a glide-final stem. Additionally, this suffix undergoes morpheme-internal glide deletion when its initial vowel is *not* incorporated into the stem it attaches to. Thus when *-avish* is suffixed to (non-alternating) *v*- and *y*-final stems, the stem-final glide is lost and the stem vowel coalesces with the suffix-initial vowel, resulting in a long vowel followed by [vish], as shown in (30a). At this point, the suffix-internal glide is retained and no further contraction occurs. Similarly, when a stem ends in a non-deleting (i.e., long) vowel, the initial vowel of *-avish* is elided, and the suffixal glide remains intact, as in (30b).

- (30) a. *miník nitháàvish* Stem ending in glide
 miník ni- thav -avish
 of.course 1s(>3)- knock.down.acorns -PROSP
 ‘I’ll knock the acorns down.’ [MO WB_KL-17:31]
- b. *vaa múùk nutáàtripaa_{vish}* Stem ending in long V
 vaa múùk nu- táàtripaa -avish
 that with 1pl(>3)- hook.towards.land -PROSP
 ‘We’ll hook it out with that.’ [NR WB_KL-01:103]

In contrast, *-avish* surfaces as [eesh] after verbs ending in non-glide consonants. Bright considers *-eesh* and *-avish* separate allophones, but it would be preferable not to analyze them

this way if they can be derived from the same underlying form with regular phonological rules, which I believe is possible. In these cases, the morpheme-internal *v* must be deleted, and the suffix vowels subsequently must coalesce into a long vowel. When a stem ends in a deleting final vowel (see §3.4.3), the stem-final vowel is lost and again *-avish* contracts to [eesh]. Examples are given in (31).

- (31) a. *nishxáàreesh* Stem ending in C
 ni- ish^xáàr -avish
 1s(>3)- go.fishing -PROSP
 ‘I’m going to go fishing.’ [VS LA-VS-01:17]
- b. *chí níkráveesh* Stem ending in non-alternating *v*
 chí ni- ikrav -avish
 soon 1s(>3)- grind -PROSP
 ‘I’m gonna grind (acorns) soon.’ [LA LA-02:15]
- c. *chí nítákireesh* Stem ending in short V
 chí ni- tákiri -avish
 soon 1s(>3)- leach(acorn.meal) -PROSP
 ‘I’m gonna leach those (acorns).’ [LA LA-02:17]

The alternations seen with this suffix are compatible with the regular glide deletion processes, but in order to obtain the correct outcomes, glide deletion and resyllabification must apply left-to-right and only in one iteration.

2.3.6 *h* Deletion and epenthesis

The presence of *h* at the ends of and between morphemes is often conditioned by phonological, morphological, or lexical factors.

Word-final *h*-deletion

Word-final *h* is deleted when followed by another word, but retained before pause (Bright 1957:18). This process is fed by word-final vowel deletion in nouns (§3.3.1), with an exception. A noun ending in *CVha* → *CV*, but a noun ending in *CVVha*, on the other hand, → *CVVh* (Bright 1957:52).

h-deletion with suffixes

Phonologically conditioned *h*-insertion/deletion with certain suffixes Following non-deleting *a*, all *a*-initial suffixes have an epenthetic *h* inserted before them (Bright 1957:41). In effect, this only applies to nominal suffixes, because the non-deleting final *a* are only found in nouns.

Denominal adverb-forming *-hiipux* PRIVATIVE retains an *h* after nouns ending in non-deleting *a*, and loses the *h* elsewhere. Bright analyzes this *h* as underlying rather than epenthetic (Bright 1957:76), but there does not seem to be any compelling reason to do so, especially as it is the same pattern found with *a*-initial suffixes (except that this is the only *i*-initial suffix to follow the pattern).

When suffixed to a noun ending in *VVh-*, *ak* LOCATIVE → *-k* and the intervening *h* is lost. One exception to this rule is with *pááh* ‘boat’, resulting in *pááhak* ‘in a boat’, where the *h* is retained (Bright 1957:73). A minimal word size explanation is not possible here, because the regular process applies to *ááh* ‘fire’, resulting in *áák* ‘in fire’. Therefore, it must be considered a lexical exception.

Bright specifies that participle-forming *-an* PARTICIPIAL → *-han* after “occlusives” (Bright 1957:66). The examples given show *-han* following *ch*, and *-an* following vowels, *h* and *sh*. This suggests that *-han* follows [-continuant] sounds while the *-an* allomorph follows [+continuant] sounds, although no examples with nasal or oral stops have been found to determine if this feature specification is correct.

***h*-insertion/deletion with inflectional suffixes** Some inflectional suffixes show variation between an *h*-initial form and a vowel-initial form. Bright analyzes these as enclitics which can attach to nominal or verbal stems, with the two forms being allomorphs. The epenthetic *h* after non-deleting *a* rule described above would not explain the nominal forms because the *h*-initial forms appear on nouns regardless of the stem ending. Following Macaulay (1989), they are analyzed here as suffixes, with the *h*-initial forms actually consisting of two morphemes, the denominalizer *-hi* and the inflectional suffix. However, there are a couple of irregularities that cannot be explained by the presence of the denominalizer. These suffixes are given in (32)–(34).

- (32) a. *-avish* PROSPECTIVE → *-heesh* after nominal predicates
 → *-eesh/-avish* after verbs
- b. *-anik* ANCIENT → *-hanik* after nominal predicates and after *-ap* INVERSE/NEGATIVE
 → *-anik* elsewhere
- c. *-irak* ‘where’ → *-hirak* after nominal predicates
 → *-irak* after verbal predicates
- d. *-ara* NEGATIVE → *-hara* after nominal predicates
 → *-ara* after verbal predicates
- (33) *-at* PAST → *-hat* after *-(h)an* PARTICIPIAL
 → *-at* or *-hat* after *-ap* INVERSE/NEGATIVE

- (34) a. *-aheen* ANTERIOR → *-heen* after nominal predicates
 → *-aheen* after verbs.
- b. *-ahaak* IRREALIS → *-haak* after nominal predicates and verbs ending in vowels
 → *-ahaak* after verbs ending in consonants

The first set of suffixes, in (32), fit almost perfectly into the proposal that they are made up of a combination of the denominalizer and the *h*-less verbal suffix. The verbal suffix *-at* in (33) does not follow nominal predicates. A case could be made that its form after *-(h)an* PARTICIPIAL could also be an instance of a hidden denominalizer. However, either *-at* or *-hat* can occur after *-ap* INVERSE/NEGATIVE, apparently in free variation (Bright 1957:67). This latter allomorphy is surprising, because there is no reason to ever expect speakers to analyze an *-ap*-marked form as nominal, and there is no apparent phonological, morphological, or lexical explanation for the variation. Note also that the *h*-initial form of *-anik*, above, is used (invariably) following *-ap*. It may be possible that there is a phonological reason for this variation, based on comparison with the allomorphy seen in *-(h)an*, above. If so, perhaps the same rule used to apply with the other *a*-initial inflectional suffixes and has dropped out for *-avish* and *-ara* and is in the process of dropping out for *-at*.

The suffixes seen in (34) differ from the others because it appears that the initial *a* is dropped in the nominal form. This haplology is in fact expected for these two suffixes following any *h(a)* sequence in a stem (see §2.3.7), so I follow Macaulay (1989) in assuming that the underlying form of the suffix is the verb form, and that the nominal form is a haplologized version of the denominative plus the suffix. The fact that *-haak* follows verbs ending in vowel is a peculiarity of this suffix, reminiscent of the more general rule of loss of a suffix-initial *a* following a long vowel.

2.3.7 Haplology

Haplology occurs occasionally and sporadically to simplify a sequence of two identical syllables that come together at a morpheme boundary to one (Bright 1957:35). There are also a few specific morphological combinations in which haplology is regular and obligatory. See also §2.4.3 for haplology with *pa=*.

Haplology with *ahi* Bright (1957:89) describes haplology occurring when the suffixal *-ahi* component of what he considers the MODE circumfix is added to a stem that has a final *a(a)hi* sequence, to reduce the resulting *(a)ahahi* sequence to a single *(a)ahi*. Alternatively, one could say that the entire suffix is suppressed. Bright makes no mention of whether *-ahi* ESSIVE participates in the same haplology that the modal *-ahi* does. The example given for modal *-ahi* haplology (*ikyáâhi* ‘to be made’) seems, in fact, to contain the essive *-ahi*. It is possible that the primary environment for this haplology to operate in is following essive *-ahi*, and it may be that essive *-ahi* never is in a position to follow a homophonous sequence. Alternatively, it is possible that the two homophonous suffixes are actually the same morpheme, an assumption I follow here.

Haplogy with *ha* When *-aheen* ANTERIOR tense marker follows a stem ending in *h(a)*, the sequence *haheen* is reduced to *heen*. Similarly, when *-ahaak* IRREALIS follows a stem ending in *h(a)*, the sequence *hahaak* is reduced to *haak* (Bright 1957:125-126). These could alternatively be considered cases of irregular deletion, rather than haplogy.

2.3.8 Additional irregular processes

A great deal of irregular phonologically, morphologically, or lexically conditioned allomorphy is present in Karuk. These alternations are described in detail in Bright (1957); a few that are apparent in examples below are mentioned here.

Gemination and degemination

Certain morphemes contain normally geminable consonants which are exceptionally exempt from gemination, falling into four categories: 1) loan words, 2) names which may also be loans, 3) words that fall into Bright's class of grammatical adverbs, but which seem to have more function word properties than lexical ones, and 4) suffixes (Bright 1957). Additionally, the affricate *ch* has irregular behavior with regard to gemination (Bright 1957:18).

Degemination occurs when identical consonants become adjacent across word boundaries (Bright 1957:39). This would not be surprising if it only applied in environments where metrically conditioned gemination (2.1.4) would not be expected. However, it also applies in some contexts where gemination should otherwise be expected.

Irregular stem-final vowel deletion and changes

The final *a* of a *va* sequence becomes *u* preceding *-tih* DURATIVE and (for most speakers) before *-naa* PLURAL (Bright 1957:41). The final *a* of the first member of a compound is sometimes lost irregularly (there is variation by speaker and by lexical item) (Bright 1957:43). Thus while the first member of a compound normally follows the pattern for prefixes, it can occasionally follow the pattern for an unsuffixed word.

A set of nouns have a final *a* (written in Bright (1957) with capital A) that, although they are preceded by single consonant, are never deleted before pause or preceding a vowel-initial suffix as expected (see §3.3.1) (Bright 1957:43).

Shortened allomorphs of certain affixes

Two frequently used Karuk suffixes have two allomorphs, a longer and a shorter one, listed in (35). The shorter allomorph is used word-finally, and the longer one is used word-medially.

- (35) a. *-ish* ~ *-ishrih-* 'down', RESULTATIVE
 b. *-sip* ~ *-sipriv-* 'up', INITIATIVE

Based on the extremely common phenomenon of devoicing and whispering final syllables of Karuk words, it may be that this phonetic tendency has been phonologized as a (mostly)

regular alternation in these morphemes. The longer allomorph must be used when additional suffixal material follows, but may also be optionally used in word-final position (Bright 1957:96,103). See, for instance, examples in (230) and (237).

The nominal suffix *-sa* ~ *-sas* PLURAL follows almost the opposite pattern: the vowel-final form is used before other suffixes, while the two variants are in free variation at the end of words, with the vowel-final form being the more common. This suffix takes a special allomorph, *-iivsha(s)*, with possessed kinship terms (Bright 1957:81).

2.4 Processes at the left edge of the word

This section contains overviews of several processes which affect the left edge of the word, in particular, word-initial vowels and glottal stops. These descriptions contain more new observations and analysis than those presented in the previous section.

2.4.1 Glottal stops

Glottal stops are a marginal phoneme in Karuk. For the most part, they are found only as onsets to otherwise vowel-initial words, and separating two vowels across morpheme boundaries. Vowel hiatus across morpheme boundaries is normally resolved by vowel coalescence or deletion (see §3.4 for details), but these processes are blocked when a stem-initial vowel is long or bears an underlying H tone. In these environments, a glottal stop is inserted to separate the two vowels instead. This distribution points to purely phonologically conditioned presence of glottal stops. However, for a few reasons, an underlying phonemic glottal stop must be posited.

First, glottal stops are present, very rarely, in root-final position (Bright 1957:18). Further, monosyllabic vowel-initial roots are normally exempt from elision or coalescence of their initial vowel, regardless of whether the vowel bears tone or is long. Derivatives of these monosyllabic roots (which are no longer monosyllabic) retain their initial glottal stop. One monosyllabic root (*it* ‘see’) is exceptional and does not have an initial glottal, so can be reduced to a single consonant. The behavior of derived stems and the exceptional glottal-less monosyllabic root mean that while glottal stop insertion is clearly motivated for reasons of recoverability in monosyllabic roots, it cannot simply be an automatic process that occurs whenever an agreement prefix is attached to one of these roots. Finally, the remainder of verb root-initial vowels (unaccented, short, polysyllabic) are inconsistently protected by glottal stops. Most, though not all, verb roots beginning with /a/ are protected by a glottal stop. Most, though not all, verb roots beginning with /i/ or /u/ are not. As will be discussed in §3.3.3, low vowels in Karuk are less prone to deletion than high vowels (though they are not as strong as long vowels). This is an interesting parallel, but again, since it is not categorical, the glottal stops must be posited as underlying in these roots.

? insertion in prefixation and compounding

A glottal stop is also inserted before a vowel-initial stem when it is preceded by a polysyllabic morpheme in the same word if that morpheme ends in a geminable consonant (and sometimes *h*), as shown in (36a). Following a monosyllabic morpheme in the same word (36c) or one ending in a nongeminable consonant (36b), no glottal stop is inserted (Bright 1957:33). This is also true of both noun and verb roots.

- (36) a. *mukun-* ‘their’ + *impaah* ‘path’ → *mukunʔimpaah* ‘their path’
vêekin ‘wagon’ + *impaah* ‘path’ → *vêekinʔimpaah* ‘road’
- b. *fithih* ‘foot, toe’ + *xpiph* ‘nail’ → *fithiháxpiph* ‘toenail’
- c. *ááx* ‘blood’ + *impaah* ‘path’ → *axímpaah* ‘blood vessel’
kun- 3pl>(3s) + *imnish* ‘cook’ → *kunímnish* ‘they cook’

Irregular ? deletion in prefixation The iterative prefix falls closer to a verb stem than inflectional person/number marking. When the iterative prefix is added to a glottal stop-initial word, the glottal stop is deleted and the *p-* allomorph of the iterative is normally used (Bright 1957:88-89). This applies to both underlying and surface glottal stops, if we assume the latter are already present at this stage of the derivation, otherwise one could say that no glottal stop is inserted. Bright notes two exceptional glottal stop-initial stems which instead take the *ip-* allomorph of the iterative; the glottal stop deletion still occurs.

Irregular ? deletion in compounding In certain lexicalized compound words in which the second element is a monosyllabic word with a long vowel and initial glottal stop in its free form, show vowel shortening and loss of the initial glottal stop in the compound. Bright (1957:71) notes that these changes are “archaic and are observable only in a few petrified examples”. We can assume the changes based on corresponding synchronic forms containing the compounded element. This could possibly represent a former phonological process in the language, frozen in only a few forms, from a time when glottal stops were not phonemic.

2.4.2 Word-initial vowel deletion and coalescence

Following a pause, an initial vowel in a word beginning with an unaccented VCC sequence is optionally deleted (Bright 1957:53). When an initial vowel is not deleted, a glottal stop onset is supplied at the surface. Therefore, it can be assumed that a constraint against onsetless syllables in initial position leads either to the deletion of the initial vowel, (possibly in rapid or informal speech), or else to the insertion of a glottal stop (probably in more careful speech) as described in §2.4.1. Initial vowel deletion creates surface complex onsets otherwise not allowed in the language. Words with underlying initial glottal stops do not participate in this process. Short vowels in open syllables at the end of morphemes in Karuk are also subject to deletion, but in a more regular fashion than word-initial vowels; word-finally and under suffixation (see Chapter 3). Long vowels are not elided in Karuk.

? deletion in rapid speech In rapid speech, word-initial glottal stops are deleted when the preceding word ends in a vowel (Bright 1957:53). The adjacent vowels then undergo coalescence or one is deleted based on vowel quality and accent, as described in Bright (1957:53). An example is given in (37). Whether this occurs with any juxtaposed words or only in certain contexts is an open question for future phonetic investigation.

(37) *uum vookúphaanik kachakáàchich*

úúm váá ukúúphaanik kachakáàchich
3SG thus she.once.did.it bluejay.DIM

‘Bluejay is that way.’

[PM JPH.PHM-24-343a:42]

2.4.3 Proclitics

The current research focuses on accentuation in the lexical domain, so clitics are not included in the present analysis. To make sense of their forms in some of the examples presented, however, their effects are listed here briefly, based on the analysis in Bright (1957). Long vowels created in coalescence between a proclitic and a stem vowel do not ‘count’ as long for basic derived accentuation (Chapter 5).

pa= DETERMINER and *pa*= NOMINALIZER

The nominalizer *pa*= and the determiner *pa*= are homophonous, but according to Bright (1957) are distinguished by slightly different accentual, gemination, and vowel coalescence effects when they are cliticized to stems.

With *pa*= DETERMINER, glottal stop deletion only occurs in a very specific combination: when the determiner *pa*= attaches to a disyllabic stem beginning with unaccented ?VCC-, as in the first instance in (38). This includes both underlyingly vowel-initial and glottal stop-initial stems. In this combination, the glottal stop is lost, and the adjacent vowels subsequently coalesce (§3.4). Unlike the vowel coalescence in prefixing, however, this process does not always take place in careful speech, in which case the glottal stop may be retained (Bright 1957:121).

With *pa*= NOMINALIZER, glottal stop deletion occurs in a somewhat broader context: when the nominalizer *pa*= attaches to any word beginning with ?V- (where V is any short vowel, accented or unaccented). This also includes both underlyingly vowel-initial and glottal stop-initial stems. Again, in this combination, the glottal stop is lost and the adjacent vowels coalesce, as seen in the second instance in (38), but in careful speech the process may not take place (Bright 1957:121-122).

(38) *váá kumúùk kunihvithtihavish peeshyáàt peethívthaaneen*
that with.it they.will.be.cleaning the.spring.salmon the.world
tákunpikyáàhaak
when.they.fix.it
pa= ishyáàt *pa*= ithívthaaneen

‘They will clean the spring salmon with that, when they fix the world.’

[MO WB_KL-17:60]

Haplology with *pa* When *pa*= NOMINALIZER is added to a word with *pa*= DETERMINER, only one *pa* surfaces. Bright (1957:122) states that the determiner *pa*= is the one which remains. However, based on textual examples, it appears that at least some of the time, it is the nominalizer *pa*= that is retained. In many instances, it is ambiguous which *pa*= is present because the phonological effects of either would be the same in the context, but based on the differences Bright claims exist between the two morphemes when it comes to glottal stop loss and vowel coalescence (see §2.4.3), it is theoretically possible to tell them apart with certain vowel-initial stems. Using this evidence, we can see that in the example in (39) the determiner *pa*= is present, while in the second instances in both (38) and (40) it must be the nominalizer *pa*=.

- (39) *xás kunpíúp pa’avansáxiich káan tákun’úhmahaak ík kári*
 then they.said the.boys there when.they.dance.to must then
 pa= ’avansáxiich
kupéèthkeevish
 you.will.pull.them.out

‘And they said, “When the boys dance to there, you people must pull them out.”’

[JS WB_KL-08:40]

- (40) *víri payéèm panipimúsarahaak víri vaa ník kári nimáheesh*
 so now when.I.visit so that a.little then I.will.see
 pa= nipimúsarahaak
peekrívraam káán vúra u’iikráhaak
 if.the.house there INTS when.it.is.standing
 pa= ikrívraam

‘Now when I go back to see (my father), then I’ll see if the house is standing there.’

[JS WB_KL-16:37]

If the purported differences between the behavior of the two morphemes are not as regular as this, however, it is possible that the two can be considered a single morpheme, with some variation in its effects based on its syntactic position and/or by speaker.

ta= PERFECTIVE

The degree of phonological integration of the perfective *ta*= and a following predicate depends on the shape of the following stem. The only cases in which more than one accent per word are possible in Karuk occur with this morpheme. When *ta*= PERFECTIVE is combined with a verb that begins with a consonant other than a glottal stop, the perfective retains the form *ta*= and bears a H tone, as in (41a), regardless of the accentuation of the verb it attaches to,

thus forming its own accentual phrase. No examples of *ta=* combining with a stem-initial long vowel have been found.

When the PERFECTIVE is combined with a verb beginning with a short vowel in an open syllable (accented or unaccented), the stem-initial glottal stop is lost and the PERFECTIVE allomorph *t=* is attached to the stem with no vowel changes (Bright 1957:139), as in (41b). This allomorph provides an onset for the stem-initial vowel and loses its H tone, thus becoming part of the verb's accentual phrase.

When *ta=* PERFECTIVE is combined with a verb beginning with a short vowel in a closed syllable (accented or unaccented), the stem-initial glottal stop is lost and vowel coalescence (see §3.4) occurs between the perfective allomorph *ta-* and the stem vowel. The perfective retains its H tone, which can result in the appearance of two accented syllables in a single word, if the stem it attaches to bears H tone elsewhere, as in (41c). However, if the stem-initial vowel bore accent, the surface result is a single accented long vowel, as in (41d), provoking the question of whether these forms should be considered a single accentual phrase or two.

- (41) a. tá*kun'ípas*
ta= kun- ípas
 PERF= 3pl(>3s)- take.(person)
 'he's been taken' [LB WB_KL-61:15]
- b. típ*áchish*
ta= i- páchish
 PERF= 2s(>3)- throw.down
 'you throw it away' [MD GD-MD-VSu-01:79]
- c. tóó*kvíripma*
ta= u- ikvíripmu
 PERF= 3s(>3)- run.to
 'she would run [there]' [JS WB_KL-32:9]
- d. tóó*kyav*
ta= u- ikyav
 PERF= 3s(>3)- make/do
 'she did it' [VSu GD-MD-VSu-01:139]

This glottal stop deletion and vowel coalescence is obligatory, even in slow speech, in contrast to the comparable process seen with *pa=*, and also in contrast to a similar more general process which takes place across word boundaries during rapid speech (see below).

I have discovered an additional minor pattern for *ta=* which Bright does not mention: unaccented with coalescence with a stem-initial vowel, including when followed by a single

consonant (i.e., *tee-*, *too-*). It is possible that some of these forms represent mistranscribed accentuation, but at least some of them appear to be correct and could represent a formerly unknown sub-pattern, which bears further investigation.

pu= NEGATIVE

Bright does not discuss what results when the negator *pu=*, analyzed as a proclitic, precedes a vowel-initial stem. There is evidence from a few examples that *pu=* does not trigger glottal stop deletion. On stems that are underlyingly vowel-initial, a glottal stop is present between *pu=* and the vowel, as in (42).

(42) *vúra tápu'ipmáhara*

vúra ta= pu= ipmah -ara
INTS PERF= NEG= see.again -NEG

‘She couldn’t find (the child).’

[LB WB_KL-61:13]

2.5 Prosody

2.5.1 Word-level prosody (a.k.a. Accent)

Word-level prominence

Tone and stress have an impoverished distribution in Karuk. Each accented word bears exactly one stress and at most one H tone, and follows the pattern of a span of H tone followed by a span of L tone, although the entire pattern is not always realized on very short words. The drop from high to low can be either a HL tone on a long vowel or a H tone followed by a L on the next syllable. Words that are lexically unaccented surface with a final H tone, unless at the right edge of an utterance, in which case they are toneless. Stress coincides with the syllable containing the H-tone-bearing mora (at the right edge of the H span), when present, thus marking the surface contrastive tone in the word. In the absence of a surface H tone, stress falls on a long vowel when present, otherwise, stress is final.

While any syllable, from the first to the final, can bear prominence, striking patterns, alternations and gaps make it seem that generalizations regarding the placement of prominence in a stem should be possible. To this end, various representations of underlying specifications for prominence, and for the processes that affect it, have been proposed.

Previous analyses

Field notes by Harrington (ca. 1925–1933) represent the earliest reliable transcriptions of Karuk prosody. For the most part his transcriptions are phonetic, marking pitch, accent, and glottalization syllable by syllable. Interestingly, there are instances where his transcriptions

of accentuation represent information about phonological alternations, a level of abstraction not normally seen in Harrington's work (Sandy 2014b).

Bright (1957) meticulously describes the word prosody of Karuk in morphophonemic terms, using three accent phonemes, 'acute' (H), 'circumflex' (HL), and 'no accent', one of which characterizes every syllable. A phonological word contains at most one accented syllable, and he considers words containing neither 'acute' nor 'circumflex' accents 'unaccented', even if they bear stress. Under Bright's system, an extensive list of seemingly arbitrary rules is required to define the environments for the processes that result in surface accentuation. Subsequent research, including the present study, do not dispute Bright's transcriptions of accentuation in the vast majority of cases, but rather seek to simplify and motivate the representations in a more explanatory fashion.

Hamp (1958)'s proposed analysis of accent on long vowels, though couched in phonemic theory, prefigures an autosegmental (Goldsmith 1979) analysis using two V slots and a single H tone. He also does away with Bright's 'no accent' phoneme, claiming it is predictable by the absence of the single accent phoneme he proposes.

The prosodic system of Karuk has more recently been characterized in terms of tone and stress (Macaulay 1990; Crowhurst & Macaulay 2007). Macaulay (1990) provides an autosegmental tonal analysis of Karuk word prosody using a privative H tone (H/ \emptyset system). She separates tone from stress and argues that tone is specified in the lexicon and that stress follows from tone, or is assigned by default where there is no lexically specified tone. Crowhurst & Macaulay (2007) divide Karuk roots into three accent classes, H, HL, and L. In Crowhurst and Macaulay's system, membership in an accent class is idiosyncratic, but once the class is known, how the accent will be associated is predictable. HL and L tones are underlying, while assignment of H tones is metrically driven. Crowhurst & Macaulay (2007) demonstrate some systematicity in placement of tone in roots, but require lexical tone in many cases and do not address the role of coda consonants, which are found to be key in the current analysis.

Current analysis

Representations in the present analysis are closest to those of (Macaulay 1990). I represent Karuk accent with a privative H tone. H tone is either lexically specified or assigned by morphology, and stress is associated with the tone-bearing syllable in the word at the end of derivation. If there is no lexical tone, stress and H tone are assigned by default.

It is necessary to analyze tone and stress independently in Karuk. High tone and stress do not always coincide (see §2.5.2 for stress in absence of tone), and the tone pattern on a stressed long vowel can either be level high or high-low falling. Thus the location of stress in a word is predictable by the location of tone, but the converse is not true. Because of this, I specify tone or stress whenever relevant in my discussion of prominence. As noted above, while the term 'accent' may not describe a coherent class of languages, it is nonetheless a useful shorthand which I make use of to describe the location in a word that bears a contrastive tone, when the particular tone pattern is unimportant.

Support for the analysis of prominence as tone (rather than stress) at the level of the root

and stem comes from patterns of placement and vowel lengthening, discussed in subsequent chapters. Evidence for metrical structure is present at the level of inflection and at the phrasal level.

A H tone within a word is always followed by a L tone (excluding surface word-final Hs supplied by the Accentual Phrase). This could be represented equally well by a HL tone, a H* accent, or a H tone followed by an automatically supplied L. For simplicity, I assume a single H tone in the present analysis, with L supplied by rule. I do not consider HL on a long vowel and H to represent different tone classes, but use HL and H simply as a notation to specify which pattern I am referring to when talking about accentuation on a long vowel. Any time H tone is referred to or an acute accent is written, these should be understood to be followed by a L tone at the surface, unless otherwise specified.

I analyze words that receive final accentuation (alternating with no tone utterance-finally) as underlyingly unaccented here, following Bright (1957). An alternative analysis (which I followed in Sandy 2014a) is to assume these stems have underlying final H tone. The underlying final H analysis is attractive for its simplicity, but runs into problems in explaining the three-way contrast in monosyllables and the rare H-tone final word that, according to Bright, does not show the same alternation. The presence of unaccented words is a common component of pitch accent systems (Itô & Mester 2016), and the presence of surface tones from the Accentual Phrase in unaccented words is not surprising, as will be shown in the following sections. Nonetheless, it is difficult to know what underlying representation is correct for these words.

2.5.2 Phrasal prosody

The relevant phrasal categories for prosody in Karuk are the Accentual Phrase (AP), the Intermediate Phrase (iP) and the Intonational Phrase or Utterance (IP) (Pierrehumbert & Beckman 1988; Jun 2005, 2014).

Accentual phrase

In Karuk, the AP is usually the same as a word. The AP does not correspond exactly to the prosodic stem discussed in Chapter 8 because syllables which are outside the prosodic stem are included within some AP and can bear AP boundary tones. Postlexically, clitics are joined with hosts and resyllabification occurs as necessary, sometimes based on morpheme-specific rules (see §2.4.3). It is possible for clitics to bear lexical accent, in which case they form their own AP, although most do not.¹² AP boundaries are placed based on the surviving accents at this point. APs are marked by a left edge %L boundary tone. This tone associates with the first mora of a word if that mora does not already bear a lexical tone. If there is a lexical H tone associated with the first mora, the boundary L tone is not

¹²In the case of *ta=* PERFECTIVE, the clitic can form its own AP in addition to a stem AP under certain conditions, described in §2.4.3. In the case of *pa=* NOMINALIZER, the clitic can only bear accentuation in combination with certain unaccented stems, in which case it becomes part of the stem AP. The clitic *pu=* NEGATIVE never bears accentuation.

linked. Additionally, if the first mora is part of a long vowel, the L boundary tone cannot dock due to a prohibition on LH contours in Karuk. If there is already a H tone in the word, the AP assigns no additional prominence.

Lexically unaccented words receive a default final **H%** from the AP. A phrasal level tone in these words predicts the pattern in unaccented words observed by Bright (1957:52). Compare underived *chishúh* ‘dog’ which receives final accentuation, and *pamichíshiih* ‘your dog’, which receives the high-before-long pattern (43).

- (43) a. *chishúh* *ûkam* *utháániv*.
chishiih *ûkam* *utháániv*
 dog outdoors it.is.lying.down
 ‘There was a dog lying down outside’ [VS VS-08:22]
- b. *pananichíshiih* *ûkam* *utháániv*.
pa= nani- chishiih *ûkam* *utháániv*
 DET= 1s.POSS- dog outdoors it.is.lying.down
 ‘My dog is lying outside’ [VS VS-08:23]

This pattern is strikingly similar to the default tone assignment in unaccented words in Japanese and Basque (Elordieta 1997, 1998; Hualde 1999; Hualde et al. 2002; Pierrehumbert & Beckman 1988). In the analysis of Bizkaian Basque presented in Gussenhoven (2004), unaccented words in Basque are assigned a $L_\alpha H_\alpha$ which associates at the left edge, and can have a default H^*L at the right edge, but no phonetic difference between just the $L_\alpha H_\alpha$ or both the $L_\alpha H_\alpha$ and the H^*L is discernable. In the analysis of Tokyo Japanese presented in Gussenhoven (2004), there is also a $L_\alpha H_\alpha$, but there is a phonetic contrast between words with a $L_\alpha H_\alpha$ and H^* and those with only a $L_\alpha H_\alpha$. Further phonetic work is required to determine which is the best analysis for the default H tone in unaccented words in Karuk.

Only underived words can receive default H tone from the AP, because derived words all gain some accent in derivation. Short function words do not receive lexical accent but can receive accent postlexically via intonation. An example of what appears to be an unaccented, underived and uninflected verb receiving final accentuation is given in (44a), with an inflected example for comparison in (44b).

- (44) a. *kári xás vúra iksháh* *u’ahvákir*.
kári xas vúra ikshah *u’ahvákir*
 then then INTS laugh he.died.of
 ‘And he died laughing.’ [MO WB-KL-63:14]
- b. *xáyfaat ikshah*.
xáyfaat i- ikshah
 don’t! 2s(>3)- laugh

‘Don’t laugh.’

[VS VS-09:22]

One possible exception to derived words all gaining accent in derivation is monomoraic verb roots with unaccentable prefixes. It is impossible to determine whether these are accented at prefixation or not, as the results would be identical (an analysis for accentuation of these forms is given in §5.2.4). Not including these monomoraic roots, less than 1% of the verb tokens in the corpus receive default accentuation from the AP, since the vast majority of verbs are inflected.

Intonational Phrase

An IP in Karuk is characterized by a right edge **L%** boundary tone which has additional glottal effects. This boundary tone explanation unifies and motivates the observations Bright (1957:11-13) makes regarding the allophones of his “acute accent” and “no accent” phonemes. IP-final boundary L links to the final mora of an IP. These boundary tones override AP-final tones, resulting in a final L on a short vowel or HL contour on a long vowel bearing a H tone.¹³ The IP-final **L%** is also associated with glottalization and devoicing. Devoicing or whispering can spread to unfooted syllables at the end of the word. When the **L%** boundary tone delinks the only H tone in the word (e.g., in lexically unaccented words that receive final H tone from the AP), stress falls on a long vowel if present (no examples of unaccented words with more than one long vowel have been found), otherwise on the final syllable. This phenomenon shows that while tone and stress usually coincide in Karuk, they are independent to some degree.

Interaction of tone and stress

A word with a surface final H tone, such as *umáh* in (45a) and *u’úúm* in (46a), loses that H tone at the end of an intonational phrase (in these examples, stressed syllables are indicated with underlining; accent marks indicate tone). When this happens, stress defaults either to the final syllable of the word, as in (45b), or to a long vowel, when present, as in (46b) and *umi* in (46c) (following the description given by Bright 1957:12–13, 57). For this reason, high pitch is not a defining characteristic of stress in Karuk.

- (45) a. kári xás káán **umáh** akvaat
 then then there he.saw raccoon

‘And there he saw raccoons...’

[MO WB_KL-05:4]

- b. kári xás **umah**
 then then he.saw

‘And he saw her.’

[MO WB_KL-62:4]

¹³A few lexical exceptions retain H tone IP-finally, see Bright (1957:55).

- (46) a. xás pakáán u'úúm yánava yúra áhtaay má'ninay
 then NOMZ=there he.arrived EVID INTS much.fire high.mountain.country
 ‘And when he got there, he saw lots of fire in the mountains...’
 [JS WB_KL-10:22]
- b. xás u'uum.
 then she.arrived
 ‘She arrived.’ [PM JPH_PHM-24-343a:12]
- c. îkam kúúk uumi!
 outdoors to.there arrive.OPT
 ‘... go outdoors!’ [LB WB_KL-61:2]

Intonation

Typical utterance-level intonation in Karuk is characterized by a gradual rise to a pitch peak, followed by a fall. The pitch peak in an utterance coincides with word accent (typically the last word accent in the phrase). The end of an utterance is characterized by devoicing, glottalization, and low tone.

Following a ToBI system (Beckman et al. 2005), word accent would be marked **H*+L**. Bright (1957:16) identifies two levels of break following utterances with the unmarked rising-falling pitch contour, which he marks with commas and periods, respectively. Bright’s “comma intonation” is followed by an Intermediate Phrase (iP) boundary, associated with a weak low boundary tone, but an audibly detectable pause is optional. This would have **wL%** for the weak L boundary tone and would normally correspond to a Break index 2. Bright’s “period intonation” is followed by an Intonational Phrase (IP) boundary, and is associated with a low boundary tone and a clear pause. This would have **L%** for L boundary tone, and would normally correspond to a Break index 3 with finality (Venditti 1997) or a Break index 4 (Beckman & Ayers 1997).

Bright defines two additional utterance-level intonational contours: a higher pitch register, which he associates with excitement, and a falling intonation, which he associates with sadness (Bright 1957:16). I have found that contexts for these ‘expressive’ contours vary from this description (e.g., for one speaker, higher register is associated with reported speech in a narrative), and that the phonetic pitch peak in an utterance falls on non-final word accents more often than Bright indicates (Sandy & Mikkelsen 2015). Intonation is an area ripe for additional research.

Chapter 3

Processes affecting TBUs

3.1 Introduction

In the following sections I analyze lexical processes that affect tone bearing units (TBUs) independently of prominence. That is, those processes which add, delete, or merge vowel moras, such as vowel epenthesis, elision, and coalescence of two short vowels into a single long vowel. The phenomena discussed here are limited to those which are not triggered by the placement of prominence, but rather are determined by syllable structure constraints interacting with the addition of morphology, intervocalic glide deletion, and the like. In informal terms, the operative constraints affecting Karuk syllable structure are the avoidance of consonant clusters, the avoidance of open syllables, and the avoidance of vowel hiatus. Specifically, epenthesis in reduplication and suffixation, word-final vowel deletion, and vowel hiatus resolution in glide deletion and affixation contexts will be examined.

Because these processes affect tone bearing units, a clear understanding of how they function and interact with morphological processes is essential to the calculation of tone placement in the analysis that follows. The processes discussed here provide important diagnostics for the interleaving of phonology and morphology in Karuk, as well as for particular phonological repairs being tied to certain sets of morphology. For instance, a H tone that is in place before vowel coalescence will result in a HL on a long vowel, whereas a H tone placed after coalescence will not. It is also important to know whether stem-final vowels are present for suffixation. Bright (1957) conflates the deletion of stem-final vowels under vowel hiatus resolution and word-finally, and posits that stem-final vowels are present for suffixation but not for the attachment of what he terms postfixes (i.e., enclitics). I disagree with his analysis and consider the two vowel deletion processes independent, which has important ramifications for the analysis of suffixation. Following Macaulay (1989), I reanalyze all the postfixes as suffixes, with no differential treatment of stem-final vowels (see §8.3.1).

A number of observations of typological and theoretical interest that can be drawn from this data are also pointed out, including affix faithfulness regularly outranking root faithfulness, reversals of constraint rankings at different points in the derivation, and gradient vowel strength. I propose a scale of relative vowel strength to account for phenomena described here. The reader who is primarily interested in accentuation, however, can safely skip this

chapter, and refer back to it when questions arise regarding the possible candidates presented in tableaux for tone assignment, or regarding evidence for the interleaving of phonology and morphology.

3.2 Vowel epenthesis

Vowel epenthesis occurs in Karuk to break up a cluster of three consonants. In Karuk, there are only two contexts in which three consonants come together: when a CCVC root is reduplicated (47a),¹ and when one of a handful of suffixes that begin with two consonants is attached to a consonant-final root (47b). In these cases, vowel epenthesis repairs the illicit structure (VCCCV → VCVCCV), thus avoiding clusters of more than two consonants and providing a nucleus for an additional syllable. The epenthetic vowel gains its quality from the preceding stem vowel and is always inserted at the morpheme boundary. As there is no evidence for any underlying morpheme-final consonant clusters, the morpheme boundary always falls between the first two consonants of the cluster.

- (47) a. *taxvukúxvuk*
taxvuk -*xvuk*
hook -RED
‘to crochet, to tat’ (Macaulay 1993:77)
- b. *ukyíivrath*
ikyiv -*vrath*
fall -over/into.sweathouse
‘he fell in’ [NR WB_KL-02a:9]

Epenthesis to break up a consonant cluster can be modeled using the Optimality Theoretic constraints (Prince & Smolensky 1993/2004; McCarthy & Prince 1995a, 1999) given in (293b)–(293b), for a simple tableau in (51).

- (48) MAX-C
Assign one violation mark for every consonant segment in the input that is not expressed in the output. MAX is separated into consonant- and vowel-specific constraints because consonants are never deleted to avoid dispreferred syllable structures, while vowels may be.
- (49) *CCC (*CCC)
Assign one violation mark for every cluster of three consonants.

¹Why it appears that only part of the root is reduplicated in the example given here is explained in the following section.

(50) DEP

Assign one violation mark for each segment in the output that does not have a correspondent in the input. (McCarthy & Prince 1995a)

(51) *CCC, MAX-C \gg DEP-V

/taxvuk-xvuk/	*CCC	MAX-C	DEP-V
a. taxvukxvuk	*!		
b. taxvukvuk		*!	
c. ☞ taxvukuxvuk			*

In the simplified tableau in (51), the fully faithful candidate fails because it violates the constraint *CCC. A candidate which deletes any of the underlying consonants fails because it violates MAX-C (only one such candidate is shown in (51)). The candidate with an epenthetic vowel wins out because while it violates DEP-V, it preserves the input consonants without an illicit consonant cluster.

Vowel harmony has been modeled in Optimality Theory by Beckman (1997); Bakovic (2003), among others. Harmony with a stem rather than affix vowel is not unexpected and can be attributed to positional faithfulness. Because there are no examples of a stem-final two-consonant cluster being followed by a consonant-initial affix in Karuk, it is unclear whether the position for epenthesis is driven by its syllabic position (between the first two Cs of a CCC cluster), or by its position relative to morphological boundaries (between the two morphemes). I will assume it is driven by the latter, because this can be motivated by an appeal to morpheme integrity.

3.2.1 Reduplication

In Karuk, reduplication is used in verb stems primarily to indicate repetition of action, although intensification and plural object meanings are also possible. Conathan & Wood (2003) describe the semantics of Karuk reduplication as event-internal repetition, which can be used with semelfactives and activities. This contrasts with pluractional *-va*, which marks event-external repetition. Reduplication is suffixing, and it appears that reduplication can be partial or complete, depending on the stem. I follow Macaulay's (1993) account of reduplication in Karuk here, in which it is the root (or second portion) of the (synchronically frozen) bipartite verb stem that is reduplicated. This accounts for the wide variation in the shapes of the reduplicants depending on the base word: the reduplicated portion of the stem can be one or two syllables, and can even have a complex onset. For further discussion of reduplication, see §7.2.1.

Epenthesis to break up a consonant cluster

When a reduplicant is of the form -CV(CVC), no vowel epenthesis occurs, as in (52). However, when a reduplicant is of the form -CCVC, the resultant form will contain a CCC

cluster, which is phonotactically illicit in Karuk. As discussed in Macaulay (1993:75-78), an epenthetic vowel is inserted between the reduplicant and the base in these forms (53). The vowel inserted harmonizes completely with the preceding vowel (no reduplicated forms contain long vowels, so there is no question of the epenthetic vowel harmonizing with a mid vowel).

- (52) *ikpákpak*
ikpak -*pak*
 chop -RED
 ‘to chop up’ (Macaulay 1993:73)

- (53) a. *chatnakátnak*
chatnak -*tnak*
 crack.nut -RED
 ‘to crack nuts repeatedly’ (Macaulay 1993:75)

- b. *vutnusútnus*
vutnus -*tnus*
 puncture -RED
 ‘to puncture repeatedly’ (Macaulay 1993:75)

Unexpected lexically conditioned epenthesis

There is a set of roots which unexpectedly take a vowel between the base and reduplicant in their reduplicated form, even though there is no CCC cluster to break up, as in the examples in (54).

- (54) a. *?ixaxáxax*
?ixax -*xax*
 split/shred -RED
 ‘to rip up’ (Macaulay 1993:78)

- b. *ikfukúfuk*
ikfuk -*fuk*
 crawl -RED
 ‘to crawl around aimlessly’ (Macaulay 1993:75)

Macaulay (1993:78-80) offers two possible explanations for this pattern, though neither is able to explain all the anomalous cases. One explanation is phonological, in which a restriction on adjacent consonants of the same place of articulation triggers vowel epenthesis. This

seems a plausible explanation in cases such as (54a), though there are a few exceptions on both sides (i.e., consonants with the same place of articulation without a vocalic increment, and vowel insertion where consonants do not share the same place of articulation, as in (54b)). The second explanation is that these stems historically had a final vowel, which was lost in the basic form but was retained in the reduplicated form. This also seems plausible, since final vowels on Karuk verbs are often deleted (see §3.3.1 for details), so their loss in a form that rarely appears suffixed seems a likely historical change. Both Bright (1957) and Macaulay (1993) note that at least some of these words have a final vowel in the reduplicated form as well, which would lend credence to this theory. However, the few textual examples showing final vowels on reduplicated words, given in (55), are not particularly definitive.

- (55) a. *áhup kunikxaxaxáxati*
áhup kun- ikxaxaxaxa -tih
 wood 3pl(>3s)- split.wood -DUR
 *ikxax -xax
 -RED
 ‘They’re splitting wood.’ [D:ikxaxáxax (KV 'ikxax)]
- b. *pa’áama yoochusuchúsuha* (cf. *ikchusúchus* ‘to splash’ [D:ikchusúchus])
pa’áama ya- u- chusuchusu -hi
 the.salmon (?) 3s(>3)- make.splashing.noise -DENOM
 *chus -chus
 -RED
 ‘The salmon made a splashing noise.’ [MH (de Angulo & Freeland 1931:203)]

With more textual evidence showing whether stems and their reduplicated forms display a final vowel when suffixed, it would be possible to provide evidence supporting or contradicting the historical final vowel theory. If both CCVC reduplicated forms and unexplained (V)CVC reduplicated forms have final vowels, this would point to a restriction on base-reduplicant identity. That is, if a vowel is inserted after the base due to phonological constraints, a vowel is also inserted after the reduplicant, so that the two parts are identical in phonological form. However, if only the unexplained (V)CVC reduplicated forms have final vowels, this would provide evidence for the lost final vowel explanation: the reduplicated base is actually of the form CVCV in these cases. Currently, the type of data that would shed light on this puzzle is extremely limited, so this remains an open question.

3.2.2 Suffixation

Epenthesis to break up a consonant cluster

A small set of suffixes in Karuk, listed exhaustively in (56), begin with a consonant cluster. Following a vowel-final stem, no vowel epenthesis occurs, and the suffix syllabifies with the

stem. Following a consonant-final stem, a vowel that matches the preceding vowel in the word in height and backness² is inserted between the stem and the suffix.

- (56) a. *-vraa* ‘over’
 b. *-vrath* ‘over, into a sweathouse’
 c. *-vrik* ‘in response to motion’
 d. *-vrin* ‘in opposite directions’
 e. *-vruk* ‘down over’

Bright (1957:44) analyzes these suffixes as having allomorphs with a harmonic initial vowel that are used following consonant-final stems. However, I prefer to analyze these suffixes as having a single allomorph, and the harmonic vowel as a result of a general phonological process in the language that takes place whenever an illicit CCC sequence arises. The fact that the harmonic vowel takes on the quality of the preceding vowel, when the other vowel/consonant alternations at suffix boundaries do not involve vowel harmony, provides further evidence that the harmonic vowels seen with these suffixes are truly epenthetic vowels which are completely unspecified for place, while the stem-final and suffix-initial vowels discussed elsewhere are underlying.

Unexpected lexically conditioned epenthesis

One additional suffix, *-thuna* ‘around, here and there’, also triggers insertion of a harmonic vowel following a consonant-final stem, despite its apparent lack of an initial consonant cluster. Bright (1957) includes this suffix with those listed in (56) as having an allomorph with an underspecified vowel. Under my analysis, *-thuna* must be associated with a morpheme-specific cophonology that triggers vowel epenthesis. I can only speculate as to why *-thuna* might pattern with the other suffixes that trigger vowel epenthesis. It is the only *th*-initial suffix found in Karuk, but there are quite a number of *s*- and *f*-initial suffixes which do not receive a harmonic vowel, so there is no reason to think that a fricative would trigger this process. Generally in the language *th* can be found following other consonants, but it is never found following *s* or *sh*, and, interestingly, *v*. I suggest therefore that this suffix historically had an initial *vth* sequence, triggering the harmonic vowel epenthesis, and that due to a sound change in the language *v* was lost preceding *th*, but the harmonic epenthetic vowel was retained in this morpheme.

3.2.3 Summary

Karuk employs epenthesis to avoid clusters of three consonants in the two contexts in which they can occur. Epenthetic vowels are harmonic with the preceding vowel in the word. Vowel epenthesis has been shown to work in this fashion in both clusters arising in reduplication

²A long mid vowel in the preceding stem triggers a high vowel in the suffix (Bright 1957:44).

and a small set of derivational suffixes. Epenthesis to break up a consonant cluster is modeled using the constraint ranking given in (57).

(57) *CCC, MAX-C \gg DEP-V

Epenthesis also arises in a few unexpected reduplicated words and with one unexpected suffix, for which possible historical explanations have been proposed.

3.3 Word-final vowels

In many stems in Karuk, a short vowel is deleted when word-final, and only surfaces under suffixation. In other stems, short vowels are retained in word-final position. Retained vowels that are underlyingly high surface as low vowels in word-final position. These final vowel deletion and mutation processes are general ones which occur in both nouns and verbs, and in both derived and underived stems in Karuk.³ Bright (1957:40-43) describes these phenomena in terms of morphophonemic segmental alternations that take place theme-finally, and which vary somewhat by part of speech. In this section, I present an Optimality Theoretic (Prince & Smolensky 1993/2004; McCarthy & Prince 1995a, 1999) analysis which provides a unified explanation of these vowel deletion and mutation phenomena based on the avoidance of light final syllables and illicit syllable structures, in combination with a proposed strength scale of vowels.

3.3.1 Deletion of final vowels

A short vowel at the end of a word in Karuk is deleted when the preceding consonant can be syllabified as the coda of a preceding syllable, as shown in (58a) and (59a). For comparison, the same stems are shown with suffixes in the second part of the examples, in which the underlying stem-final vowels surface.

(58) a. *amkír_*
amkíra
 table
 ‘a table’

[JS WB_KL-92:81]

³Vowel-final adverbs and adjectives are excepted from final vowel deletion and mutation. A few lexical exceptions in nouns exist, in which a final *a* never deletes (represented by Bright (1957) as the morphophoneme *A*). I propose that these exceptional forms have a final ghost /h/. A final ghost consonant would explain the exceptionality of these words in avoiding final vowel deletion. Further evidence for the underlying presence of a final /h/ is that (1) it surfaces before *a*-initial suffixes (which Bright (1957:43) interprets as a suffixal allomorph), and (2) some speakers have a variant of some of these words with an overt [h] (Bright 1957:43, fn. 7). Verbs derived by the denominal suffix /-hi/ retain a final vowel regardless of syllabification. Bright (1957:41) describes this exception in segmental terms, but I interpret it as a morphological exception. Note that the negative verbal suffix *-ara* (§8.3.1) is also exempt from final vowel deletion.

- b. *amkirasúruk*
amkíra -suruk
 table -under
 ‘under a table’ [JS WB_KL-92:43]
- (59) a. *kun’áchakrupu*
kun- ’áchakrupu
 3pl(>3s)- float.in.bunch.downriverward
 ‘they floated downriver in a bunch’ [NR WB_KL-57:34]
- b. *kun’áchakruputih*
kun- ’áchakrupu -tih
 3pl(>3s)- float.in.bunch.downriverward -DUR
 ‘they were floating in a bunch downriver’ [NR WB_KL-57:44]

This deletion can be modeled straightforwardly as a tension between faithfulness to input segments and markedness of word-final vowels, using the constraints presented in (60) and (61).

- (60) MAX-V
 Assign one violation mark for every vowel segment in the input that is not expressed in the output.
- (61) *V#
 Assign one violation mark for every phonological word that ends in a short vowel. (McCarthy 2008)

The markedness constraint *V# must make specific reference to vowel length, because long vowels are never deleted word-finally in Karuk. As will be shown below, it will become necessary to refine this constraint to make reference to vowel height as well, but for the moment, the constraint at play can be thought of as a ban on word-final short vowels.

Tableau (62) compares unfaithful winning candidate [amkír] to the faithful losing candidate [amkíra]. The faithful candidate obeys MAX-V but violates the markedness constraint *V#. For the winning candidate to be more harmonic, *V# must dominate MAX-V. This shows that it is better to delete a final short *a*, as in the winning candidate, than to retain it.

- (62) *V# \gg MAX-V


/amkíra/	DEP	*V#	MAX-V
a.  amkír			*
b. amkíra		*!	

Tableau (63) compares the winning candidate [amkír] with two losing candidates of a different sort. The forms [amkíra'] and [amkíraa] satisfy *V# by epenthesis, rather than deletion, making the final syllable heavy. Epenthesis violates DEP (50). As an added final consonant or vocalic mora do not result in a more harmonic candidate than [amkír], DEP must dominate MAX-V.

(63) *DEP \gg MAX-V

/amkíra/	DEP	*V#	MAX-V
a. [☞] amkír			*
b. amkíra'	*!		
c. amkíraa	*!		

3.3.2 Retention of final vowels

If deleting a final short vowel would create an illicit CC consonant cluster in the coda of the preceding syllable, final vowel deletion does not take place, as shown in (64).

- (64) a. *pa'ávansa*
pa= 'ávansa
 DET= man
 'the man' [VS VS-09:2]
- b. *kun'iruvátakra*
kun- 'iruvátakra
 3pl(>3s)- (pl.)enter
 'they entered (it)' [PM (Harrington 1932b:264)]

The markedness of complex codas is captured by the constraint in (65).

- (65) *COMPLEX-CODA (*CC-CODA)
 Assign one violation mark for every tautosyllabic consonant cluster in coda position.

Tableau (66) shows that the faithful candidate [ávansa] wins out over the unfaithful candidate [ávans], the opposite outcome from that seen in Tableau (62). The candidate [ávans] violates the markedness constraint *COMPLEX-CODA, which is ranked more highly than *V#. In fact, this outcome is never observed in Karuk, so *COMPLEX-CODA must be undominated.⁴

⁴A candidate with the same segments as [ávans] but syllabified in such a way that the final consonant is unsyllabified or forms its own syllable is not presented here, but would fare no better than a candidate with a complex coda. I assume constraints regulating syllabification, such as *C^{unsyll}, are undominated in Karuk.

(66) *COMPLEX-CODA \gg *V#

/ávansa/	*CC-CODA	DEP	*V#	MAX-V
a. ávans	*!			*
b. $\text{[á]va} \text{[n]sa}$			*	

Tableau (67) presents two candidates that satisfy *V# by epenthesis. These candidates still lose to the faithful candidate [ávansa] which violates MAX-V. This shows that DEP dominates *V#.

(67) DEP \gg *V#

/ávansa/	*CC-CODA	DEP	*V#	MAX-V
a. $\text{[á]va} \text{[n]sa}$			*	
b. ávansa'		*!		
c. ávansaa		*!		

Finally, in tableau (68), the candidate [ávan] loses to the faithful candidate [ávansa]. While this candidate satisfies *COMPLEX-CODA, it violates the highly ranked markedness constraint MAX-C (48).

(68) MAX-C \gg *V#

/ávansa/	MAX-C	*CC-CODA	DEP	*V#	MAX-V
a. ávan	*!				*
b. ávans		*!			*
c. $\text{[á]va} \text{[n]sa}$				*	

3.3.3 Mutation of final vowels

In the case that a retained final vowel is underlyingly high, it surfaces as a low vowel, as shown in (69a) and (70a) (as above, the second part of the examples give suffixed forms in which the underlying vowel is retained).⁵

(69) a. *kunípvitma*

kun- ip- vitmu
 3pl(>3s)- ITER- paddle.to

'they paddled back'

[NR WB_KL-57:97]

⁵The contrast between the glottal stop and retention of long vowel in (70a) and the deletion of the vowel in (70b) is due to a vowel-shortening process triggered by the pluractional suffix *-va*. The subsequent different vowel hiatus resolution strategies for stem-initial short and long high vowels are detailed in §3.4.4.

b. *úpviitmutih*

u- ip- viitu -tih
3s(>3)- ITER- paddle.to -DUR

‘he was paddling back’

[NR WB_KL-57:107]

(70) a. *u’íithra*

u- iithri
3s(>3)- (container/liquid).sit/lie

‘he is sitting’

[MO WB_KL-19:24]

b. *uthrítakoo*

u- iithri -taku -va
3s(>3) (container/liquid).sit/lie -on.top.of -PLURACT

‘it (container) sat’

[LB WB_KL-18:13]

While any word-final light syllable is dispreferred in Karuk, a word-final light syllable containing a high vowel is even worse than one containing a low vowel. The shift in vowel quality seen in these examples avoids this worst type of final syllable.

A broad generalization can be made about the variable markedness of vowels in final position can be made: the stronger a vowel is, the less marked it is in final position. Scales of vowel strength based on vowel height and vowel length are given in (71). Scales have been employed in Optimality Theory to capture gradient distinctions such as the one seen here, e.g. Mortensen (2006); de Lacy (2004); Gouskova (2004); Flemming (2004).

(71) a. Height scale:
LOW > HIGH

b. Length scale:
V: > V

These scales are phonetically grounded in that within the sonority hierarchy, low vowels have high intrinsic sonority and high vowels have low intrinsic sonority (Lehiste 1970; Prince & Smolensky 1993/2004; Kenstowicz 1996; Morén 2001). A plausible basis for vowels with higher sonority being less prone to deletion is that they are perceptually more salient than vowels with lower sonority. Similarly, phonologically long vowels are categorically less prone to deletion than phonologically short vowels, because their greater weight and duration makes them perceptually more salient.

The scales are combined into a single harmony scale in (72).⁶

⁶In featural terms, for Karuk, /i, ii, u, uu/ are [+high, -low], /ee, oo/ are [-high, -low], and /a, aa/ is [-high, +low]. Short mid vowels are not present in native Karuk words, so are not included here.

- (72) Combined vowel strength scale:
 $V: \succ V(\text{low}) \succ V(+\text{high})$

In order to capture the variable markedness of vowels in final position, the constraint $*V\#$ introduced above as (61) must be further refined. The general constraint against final vowels (e.g., McCarthy (2008) and references therein) is subdivided into a family of constraints, given in (73). These constraints form a dominance hierarchy based on the scale in (72).

- (73) $*V\#$ family of constraints:
 $*V(+\text{high})\# \gg *V(\text{low})\# \gg *V:\#$

Word-final long vowels are not avoided in Karuk, so the constraint against final long vowels, $*V:\#$, is ranked low enough to be inactive. The specific constraint $*V(\text{low})\#$, detailed in (74), replaces the general constraint $*V\#$ in the rankings established above. $*V(+\text{high})\#$, detailed in (75), must be ranked above it, based on the dominance hierarchy in (73). The interaction of these constraints with faithfulness constraints and the markedness constraint $*\text{COMPLEX-CODA}$ determine the surface forms seen in Karuk.

- (74) $*V(\text{low})\#$ ($*V(\text{lo})\#$)
 Assign one violation mark for every phonological word that ends in a short low vowel.
- (75) $*V(+\text{high})\#$ ($*V(+\text{hi})\#$)
 Assign one violation mark for every phonological word that ends in a short high vowel.

Tableau (77) shows that, as above, a candidate which violates $*\text{COMPLEX-CODA}$, [kunípviitm] loses to a candidate with a final short vowel. MAX-C and DEP are not shown in this tableau because they do not favor any or the winners or losers presented here.

To explain why the faithful candidate [kunípviitmu] loses to the unfaithful winning candidate [kunípviitma], the relative ranking of $*V(\text{low})\#$ and $*V(+\text{high})\#$ becomes important. In addition, as a change in vowel quality does not violate MAX or DEP , but identity, an IDENT constraint referring to vowel height is introduced in (76).

- (76) $\text{IDENT}(\text{high})$ ($\text{ID}(\text{hi})$)
 Assign one violation mark for every vowel in the output which does not match in height to the corresponding vowel in the input.

For [kunípviitma] to win out over the faithful candidate [kunípviitmu], the markedness constraint $*V(+\text{high})\#$ must be ranked higher than both $*V(\text{low})\#$ and the faithfulness constraint $\text{IDENT}(\text{high})$. Because [kunípviitm] loses, $*V(+\text{high})\#$ cannot dominate $*\text{COMPLEX-CODA}$.

(77) *V(+high)# \gg IDENT(high), *V(low)#

/kunípviitmu/	*CC-CODA	*V(+hi)#	ID(hi)	*V(lo)#	MAX-V
a. kunípviitm	*!				*
b. kunípviitmu		*!			
c. ☞ kunípviitma			*	*	

Tableau (78) shows that vowel deletion as described in §3.3.1 is still predicted with the elaborated constraint ranking established here. When no coda consonant cluster is created with the deletion of a final high vowel, the candidate with final vowel deletion, [kun'áchakrup], wins over both the faithful candidate and a candidate with a final low vowel.

(78) /kun'áchakrupu/	*CC-CODA	*V(+hi)#	ID(hi)	*V(lo)#	MAX-V
a. ☞ kun'áchakrup					*
b. kun'áchakrupu		*!			
c. kun'áchakrupa			*!	*	

3.3.4 Summary

In this section, I have shown that final vowel deletion, retention, and mutation in Karuk can be explained using a set of basic faithfulness and markedness constraints and a vowel strength scale. Vowel deletion depends on a tension between markedness of vowels in word-final position and markedness of consonant clusters in codas. The change in vowel height in some retained final vowels in Karuk depends upon the relative markedness of vowels in final position, which is modeled with a harmony scale of vowel strength based in the sonority hierarchy. Following this scale, low vowels have greater strength, and are therefore less marked in word-final position than high vowels. The complete constraint ranking is given in (79).

(79) MAX-C, *COMPLEX-CODA, DEP, *V(+high)#
 \gg
 IDENT(high), *V(low)# \gg MAX-V

3.4 Vowel hiatus resolution

Vowel hiatus is disallowed in Karuk, categorically at the lexical level, albeit with some gradience at higher levels of the grammar. Sequences of two different vowels are not found in any lexemes. When two vowels come together through morphological processes, hiatus is resolved by either elision of one of the two vowels, or coalescence of the two into a single long vowel. When neither coalescence nor elision is possible, a glottal stop separates two vowels in

sequence. Which repair is used is predictable by the type of morphological process and the syllable structures and vowel qualities involved. In cliticization and across word boundaries in limited contexts,⁷ coalescence is categorical for certain combinations, and variable by speaker and speech rate for others. The presence of the glottal stop in these contexts is, again, gradient by speaker and speech rate. In this section, I focus only on lexical processes; for more information on vowel hiatus across word boundaries (e.g., those referred to in §2.4.3, and others), see Bright (1957:34,53,121-122).

Similar to the phonological processes affecting word-final vowels described in §3.3, the resolution of vowel hiatus is influenced by vowel height. However, it is clear that the processes involved in vowel hiatus resolution are distinct from those affecting word-final vowels, because the fate of a morpheme-final vowel with another morpheme following it in the same word follows a different pattern from that of a word-final vowel.

In this section, I show that subsequent to intervocalic glide deletion within derived words, vowel hiatus is resolved by coalescence; in suffixation, vowel hiatus is resolved by elision; in prefixing and compounding, both elision and coalescence are seen, with an asymmetry based on prefix vowel height. These processes are common ways for a language to resolve vowel hiatus, but Karuk is typologically unusual in that affix faithfulness outranks root faithfulness in this context.

3.4.1 Vowel hiatus principles

Casali (1997:497–499) describes the six ways a language can deal with a vowel-vowel sequence, and discusses the principles which stand in opposition to each of these outcomes. The possible outcomes are: heterosyllabification, diphthong formation, glide formation, epenthesis, vowel elision, and coalescence. The first three do not occur in Karuk, indicating that the constraints ONSET (Prince & Smolensky 1993/2004), NODIPH (Rosenthal 1994; Casali 1994), and *CG (Casali 1994) are ranked so highly in Karuk as not to permit these outcomes. To simplify the tableaux in the following sections describing vowel hiatus resolution, candidates that violate these principles will not be considered.

Vowel elision, vowel coalescence, and glottal stop epenthesis all take place in Karuk. Vowel elision is opposed by MAX (McCarthy & Prince 1995a), and coalescence violates both UNIFORMITY and IDENT (McCarthy & Prince 1995a). Following Casali (1996), I treat elision and coalescence not as two independent phenomena, but rather as a unified set of processes, with the choice between them being predictable and controlled by the interleaving of feature- and/or position-sensitive IDENT constraints.⁸ Epenthesis is opposed by DEP (McCarthy & Prince 1995a). Glottal stop epenthesis occurs in limited contexts in Karuk, when vowel elision and coalescence are not possible due to highly ranked context-specific constraints. The conditions under which each of the outcomes in Karuk occur and the critical rankings of the constraints violated by each are explored in the following sections.

Casali (1996) defines coalescence as a vowel in the output that is distinct from but that

⁷i.e., the adverbial proform *vaa* can combine with a vowel-initial verb.

⁸Casali (1996) employs feature-sensitive and position-sensitive PARSE constraints; the principles are exactly the same.

shares features of each of two different input vowels, while he considers a vowel in the output that matches one of the input vowels featurally a case of elision, regardless of the length of the resulting vowel. Casali (1996) does not address vowel length at all, only segment quality. In Karuk, as I will show, both quality and quantity of the output vowel vary depending on the features and position of the input vowels. Therefore, it is necessary to incorporate quantity into a full analysis of vowel coalescence and elision. Given the facts of Karuk, it makes more sense to group all bimoraic outputs under the term coalescence (including a case in which both input vowels and the output vowel are featurally identical), and to reserve the term elision for the cases where a mora is deleted in the output.

3.4.2 Glide deletion

Glides in Karuk (*v* and *y*)⁹ are normally deleted when between short vowels in derived environments, as can be seen in the examples in (80). Stem-final glides are deleted when a vowel-initial morpheme follows them; some glide-initial suffixes lose the glide when attaching to a vowel-final stem, while some do not (see §2.3.5). In addition to triggering glide deletion on a glide-final stem, the suffix *-avish* PROSPECTIVE undergoes morpheme-internal glide deletion when its initial vowel is *not* incorporated into the stem it attaches to, as in the examples in (81). Whenever vowel hiatus results from intervocalic glide deletion, it is resolved through vowel coalescence, the output of which is a long vowel that shares features of the two input vowels.

- (80) a. *ipít íp ûkam pa'ákviish ukréèt.*
 ipít íp ûkam pa= ákviish u- ikriy -at
 yesterday PAST outdoors DET= wildcat 3s(>3)- sit/stay -PAST
 ‘There was a bobcat outside yesterday.’ [VS VS-10:6]
- b. *kári xás áàpun tóóyvéèsh paxuun.*
 kári xás áàpun ta= u- iyvay -ish pa= xuun
 and then on.the.ground PERF= 3s(>3)- pour -down DET= acorn.soup
 ‘Then she poured the acorn soup down on the ground.’ [MO WB_KL-33:16]
- c. *uthaantákoo pa'amkírak*
 u- tháántaku -va pa'amkírak
 3s(>3)- lay.things.on -PLURACT on.the.table
 ‘It’s sitting on the table.’ [VS VS-33:3]

⁹Alternating *v*, which counts phonologically as a full consonant rather than a glide, is exempt from this process.

(81) a. *miník nitháàvish*

miník ni- thav -avish
 of.course 1s(>3)- knock.down.acorns -PROSP

‘I’ll knock the acorns down.’

[MO WB_KL-17:31]

b. *chí nitákireesh*

chí ni- tákiri -avish
 soon 1s(>3)- leach(acorn.meal) -PROSP

‘I’m gonna leach those (acorns).’

[LA LA-02:17]

Since vowel coalescence occurs consistently in glide deletion contexts, this is straightforward to model. The tableau in (84) compares two candidates for which the adjacent vowels in the input are identical in quality. The candidate [nitháàvish], which retains both input vowel moras, wins over the candidate [nithávish], which elides one of them. To retain both vowel moras, MAX, given in (82), must outrank UNIFORMITY, the constraint opposing coalescence of independent segments in the input into a single segment in the output, given in (83).

(82) MAX

Assign one violation mark for every segment in the input that is not expressed in the output. This version of MAX is specific to quantity and is thus violated by the deletion of a vowel mora, but not by the merging of two single vowels into one long vowel (which is opposed by UNIFORMITY), or by a change in quality (which is opposed by IDENT).

(83) UNIFORMITY

Assign one violation mark for each segment in the input which does not correspond to a distinct segment in the output. (McCarthy & Prince 1995a)

(84) MAX \gg UNIFORMITY

/ni-thav-avish/	MAX	UNIFORMITY
a. ☞ nitháàvish		*
b. nithávish	*!	

Tableau (87) compares candidates for an input in which the quality of the adjacent vowels differs. The combination of a low vowel with a high front vowel results in a long front mid vowel. The candidates with vowel elision, [úkrit] and [úkrat], lose because they violate MAX. Since all the remaining candidates violate UNIFORMITY, the IDENT constraints listed in (85)-(86) must be active in determining the winning candidate. The constraints IDENT(front) and IDENT(-high) ensure that the candidate with a coalesced vowel that shares features of

both the input vowels, [úkreet], will win over those that only retain features of one of the input vowels, [úkriit] and [úkraat].¹⁰


(85) IDENT(front) (ID(front))

Assign one violation mark for every vowel in the output which is not faithful in frontness to the corresponding vowel in the input.

(86) IDENT(-high) (ID(-hi))

Assign one violation mark for every [-high] vowel in the input which does not correspond to a [-high] vowel in the output.

(87) MAX, IDENT(front), IDENT(-high) \gg UNIFORMITY

/u-ikriv-at/	MAX	ID(front)	ID(-hi)	UNIFORMITY
a.  ukrêet				*
b. ukrît			*!	*
c. ukrâat		*!		*
d. úkrit	*!		*	
e. úkrat	*!	*		

As seen in (80c), the combination of a low vowel with a high back vowel results in a long back mid vowel, which will also result from the same constraint ranking shown in (87).

There is only a single example of two different high vowels coming together as a result of glide deletion. In this instance, the back quality of the suffixal vowel surfaces.¹¹ It is not possible to determine whether vowel quality or position controls the result of this particular type of vowel coalescence, without additional examples displaying the reverse situation.

Summary

Vowel hiatus resulting from glide deletion is resolved through coalescence of the adjacent vowels into a single long vowel. In the case of vowels which differ in height coming together, the resultant long vowel is of mid height and matches the high vowel in backness. The constraint ranking shown in (88) correctly derives these outcomes, so must be active in glide deletion. There is no evidence for asymmetric influence of morphological position (i.e., root or affix), vowel quality, or vowel weight in the outcome.

(88) MAX, IDENT(front), IDENT(-high) \gg UNIFORMITY

¹⁰In featural terms, for Karuk, /i, ii, ee/ are [+front], /u, uu, oo/ are [-front] and /a/ is [∅front]. Short mid vowels are not found in native Karuk words, so constraints against short [e] and [o] are highly ranked and candidates with these vowels are not included here, while their long counterparts are.

¹¹*ihyiv -unish* → *ihyúunish* ‘to shout to’ (Bright 1957:35)

3.4.3 Suffixation

When a stem-final and a suffix-initial vowel come together, the resulting vowel hiatus is resolved through elision. It is consistently the stem vowel that is elided, rather than the suffixal vowel, with the exception of long vowels. If the stem-final vowel is long, the long vowel is preserved and the suffixal vowel is elided. To model this pattern of elision, position-sensitive constraints are required. A need for position-sensitive constraints to distinguish between faithfulness to root vs. affix features in some languages is well established (Steriade 1994; Beckman 1997, 2004; Zoll 2004). But for affix faithfulness to outrank root faithfulness, as it must in Karuk suffixation, is unexpected and contrary to proposed universals of root faithfulness outranking affix faithfulness (both in vowel hiatus contexts and more generally, e.g., ROOTFAITH \gg AFFIXFAITH [McCarthy & Prince 1995a]; MAXLEX \gg MAX [Casali 1997]).

Recall that stem-final vowels are also often deleted on the surface when word-final (§3.3.1). The vowel hiatus resolution and final vowel deletion processes are separate processes, because word-final vowel deletion is sensitive to syllable structure, while stem-final vowel deletion takes place under suffixation whenever vowel hiatus occurs, regardless of syllable structure. Therefore, we must consider stem-final vowels to be present underlyingly, and when suffixation takes place they are only elided where vowel hiatus is found. When a word-final vowel is present underlyingly at the end of derivation, a separate phonological process determines whether it may be deleted based on licit syllable structure.

Verbs

When a verb stem ends in a short vowel and a suffix attaching to it begins in a vowel, the stem vowel is always elided.¹² For example, in (89a), the root-final *u* is elided when the vowel-initial suffix *-at* is attached. The second part of each example given here shows the underlying stem-final vowel surfacing when followed by a consonant-initial suffix, for comparison.

- (89) a. *u'úúmat* u + a
 u- *uumu* *-at*
 3s(>3)- arrive -PAST
 ‘he went there’ [ED WB_KL-88:1]
- b. *u'uumútih*
 u- *uumu* *-tih*
 3s(>3)- arrive -DUR
 ‘he went to it’ [NR WB_KL-11:17]

¹²This was originally observed by Bright (1957:41), although his description of the phenomenon differs significantly from the way I state it here, since he analyzes this process in conjunction with the word-final vowel deletion process, while I consider these separate processes.

Another example of stem vowel elision is given in (90). This example demonstrates that stem-final vowel elision in vowel hiatus resolution is independent from word-final vowel deletion. While the root-final vowel in the verb *uumu* seen in (89) would also be elided word-finally, the root-final vowel in the verb *imkáánnvu* in (90) would be retained word-finally because it is preceded by a consonant cluster. Nonetheless, as seen in (90a), this vowel is elided to resolve vowel hiatus when a vowel-initial suffix follows it.

- (90) a. *tóómkaanvar* u + a
ta= u- imkáánnvu -ar
 PERF= 3s(>3)- gather -go.to
 ‘she went to gather (food from plants)’ [NR WB_KL-40:16]
- b. *úmkaanvutih*
u- imkáánnvu -tih
 3s(>3)- gather -DUR
 ‘she was gathering (food from plants)’ [NR WB_KL-40:22]

This pattern holds in derived stems as well as in roots. Examples (91a) and (92a) show stems in which a suffix-final vowel is elided when a vowel-initial suffix is attached outside of it. Again, the stem-final vowel in (91) would be elided word-finally while the stem-final vowel in (92) would be retained word-finally, but when a vowel-initial suffix follows, both are elided.

- (91) a. *ni’árihroovish* u + i
ni- árih -roovu -ish
 1s(>3)- jump -upriverward -down/result
 ‘I’ll go upriver’ [JS WB_KL-91:5]
- b. *u’árihroovutih*
u- árih -roovu -tih
 3s(>3)- jump -upriverward -DUR
 ‘he was going upriver’ [CP WB_KL-14:1]
- (92) a. *kun’ípasmanik* u + a
kun- ípas -mu -anik
 3pl>(3s)- bring.person -to -ANC
 ‘they brought her there’ [MO WB_KL-33:85]
- b. *úpvitmutih*
u- ip- vit -mu -tih
 3s(>3)- ITER- paddle -to -DUR

‘he was paddling back’

[NR WB_KL-57:107]

Low vowels have a special status in word-final vowel effects (§3.3.3) and in prefixation (§3.4.4), but not in suffixation. The example in (93a) shows that the same pattern of suffix vowel preservation holds when the stem-final vowel is a low vowel.

(93) a. *kunihmárish* a + i

kun- *ihmara* *-ishrih*
3pl>(3s)- run(pl.) -down/result

‘they stopped running’

[JS WB_KL-06:65]

b. *kunihmárarup*

kun- *ihmara* *-rupu*
3pl>(3s)- run(pl.) -downriverward

‘they ran downriver’

[JS WB_KL-06:70]

Examples (94a)–(95a) show that when a low stem-final vowel and a low suffix-initial vowel come together, elision still takes place without any coalescence or compensatory lengthening. When the stem vowel and suffix vowel are identical in quality, it is hard to say with certainty which is elided, but it is safe to assume it is the stem vowel in the absence of any evidence to the contrary, based on the pattern established for vowels of differing quality above.

(94) a. *uthivrúhuthunanik* a + a

u- *thivrúhuthuna* *-anik*
3s(>3)- float.around -ANC

‘they floated around’

[MO WB_KL-56:8]

b. *uthivrúhuthunatih*

u- *thivrúhuthuna* *-tih*
3s(>3)- float.around -DUR

‘it is floating around’

[CP WB_KL-03:102]

(95) a. *kunsíitvat* a + a

kun- *síitva* *-at*
3pl>(3s)- steal -PAST

‘they stole him’

[LB WB_KL-61:21]

b. *kunsíitvanaatih*


kun- *síitva* *-naa* *-tih*
3pl>(3s)- steal -PL -DUR

‘they stole (them)’

[D:*sítva* (KS38. Mice story 012)]

MAX must be violated for elision to take place. Tableau (96) shows a simple case where two vowels of identical quality come together, and compares the unfaithful winning candidate [kunsítvat] to the faithful losing candidate [kunsítvaat]. The faithful candidate obeys MAX but violates UNIFORMITY. Thus UNIFORMITY dominates MAX and prevents coalescence at the expense of the deletion of one of the two vowels.

(96) UNIFORMITY \gg MAX


/kun-siitva-at/	UNIFORMITY	MAX
a. kunsítvaat	*!	
b.  kunsítvat		*

The vowel that is retained on the surface is determined by the relative ranking of the specific MAX-SUFFIX, listed in (97), and the more general MAX (or a root-specific MAX constraint). The candidates with vowel coalescence and surface long vowels fail because they violate UNIFORMITY. Of the two candidates that do not violate UNIFORMITY, the candidate that retains the suffix vowel [u’úúmat] wins over the candidate that retains the root vowel [u’úúmut]. Therefore, MAX-SUFFIX must dominate MAX.

(97) MAX-SUFFIX (MAX-SFX)

Assign one violation mark for every suffix vowel segment in the input that is not expressed in the output.

(98) UNIFORMITY, MAX-SUFFIX \gg MAX

/u-’uumu-at/	UNIFORMITY	MAX-SFX	MAX
a. u’úúmut		*!	
b. u’úúmuut	*!	*!	
c.  u’úúmat			*
d. u’úúmaat	*!		*
e. u’úúmoot	*!	*!	*

Nouns

In his description, Bright (1957:40-42) implies that stem-final vowels followed by vowel-initial suffixes in nouns are treated differently than they are in verbs. Rather than elision of the stem vowel across-the-board, as happens in verb stems, he indicates that elision of stem-final vowels follows the pattern for word-final vowels (see §3.3). That is to say, a root-final short vowel would be elided following a single consonant, but retained following a consonant cluster. However, no evidence is provided to support such a distinction.

The examples given in (99) are the only ones found that display the combination of syllable shapes in question.

- (99) a. *piithvávan*
piithva -avan
 four -animate
 ‘four (animate)’ (Bright 1957:75)
- b. *ávansas*
ávansa -as
 man -PL
 ‘men’ [ED WB_KL-85:20]

The paucity of relevant examples is not surprising, since suffixation is much less common in nouns than in verbs, and exceedingly few nouns end in -CCV. While inconclusive, these examples are compatible with the elision pattern seen in verbs, and do not provide evidence for a vowel mora from both the stem and the suffix being retained on the surface. In the absence of any evidence to the contrary, I assume that vowel hiatus resolution in noun suffixation can be explained by the same constraint ranking as that in verbs.

Stem-final long vowels

Long vowels are never elided, including before a vowel-initial suffix. This is true in both verbs and nouns. Examples of non-high long vowels combining with *a*-initial suffixes all appear to result in elision of the suffix-initial vowel (100) (c.f. Bright 1957:43).

- (100) a. *ukimfíruraanik*
u- *kimfírura* -anik
 3s(>3)- burn.off.hair -ANC
 ‘he burnt it off’ [Y JPH_KT-01b:4]
- b. *nipthivkéévish*
ni- *p-* *thivke* -avish
 1s(>3)- ITER- go.along -PROSP
 ‘I’ll go along’ [NR WB_KL-02:35]
- c. *kun’áhoot*
kun- *’áhoo* -at
 3pl(>3s)- go -PAST
 ‘they went’ [ED WB_KL-88:60]

- d. *koos*
koo -asa
 such -PL
 ‘such ones’ (Bright 1957:81)

It is true that if coalescence occurred, the same outcomes might be expected as those seen here. Combinations of high and low vowels in this context might shed some light on whether elision or coalescence is the best analysis. Unfortunately, there are no examples of high long vowels followed by any vowel-initial suffixes. The only potential examples of long stem vowels followed by suffixes beginning with a high vowel come from the optative. The elsewhere allomorph of the optative suffix is *-i*. According to Bright (1957:66), the optative has a zero-allomorph following long vowels.¹³ Instead of analyzing this allomorph as underlyingly zero, I posit the entire monosegmental suffix is elided following a long vowel, as shown in (101). This is consistent with the other vowel hiatus outcomes seen involving long vowels.

- (101) a. *'áhoo*
'áhoo -i
 go -OPT
 ‘walk!’ (Bright 1957:66)
- b. *naa*
naa -i
 come -OPT
 ‘come!’ (Bright 1957:66)

The optative suffix provides the strongest evidence for elision of the suffix vowel rather than coalescence, because as (101b) shows, no raising occurs when a low long vowel and a high suffix vowel come together.¹⁴

Tableau (103) compares possible outputs for a long stem vowel followed by a suffix vowel. A highly ranked MAX-LONG constraint (293b) ensures that long vowels in the output match long vowels in the input. The candidate [ni], which is faithful to the suffixal vowel and not the stem vowel, fails because it violates MAX-LONG. The candidate [naa], which is faithful to the stem vowel and not the suffix vowel wins, so MAX-LONG must outrank MAX-SUFFIX. The candidate in which the two vowels are coalesced, [nee], also fails.

- (102) MAX-LONG
 Assign one violation mark for every long vowel in the input that is not expressed in the output.

¹³The other allomorph of the optative is nasalization of certain consonants, with no overt suffix.

¹⁴No examples of a long stem vowel combining with a long suffixal vowel have been found, so it is unknown what strategy would be applied in this situation.

(103) MAX-LONG \gg UNIFORMITY, MAX-SUFFIX \gg MAX

/naa-i/	MAX-LONG	UNIFORMITY	MAX-SFX	MAX
a. ni	*!			*
b. ni naa			*	*
c. nee	*!	*		

Summary

Vowel hiatus created by suffixation is resolved through elision of the stem vowel, unless the stem vowel is long, in which case the suffix vowel is elided. The vowel that surfaces is determined by position-specific constraints in which affix faithfulness outranks root faithfulness, and a weight-sensitive MAX constraint which allows for elision of long vowels to be penalized more than the elision of short vowels. The constraint ranking shown in (104) is active in suffixation.

(104) MAX-LONG \gg UNIFORMITY, MAX-SUFFIX \gg MAX

3.4.4 Prefixation and compounding

Vowel hiatus resolution in prefixation and compounding follows a more complex pattern than the patterns seen in glide deletion or suffixation, but it is still predictable. When V1 is a low vowel, the two vowels coalesce to form a single long vowel, as shown in the examples in (105). When V1 is a high vowel, V2 is elided, as shown in the examples in (106). However, a long vowel cannot be elided, so when V2 is long, a glottal stop is epenthesized between the two vowels instead, as in (107).

- (105) a. *akunváápxaan* a + a \rightarrow aa
 á*kunva* á*pxaan*
 hunting cap
 ‘man’s work cap’ [D:*akunváápxaan*]
- b. *néémchak* a + i \rightarrow ee
 n*a-* i*mchak*
 2s/3s > 1s- get.burned
 ‘I burned myself’ [VS VS-11:44]
- c. *asóóhraam* a + u \rightarrow oo
 a*sa* u*hraam*
 stone pipe

- ‘stone pipe’ [D:asóohraam]
- (106) a. *nímnish* i + i → i
ní- *ímnish*
 1s(>3)- cook
 ‘I cook’ [VSu VSu-01:15]
- b. *nanípsihh* i + a → i
naní- *ápsihh*
 1sPOSS- leg
 ‘my leg’ [JS WB_KL-32:79]
- c. *múspuk* u + i → u
mu- *ishpuk*
 3sPOSS- money
 ‘his money’ [JS WB_KL-04:24]
- d. *úxyar* u + a → u
u- *axyar*
 3s(>3)- fill.container
 ‘it overflows (it)’ [MH (de Angulo & Freeland 1931:204)]
- (107) *u’íithra* V + VV → V’VV
u- *íithri*
 3s(>3)- (container/liquid).sit/lie
 ‘he is sitting’ [MO WB_KL-19:24]

This pattern of vowel hiatus resolution is found in all prefixation, both nominal and verbal, as well as in noun-noun compounding (in which the first element of the compound behaves like the prefix, and the second element behaves like the root). It is notable that the quality and quantity of the resulting vowel are both controlled by the quality of the prefix vowel. In this way, Karuk provides additional counterexamples to proposed universals of root faithfulness outranking affix faithfulness.

The prefixal pattern is straightforward enough to describe, but more complicated to model using constraints. First, the quality of V1 must be retained, and long vowels cannot be elided. If V1 is a high vowel, only one mora surfaces, so elision of V2 is triggered. If V1 is a low vowel, no elision is triggered, and two moras surface. If V2 is a high vowel, vowel coalescence takes place, resulting in a long mid vowel.

Quantity

First, the question of output vowel quantity is addressed. Setting aside the question of long input vowels for the moment, vowel elision takes place when the prefix vowel is high, regardless of the quality of the root vowel. Coalescence takes place when the prefix vowel is low, regardless of the quality of the root vowel. Therefore, the constraint(s) regulating these processes must make reference, directly or indirectly, to input prefix vowel quality and output vowel length.

Retaining two vowel moras in the output is driven by the faithfulness constraint MAX, which is in tension with some markedness constraint militating against long high vowels. This could be expressed in a number of different ways, for instance, using a constraint that simply states [+high] vowels should not be long. Assuming that the quality of the output vowel is independently determined by identity constraints indexed to prefix vowels, a general *V:(+high) constraint would be sufficient to obtain the correct quantity results. However, there is not much motivation for a *V:(+high) constraint being active in Karuk, because long high vowels are not uncommon generally in the language. For this reason, I choose instead to use an identity constraint which refers an abstract strength feature, based on the same strength scale established above in (72) for word-final vowel deletion and mutation, repeated here as (108).

- (108) Combined strength scale:
 V: > V(low) > V(+high)
 +strong | -strong

In the context of word-final vowels, each point on the scale corresponded to a different outcome. In the context of prefixation and compounding, by contrast, it only matters whether a vowel is above or below a certain point on the scale (i.e., the division between short low and short high vowels). Specifically, a [+strong] prefix vowel in the input must correspond to a [+strong] vowel in the output, and a [-strong] prefix vowel in the input must correspond to a [-strong] prefix vowel in the output. This is captured by the identity constraint in (109).

- (109) IDENT(strength)-PREFIX (ID(str)-PFX)
 Assign one violation mark for every vowel in the output which does not match in strength to the corresponding prefix vowel in the input.

Thus a long vowel (of any quality) in the output corresponding to a low vowel in the input would satisfy this constraint, while a long vowel (of any quality) in the output corresponding to a short high vowel in the input would violate this constraint. The prefix position-specific version of IDENT(strength) must outrank a general IDENT(strength) constraint to capture the asymmetry in whether input prefix or root strength is maintained in the output.

Tableaux (110)–(111) show two different outcomes for words in which the prefix and root vowels that come together are the same in quality. In (110), both the prefix and root vowel are low vowels. Neither a short low vowel nor a long low vowel in the output violate

IDENT(strength)-PREFIX, because both count as strong. Therefore, the faithful candidate, [akunváápxaan], which retains both the prefix and root vowel moras as a single long vowel, wins over [akunváp̄pxaan], which violates MAX.

(110)

	/akunva-ápxaan/	ID(str)-PFX	MAX
a.	akunváápxaan		
b.	akunváp̄pxaan		*!

In contrast, when both prefix and root vowels are high, as in (111), the faithful candidate [níímnish] violates IDENT(strength)-PREFIX, because the a short prefixal *i* in the input is not strong, while a long *ii* in the output is strong. The winning candidate [nímnish] violates MAX, but satisfies IDENT(strength)-PREFIX, so IDENT(strength)-PREFIX must be ranked above MAX.

(111) IDENT(strength)-PREFIX \gg MAX

	/ni-immish/	ID(str)-PFX	MAX
a.	níímnish	*!	
b.	nímnish		*

Quality

Turning to the outcomes for words in which prefixal and root vowels do not match in quality, I first take the case in which two high vowels of different qualities come together, as in example (106c), repeated here as (112).

(112) *múspuk*

mu- *ishpuk*
 3sPOSS- money

‘his money’

[JS WB_KL-04:24]

A candidate [muishpuk] with adjacent vowels would be ruled out by the high-ranked constraints against heterosyllabification and diphthong formation. Similarly, as the phonological inventory of Karuk does not include a high central vowel, undominated constraints against [ɨ] or [u] prevent these as a possible outcomes. None of these ruled-out candidates are shown here. Tableau (115) compares the remaining possible candidates: those with long or short vowels matching the quality of one input vowel or the other. Here a pair of identity constraints must be (re)introduced. IDENT(front)-PREFIX, shown in (114), is part of a subhierarchy of constraints, in which the specific constraint correlated to the prefix position outranks the general constraint IDENT(front), which was seen above in §3.4.2 and repeated here in (113).

(113) IDENT(front) (ID(front))

Assign one violation mark for every vowel in the output which does not match in frontness to the corresponding vowel in the input.

(114) IDENT(front)-PREFIX (ID(front)-PFX)

Assign one violation mark for every vowel in the output which does not match in frontness to the corresponding prefix vowel in the input.

In the tableaux shown here, these constraints are not critically ranked in respect to one another, but based on a general tendency in Karuk in which prefix-specific identity constraints outweigh their general counterparts, I assume this ranking.

(115) IDENT(strength)-PREFIX, IDENT(front)-PREFIX \gg IDENT(front) \gg MAX

	/mu-ishpuk/	ID(str)-PFX	ID(front)-PFX	ID(front)	MAX
a.	múúspuk	*!		*	
b.	míshpuk	*!	*!	*	
c.	mu múspuk			*	*
d.	míshpuk		*!	*	*

Since the short prefixal *u* in the input is not strong, both candidates with long vowels, [múúspuk] and [míshpuk], are ruled out by IDENT(strength)-PREFIX. The remaining candidates must then violate MAX. When only one vowel can surface, the question is whether the root or prefix vowel surfaces. The candidate which is faithful to the root vowel, [míshpuk] loses to the candidate which is faithful to the prefix vowel, [múshpuk].

Next, outcomes of high and low vowels combining are considered. When a high prefix vowel combines with a low stem vowel, elision occurs. In the tableau in (116), all candidates but [úxyar] are ruled out by the highly ranked IDENT(strength)-PREFIX, which ensures the winning candidate contains a short high vowel.

	/u-axyar/	ID(str)-PFX	ID(front)-PFX	ID(front)	MAX
a.	óóxyar	*!			
b.	úúxyar	*!			
c.	ááxyar	*!	*!	*	
d.	u úxyar				*
e.	áxyar	*!	*!	*	*

When the prefix vowel is low and the stem vowel is high, lower-ranked identity constraints come into play. In addition to IDENT(front), IDENT(-high), seen above in §3.4.2 and repeated here in (117), is required for vowel coalescence.

(117) IDENT(-high) (ID(-hi))

Assign one violation mark for every [-high] vowel in the input which does not correspond to a [-high] vowel in the output.

Again, this identity constraint is part of a subhierarchy of constraints in which the position-specific version indexed to prefix height outranks the general version. However, since height is in essence subsumed by the IDENT(strength)-PREFIX constraint, it is not necessary to show separate identity constraints for prefix height.

In the tableau in (118), it can be seen that only one candidate, [nímchak], with a short high vowel, is ruled out by IDENT(strength)-PREFIX, because all the other candidates are [+strong]. Since the input prefix vowel is not specified for [front], none of the candidates violate IDENT(front)-PREFIX. For the first time, the effect of the lower-ranked IDENT(front) constraint is apparent. Since the frontness of the prefix vowel is of no consequence, a candidate which matches the frontness of the stem vowel (in this case, [+front]) is preferable to one which does not. Therefore, the candidates [náámchak] and [námchak] lose. IDENT(-high), differentiates between the two candidates with long [+front] vowels: it is violated by a high but not by a mid vowel. The combination of the frontness and height identity constraints ensure the “compromise” candidate [néémchak] wins, resulting in coalescence with features of each input vowel in the output.

(118) IDENT(strength)-PREFIX, IDENT(front)-PREFIX

»

IDENT(front) » IDENT(-high), MAX

/na-imchak/	ID(str)-PFX	ID(front)-PFX	ID(front)	ID(-hi)	MAX
a. néémchak					
b. náámchak			*!		
c. nímchak				*!	
d. námchak			*!		*
e. nímchak	*!			*	*

Long vowels

When the stem vowel is long, as in (107), repeated here as (119), it cannot be elided. In this case, the repair is the insertion of a glottal stop between the two vowels. Glottal stop epenthesis avoids violation of any IDENTITY or MAX constraints because both the prefix and stem vowels surface intact. But because glottal stop insertion does not take place in hiatus resolution of two short vowels, a ban on epenthesis can only be violated to avoid violation of MAX-LONG. The tableau in (120) shows that the candidate involving elision or coalescence are fail because they violate MAX-LONG. This tableau can be directly compared to the one in (115), and it becomes clear that unless a long vowel is present on the input, DEP will not be violated to avoid vowel hiatus.


(119) \underline{u} ' \underline{i} thra V + VV → V'VV

\underline{u} - \underline{i} thri
3s(>3)- (container/liquid).sit/lie

'he is sitting'

[MO WB_KL-19:24]

(120) MAX-LONG ≫ DEP ≫ IDENT(strength)-PREFIX, IDENT(front)-PREFIX

/u-iithra/	MAX-LONG	DEP	ID(str)-PFX	ID(front)-PFX
a. úúthra	*!		*	
b. ííthra	*!		*	*
c. úthra	*!			
d. íthra	*!			*
e.  u'ííthra		*		

The MAX-LONG constraint active here is a global one, and need not be indexed to stem vowels.

Summary

In prefixation and compounding, vowel hiatus can be resolved by elision or coalescence. Which of these repairs is employed is determined by input vowel length and by prefix vowel quality, and is thus similar to Karuk suffixation in generally ranking affix faithfulness over root faithfulness. Also similar to suffixation, preservation of long vowels overrides normal vowel hiatus resolution, although the repair strategy is different (glottal stop epenthesis in prefixation vs. suffix vowel elision in suffixation). A vowel elision outcome in prefixation is driven by a highly ranked constraint requiring [-strong] prefix vowels (i.e., [+high] vowels) to be light in the output. When only one mora can surface, prefix identity constraints ensure the resulting vowel matches the prefix vowel in quality. When the prefix vowel is strong, a coalescence outcome is preferable to elision, and identity constraints push the resulting vowel to fall between the two input vowels in quality. The combined constraint ranking which correctly derives these varied outcomes is given in (121).

(121) MAX-LONG ≫ DEP ≫ IDENT(strength)-PREFIX, IDENT(front)-PREFIX
 ≫
 IDENT(front) ≫ IDENT(-high), MAX

Note that when only one vowel can surface, V1 features are preserved and linked to the V2 mora, as this will be important for whether a vowel will fall inside the accentable prosodic stem (discussed in Chapter 8).

3.5 Discussion

3.5.1 Syllable structure principles

The various processes in Karuk which add or delete TBUs lend themselves well to a constraint-based analysis, as they all work to avoid dispreferred syllable structures: consonant clusters, vowel hiatus, open, light word-final syllables, and onsetless syllables. Epenthesis is used to avoid a three-consonant cluster. It is not used, however, to avoid a word-initial two-consonant onset, or a word-final two-consonant coda, as these could be avoided by faithfulness to the input structure. The former is acceptable (though used variably) to avoid a short, unaccented, onsetless vowel, and the latter is avoided by preserving a following vowel. Epenthetic vowels behave like any other short vowel with respect to tone, so they must be assigned lexically, as they are present when derived tone is assigned.

While these word-final vowel elision and stem-final vowel elision under suffixation have similar outcomes in many cases, their motivations are unrelated. The former elision avoids word-final short vowels, but they are retained to avoid a word-final consonant cluster. The latter elision avoids vowel hiatus when a vowel-initial suffix is attached to the stem. Underlying stem-final vowels must be present throughout the derivation because they surface when a suffix beginning with one or two consonants is attached.

Whether vowel hiatus in Karuk is resolved by elision, vowel coalescence, or epenthesis, depends on phonological and morphological factors. What is of particular interest here is that affix faithfulness outranks root faithfulness in several cases, and that a constraint ranking reversal is required to account for different outcomes of vowel hiatus resolution in different contexts. In addition, a scale of gradient vowel strength is required to account for separate phenomena seen in final vowel deletion and in vowel hiatus resolution in prefixing.

3.5.2 Affix faithfulness and root faithfulness

The Karuk system described here poses a serious challenge to the universals of vowel hiatus resolution proposed in Casali (1996, 1997). On one hand, the Karuk system looks at first glance like a clear example of Casali's Asymmetric Height Coalescence, and can be described fully and concisely using his position- and feature- sensitive constraints (with the addition of constraints to address vowel length), as I have done here. On the other hand, the relative ordering of both feature preservation and position preservation are the opposite of his proposed universals for Asymmetric Height Coalescence. In Karuk, [+high] is preserved over [-high] and [-high] over [low], the reverse ordering of that given as a universal by Casali (1996:88). Casali ranks positional constraints over general, assuming that positional constraints are always linked to the root or lexical/content morpheme over the affix or functional morpheme. In Karuk, positional constraints are indeed ranked over the general, to derive the asymmetric effects seen, but in prefixing, they must make reference to the prefix position rather than the root. I propose prefix-specific IDENT and suffix-specific MAX constraints to account for the Karuk patterns.

Casali (1997) proposes a MAXLEX constraint to indicate the driving force behind a universal preference for preservation of lexical/content morpheme material over affixal material. The fact that the pattern is the same in both compounding (in which both V1 and V2 are part of lexical content words) and prefixation (in which only V2 is part of a lexical content word), shows that for Karuk, the content status of the morpheme is inconsequential in determining vowel hiatus resolution. However, I agree with Casali that a more functional explanation than linear order is called for. In the Karuk case, the root or head of a compound is always the rightmost element, and the leftmost element behaves as an affix phonologically, so a strictly position-sensitive constraint referring to this ‘prefixal’ element is appropriate.

The pattern of vowel hiatus resolution in Karuk suffixation is even more straightforward than that of prefixation. In suffixation, there is an even stronger preference for affix faithfulness over root faithfulness, to the point where the root vowel is always elided unless it is long. This outcome is less surprising in the suffixal context than in the prefixal context, because the suffix-initial vowel is morpheme-initial, a privileged position for faithfulness (Casali 1997). In addition, because stem-final vowels are frequently elided in word-final position, they must carry a low functional load for recoverability.

3.5.3 Recoverability

A plausible functional explanation for the unusual affix faithfulness seen in Karuk has to do with recoverability. Casali (1997) uses the constraint MAXMS to prevent deletion of monosegmental morphemes. Of the eight vowel-final verbal person marking prefixes in Karuk, two are monosegmental (*i-*, *u-*). Of the remaining six, three have the form *nV* (*na-*, *ni-*, *nu-*), and two have the form *kV* (*ku-*, *kii-*). Elision of the vowel in all these prefixes, even those of the form CV, would pose a serious problem for recoverability. Of six vowel-final nominal possessive prefixes, two pairs (*mi-*, *mu-*; *nani-*, *nanu-*) would also be indistinguishable without their final vowel. Several of these confuseable prefixes are high-frequency. Vowel-initial roots, on the other hand, are not particularly common in the Karuk lexicon, and the initial vowels are very rarely, if ever, necessary for recoverability of the root. It is no surprise, then, that this language would tend towards preservation of an affix segment over a root segment in this position. I presume that the pattern of preserving any prefixal vowel over any root vowel, including in cases where recoverability would not be diminished by preserving root faithfulness, is driven by paradigm uniformity constraints. While issues of implementing a recoverability-driven analysis are beyond the scope of the present study, see, e.g. Cohen Priva (2012); Wedel et al. (2013) for more on this topic.

It is a bit perplexing that noun-noun compounds would have begun to follow the prefixal pattern, since the final vowel of a lexical noun is far less likely to be required for recoverability than that of a prefix. Synchronically, though, one can say that the first element of a compound is treated morphophonologically the same way that nominal prefixes are (additional evidence for this is found in accentuation, because compounds trigger the same basic derived accentuation pattern that is linked to both nominal and verbal inflectional prefixes).

3.5.4 Feeding and constraint ranking reversal

Suffixal vowel hiatus resolution can feed glide deletion, which in turn feeds vowel hiatus resolution. Evidence for this comes from the fact that both suffixal and glide deletion vowel hiatus can arise with the suffix *-avish* PROSPECTIVE discussed in §2.3.5, as in (31c). The vowel hiatus that results from suffixation must be resolved before glide deletion takes place, which in turn must occur before the suffix-internal vowel hiatus is resolved. A different ordering or simultaneous application of these processes would be incompatible with the forms attested in (30). This shows that vowel hiatus resolution in the context of glide deletion must take place at a later stage in the derivation than vowel hiatus resolution that takes place in the context of attaching morphemes. Furthermore, key constraints that determine which repair for vowel hiatus will take place must be ranked in opposite orders in the two different contexts, making it impossible for these outcomes to be evaluated in tandem. In the context of glide deletion, MAX, IDENT(front), and IDENT(-high) are crucially ranked above UNIFORMITY, while in the context of affixation, UNIFORMITY is crucially ranked above MAX, IDENT(front), and IDENT(-high). Coalescence in very specific situations in the affixation context can be obtained with position- and feature-specific constraints dominating the general UNIFORMITY constraint. However, specific constraints would not be able to explain the across-the-board coalescence that occurs following glide deletion. Ranking reversals such as this are not predicted in indexed constraint models (Alderete 2001; Benua 1997; Itô & Mester 1995, 1999a; Pater 2009) but are predicted in cophology models (Anttila 2002; Inkelas & Zoll 2007).

3.5.5 Gradient vowel strength

In §3.3.3, I proposed a scale of vowel strength which combines both vowel length and vowel height, repeated here as (122).

- (122) Combined vowel strength scale:
 V: > V(low) > V(+high)

Differences in intrinsic vowel weight based on the sonority scale are well-motivated, but pose problems for a moraic model of vowel weight. In Karuk, long vowels are categorically heavier than short vowels, and fit well with moraic theory (they contain two tone bearing units, while short vowels contain one; two short vowels can merge to create a single long vowel, and so forth). If this is the case, all short vowels should have a single mora, eliminating the distinction between strong and weak short vowels. If strong vowels such as *a* are linked to a single mora, weak vowels such as *i* should have no moras, but this is impossible, since they are pronounced, and contribute a mora under coalescence. Conversely, if *i* has a single mora, *a* would have to have two, then a long *aa* would have to have four, which seems quite absurd and would not fit in with the good evidence for a categorical distinction between long and short vowels. The Karuk system, therefore, needs both a categorical length distinction which is always active, and a subtler strength distinction between vowels of different quality, which is only apparent in limited contexts. Moren's theory of distinctive versus coerced weight

(Morén 2000, 2001), the latter of which is associated with sonority, presents a potentially useful explanation for gradient vowel strengths in Karuk.

Part II

Influence of syllable structure on prominence

Chapter 4

Root accentuation

4.1 Introduction

In this chapter, I introduce the possible tone patterns on roots in Karuk, demonstrate the degree to which they are predictable by syllable structure, and propose an analysis of how syllable structure influences tone placement in roots. Roots in Karuk can have one lexical H tone, or they can be underlyingly toneless (or unaccented). In principle, a H tone could be associated with any TBU (that is, with any vocalic mora¹). In some roots, especially those with long vowels, lexical tone is arbitrary and contrastive. However, in the most common verb root shapes, tone placement is predictable by syllable structure and is non-contrastive. In particular, a constraint against high tone on closed syllables with short vowels (abbreviated as $*(C)\acute{V}C$) is proposed.² This constraint accounts for a number of seemingly disparate patterns of prominence in Karuk, including the skewed tone distributions in verb roots shown in this chapter, and the stability of tone under affixation, and affix-triggered vowel lengthening that comes up in §7.3. These findings fit in with recent work by Itô & Mester (2016) which similarly finds unaccentedness in the Japanese lexicon as a resolution to conflicting prosodic constraints.

4.2 Lexical tone in Karuk

4.2.1 Possible root tone patterns

Surface tones in Karuk, as described in §2.1.4 can be level H, HL, and L, with other effects due to phrasal boundary tones. Only H tone need be active, as every H is followed by a L when possible. H can associate with any mora, resulting in a level H on a short vowel and level H or falling HL on a long vowel. LH contours are not found, so a H associated with

¹In other chapters, the question of moraicity of consonants comes up, but throughout this chapter mora notation simply indicates TBUs.

²This constraint was first proposed in Sandy (2014a), and some of the ideas in this chapter are adapted from that work, although the actual analyses of root accentuation differs.

the first mora of a long vowel will produce HL, while a H associated with the second mora of a long vowel must produce HH.

Verb roots in Karuk typically consist of one or two syllables. Most three-syllable stems appear to be derived (though they may be lexicalized), while a number of three-syllable roots are not obviously decomposable. The vast majority of longer stems (i.e., those of four moras or more) are clearly derived and follow patterns of prominence for derived stems, so it is not useful to talk about lexical tone patterns on longer roots. As shown in Table 4.1, lexical tone is found in three general patterns on Karuk roots (including both nouns and verbs).³ These patterns are: toneless, HL at the left edge of the root and HL at the right edge of the root. Rather than three fixed tone patterns, I posit that the patterns seen can be attributed to a maximum of one H tone per word, which can be associated to any TBU.

Table 4.1: Possible root tone patterns

1 syllable		2 syllables				3 syllables		
σ	σ	σ	σ	σ	σ	σ	σ	σ
	^				^			
μ	μ	μ	μ	μ	μ	μ	μ	μ
L	LL	LL	LLL	LLL	LLL	LLL	LLL	LLL
	HL	HL	HLL	HLL	HLL	HLL	HLL	HLL
	HH		HHL	HHL	HHL	HHL	HHL	HHL

Monosyllabic roots with a short vowel cannot bear tone.⁴ These tend to be bound roots and rarely, if ever, surface unaffixed or uncompounded. Monosyllabic roots with a long vowel show a three-way tonal contrast, which I attribute to no tone, or a H tone associated with either the first or second mora, resulting in LL, HL, and HH, respectively. Disyllabic roots with two short vowels can either be toneless or have a H tone associated with their first mora, resulting in LL or HL. Roots with three moras, either disyllabic roots with one long vowel or trisyllabic roots with all short vowels, display the same three tone patterns. Trimoraic roots can be toneless, HLL or HHL.⁵ HLL results from a H tone associated with the first mora in the root, and HHL results from a H tone associated with the second mora. In longer stems, very few are clearly underived. Those that seem to be underived display a variety of tone placement consistent with the idea that H tone can be associated with any single mora.

4.2.2 Gaps

Gaps in the patterns shown in Table 4.1 indicate that an avoidance of a final H tone limits the otherwise free association of H tone with any TBU. Monomoraic roots show a complete

³Only noun and verb roots (n=714) are included here; other parts of speech, e.g., particles, postpositions, ideophones, interjections, pronouns, and adjectives are not included.

⁴A HL contour tone on a short vowel is found exceptionally in a two loan words.

⁵Due to a phrasal boundary L tone (§2.5.2), a HHL root with a short vowel in its first syllable will be realized LHL, while a HHL root with a long vowel in its first syllable will be realized HHL.

neutralization of tonal contrasts, while two-syllable bimoraic roots show a neutralization between a final H and toneless. A three-way contrast is retained on one-syllable bimoraic roots. A ban on H tone on final moras can account for the gaps seen in Table 4.1 under one and two syllable roots, as well as the lack of HHH roots. There are a handful of two-syllable stems (likely derived) and loan words in Karuk that have been analyzed with a final H on a long vowel (Bright 1957), but evidence to support this analysis for the native Karuk words is sparse.⁶ The question of the existence of lexical final H tone on disyllabic roots aside, a three-way tonal contrast is required to account for the tone patterns of monosyllabic roots (see Bright (1957) for a description of the anomalous behavior of these roots), which is obtained straightforwardly with a H tone linked to one or none of two moras. It seems then, that the ban on final H must be absolute in monomoraic syllables, while it may be violated in long-voweled final syllables in unusual cases and in monosyllabic roots.

4.2.3 Skewed distribution in disyllabic roots

Nonfinality can account for the *possible* tonal patterns in roots. The distribution of these possible patterns across lexical items of various lengths might be expected to be arbitrary, yet it is not. When syllable structure is taken into account, the distribution of those patterns is partially predictable. In particular, HL over two monomoraic syllables, the most common shape for verb roots, is largely predictable based on CV structure. Table 4.2 shows the distribution of tone patterns on monosyllabic roots with long vowels and 2-3 syllable roots with short vowels.⁷ Roughly even proportions of monosyllabic roots fall into each tonal pattern,

Table 4.2: Distribution of H tone in roots

Syllables	1			2		3		
	σ	σ	σ	σ	σ	σ	σ	σ
	\wedge							
	μ	μ		μ	μ	μ	μ	μ
LL(L)	24			158				4
HL(L)	31			119				27
HH(L)	39			4*				41
total	94			281				72

* Only four noun roots fall into this category: two names and two loanwords.

⁶For loan words, when a pattern of prominence diverges from a typical Karuk pattern and follows the original source word pattern, I presume that this reflects influence of the loan word phonology and does not represent a native Karuk pattern (e.g., *sikááh* ‘cigar’).

⁷The proportions of roots for each tone is based on 71% of the lexicon of 7,180 entries being morphologically parsed or marked as roots. The proportions in this sample are representative of the lexicon as a whole, since the work has been done in several alphabetical slices, with no particular part of speech or word shape being parsed preferentially. However, the numbers should be updated for maximal accuracy, and to locate rare or anomalous root patterns, when the entire lexicon has been parsed.

but in roots with two moras over two syllables, more roots are toneless than tone-bearing, and tone is final only in four exceptional nouns. When nouns and verbs are separated, and even more striking skewing of distribution is seen, as shown in Table 4.3. Verb roots are overwhelmingly disyllabic, and of those, there are many more toneless than tone-bearing.

Table 4.3: Distribution of H tone in verb roots

Syllables	1	2	3
	σ	$\sigma \sigma$	$\sigma \sigma \sigma$
	\wedge	$\begin{array}{ c } \hline \\ \hline \end{array}$	$\begin{array}{ c } \hline \\ \hline \end{array}$
	$\mu \mu$	$\mu \mu$	$\mu \mu \mu$
LL(L)	5	147	2
HL(L)	13	62	12
HH(L)	3	0	16
total	21	209	30

Disyllabic verb roots with short vowels are focused on here because they are so numerous and show the greatest skewing. In these roots, whether the first syllable is open or closed is important in determining where prominence falls. In Table 4.4, the distributions of tone in disyllabic verb roots are broken down by syllable structure.

Table 4.4: Distribution of H tone in disyllabic verb roots with short vowels

Shape of 1st syllable	Syllable with tone	
	1st	2nd
Open	62	14
Closed	0	133

When verbs are sorted by syllable structure as in Table 4.4, a pattern becomes apparent: the placement of prominence in these verbs is highly dependent on whether the first syllable is open or closed. If the first syllable is open, the root is much more likely to bear H tone on the first syllable, as in example (123a), than be toneless, as in example (123b). If the first syllable is closed, as in example (123c), the root is always toneless.

- (123) a. *cháfičh* ‘to gnaw meat from’ [D:*cháfičh*]
 b. *chifičh* ‘to defeat’ [D:*chifičh*]
 c. *tathrip* ‘to strain out (soaked acorns)’ [D:*tathrip*]

Overall, this skewing is too great to be due to chance. In §4.3, an Optimality Theoretic account is proposed which accounts for this skewed distribution of prominence, assuming

three possible tonal inputs (disyllables may be underlyingly toneless or have a H tone linked to any one mora), and an interaction between a ban on H on (C)VCs, a ban on H on final moras, and tone faithfulness.

4.2.4 Differences in distributions between nouns and verbs

Of the trimoraic roots, toneless with all short vowels and toneless with a long vowel in the first syllable are exceedingly rare in verbs and are not found in underived nouns. On the other hand, quite a few toneless noun and verb roots with a long vowel in the second syllable are found.

Nouns follow the same pattern of avoidance of H tone on a closed initial syllable as do verbs, with only four exceptions: two loans and two names. The most notable difference in the distributions for nouns and verbs is that while disyllabic verbs mostly have two short vowels, in nouns, a short-long shape is more common for disyllabic roots, confounding the very clear skewing seen in verbs.

4.3 Constraints on placement of H tone

The distribution of H tone in Karuk roots is accounted for by a constraint against H tone on closed syllables with short vowels ($*(C)\acute{V}C$), in conjunction with other common constraints, such as a requirement for H tone to be non-final. While a $*(C)\acute{V}C$ constraint in particular has not been seen before, precedence for avoidance of tone on a closed syllable exists. Gordon (1999) makes a distinction between a type of syllable weight that attracts stress, based on total energy, and a type of syllable weight that attracts tone, that crucially depends on sonorant energy. This distinction could account for a CV syllable being a better target for tone than a CVC syllable in Karuk.

In a typological study of contour tones, Zhang (2001) finds that in some Chinese dialects CV syllables can bear more tonal contrasts than CVC syllables. While not directly applicable to the Karuk patterns, this study provides typological evidence that CVs may be better tone bearing units than CVC syllables in general.

This reasoning supports the analysis of the avoidance of prominence on this syllable type as a tonally-driven constraint, rather than a stress-driven one. There is more motivation for tone than stress to be preferentially attracted to a (C)V syllable over a (C)VC syllable, and there is no metrical or syllable-weight based explanation for stress to be avoided on syllables of this shape.

Ban on H on (C)VC syllables In Karuk, the restriction limiting surface contour tones to syllables with long vowels is readily explained by a representation in which long vowels have two moras, either of which can have a H tone linked to it. However, a more gradient representation of syllable weight than that of moras is also needed in Karuk. A gradient restriction causes high tones to be attracted to rimes which are relatively longer than others, though at a sub-moraic level. It is gradient because there is a hierarchy of rime length, as

shown in (124), which interacts with other constraints on tone placement. In this hierarchy, a CV syllable is a better tone bearing unit than a CVC syllable, and because it has the greatest sonorant energy, a CVV syllable is the best tone bearing unit.

$$(124) \quad (C)V\dot{V}(C) \succ (C)V \succ (C)VC$$

The harmonic scale in (124) gives us a corresponding constraint ranking in (125), of which only the highest ranked constraint is active in the phenomena discussed here.

$$(125) \quad *(C)\acute{V}C \gg *(C)\acute{V} \gg *(C)\acute{V}\acute{V}(C)$$

The constraint for avoidance of a high tone on a closed short syllable is given in (126). This constraint can be seen to be active, though not extremely highly ranked, throughout the grammar. In verb roots, as a sort of morpheme structure constraint, however, it is undominated.

$$(126) \quad *(C)\acute{V}C$$

Assign one violation mark for every (C)VC syllable bearing H tone.

Ban on final H In disyllabic roots, the avoidance of initial H tone in CVC syllables is counterbalanced by an equally strong avoidance of final H tone. There is a tendency to avoid final prominence throughout the Karuk grammar. To account for avoidance of H tone in the final syllable of a prosodic stem, a NON-FINALITY(TONE) constraint (abbreviated as NON-FIN(T)), given in (127), is employed.

$$(127) \quad \text{NON-FIN}(T, \mu, P) (\text{NONFIN}(T))$$

Assign one violation mark for every tone T that falls on the final mora of a prosodic stem (after Hyde 2007).

NON-FIN(T) in effect requires a H to be followed by a L, because a L is supplied by default following a H tone.

Faithfulness to input tone The tendency for initial prominence in roots with an open initial syllable is strong but not absolute. Therefore, some of the roots must have a H tone on the input, while others are toneless. DEP-T prevents the insertion of a tone that is not present underlyingly. The identity constraint in (129) ensures that an underlying tone is not deleted, while (130) is violated by either movement or deletion of an underlying tone.

$$(128) \quad \text{DEP-T}$$

Assign one violation mark for every tone in the output that does not have a correspondent in the input.

(129) MAX-T

Assign one violation mark for every tone in the input that is not expressed in the output.

(130) IDENT-ASSOC(T) (ID-ASSOC)

If there is an association between x and tone T in the input, then there is an association between x' and T' in the output, where x' and T' are the correspondents of x and T respectively. Assign one violation mark for each tone association in the input that is not retained in the output. (de Lacy 2002; Myers 1997)

Constraint ranking Assuming inputs could include a H tone linked to any one mora, or no input tone, the constraint rankings given in (131)–(134) result in the correct surface tone patterns.⁸ DEP-T prevents insertion of a tone in an underlyingly toneless root, and is highly but not crucially ranked with respect to the other constraints given in (131)–(132). Tableaux are given in (131)–(132) which show possible outputs for roots with an open initial syllable.

In (131), the faithful candidate b., with a H tone linked to the first syllable wins. In (132), the faithful candidate c., with a H tone linked to the final syllable, loses due to non-finality. Both of the remaining candidates violate IDENT-ASSOC(T), so candidate b., which retains a H tone on the surface, wins out over candidate a., which violates MAX-T.

(131) NON-FIN(T, μ , P) \gg IDENT-ASSOC(T), MAX-T

	(C)VCV(C) H	NONFIN(T)	ID-ASSOC	MAX-T
a.	(C)VCV(C) H		*	*
b. \rightarrow	(C)VCV(C) H			
c.	(C)VCV(C) H	*!	*	

⁸For simple roots, it is not necessary to assume underlying tone associations, and the correct results can be obtained with *(C)V̇C, NONFIN(T) \gg MAX-T. For consistency with longer roots, where underlying tone associations are needed, however, I present an analysis which accounts for underlying tone associations here.

(132) NON-FIN(T, μ , P) \gg IDENT-ASSOC(T), MAX-T

	(C)V _H CV(C)	NONFIN _T	ID-ASSOC	MAX-T
a.	(C)V _H CV(C)		*	*
b.	(C)V _H CV(C)		*	
c.	(C)V _H CV(C)	*!		

Tableaux are given in (133)-(134) showing the possible outputs for roots with a closed initial syllable.

(133) *(C)VC, NON-FIN(T, μ , P) \gg IDENT-ASSOC(T), MAX-T

	(C)VCCV(C)	*(C)VC	NONFIN _T	ID-ASSOC	MAX-T
a.	(C)VCCV(C)			*	*
b.	(C)VCCV(C)	*!			
c.	(C)VCCV(C)		*!	*	

(134) *(C)VC, NON-FIN(T, μ , P) \gg IDENT-ASSOC(T), MAX-T

	(C)VCCV(C)	*(C)VC	NONFIN _T	ID-ASSOC	MAX-T
a.	(C)VCCV(C)			*	*
b.	(C)VCCV(C)	*!		*	
c.	(C)VCCV(C)		*!		

In these tableaux, no matter where the input tone is linked, the faithful candidate fails, either due to *(C)VC or to non-finality, resulting in the candidate with no tones winning in both cases.

Assuming that some number of each shape of disyllabic root have no tone, have H tone linked to the first mora, and have H tone linked to the second mora, the expected outcomes of the constraint interactions shown here represent the skewing seen in Table 4.4. The preponderance of toneless roots results from all closed initial syllable inputs (approximately 2/3 of these roots) having the same outcome, regardless of input tones. Any open initial syllable root with an input H, on either mora, results in the greater number of initial H roots, and the small number of toneless open initial syllable roots can only result from a one input: a toneless open initial syllable root.

4.4 Ambiguity

Because of the protected nature of the HL structure created in open-initial disyllabic roots, this underlying tone structure can be visible (and attributable to an underlying representation). In roots of different shapes, especially trimoraic roots, it is much harder to determine what, if any, the underlying tone pattern would be. This is because the possible H tone placement and default accentuation placed by the derivation would rarely be contrastive.

4.5 Summary

In this chapter, the possible root tone patterns in Karuk have been introduced, and I have shown that underlying tone in Karuk is partially predictable based on syllable structure. Nonetheless, not all root prominence cannot be reduced to automatic assignment, so arbitrary lexical tone must interact with general constraints on its placement.

A constraint against H tone on closed syllables with a short vowel is proposed: $*(C)\acute{V}C$. This constraint not only accounts for the skewed tone distributions in Karuk roots, but its effects can also be seen in the stability of tone under affixation (discussed in Chapter 6) and in affix-triggered vowel lengthening (discussed in §7.3). In this way, an unusual tonal constraint provides coherent phonological motivations for some of the patterns which have previously required diacritics. Interactions with several other factors make the $*(C)\acute{V}C$ constraint rarely surface-apparent, however. These include the fact that the prohibited structure can occur lexically in longer roots, the constraint's interaction with basic derived accentuation (in which it is ranked so low as to be inactive, see Chapter 5), and further opacity created by surface gemination (see §2.1.4).

Chapter 5

Basic derived accentuation

5.1 Introduction

As I have shown in Chapter 4, syllable structure determines whether disyllabic verb roots can underlyingly bear H tone or not. Syllable structure also plays an important role in the placement of H tone in inflected words, albeit in a rather different way. Inflected words receive basic prosodic prominence at the end of derivation, the placement of which is sensitive to the presence of long vowels.

In this chapter, I propose a new foot type, the high-before-long trochee, and provide an analysis of its formation using metrical footing and alignment. In the absence of long vowels in the stem, penultimate accentuation arises with the same set of constraints. The penultimate/high-before-long pattern is the most widespread pattern of prominence found in Karuk, seen in both inflected nouns and inflected verbs. It accounts for prominence in half of all the verb tokens in the corpus. It does not apply to bare roots, which receive a different pattern of default accent postlexically (see §2.5.2), and can thus be considered a derived environment effect (Kiparsky 1993; Łubowicz 2002). This chapter focuses on the metrical part of the prosodic system that is active at the end of the derivation (subsequent to the final vowel deletion process described in Chapter 3). At word level, a primary stress foot is built in a predictable location based on syllable structure, and H tone is automatically associated with the head of the foot, as a manifestation of prominence.

The major exception to this pattern is due to a protected tone-syllable alignment in the input. If there is a HL tone bigram in the input at this level, a stress foot will be built around it instead, as described in Chapter 6. While underlying H disyllabic roots discussed in Chapter 4 typically fall into this exceptional category, it is possible for an underlying H to be erased. Furthermore, a protected HL configuration need not be underlying, but can be created through derivation. Likewise, the long vowels that factor into the placement of prominence can be underlying or derived. For these reasons, the basic derived accentuation pattern can be described in purely phonological terms, without need for reference to underlying morphological structure or strong or weak accent on stems. Apparent exceptions to the basic pattern are due to a limited window of application caused by a misalignment of the prosodic and morphological stems, discussed in Chapter 8.

5.1.1 Basic word-level accentuation

The pattern in question is one in which prominence falls on the vowel immediately to the left of the rightmost long vowel in a word, as in (135a). For ease of reference, I call this tone-syllable alignment the HIGH-BEFORE-LONG pattern. In a word with no long vowels, prominence is penultimate, as in (135b), which is considered part of the same pattern.

- (135) a. *usasipúniihva* High-before-long
 u- *sásipunih* -*va*
 3s(>3)- (plural)be.in.line.downward -PLURACT
 ‘it runs down in lines’ [JS WB_KL-87:2]
- b. *kunpachnutúchnut* Penultimate
 kun- *pachnutúchnutu*
 3pl(>3s)- nibble
 ‘they nibble’ (Bright 1957:63)

The preference seen in this language for prosodic prominence to fall directly before a long vowel is typologically unusual (Hayes 1995), but straightforward to model using various alignment constraints. I argue that this is the phonologically unmarked pattern in Karuk, which arises without interference from tones in the input or other morphological complications. The mechanisms which produce exceptions to this default, and the reasoning for tying this pattern to agreement prefix morphology are discussed in the following chapters.

Bright (1957:49-50) describes this basic pattern and labels it Recessive Accentuation. However, I find that this pattern is far more widespread in the language than the situations in which Bright’s Recessive Accentuation would apply. Numerous other accentual patterns which Bright explains in complex derivational terms in fact converge upon this single pattern on the surface.

This pattern arises at the word level¹ when the input has no prosodic prominence due to morphological processes which erase input tone. It also results when the input to ‘weak’ morphological processes contain tone in configurations other than the protected bimoraic HL structure (detailed in Chapter 6). These processes include all nominal compounding and prefixation, as well as much verbal prefixation and suffixation. Examples of basic accentuation in inflected verbs are given in (136). Examples of basic accentuation in nominal prefixation and compounding are given in (137).

(136) Inflected verbs with basic accentuation

- a. *ku(nímnish)*
 kun- *imnish*
 3pl(>3s)- cook

¹This basic accentuation pattern is placed after the word is syllabified and deletable word-final vowels have been deleted (see §3.3.1).

‘they cook (it)’ [JS WB_KL-21:11]

b. (*ná'aath*)*va*

na- *'ááthva*
2s/3s>1s- be.afraid

‘I am afraid’ [LA LA-01:1]

c. *kun(sánpíith)vutihánik*

kun- *sar* *-píithvu* *-tih* *-ánik*
3pl(>3s)- carry.things -around.PLURACT -DUR -ANC

‘they had been carrying them around long ago’ [PM JPH.TKIC-IV.3:4]

d. *tu'írih(shúroo)*

ta= *u-* *'írihshuru* *-va*
PERF= 3s(>3)- drip.off -PLURACT

‘it is dripping off’ [JS WB_KL-92:80]

e. *ipma(hóónkoo)nara*

∅- *ipmahóónkoon* *-ara*
3s.NEG- feel -NEG

‘he didn’t feel’ [JS WB_KL-04:172]

(137) Inflected/derived nouns with basic accentuation

a. *mu(píkship)*

mu- *píkship*
3sPOSS- shadow

‘his shadow’ (Bright 1957:49)

b. (*mútaat*)

mu- *táát*
3sPOSS- mother

‘his mother’ [JS WB_KL-32:52]

c. (*múvaa*)*san*

mu- *váásan*
3sPOSS- enemy

‘his enemy’ (Bright 1957:49)

- d. *arara(píkship)*
áraara pikship
 person shadow
 ‘a person’s shadow’ (Bright 1957:49)
- e. *pufich(íkyee)pux*
púúfich ikyéépux
 deer hide
 ‘deerhide’ (Bright 1957:49)
- f. *ish(kéésh’aas)*
ishkéèsh áás
 river water
 ‘river water’ (Bright 1957:49)

5.1.2 An unusual foot

The inventory of bounded foot types as described by Hayes (1995) are given in (138). A schematic representation of the high-before-long foot preferred in Karuk is given in (139) for comparison.

(138) Foot inventory (after Hayes 1995:71)

- a. (ó σ) Syllabic trochee
- b. (ó σ) (ó)
 | | ^
 μ μ μ μ Moraic trochees
- c. (σ ó) (ó)
 | ^
 μ μ μ Iambs

(139) Unmarked foot in Karuk

- (ó σ) High-before-long trochee
 ^
 μ μ

The preferred foot in Karuk is a left-headed binary foot, that is, a trochee. In this case, prosodic prominence is associated with high tone (pitch peak) and stress (higher intensity). The non-head of the foot is associated with a drop in pitch and intensity. The initial syllable is quantity insensitive, as expected in a syllabic trochee (138a). As I will show in §6.2, moraic trochees (176b) do play a role in Karuk, but do not account for the accentual behavior described here.

The high-before-long trochees seen in Karuk are typologically unusual in that vowel length is associated with the rightmost syllable. Length in the rightmost syllable is a pattern frequently seen with iambic feet (138c), where duration is associated with prosodic prominence. Therefore, the unmarked case in Karuk represents a foot type not included in Hayes' inventory. Nonetheless, the Karuk pattern actually reinforces the rhythmic groupings underlying the Iambic/Trochaic Law (Hayes 1995:79-80), but requires a more nuanced view of the term 'prominence'. According to the Iambic/Trochaic Law, elements contrasting in intensity lead to groupings with initial prominence, and elements contrasting in duration lead to groupings with final prominence. Based on these principles, it follows that initial intensity in combination with final duration would create a very strong grouping effect, but relative prominence of the two elements would be open to interpretation. The fact that high pitch is associated with the initial syllable adds to the perception of initial prominence in these feet in Karuk.

An example of a word containing the least marked foot for Karuk is shown in (140). This foot is aligned with the rightmost long vowel in a word.

(140) *usasipúnihva* Word containing a long vowel

σ	σ	σ	σ	σ	σ		σ	σ	σ	σ	σ	σ
				^						^		
μ	μ	μ	μ	μ	μ		μ	μ	μ	μ	μ	μ
				v						v		
u	sa	si	pu	nih	va	→	u	sa	si	(pu	nih)	va
							H	L				

When no long vowel is present, a disyllabic trochee is simply built at the right edge of the word. This foot contains two short-voweled syllables, again with the high tone associated with the leftmost syllable, as in (141).

(141) *kunpachnutúchnut* Word containing all short vowels

σ	σ	σ	σ	σ		σ	σ	σ	σ	σ
μ	μ	μ	μ	μ		μ	μ	μ	μ	μ
kun	pach	nu	tuch	nut	→	kun	pach	nu	(tuch	nut)
								H	L	

5.2 Basic constraint rankings and justifications

5.2.1 Words with no long vowels

In this section, the core constraints required for the penultimate pattern are discussed. In a word of all short vowels, one disyllabic foot is built at the right edge of the word. A high tone is aligned with the left edge of the foot. Examples of words with all short vowels following this footing pattern are given in (142).

- (142) a. (*níkrav*) ‘I grind (it)’ [NR WB_KL-83:1]
 b. (*káhih*) ‘Shasta language’ [D:*káhih*]
 c. *ku(nímnish)* ‘they cook’ [JS WB_KL-21:11]
 d. *ax(rátip)* ‘gooseberry bush’ [D:*axrátip*]
 e. *muku(níthvuy)* ‘their names’ [JS WB_KL-0:2]
 f. *pananim(sháxvuh)* ‘my gum’ [LB WB_KL-18:26]
 g. *kunpachnu(túchnut)* ‘they nibble’ (Bright 1957:63)

A penultimate stress pattern with a left-headed (trochaic) foot at the right edge of the word is very common among languages with fixed stress (Goedemans & van der Hulst 2013), and is easily derived using familiar constraints given in (143)–(148).

- (143) GRAMMATICAL WORD = PROSODIC WORD (GRWD=PRWD)
 A grammatical word must be a prosodic word. Assign one violation mark for a grammatical word that contains no metrical feet. (Kager 1999)
- (144) FOOT BINARITY (MIN) (FT-BIN)
 Feet are minimally binary under a syllabic analysis. Assign one violation mark for every foot which contains less than two syllables. (McCarthy & Prince 1996; Prince & Smolensky 1993/2004)
- (145) FOOT BINARITY (MAX) (FT-BIN(MAX))
 Feet are maximally binary under a syllabic analysis. Assign one violation mark for every foot which contains more than two syllables. (McCarthy & Prince 1996; Prince & Smolensky 1993/2004)
- (146) PARSE SYLLABLE (PARSE-SYL)
 Syllables are parsed into feet. Assign one violation mark for each syllable that is unfooted.

- (147) **ALL-FEET-RIGHT (ALL-F_T-R_T)**
 Every foot stands at the right edge of a prosodic word. Assign one violation mark for each syllable separating the right edge of a foot from the right edge of the prosodic word. (after McCarthy & Prince 1993)
- (148) **RHYTHM_{TYPE}=TROCHEE (TROCHEE)**
 Feet have initial prominence. Assign one violation mark for each foot which does not have initial prominence. No violations are assigned for degenerate feet of only one syllable. (Prince & Smolensky 1993/2004)

First, the constraints regulating the parsing of words into feet will be addressed. In the tableau in (149), candidate (a), which has no feet, is ruled out by the constraint **GRAMMATICAL WORD = PROSODIC WORD**. Candidate (b), with a single unbounded foot, fails because it violates **FOOT BINARITY (MAX)**. In fact, these constraints are never violated in Karuk, so candidates that violate them will not be shown in further tableaux. Candidate (c), which is maximally parsed into feet and has no violations of **PARSE SYLLABLE**, fails because it violates minimal foot binarity, so **FOOT BINARITY (MIN)** must outrank **PARSE SYLLABLE**. Candidate (d) with a single binary foot wins because it does not violate **FOOT BINARITY (MIN)**.

- (149) **GRAMMATICAL WORD = PROSODIC WORD, FOOT BINARITY (MAX)**
 >>
FOOT BINARITY (MIN) >> PARSE SYLLABLE

	mupikship	GrWd=PrWd	F _T -BIN(MAX)	F _T -BIN	PARSE-SYL
a.	mupikship	*!			***
b.	(mupikship)		*!		
c.	(mu)(pikship)			*!	
d.	[☞] mu(pikship)				*

Tableau (150) shows that candidate (b) with a single binary foot at its right edge, wins over candidate (c) (or any other potential candidate with a non-right-aligned foot). In order for this to occur, some constraint aligning a foot with the right edge of the word must be active. It is better to have one foot at the right edge of the word, as in candidate (b), than to have a foot at the right edge of the word and parse the remaining syllables into additional binary feet, as in candidate (d). Therefore, it is clear that the constraint regulating the right-alignment is **ALL-FEET-RIGHT** (every foot must be at the right edge of the word) rather than **ALIGN-RIGHT** (a foot must be at the right edge of the word), and this constraint must outrank **PARSE SYLLABLE**. **PARSE SYLLABLE** is so low-ranked as to be inactive in Karuk, and will not be displayed in further tableaux. Candidate (a) has no violations of **ALL-FEET-RIGHT**, like the winning candidate, but it fails because it violates **FOOT BINARITY (MIN)**, so **FOOT BINARITY (MIN)** must dominate **ALL-FEET-RIGHT**.

(150) FOOT BINARITY (MIN) \gg ALL-FEET-RIGHT \gg PARSE SYLLABLE

	ararapikship	FT-BIN	ALL-FT-RT	PARSE-SYL
a.	ararapik(ship)	*!		****
b.	☞ arara(pikship)			***
c.	(ara)rapikship		*!***	***
d.	a(rara)(pikship)		*!*	*

Next, a constraint that specifies the headedness of the foot is needed. In the simple cases of words of all short vowels, feet are clearly left-headed, so a TROCHEE rhythm type constraint, stating that feet have initial prominence, is used. This makes sure that, with the footing seen in the winning candidates above, prominence falls on the penultimate syllable, resulting in *mu(píkship)* and *arara(píkship)*, rather than the ultimate syllable, resulting in **mu(pikshíp)* or **arara(pikshíp)*. This constraint is not apparently violated in Karuk, so is ranked highly with the other undominated constraints.

5.2.2 Words with one long vowel

In this section, the set of constraints established above is elaborated to account for the high-before-long pattern of prominence seen in polysyllabic words containing one long vowel. Examples of words containing a long vowel that follow this footing pattern are given in (151). These words show that when a long vowel is present in the word, prominence is not necessarily penultimate. In these words, the long vowel must be footed, yet stress is not drawn to the heavy syllable containing it, as might be expected. The resulting foot form is still considered a Trochee and will not violate TROCHEE. That is, for this language, phonemic vowel length does not play into “prominence”.

- (151) a. (*ná'iin*) ‘(it) is wrong with me’ [WB_KL-14:9]
 b. (*mítaat*) ‘your mother’ [D:táat]
 c. (*ná'aax*)*ha* ‘I bleed’ (Bright 1957:62)
 d. *ku(máthuuf)* ‘some creek or other’ (Bright 1957:57)
 e. *kun(tápkwup)* ‘they like (him)’ [WB_KL-60:22]
 f. (*úmniish*)*tih* ‘he’s cooking’ (Bright 1957:62)
 g. *va'i(rípraam)* ‘its mine’ [DAF_KT-05b:2]
 h. *ikma(háchraam)* ‘sweathouse’ [D:ikmaháchraam]
 i. *ku(nímnish)**tih* ‘they’re cooking’ (Bright 1957:62)

- j. *kun('áara)rahitih* ‘they were living’ [WB_KL-04:122]
 k. *upikyafi(páyaach)ha* ‘he won (it) back’ [WB_KL-13:16]
 l. *apxantichsa(híshyuu)xach* ‘domestic rabbit’ [D:apxantichsahíshyuuach]
 m. *kunpamfipishni(háyaach)ha* ‘they gathered together’ [WB_KL-13:2]
 n. *aptinihich(sánsaan)hitihan* ‘type of plant’ [D:aptinihichsánsaanhitihan]

The tendency for right-alignment of feet in a prosodic word is in tension with a requirement for a foot to contain a long vowel. The requirement that a foot contain a long vowel, when present, is captured by the alignment constraint in (152).

- (152) ALIGN(Foot, R, $\sigma_{\mu\mu}$, R) (ALIGN-R($\sigma_{\mu\mu}$))
 A foot must have a syllable containing a long vowel at its right edge. Assign one violation mark for each foot that does not have a final syllable containing a long vowel. (after McCarthy & Prince 1993)

In the tableau in (154), candidate (a) with one right-aligned foot loses to candidate (c), so ALIGN(Foot, R, $\sigma_{\mu\mu}$, R) must dominate ALL-FEET-RIGHT. It is not enough for the long vowel to be footed, because candidate (b), which has fewer violations of ALL-FEET-RIGHT still loses to candidate (c), thus the long vowel alignment constraint must be defined as it is. An additional CULMINATIVITY constraint, given in (153), is required to rule out candidates with more than one foot, such as (d), since two feet can be built in a word like this without any additional violations of ALL-FEET-RIGHT.

- (153) CULMINATIVITY (CULM)
 A prosodic word has a maximum of one foot. Assign one violation mark for each foot beyond one in a prosodic word.

In the present set of data, CULMINATIVITY is unviolated, so this constraint is ranked highly and is unranked with respect to the other undominated constraints.

- (154) TROCHEE, CULMINATIVITY
 >>
 ALIGN(Foot, R, $\sigma_{\mu\mu}$, R), FOOT BINARITY (MIN) >>> ALL-FEET-RIGHT

	kun'araarahitih	TROCHEE	CULM	ALIGN-R($\sigma_{\mu\mu}$)	FT-BIN	ALL-FT-RT
a.	kun'araara(hítih)			*!		
b.	kun'a(ráára)hitih			*!		**
c.	☞ kun('áara)rahitih					***
d.	kun('áara)ra(hítih)		*!			***

The tableau in (156) shows that an unfaithful candidate (b) with vowel lengthening satisfying both $\text{ALIGN}(\text{Foot}, \text{R}, \sigma_{\mu\mu}, \text{R})$ and ALL-FEET-RIGHT loses to a faithful candidate (a). Therefore, a DEP constraint, given in (155), must be ranked above $\text{ALIGN}(\text{Foot}, \text{R}, \sigma_{\mu\mu}, \text{R})$.

(155) DEP- μ

Assign one violation mark for every mora in the output that does not have a correspondent in the input. (after McCarthy & Prince 1995a)

(156) TROCHEE, DEP- μ

>>

$\text{ALIGN}(\text{Foot}, \text{R}, \sigma_{\mu\mu}, \text{R}), \text{FOOT BINARITY (MIN)} \gg \text{ALL-FEET-RIGHT}$

ararapikship	TROCHEE	DEP- μ	ALIGN-R($\sigma_{\mu\mu}$)	FT-BIN	ALL-FT-RT
a. $\text{arara}(\text{píkship})$			*		
b. $\text{arara}(\text{píkshiip})$		*!			

5.2.3 Words with more than one long vowel

In words with two adjacent long vowels, such as those listed in (157), both of the vowels are contained in a single foot. Prominence aligns with the left edge of the foot, as usual.

(157) a. *nu(pááxkeet)* ‘we won’ (Bright 1957:63)

b. *upma(hóónkoon)* ‘he feels’ [DJ WB_KL-60:3]

c. *ipma(hóónkoo)nara* ‘he didn’t feel’ [JS WB_KL-04:172]

The tableau in (158) shows that constraint ranking established above will result in this footing. Candidate (a) loses because it fails to align the foot with a long vowel. While low-ranked, ALL-FEET-RIGHT is still active in words with long vowels. Candidate (b) wins out over candidate (c) because while each contain a perfectly acceptable foot as far as long vowel alignment goes, the foot in (b) is further to the right of the word than the foot in (c), so the candidate has fewer violations of ALL-FT-RT .

(158) TROCHEE, DEP- μ

>>

$\text{ALIGN}(\text{Foot}, \text{R}, \sigma_{\mu\mu}, \text{R}), \text{FOOT BINARITY (MIN)} \gg \text{ALL-FEET-RIGHT}$

ipmagoonkoonara	TROCHEE	DEP- μ	ALIGN-R($\sigma_{\mu\mu}$)	FT-BIN	ALL-FT-RT
a. $\text{ipmagoonkoo}(\text{nára})$			*!		
b. $\text{ipma}(\text{hóónkoo})\text{nara}$					**
c. $\text{ip}(\text{máhoon})\text{koonara}$					***!

For a word of this shape, it would be reasonable to ask whether candidate (b) wins because it is the only candidate that foots both long vowels in the word. In that case, a constraint requiring long vowels to be footed could take the place of $\text{ALIGN-R}(\sigma_{\mu\mu}, \text{FT})$. Words with non-adjacent long vowels show that this is not the case, and that the constraints shown here are, in fact, the correct ones.

In a word with two long vowels that are not adjacent, such as those listed in (159), only the rightmost is footed. Again, prominence aligns with the left edge of that foot.

- (159) a. *kunpaxee(páyaach)ha* ‘they won (it) from them’ [CP WB_KL-13:8]
 b. *kun’uum(xávxaav)tih* ‘they pulled them up by the roots’ [ED WB_KL-85:25]
 c. *akviinakichkaru’a(rákaas)* ‘size of dentalium shell’ [D:akviinakichkaru’arákaas]

It now becomes clear why the constraint active in aligning the foot with a long vowel must be along the lines of “a foot has a long vowel” rather than “a long vowel must be footed.” In the tableau in (160), candidates (c) and (d), which foot the two long vowels present in the input, lose to candidate (a), which foots only one long vowel. Candidate (c) loses because it violates CULMINATIVITY . Candidate (d) has a ternary foot, which satisfies $\text{ALIGN-R}(\sigma_{\mu\mu})$ and TROCHEE , but violates $\text{FOOT BINARITY (MAX)}$. The presence of both $\text{ALIGN}(\text{Foot}, \text{R}, \sigma_{\mu\mu}, \text{R})$ and ALL-FEET-RIGHT ensure that the rightmost long vowel, and only the rightmost long vowel, will be footed. The rightmost single foot possible with a long vowel at its right edge will incur the least violations of ALL-FEET-RIGHT , as in candidate (a). Any foot further to the left, such as in candidate (b), will be less optimal.

- (160) $\text{FOOT BINARITY (MAX)}, \text{CULMINATIVITY}$
 \gg
 $\text{ALIGN}(\text{Foot}, \text{R}, \sigma_{\mu\mu}, \text{R}) \gg \text{ALL-FEET-RIGHT}$

kunpaxee payaachha	FT-BIN(MAX)	CULM	ALIGN-R($\sigma_{\mu\mu}$)	ALL-FT-RT
a. ☞ kunpaxee(páyaach)ha				*
b. kun(páxee)payaachha				**!*
c. kun(páxee)(páyaach)ha		*!		****
d. kunpa(xéépayaach)ha	*!			*

5.2.4 Words with limited prosodic domain

Agreement prefixes are almost always required on Karuk verbs. The sole exceptions are a few cells in the optative and negative paradigms which are zero-marked in the prefix slot, but these have suffixes marking the optative or negative. This means that even a monosyllabic verb root never surfaces as monosyllabic, so in even in the smallest stems shown so far, a disyllabic trochee could always be built, yielding high-before-long accentuation. However,

Karuk agreement prefixes have two different metrical behaviors: one set is included within the domain for accentuation, and another set is not. This phenomenon is explored in depth in Chapter 8, but for the present discussion it will simply be stipulated that NON-COHERING prefixes fall outside an accentable window on Karuk verb stems. Therefore, with a non-cohering prefix, a monosyllabic verb root is, in effect, too small for a disyllabic foot. In this case, accent falls on the root. Similarly, it is possible with a non-cohering prefix that the rightmost long vowel in a word is already at the very left edge of the accentable domain, so accent cannot fall to the left of it, as would be expected in a high-before-long configuration. In this case, accentuation falls on the long vowel itself.

Examples are given in (161), with the accentable prosodic stem (P-stem) shown in square brackets.

- (161) a. *kun*[(*máh*)]_P ‘they see (it)’ [CP WB_KL-52:7]
 b. *kun*[(*’úñ*)]_P ‘they live’ [NR WB_KL-49:1]
 c. *u*[(*mááh*)*tih*]_P ‘he saw him’ [NR WB_KL-01:2]
 d. *nu*[(*pááh*)*tiship*]_P ‘we carried it back up’ [NR WB_KL-83:30]
 e. *kun*[(*’ááh*)*punma*]_P ‘they found out’ [MO WB_KL-38:15]

When an monosyllabic root is paired with a non-cohering prefix, a degenerate foot is built, and prominence falls on the root. Tableau (162) shows that candidate (b), with a degenerate foot wins out over candidate (a), with no feet. This makes it clear that FOOT BINARITY (MIN) is violated to satisfy GRAMMATICAL WORD = PROSODIC WORD. Candidate (c), in which the degenerate foot has two moras, also loses, indicating that the foot binarity constraints are correctly defined as a syllabic, and not moraic, requirement for feet to be binary.

- (162) GRAMMATICAL WORD = PROSODIC WORD, DEP- μ \gg FOOT BINARITY (MIN)

	kun-[mah] _P	GRWD=PRWD	DEP- μ	FT-BIN
a.	kunmah	*!		
b.	☞ kun(<i>máh</i>)			*
c.	kun(<i>mááh</i>)		*!	*

The tableau in (163) shows that the correct results are obtained in a longer word when ALIGN(Foot, R, $\sigma_{\mu\mu}$, R) outranks FOOT BINARITY (MIN). Candidate (a), which has a degenerate foot that includes the long vowel, wins over candidate (c), which leaves the long vowel unfooted, violating ALIGN(Foot, R, $\sigma_{\mu\mu}$, R). Candidate (b) loses because while the long vowel is footed, it is not aligned with the right edge of the foot. Candidate (d) has a flipped foot, in which the long vowel is aligned with the non-head of the foot. This candidate loses, showing that the rhythm type constraint TROCHEE is correctly ranked highly. The unfaithful

candidate (e) loses because it violates DEP- μ , so DEP- μ also clearly must dominate FOOT BINARITY (MIN).

(163) TROCHEE, DEP- μ

»

ALIGN(Foot, R, $\sigma_{\mu\mu}$, R) » FOOT BINARITY (MIN) » ALL-FEET-RIGHT

nu-[paatiship] _p	TROCHEE	DEP- μ	ALIGN-R($\sigma_{\mu\mu}$)	FT-BIN	ALL-FT-RT
a. ☞ nu(páá)tiship				*	**
b. ☞ nu(páátí)ship			*!		*
c. ☹ nupaa(tíship)			*!		
d. ☞ nu(paátí)ship	*!		*		*
e. ☹ nupaa(tíshiip)		*!			

Candidates (a) and (b) have the same phonetic form, but candidate (a) satisfies ALIGN(Foot, R, $\sigma_{\mu\mu}$, R) and violates FOOT BINARITY (MIN), while candidate (b) satisfies FOOT BINARITY (MIN) and violates ALIGN(Foot, R, $\sigma_{\mu\mu}$, R). The tableau in (164) shows that the reverse ranking of ALIGN(Foot, R, $\sigma_{\mu\mu}$, R) and FOOT BINARITY (MIN) would not obtain the correct results. Candidate (a) loses to candidate (b), which is an equally possible surface form, because it violates FOOT BINARITY (MIN). However, with this constraint ranking, candidate (b), would lose to the unattested candidate (c), which has fewer violations of ALL-FEET-RIGHT.

(164)

nu-[paatiship] _p	TROCHEE	DEP- μ	FT-BIN	ALIGN-R($\sigma_{\mu\mu}$)	ALL-FT-RT
a. ☞ nu(páá)tiship			*!		**
b. ☞ nu(páátí)ship				*	*!
c. ☹ nupaa(tíship)				*	
d. ☞ nu(paátí)ship	*!			*	*
e. ☹ nupaa(tíshiip)		*!			

5.3 Summary

In this chapter, a widespread pattern of prosodic prominence in Karuk has been introduced, and a HIGH-BEFORE-LONG foot structure has been proposed to account for it. This foot is unusual because it has initial prominence (in terms of intensity and pitch), but final length (in terms of vowel duration). A constraint ranking has been presented which generates this structure. The constraints are all familiar ones with the exception of an alignment constraint ALIGN(Foot, R, $\sigma_{\mu\mu}$, R), which ensures that a foot have a long vowel at its right edge,

independent of foot prominence. A summary of the complete constraint ranking established in this chapter is given in (165).

- (165) GRAMMATICAL WORD = PROSODIC WORD,
 FOOT BINARITY (MAX), TROCHEE, CULMINATIVITY, DEP- μ
 >>
 ALIGN(Foot, R, $\sigma_{\mu\mu}$, R)
 >>
 FOOT BINARITY (MIN)
 >>
 ALL-FEET-RIGHT
 >>
 PARSE SYLLABLE

The constraints active here differ greatly from those that determine prominence in roots. In particular, $*(C)\acute{V}C$ is inactive, since not only is H on CVC allowed, it is preferred, as evidenced by the gemination of geminable consonants following accent in an open syllable (§2.1.4). I have analyzed this distinction as tone-based constraints taking priority at the root level, and metrical constraints taking priority at this level of inflection. It would also be possible to analyze the distinction as two different metrical types, with a moraic trochee taking precedence at the root level and a high-before-long foot taking precedence at the inflectional level. In either case, reference to the alignment of tone and metrical structure and quite different constraint rankings are required at each level.

The metrical constraints seen here account for patterns of prominence in half of the instances of inflected verbs in the corpus, and in a large portion of possessed nouns and nominal compounds. This is to say that the pattern is found in a heterogenous grouping of Karuk words, and can be considered the unmarked, elsewhere case for prominence in the language. However, different surface patterns can obtain which this model does not account for. Therefore, the model must be complicated somewhat to explain patterns seen in underived roots, and in some derived forms. In the following chapters, these other patterns which are not accounted for by the basic set of constraints introduced here will be investigated, and I will show that certain morphology can affect the placement of prosodic prominence, and that even the basic pattern is best understood as being linked to particular morphological constructions itself.

Chapter 6

Protected HL structure

6.1 Introduction

As mentioned in Chapter 5, there is one major exception to the basic derived accentuation pattern in Karuk: a particular tone-syllable alignment which, when present in the input, blocks application of the basic derived pattern. This alignment is a high tone followed by a low tone realized over exactly two moras, which I call the PROTECTED HL structure. This can be a HL falling tone on a single long vowel, as in (166a), or a HL sequence realized over two short-voweled syllables, without an intervening coda consonant, as in (166b). Whether or not a coda consonant follows the HL sequence is inconsequential. Blocking by this structure accounts for prominence in 35% of verb tokens in the corpus.

- (166) a. *axváàh*
 ‘head’ [VS VS-25:5]
- b. *'ápuroon*
 ‘magic charm’ [MO WB_KL-28:22]

In his morphophonemic analysis of Karuk accentuation, Bright (1957:45-46) observes that his Circumflex accent, and his Acute accent in a $\acute{V}CV$ sequence, are, with a few exceptions, exempt from processes which, in his analysis, move accent. He calls stems with accentuation of this kind Fixed Accent stems. My protected HL corresponds directly to Bright’s notion of Fixed Accent, and I generally agree with his observations of the details of the phenomena. My aims here are to provide a unified description of the accentual patterns in this category, and by casting them in modern phonological terms, to offer insight into how they fit into the greater prosodic system of the language, and why they might behave exceptionally.

The two-syllable version of the protected HL structure is, of course, the same configuration found in roots with underlying high tone discussed in Chapter 4. However, it is not enough to say that basic derived accentuation applies only to underlyingly unaccented roots and underlying tone surfaces otherwise. Underlying root tone can be erased by certain strong derivational morphology, and there is evidence for underlying tone which does not

form a protected HL. Furthermore, underlyingly unaccented roots can gain H tone¹ through derivation, and while this tone can incidentally fall into a protected HL, it need not. For these reasons, the configuration that blocks application of the basic derived pattern is best defined solely in terms of tone-syllable alignment, rather than in more abstract terms of underlying tone, or of weak/strong or dominant/recessive accentuation associated with specific morphology used in classical analyses of Indo-European accent systems (see, e.g., Halle & Mohanan 1985; Halle & Vergnaud 1987; Melvold 1989; see also Czaykowska-Higgins 1993).

The HL structure in and of itself is not particularly unusual or marked in a cross-linguistic sense, as it forms a moraic trochee, with H tone associating to the head of the foot (Hayes 1995; de Lacy 2002). What is unusual about the protected HL phenomenon is that this perfect moraic trochee is not the default output of prominence constraints at inflection. As I will show, the persistence of the protected HL tone-syllable alignment through the derivation requires faithfulness to a positive definition, and cannot be attributed to avoidance of marked structures as could the placement of tone in roots in Chapter 4. The protected HL tone-syllable alignment is marked in that it will not be created at the expense of a more optimal alignment for basic prominence. Yet when it is present, faithfulness to it blocks the creation of an unmarked high-before-long foot. Furthermore, the phenomenon reveals that different metrical preferences are active at different points in the derivation. In this way, the protected structure phenomenon poses a perplexing problem for modeling in an OT approach because Faithfulness to a specific structure in the input is required, yet this structure is never the default output of other constraints.

The protected status of the HL structure is a general pattern in the language and is seen not only at the application of basic derived accent, but at several –though not all– levels of the morphology. This chapter provides a discussion of this phenomenon on its own, because it cannot be associated with just one set of morphology, and it provides important groundwork for understanding the various processes affecting Karuk accentuation. It will be referred back to as the phenomenon comes up in discussion of various derivational processes.

6.2 Protected configuration

6.2.1 Where effects of protected HL can be seen

The HL configuration has a special protected status at multiple levels of the derivation. A protected HL in the input has an effect on the output for both nouns and verbs in basic derived accentuation associated with inflection. The protected HL structure also blocks changes associated with Level 2 derivational suffixes (§7.3) in verbs. Level 1 derivation (§7.2), and multi-level strong suffixes (§7.5) are not sensitive to a protected HL structure in the input, because attachment of these morphemes erases all input accentuation in verbs.

¹H tone is always followed by L, unless final, so it is not important to this analysis whether derived tone is considered to be a HL or a H with the following L supplied automatically.

Basic derived accentuation

An important exception to the accentuation pattern described in Chapter 5 is that it does not apply when a protected HL configuration is present in the input. Basic derived accentuation normally applies to possessed nouns (marked with a possessive prefix) and to compounded nouns (where the first element acts as a prefix and the second element as a stem). A protected HL structure in a noun stem (or second element of a compound) will block application of basic derived accent.² Basic derived accentuation also normally applies to inflected verbs, but is blocked by a protected HL structure in the verb stem.

For comparison, examples of inflected verbs and nouns where basic high-before-long accentuation does not apply are given below in (167)–(168). In an inflected word containing a long vowel, prominence is expected to fall on the syllable preceding the long vowel, but in the examples in (167), it does not. In an inflected word containing only short vowels, prominence is expected to be penultimate, but in the examples in (168), it is not. In each of these cases, the unmarked high-before-long placement of prominence does not surface when the protected bimoraic HL structure is present. Instead, a moraic trochee is built around the protected HL.

(167) High-before-long prominence blocked by protected HL

a. *up(váà)ram* (**úpvaa)ram*, cf. *úpthaaniv* [MO WB_KL-33:10])

u- *ipváàram*

3s(>3)- go.back

‘she went home’

[PM JPH_PHM-24-343a:30]

b. *kun'iru(véèh)riv* (**kun'i(rúveeh)riv*, cf. *usasipúniihva* [JS WB_KL-87:2])

kun- *'iruvéèh riv*

3pl(>3s)- stand.(long.objects)

‘they were standing’

[JS WB_KL-08:39]

c. *mux(váàh)* (**múxvaah*), cf. *múthvaay* [VS D:*ithvaay*])

mu- *axváàh*

3sPOSS- head

‘her head’

[VS D:*axváàh*]

²A protected HL in the first element of the compound is not retained because all but the final syllable of this element fall outside the prosodic domain for accentuation.

One compounded noun with the protected structure in the rightmost element found in the lexicon showed the default pattern (*ishpuk* ‘money’ + *kít* ‘female grand relative through woman’ → *ishpúkiit* ‘type of wasp’), and one inexplicably showed the opposite pattern (*ípaha* ‘tree’ + *xanchúífich* ‘frog’ → *ípahaxanchúífich* ‘tree frog’). I presume these words have been subject to additional compounding or contraction processes which are no longer visible in the stem, or have been otherwise reanalyzed.

- d. *mu('ápu)roon* (**mu'a(púroon)*, cf. *muchíshiih* [VS VS-19:4])
mu- 'ápuroon
 3sPOSS- magic.charm
 ‘her magic charm’ [MO WB_KL-28:22]
- e. *afishnihāpīh(nîch)* (**afishnihān(pîhniich)*, cf. *ipahaxáyviish* [D:*ipahaxáyviish*])
afishrîhan pîhnîch
 young.man old.man
 ‘bachelor’ [D:*afishnihānpîhnîch*]

(168) Penultimate prominence blocked by protected HL

- a. *kun('ika)kurih* (**kun'ika(kúrih)*, cf. *kuniptáthrip* [JS WB_KL-75:9])
kun- 'íkakurih
 3pl(>3s)- (pl.)jump.into.water
 ‘they jumped in’ [LB WB_KL-22:28]
- b. *ukriv(rúhu)nih* (**ukrivru(húnih)*, cf. *nuvuxichvúxich* [VSu VSu-04:2])
u- ikrivrúhunih
 3s(>3)- roll.downhill
 ‘he rolled downhill’ [JS WB_LA78.1-019:57]
- c. *iv('ávah)kam* (**iv'a(váhkam)*, cf. *achípvuuh* [D:*achípvuuh*])
iiv 'ávahkam
 house on.top
 ‘(on the) roof’ [NR WB_KL-34:31]

Level 2 Derivation

The effect of the protected HL structure can also be seen earlier in the derivation. Level 2 derivational suffixes can trigger stem-final vowel lengthening or stem-final accentuation in verb roots or stems they attach to. These effects themselves are discussed in detail, and are analyzed as being part of the same process, in §7.3. Here I take them as a given and focus on how a protected HL configuration in the input blocks their application.

The examples in (169) show stem-final lengthening triggered by derivational suffixes on verb roots that do not have a protected HL structure in the input. In each of these examples, the disyllabic verb root contains two short vowels underlyingly, and in each, the vowel in the final root syllable (underlined) surfaces as long.

(169) Stem-final lengthening

a. *kunívyihvarak*

kun- *ivyih* *-varak*
 3pl(>3s)- (pl.)come -down.from.upriver
 ‘they came down from upriver’

[NR WB_KL-02:15]

b. *úkyimkurih*

u- *ikyiv* *-kurih*
 3s(>3)- fall -into.water
 ‘he fell in (the water)’

[MO WB_KL-05:59]

By contrast, the examples in (170) show the same suffixes attaching to verb roots that contain the protected HL configuration (marked with parentheses). In these examples, no lengthening takes place in the final root syllables (underlined).

(170) Stem-final lengthening blocked by protected HL

a. *kunith(vírip)varak*

kun- *ith(vírip)* *-varak*
 3pl(>3s)- (two.)run -down.from.upriver
 ‘they ran down from upriver’

[CP WB_KL-51:33]

b. *kun(‘íkak)kurih*

kun- (*‘íkak*) *-kurih*
 3pl(>3s)- jump -into.water
 ‘they jumped in’

[LB WB_KL-22:28]

The examples in (171) show prominence falling on the final syllable of the verb root (underlined), directly before the derivational suffix. The stem-final placement of tone is triggered by the derivational suffixes *-kurih*, *-unih*, and *-rav*, in these examples. This process affects stems which have no underlying tone, as in (171a), and also stems which have underlying tone, as in (171b)–(171c), as long as the underlying tone is not in the protected configuration.

(171) Stem-final prominence

a. *kunixyákurih*

kun- *ixya* *-kurih*
 3pl(>3s)- throw.(pl.) -into.water
 ‘they threw them in (the water)’

[MO WB_KL-55:13]

- b. *ukrivúhunih*
u- ikrívruh -unih
 3s(>3)- roll -down
 ‘he rolled downhill’ [JS WB_LA78.1-019:57]
- c. *poo`iinkáravahaak*
pa= u-`iínka -rav -ahaak
 NOMZ= 3s(>3)- be.on.fire -in -IRR
 ‘when he burns up’ [D:iinkárav (KS44. Grizzly and hazelnuts 037)]

For comparison, the examples in (172) show the same suffixes (*-kurih*, *-unih*, and *-rav*) with verb stems that have the protected HL configuration in the input (marked with parentheses). In these words, the protected HL configuration is retained at the surface, and the suffixes are unable to trigger placement of tone in the final stem syllables (underlined).

(172) Stem-final prominence blocked by protected HL

- a. *u(súru)kurihahith*
u- (súru) -kurih -ahi -tih
 3s(>3)- make.hole -into.water -ESS -DUR
 ‘a hole was made into (the floor)’ [JS WB_KL-76:8]
- b. *kunith(víri)punih*
kun- ith(víri)p -unih
 3pl(>3s)- (two.)run -down
 ‘they (two) are running downhill’ [VS VS-19:4]
- c. *u(`áha)ram*
u- (`áha) -rav
 3s(>3)- drive.animals -in
 ‘he chased it’ [JS WB_KL-04:78]

6.2.2 Sources of HL configuration

The most important feature of the protected HL phenomena is that it applies wherever the configuration arises, for any reason. This means that its protected status cannot be attributed to underlying tone which is retained throughout the derivation. The protected structure can be present in a root, but a $\acute{V}CV$ configuration can also arise through derivation (as seen in several of the examples in the preceding section), and a $\acute{V}\acute{V}$ can result from intervocalic glide deletion.

Examples of words in which the protected HL structure is present in roots are given in (173), with the underlying HL structure underlined.

(173) Underlying protected HL

a. *u(héèr)*

u- *ihéèra*

3s(>3)- smoke

‘(s)he smokes’

[PM JPH.TKIC-III.4:2]

b. *na(xúri)ha*

na- *xúrihi*

2s/3s>1s- be.hungry

‘I am hungry’

[VS VS-05:10]

c. *kun(’íkà)kurih*

kun- *íkàk* *-kurih*

3pl(>3s)- (pl.)jump -into.water

‘they jumped in’

[LB WB_KL-22:28]

d. *kunith(víri)punih*

kun- *ith**vírip* *-unih*

3pl(>3s)- (two.)run -down

‘they (two) are running downhill’

[VS VS-19:4]

e. *u(súru)kurihahitih*

u- *súru* *-kurih* *-ahi* *-tih*

3s(>3)- make.hole -into.water -ESS -DUR

‘a hole was made into (the floor)’

[JS WB_KL-76:8]

Even when there is no protected HL structure present underlyingly, prominence can fall into this configuration through tone placement triggered by a morphological process, often in combination with resyllabification of the input stem with the affix. When this occurs, the HL structure is treated in exactly the same way as one which was present underlyingly, by outer morphological processes. Examples of derived protected HL structures are given in (174). The roots in these examples vary in syllable shape and accentuation, but none contain the protected HL structure. The HL structure is created during the addition of derivational morphology (the structure is underlined when it appears).

(174) Derived protected HL over two syllables

a. *ukriv(rúhu)nih*

u- ikrivrúhunih
 3s(>3)- roll.downhill
 ikrívruh -unih
 roll -down

‘he rolled downhill’

[JS WB_LA78.1-019:57]

b. *kunix(yáku)rih*

kun- ixyákurih
 3pl(>3s)- throw.(pl.)into.water
 ixya -kurih
 throw.(pl) -into.water

‘they threw them in (the water)’

[MO WB_KL-55:13]

c. *poo`iin(kára)vahaak*

pa=	u-	<u>'iinkárav</u>	-ahaak
NOMZ=	3s(>3)-	burn.up	-irr
		'íinka	-rav
		be.on.fire	-in

‘when he burns up’

[D:*iinkárav* (KS44. Grizzly and hazelnuts 037)]

A HL is not assigned to a single long vowel as a default accentuation pattern, but it can arise through derivation when a $\acute{V}CV$ configuration is formed in which the consonant is a glide. The glide is deleted intervocalically, and the vowels coalesce into a single long vowel (see §3.4.2). In this situation, the HL tones remain linked to their vocalic moras, forming a $\acute{V}\acute{V}$. Examples are given in (175).

(175) Derived protected HL over one syllable

a. *tóoy(véèsh)*

ta=	u-	<u>iyváyish</u>
PERF=	3s(>3)-	pour.down
		iyvay -ishrih
		pour -down/result

‘she poured it out’

[MO WB_KL-33:16]

b. *ni(tháà)vish*

	<u>nithávavish</u>
I.will.knock.down.acorns	
ni-	thav -avish
1s(>3)-	knock.down.acorns -PROSP

‘I will knock them down’

[MO WB_KL-17:31]

c. *uk(réèt)**ukrívát*

it.sat/stayed

u- ikriv -at

3s(>3)- sit/stay -PAST

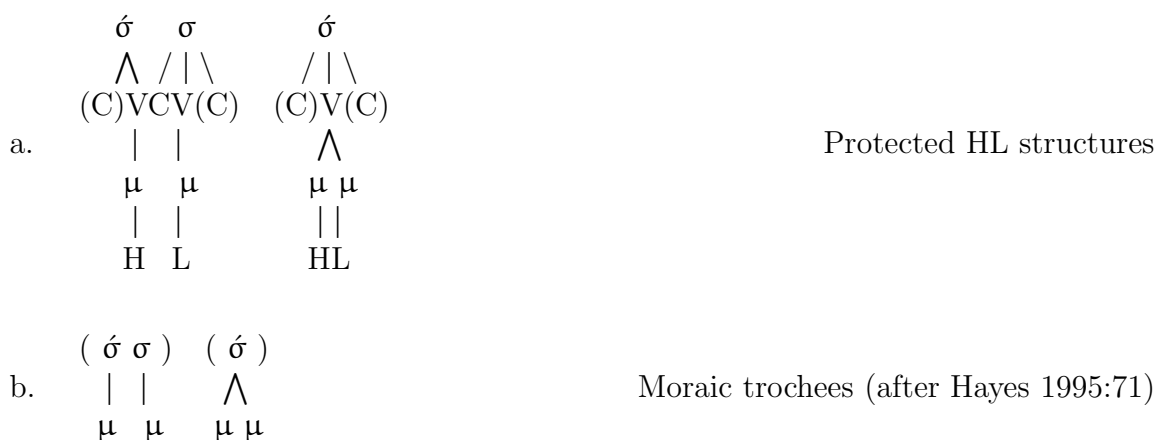
'it sat'

[VS VS-10:6]

6.2.3 Key features

As noted above, the protected HL structure is defined in tonal and syllabic terms, such that a HL sequence is realized over exactly two moras, with no intervening coda consonant. Schematic representations of the possible protected HL structures are given in (176a). These structures resemble moraic trochees, as shown in (176b), and I argue they are footed as such, when metrical stress is assigned to the prosodic word.

(176)



However, the protected structure must make reference to tone and cannot be defined solely in metrical terms, for two reasons. First, a syllable containing a long vowel with a level H tone would also form a moraic trochee, but it does not have the same protected status as a syllable containing a long vowel with a falling HL tone. Second is the question of coda consonants. If coda consonants were moraic, this would explain why a closed first syllable would prevent a CVC.CV structure from being a protected HL structure: it would contain too many moras to form an ideal moraic trochee. But if coda consonants were moraic, CV.CVC or CVVC structures would also have too many moras to form an ideal moraic trochee, yet the final coda consonants in these structures do not affect their protected HL status. For these reasons, the protected HL structure is best explained in terms of tone-syllable configuration throughout the derivation, with metrical structure being aligned with existing tones at the end of the derivation.

In her analysis of the Neo-Štokavian dialect of Serbo-Croatian, Zec (1999) employs trochaic feet (which obey binarity by either moras or syllables) and tonal feet, which can be smaller (one or two moras) to ensure lexical tone is footed. The Karuk foot inventory displays a similar asymmetry, though the details and my analysis differ. In Karuk, feet can be binary syllabic trochees or binary moraic trochees, the latter arising only in order to foot a lexical HL. In Karuk, minimal foot size can be violated to satisfy culminativity and long vowel alignment constraints, but need not be violated to foot a lexical tone.

6.3 Analysis

6.3.1 Special Faithfulness

Basic metrical constraints for Karuk were introduced in Chapter 5, with the presumption that prominence in the input has no effect on the output. As I have shown here, certain prominence in the input does affect the output, and the unmarked metrical pattern introduced above must be seen as the elsewhere case. As I have also shown, the very same structure in the input has a protected status earlier in the derivation, where an entirely different set of prominence constraints are at play. In this section, I focus on how the protected structure interacts with the basic derived accentuation pattern, but the same identity constraints introduced here will also be active and serve to protect the HL structure wherever it has a special status.

The basic metrical constraint ranking already established can be expanded to accommodate the protected HL effect. To model the protected HL phenomenon, two constraints are introduced: a general tone association faithfulness constraint that prevents movement of tones, given in (177), and a specific constraint for faithfulness to the protected HL structure, given in (178). To avoid proposing underlying footing, I define the protected structure here solely in terms of tone-mora alignment (see §6.4.3 for more on this possible alternative analysis). The constraints presented here assume underlying syllabification and tone associations; not all of these can be surface-generated for Karuk.

(177) IDENT-ASSOC(T) (ID-ASSOC)

If there is an association between x and tone T in the input, then there is an association between x' and T' in the output, where x' and T' are the correspondents of x and T respectively. Assign one violation mark for each tone association in the input that is not retained in the output. (de Lacy 2002; Myers 1997)

(178) IDENT-ASSOC(HL_{μμ}) (ID(HL_{μμ}))

Assign one violation mark for each HL tone sequence associated with exactly two adjacent vowel moras, without a coda consonant intervening in the middle, in the input, that is not retained in the output.

While positional- and domain-specific faithfulness constraints are well established (see, e.g., Beckman 1997; Smith 1997, 2011), constraints ensuring faithfulness to a particular tone-structure association are undersirable in an OT framework. However, the Karuk data

presents a serious challenge for the ideal of modeling all patterns in terms of universal markedness, as I discuss in the subsequent sections. Furthermore, a single faithfulness constraint allows for the unification of the phenomena of faithfulness to this particular protected structure at different levels of the derivation, in which different markedness constraints are clearly active.

A fairly low-ranked markedness constraint against HL over two moras in a single syllable, given in (179), is also required to prevent this particular HL configuration from occurring in the output when it is not present in the input.³ The HL configuration over a two-syllable sequence does not carry the same markedness as the homosyllabic version, as it arises frequently in derivation. For this reason, the active markedness constraint must refer only to the contour tone, rather than the protected HL structure in general.

- (179) *NoFALL
Assign one violation mark for each homosyllabic HL sequence in the output. (Gussenhoven 2004)

Protected HL over two syllables

The first possible input contains the protected HL structure realized over two syllables, as in (180). For comparison, a word in which the input contains no protected structure is given in (181).

- (180) Protected HL over two syllables

- a. *nu(ʼifi)kar*
nu- ʼifik -ar
 1pl(>3)- pick.up -go.to
 ‘we go gather’ [MO WB_KL-17:27]

- (181) No protected HL in input

- a. *uʼaxay(chákish)*
u- axáychak -ishrih
 3s(>3)- take.away.closing.up -down/result
 ‘he grabbed her’ [MO WB_KL-62:7]

In a word with a protected HL over two syllables in the input, a regular disyllabic trochee will be built around the existing HL. In tableau (182a), the faithful candidate [nuʼifikar] wins out over the candidate [nuʼifikar] with a single foot aligned at the right edge of the stem.

³A markedness constraint against a LH tone contour over two moras in a syllable, *NoRISE, is also active in Karuk, but is undominated, so is not shown here. *NoCROWD bans contour tones on a single TBU, and is only violated in rare lone words.

This is possible because the tone faithfulness constraint IDENT-ASSOC(HL_{μμ}) outranks ALL-FEET-RIGHT. In tableau (182b), however, where the input does not contain a protected HL structure, the unfaithful candidate [u'axaychákish], which obeys ALL-FEET-RIGHT, wins over the faithful candidate [u'axáychakish]. Therefore, the highly ranked tone faithfulness constraint must be specific to the protected HL structure, while the general tone faithfulness constraint IDENT-ASSOC(T) is ranked below the basic metrical constraints. In this way, the metrical foot automatically aligns with the input tone when it is in a protected HL configuration, without the need for any additional alignment constraints.

- (182) IDENT-ASSOC(HL_{μμ})
 >>
 ALIGN(Foot, R, σ_{μμ}, R) >>> ALL-FEET-RIGHT >>> IDENT-ASSOC(T)

a.

nu-ífi _{kar}	ID(HL _{μμ})	ALIGN-R(σ _{μμ})	ALL-F _T -R _T	ID-ASSOC
a. \mathfrak{F} nu('ífi)kar		*	*	
b. nu'i(fíkar)	*!	*		*

b.

u-'axáychakish	ID(HL _{μμ})	ALIGN-R(σ _{μμ})	ALL-F _T -R _T	ID-ASSOC
a. u'a(xáycha)kish		*	*!	
b. \mathfrak{F} u'axay(chákish)		*		*

The tableau in (183) shows a candidate in which two feet are built: one around an input HL, and the other satisfying alignment constraints. The candidate with more than one foot loses to a candidate with only one foot, due to the highly ranked CULMINATIVITY constraint.

- (183) CULMINATIVITY, IDENT-ASSOC(HL_{μμ})
 >>
 ALIGN(Foot, R, σ_{μμ}, R) >>> ALL-FEET-RIGHT >>> IDENT-ASSOC(T)

kun-'íkakurih	CULM	ID(HL _{μμ})	ALIGN-R(σ _{μμ})	ALL-F _T -R _T	ID-ASSOC
a. \mathfrak{F} kun('íka)kurih			*	**	
b. kun'íka(kúrih)		*!	*		*
c. kun('íka)(kúrih)	*!		*	**	

Protected HL over one syllable

The second possible input contains the protected HL structure realized over a single syllable containing a long vowel, as in (184). For comparison, a word in which the input contains no

protected structure is given in (185).

(184) Protected HL over one syllable

a. *mu(téèn)va*

mu- téènva
3sPOSS- earrings

‘her earrings’

[VS VS-25:5]

(185) No protected HL in input

a. *(ná’aath)va*

na- ’ááthva
2s/3s>1s- be.afraid

‘I am afraid’

[LA LA-01:1]

In a word with a protected HL on a single syllable in the input, a moraic trochee (or a degenerate syllabic trochee) is built over the HL input. The tableau in (186a) shows that the faithful candidate (a) wins over the unfaithful candidate (c), although candidate (c) satisfies the long vowel alignment constraint $\text{ALIGN}(\text{Foot}, \text{R}, \sigma_{\mu\mu})$. As with the protected HL over two syllables, the high-ranked tone faithfulness constraint ensures that the stress foot is built over the syllable containing the input high tone in the protected configuration. Because $\text{ALIGN}(\text{Foot}, \text{R}, \sigma_{\mu\mu}, \text{R})$ outranks FOOT BINARITY , candidate (a), in which only the syllable containing the long vowel is footed, wins out over candidate (b) in which the following syllable is also included in the foot.

Tableau (186b) shows that when the input high tone is in a configuration other than the protected HL, the candidate which satisfies $\text{ALIGN}(\text{Foot}, \text{R}, \sigma_{\mu\mu})$ and FOOT BINARITY wins over the faithful candidate, confirming that the general tone faithfulness constraint is ranked below the rest of the metrical constraints.

(186) $\text{IDENT-ASSOC}(\text{HL}_{\mu\mu}) \gg \text{ALIGN}(\text{Foot}, \text{R}, \sigma_{\mu\mu}, \text{R})$

\gg

$\text{FOOT BINARITY (MIN)} \gg \text{ALL-FEET-RIGHT} \gg \text{IDENT-ASSOC(T)}$

a.

mu-téènva	ID($\text{HL}_{\mu\mu}$)	ALIGN-R($\sigma_{\mu\mu}$)	FT-BIN	ALL-FT-RT	ID-ASSOC
a. μ mu(téèn)va			*	*	
b. mu(téènva)		*!			
c. (múteen)va	*!			*	*

b.

	na-'ááthva	ID(HL _{μμ})	ALIGN-R($\sigma_{\mu\mu}$)	FT-BIN	ALL-FT-RT	ID-ASSOC
a.	na('ááth)va			*!	*	
b.	na('ááthva)		*!			
c.	☞ (ná'aath)va				*	*

Elsewhere case

Finally, with any other tonal input than the protected HL structure, including no underlying tones, basic derived accentuation prevails. That is, accentuation follows the description given above in Chapter 5, resulting in a regular, quantity-insensitive syllabic trochee, with prominence expressed in terms of stress and H tone on the head, with alignment to a long vowel when possible, and foot binarity when possible. The constraints regulating this output outrank general faithfulness to tone, as seen in the tableau in (187a).

If a binary foot is not possible due to too few syllables in the prosodic stem, a degenerate foot is built. This foot can only have high tone associated with the entire syllable, which does not violate TROCHEE. It will not be assigned a HL contour, due to the *NOFALL constraint. Tableau (187b) shows a word in which none of the candidates can satisfy FOOT BINARITY, because the metrical domain only contains one syllable. A foot must be assigned because of the highly ranked GRAMMATICAL WORD = PROSODIC WORD. The candidate with high tone and stress associated with the entire long vowel wins over the candidate with a HL contour over the long vowel, even though the latter would form a better trochee if initial prominence within the nucleus of the syllable were considered. The *NOFALL constraint prevents the candidate with a HL contour which is not present in the input from winning over the candidate with a level H tone.

(187) ALIGN(Foot, R, $\sigma_{\mu\mu}$, R)

»

FOOT BINARITY (MIN) » *NOFALL » IDENT-ASSOC(T)

a.

	u-[ikyíimkurih] _p	ALIGN-R($\sigma_{\mu\mu}$)	FT-BIN	*NOFALL	ID-ASSOC
a.	☞ (úkyiim)kurih				*
b.	uk(yíim)kurih		*!		
c.	uk(yîm)kurih		*!	*	*

b.

u-[uumu] _p	ALIGN-R($\sigma_{\mu\mu}$)	FT-BIN	*NoFALL	ID-ASSOC
a. $\text{u}(\text{'úúm})$		*		
b. $\text{u}(\text{'úùm})$		*	*!	

6.4 Alternative approaches

In this section, I briefly touch on other possible theoretical approaches to this phenomenon and discuss why they are not as appropriate as the one I have chosen.

6.4.1 Comparative markedness

In his theory of comparative markedness, McCarthy (2003) shows that the general constraint ranking NEW MARKEDNESS \gg FAITH \gg OLD MARKEDNESS generates both derived environment effects and grandfather effects. Essentially, instances of a marked configuration present in the input (“old” violations) are acceptable in the output, while instances of the same configuration that were not present in the input (“new” violations) are not. McCarthy argues that comparative markedness is superior to faithfulness theory because its handling of grandfather effects is more general and related to universal markedness constraints, rather than very specific feature faithfulness constraints. Further, he provides an example from Sundanese which can be explained by comparative markedness and not by separate faithfulness constraints. However, while there may be cases which can be modeled by comparative markedness and not by faithfulness theory, the opposite is also true. Karuk presents a situation in which comparative markedness fails to explain a pattern which special faithfulness constraints can explain. The issue that the protected HL pattern in Karuk presents for comparative markedness is that, while retaining a structure that was present in the input, it is not really a grandfather effect in terms of old vs. new markedness. There is no evidence that a (C)Ṽ.CṼ structure is actually marked in the output.

For the sake of argument, I show sample tableaux in (188)–(189) with new and old versions of a constraint against the (C)Ṽ.CṼ structure ranked on either side of the active alignment and identity constraints. In neither case can these markedness constraints obtain the correct outcome. In (188), the fully faithful candidate (FFC) has a old violation of the protected structure. But because this candidate does not satisfy the alignment of H tone with the right edge of the stem, it fails. The candidate which satisfies the alignment constraint, and happens not to have any new violations of the protected structure, wins, incorrectly.

(188) Old protected structure cannot be changed to satisfy alignment

vúpak-sip	$N^*(C)\acute{V}.C\grave{V}$	ALIGN-R(stem)	ID-ASSOC	$O^*(C)\acute{V}.C\grave{V}$
a. ☞ (FFC) (vúpak)sip		*!		*
b. ☉ vu(páksip)			*	

[D:vúpaksip (DF 06: The Coyote Pups 020)]

In (189), the FFC does not contain an instance of the protected structure, and still violates the alignment constraint. Here candidate (b) satisfies the alignment constraint but happens to have an instance of the protected structure in the output, and because of this, fails, also incorrectly.

(189) New protected structure can be created to satisfy alignment

tapákpak-ahi	$N^*(C)\acute{V}.C\grave{V}$	ALIGN-R(stem)	ID-ASSOC	$O^*(C)\acute{V}.C\grave{V}$
a. ☉ (FFC) ta(pákpak)ahi		*		
b. ☞ tapak(páka)hi	*!		*	

[JS WB_KL-86:8]

Thus the $(C)\acute{V}.C\grave{V}$ configuration itself is not at all avoided in the output, when alignment constraints are satisfied. Furthermore, when a new instance of the configuration does occur, it is in fact retained for further derivation, as shown above in (174).

On the other hand, $(C)\acute{V}\acute{V}(C)$ is clearly a marked structure in Karuk, and comparative markedness would be useful in explaining its distribution. A contour tone is acceptable when present in the input, but is almost never created (save for the intervocalic deletion of a glide and an unusual subset of accentual behavior described in §7.6), so differently ranked old and new versions of a constraint *NOFALL are likely at play in Karuk. Still, it would be undesirable to separate the analysis of the two protected configurations, since they share so many characteristics and behave as one type in the grammar. Moreover, a mechanism is still needed which not only allows the homosyllabic HL structure to surface in the output, but which actively exempts it from the effects of alignment constraints. It is impossible for a constraint against the creation of new marked structures to fulfill this need.

Casting the old and new markedness in terms of alignment, rather than in terms of tone-syllable configuration, does not solve the problem. A highly-ranked new ALIGN-RIGHT constraint would correctly prevent new instances of non-right alignment. However, it would be necessary to limit old non-right-alignment to prominence in the protected configuration, returning us to the original problem.⁴

⁴This approach would work if there were no input tone except for the protected configuration. There is not a great deal of evidence either for or against this possibility. However, no intermediate assignment of tone would mean that there would be no unified explanation for the stem-final vowel lengthening process (§7.3). Moreover, there is evidence from zero-prefixed inflection (§8.6.1) supporting intermediate tone placement in exactly the places it would be expected given the hypothesized reasons for vowel-lengthening.

6.4.2 Constraint conjunction

A local constraint conjunction (Smolensky 1995, 2006; Lubowicz 2002) is a constraint that assigns a violation mark for every violation of both its component parts. The combination of word-oriented alignment of metrical feet and the syllable-tone alignment of HL structures makes this phenomenon a logical candidate for constraint conjunction, because two factors work in tandem to prevent an outcome that would otherwise be expected, were only one of the factors present.

A conjunction of alignment and faithfulness to input tone constraints will prevent an unfaithful tone association in the output which is anything but the preferred alignment in the stem. This has the advantage of preventing tone from moving to a protected configuration elsewhere in the word to avoid a more marked configuration. However, the same problem arises that was present with comparative markedness: faithfulness to the protected configuration and to any other underlying tones would be treated in the same way, so there would either be alignment across the board, or faithfulness to input tone across the board, which is not borne out in the data. If special faithfulness constraints are still needed, this approach does not offer any solutions for the question of the protected structure.

6.4.3 Blocking by footing

One possible explanation for the protected HL phenomenon is the presence of a moraic trochee blocking stem-final assignment of a H tone. As I will demonstrate, while this mechanism works quite well to explain the behavior of Level 2 suffixation on bare roots, it cannot account for protected HL behavior in two other areas: additional layers of suffixation, and the placement of prominence in words with long vowels.

Moraic trochees

Many suffixes, including Level 2 suffixes, assign a stem-final H when possible, as in (190) (stem-final target syllables are underlined in the following examples; see §7.3 for more details and examples).

(190) Stem-final H assigned by Level 2 suffix

a. *ikyívish*

ikyiv -*ishrih*
fall -down/result

‘to fall down’

[various D:*ikyívish*]

b. *ixyákurih*

ixya -*kurih*
throw.(pl) -into.water

‘to throw (plural objects) into water’

[MO D:*ixyákurih*]

Assignment of this H is blocked by the presence of a HL structure on the root, as in (191).

(191) Stem-final H blocked by HL on root

- a. (tátu)*yish*
 (tátuy) -*ishrih*
 sweep -down/result
 ‘to sweep’ [VS D:*tátuyish*]
- b. (súru)*kurih*
 (súru) -*kurih*
 make.hole -into.water
 ‘to make a hole into (something)’ [JS D:*súrukurih*]

A HL bigram in a disyllabic root will always include the stem-final syllable, so it would be possible to posit a moraic trochee in these roots, which blocks the assignment of a second prominence in the same foot. Similarly, in a stem with Level 1 morphology (reduplication or suffixation), prominence can only be penultimate, so any HL bigram will include the target stem-final syllable, as in (192), and could block stem-final prominence for this reason.

(192) Stem-final H blocked by HL on Level 1 stem

- a. *ih*(yárih)*ish*
 ih(yárih) -*ishrih*
 stand -down/result
 ‘to stand still’ [various D:*ihyárihish*]
- b. *im*(shúsu)*rishuk*
 im(shúsu) -*rishuk*
 [?] -out.of
 ‘(smoke) to come out’ [PM D:*imshúsurihuk*]

In the examples in (191)–(192), a prohibition of clash between adjacent prominences and/or violations of the Obligatory Contour Principle (OCP) by adjacent H tones would suffice to block a final H tone. However, in a stem with a penultimate H that is not in the protected HL configuration the blocking does not occur, so clash or OCP are not sufficient explanations.

If there is an underlying H on a penultimate CVC, under this analysis, it would form its own moraic trochee, and would therefore be in a different foot from the target syllable. In a strictly local evaluation of clash upon placement of stem-final tone, the final syllable would not be able to “see” the preceding H, as it is in a different foot, so tone is placed. Then only one foot may survive due to culminativity, and the rightmost foot is the one that is preserved. There is no reason to believe that every penultimate CVC has a H, but some

examples where citation forms are given with such, and it would be consistent to assume this placement in Level 1 morphology as well. In these cases the local evaluation of clash behavior just described is seen. As shown in (193), a stem-final H is assigned, and the underlying penultimate H is lost.

(193) Stem-final H not blocked

a. *pivaxráhish*

pi(váx)rah -ishrih
dry.up -down/result

‘(water) to go down’

[D:pivaxráhish]

b. *tapakpákahi*

ta(pák)pak -ahi
slice -ESS

‘to be sliced’

[JS WB_KL-86:8]

Stem-final lengthening

When H is assigned stem-finally to an open syllable, as shown in the preceding examples, repeated here in (194), a moraic trochee is built.

(194) a. *ik(yívish)*

b. *ix(yáku)rih*

c. *pivax(ráhish)*

d. *tapak(páka)hi*

When H is assigned stem-finally to a closed syllable, on the other hand, an ideal HL moraic trochee cannot be built across the coda. Instead, vowel lengthening in the closed syllable takes place, so that a moraic trochee can be built on that syllable, as seen in (195).

(195) Stem-final H with lengthening

a. *ik(yíím)kurih*

ikyiv -kurih
fall -into.water

‘to fall into water’

[various D:ikyíimkurih]

- b. *ikriv(rúúh)sur*
ik(rív)ruh -*suru*
 roll -off
 ‘to roll away’ [D:*ikrivrúúhsur*]

Because lengthening feeds high-before-long accentuation, the H that triggers lengthening is almost never visible at the surface, rendering this process opaque. Stem-final lengthening is never motivated in a stem with a protected HL, because stem-final accentuation placement is blocked in these stems. This, in combination with the opacity of stem-final lengthening, gives the appearance of lengthening being blocked by a HL structure directly, while it is in actuality an indirect relationship. In the examples in (196), the target syllable for stem-final high is closed even when resyllabified with the suffix, so it would have to be lengthened were it to receive a H tone. Yet because placement of a stem-final H is blocked because the target syllable is part of a HL moraic trochee, no final lengthening takes place.

(196) Stem-final H blocked

- a. *ih(yárih)ship*
ih(yárih) -*sipriv*
 stand -up/begin
 ‘to stand up’ [VS D:*ihyárihship*]
- b. *(tátuy)shur*
(tátuy) -*suru*
 sweep -off
 ‘to sweep off’ [PM D:*tátuyshur*]
- c. *(vúpak)sur*
(vúpak) -*suru*
 trim -off
 ‘to cut off’ [VS D:*vúpaksur*]

Issues for footing as an explanation for protected HL

In stems with multiple derivational suffixes, it is possible to have a HL protected structure that is not at the right edge of a stem. The suffix *-ahi* ESSIVE normally triggers stem-final H tone placement, as seen in (197), and can fall outside of other Level 2 suffixes. Non-local blocking is not predicted with this analysis, yet the protected HL still blocks placement of stem-final H by *-ahi* even when the target for H tone is not contained within the HL moraic trochee, as seen in (198).

(197) *-ahi* ESSIVE places stem-final H

a. *chi(víta)hi*

chivít *-ahi*

line.up -ESS

‘to be lined up’

[LB WB_KL-23:72]

b. *tapak(páka)hi*

ta(pák)pak *-ahi*

slice -ESS

‘to be sliced’

[JS WB_KL-86:8]

(198) Non-local blocking of stem-final H

a. *(íhu)karahi*

(íhu)kar *-ahi*

go.flower.dancing -ESS

‘to have a flower dance’

[JS WB_KL-08:31]

b. *ik(xúri)karahi*

ik(xúri)kar *-ahi*

decorate.with -ESS

‘to be decorated with’

[JS WB_KL-06:21]

c. *(súru)kurihahi*

(súru)kurih *-ahi*

make.hole.into -ESS

‘a hole to be into (something)’

[JS WB_KL-76:8]

A HL tone on a single long vowel is also protected, but this cannot be explained in the same way as HL on VCV, because it must form its own moraic trochee. A HL on a final long vowel would clearly block assignment of final H by a suffix. If it is penultimate, however, it should not interfere with placement of prominence on the following stem-final syllable, similar to a penultimate H on CVC. Yet a penultimate HL on a long vowel blocks H tone assignment on the following syllable in a way that neither accented nor unaccented CVC or CVV(C) syllables do, as shown in (199). Therefore the description of the protected structure must make reference both to tone pattern and moraic structure.

(199) Stem-final H blocked by HL on long vowel

a. *i(héè)raráv*

- i(héè)ra* -*rav*
 smoke -in
 ‘to smoke in’ [D:*ihêerarav*]
- b. *iin(kárav)*
(íín)ka -*rav*
 burn -in
 ‘to burn up’ [D:*iinkárav*]

Furthermore, some special protection for the HL structure is required at the word level, beyond its identity as a foot. As I have shown in Chapter 5, in words with at least one long vowel, there is a strong tendency for prominence to fall on the syllable preceding a long vowel. For one thing, in order for the target syllable for prominence preceding a long vowel to be identified, the two syllables must be footed together. For another, a stem-final long vowel bearing H tone, such as those created in (195), are also be footed at the stem level, yet this structure is not protected at the word level. In addition, (CVC)(CVVC) and (CVC)(CVCVC) are not equivalent structures: the former will receive accentuation on the CVC syllable, while the latter will not. At the word level, then, unmarked feet are syllabic, not moraic, and coda consonants are irrelevant, but certain moraic trochees are retained.

While it may be useful to talk about moraic trochees, especially at the first layer of suffixation, it is not enough to explain all of the protected HL effects. Either moraic feet are formed at a lower level of derivation, and only some (protected HLs) are retained at the word level, or lower levels of derivation reflect tonal phenomena while footing occurs at the word level. In any case, it is essential to define the protected configuration in terms of both moraic structure and tonal structure, and the non-local blocking seen in (198) shows that some sort of special faithfulness constraint is required.

6.5 Summary

In this chapter, I have shown that there is a particular alignment of tone and segments in Karuk which is protected, in that it is retained in various contexts where default assignment of metrical structure and prominence would result in different surface accentuation. This protected structure must be defined in terms of both tone (HL) and syllabic shape (moracic trochee), and can only be defined in these terms. It cannot be attributed to a particular tone type, or to underlying tone or any other source, since it can arise in different ways and be treated in the same manner. This pattern has been modeled using a constraint that ensures faithfulness to this particular tonal configuration outranking markedness constraints enforcing alignment of prominence to the least marked position.

This phenomenon is unusual in the protected structure’s reliance on a tone-syllable alignment, its heterogenous origins, its persistence, and its being a non-default. Accordingly, it is treated with an unusual analysis. Special faithfulness is needed to account for the structure being retained while it is not the output of default constraints, especially when it is

retained in completely different contexts with different prominence constraints at play. It is also needed to account for non-local blocking and retention of certain tone-syllable configurations and not others at the surface. Finally, the protected HL phenomena illuminate how completely different drivers of prominence are at play in different parts of the grammar, making levels a useful organizing principle for Karuk morphology. Here, I have chosen to model the HL structure primarily in tonal terms, and the high-before-long structure primarily in metrical terms. However, even under a different analysis where both structures were described in tonal or in metrical terms, completely different constraints would have to be active at different levels of the grammar to account for their presence.

Part III

Influence of morphological structure on prominence

Chapter 7

Interaction of derivational morphology and prominence

7.1 Introduction

As I have shown in the preceding chapters, surface accentuation in Karuk is largely predictable given the shape and input tones of the stem. This chapter explores to what degree those prosodic properties of verb stems themselves are predictable. In other words, where do the HL protected structures that block basic accentuation footing and the long vowels that attract it come from? Some of them must be considered underlying, but many correlate with particular morphology in ways that make a serial derivation an attractive mode of explanation.

Karuk has complex verbal morphology with around 90 individual affixes. I provide a new analysis of the prosodic effects of suffixes on stems. This analysis greatly simplifies the picture presented in Bright (1957), and more importantly, provides motivation for common accent placements and vowel lengthening effects. I collapse Bright's several position classes into four levels, based on the position and the phonological effects of the suffix on the stem it attaches to. The first three levels are addressed in this chapter; the fourth is inflection, which is addressed in Chapter 8. The vast majority of affixes can only be attached in one given level. The exception that proves the rule, so to speak, is the PLURACTIONAL suffix *-va*. This suffix can attach to a stem at almost any level, and its phonological effects are different depending on the morphological structure of the stem it attaches to.

Syllable structure is important to the placement of prominence in derivation, just as it is at the root and the word level, but how it interacts with tone placement varies depending on the morphology present. In this chapter, the effects of each level of derivational morphology on stem prosody are described. The first level is inner stem morphology, which is tightly integrated with the root, including a few suffixes and reduplication. This level has a strong prosodic effect on the root, erasing input tone. Level 2 includes the bulk of Karuk suffixes. This level is sensitive to the protected HL structure on the input, and places tone and selectively lengthens stem vowels, based on preferred tone-syllable alignments. Level 3 includes weak and variable suffixes, which either have similar effects to Level 2 or no effect on input

tone. An unusual suffix which can attach at multiple levels and has a strong effect on stem prominence is described, and finally an unexplained sub-pattern of variable prominence is addressed. Some exceptionality and idiosyncratic effects are found with a few specific morpheme combinations (detailed in Bright 1957), but on the whole, levels are quite consistent in their prosodic effects.

7.2 Level 1: Inner stem morphology

At the innermost stem level, morphological processes are all suffixing in nature. These processes are comprised of reduplication and a small set of suffixes. The output of this level gains penultimate accentuation regardless of syllable structure and input accentuation. Stem vowels are never lengthened and if long underlyingly, are shortened in certain configurations, as discussed below. Reduplication and a subset of the derivational suffixes are included together in this level because both are minimally productive and largely lexicalized, have similar strong phonological effects on the input stem, and occur inside all other suffixes. At this level, morphology has a strong effect on stem prominence, erasing any input tone. Placement of prominence is not sensitive to syllable CV structure; H on short vowels in closed syllables is not avoided.

Like many Hokan languages (DeLancey 1996; Golla 2011), Karuk lexical verbs stems typically have a bipartite structure (Bright 1957; Haas 1980; Jacobsen 1980; Macaulay 1993) which reflects an older state of the language in which instrumental prefixes combined with roots to form verb stems. For the most part, these components are not synchronically separable into morphemes, yet they do retain some morphological reality for speakers, as demonstrated in the process of reduplication, which only copies the second part of a bipartite stem, regardless of its phonological shape. Thus these “submorphemic elements” (Bright 1957) rest at the boundary between being morphologically active and completely lexicalized.

The question of the productivity of this level is taken up further in §7.2.5. The morphology described here is certainly closer to being lexical than any which comes outside of it, and it is intimately tied up with the bipartite nature of the lexical verb stem. As limited as the productivity of these processes may be synchronically, stems that have passed through this level can be distinguished from true underived roots because they display different constraints on the placement of prosodic prominence than do simple roots or bipartite stems.

7.2.1 Reduplication

Verbal reduplication in Karuk typically indicates repetition of an action, and can also signal intensity or plural objects (Macaulay 1993). Examples are given in (200)–(203).

- (200) a. *ikfuy* ‘to whistle’ [D:*ikfuy*]
 b. *ikfúyfuy* ‘to whistle a tune’ [D:*ikfúyfuy*]

- (201) a. *páarak* ‘to separate with a wedge’ [D:*páarak*]
 b. *parákrak* ‘to split logs with wedges’ (Bright 1957:90)
- (202) a. *paschip* ‘to be wet’ (Macaulay 1993:71)
 b. *paschípchip* ‘to be soaking wet’ (Macaulay 1993:71)
- (203) a. *ithxup* ‘to cover, lie covering’ [D:*ithxup*]
 b. *ithxúpup* ‘to cover many things’ (Macaulay 1993:71)

Reduplication in Karuk is suffixing and occurs at Level 1. Any accentuation on the input stem is erased, and the resulting stem bears penultimate accentuation, regardless of syllable structure or morpheme boundaries. Reduplication most frequently targets a final CVC sequence of a lexical verb stem, but can target two syllables, and even a CCVC string. Given the inconsistent shapes of the copied strings, which cannot be attributed to the segments involved, it is impossible to explain Karuk reduplication in purely phonological terms. However, as Macaulay (1993) demonstrates, it is always the final element of a bipartite stem (or an entire monomorphemic root) which is reduplicated. Therefore, the copied element can be of various phonological shapes, but is always a morphological unit. In this way, Karuk represents a clear case of morphological rather than phonological reduplication (Alderete et al. 1999; Inkelas & Zoll 2005; Yu 2005b).

I follow Macaulay’s analysis here, and in the examples below, the one- or two-syllable strings that are reduplicated represent roots, while the one- or two-syllable strings excluded from reduplication represent lexical prefixes. Examples of CVC reduplication are given in (204), and examples of CVCVC reduplication are given in (205).

(204) CVC root reduplication

- a. *tapákpak*
tápak -*pak*
 cut.through -RED
 ‘to slice’ [D:*tapákpak*]
- b. *taxúxuy*
taxuy -*xuy*
 wipe -RED
 ‘to rub on’ [D:*taxúxuy*]
- c. *ikpákpak*
ikpak -*pak*
 chop -RED

‘to chop up’

(Macaulay 1993:73)

d. *mítmit**mit* -*mit*

pop -RED

‘to be the sound of shooting’

[D:*mítmit*]e. *ikritíptip***ikritip* -*tip*

-RED

‘to fringe, cut a fringe along the edge of’

[D:*ikritíptip*]

(205) CVCVC root reduplication

a. *tatuytátuy**tátuy* -*tatuy*

sweep -RED

‘to sweep over’

[D:*tatuytátuy*]b. *ikririhrírih**ikrírih* -*ririh*

become.tilted -RED

‘to rock (something)’

[D:*ikririhrírih*]

As discussed in §3.2.1, when a CCVC root is reduplicated, a vowel is inserted to break up the illicit CCC cluster which would otherwise result. The epenthetic vowel is always inserted between the stem and the reduplicated string, and its quality is determined by that of the preceding vowel. Examples of CCVC reduplication are given in (206).

(206) CCVC root reduplication

a. *kichrasáchras**kichras* -*chras*

mash -RED

‘to mash repeatedly’

(Macaulay 1993:77)

b. *taxvukúxvuk**taxvuk* -*xvuk*

hook -RED

‘to crochet, to tat’

(Macaulay 1993:77)

One additional reduplication pattern is found, in which a vowel is inserted in the absence of a CCC consonant cluster, as in the examples in (207). See §3.2.1 for a discussion of possible explanations of this pattern.

(207) Unexplained (V)CVC reduplication

a. *ʔixaxáxax*

ʔixax -*xax*
split/shred -RED

‘to rip up’

(Macaulay 1993:78)

b. *ixipíxip*

ixip -*xip*
fly -RED

‘to flutter’

[D:*ixipíxip*]

As noted above, any input accentuation is erased and the resulting stem receives penultimate accentuation. As can be seen in the examples above, penultimate accentuation in reduplicated stems is typically stem-final, as in (204), when the reduplicant is one CVC syllable, but is not necessarily stem-final. When the reduplicant is disyllabic, accentuation falls on the first suffix of the reduplicant, as in (205). When an epenthetic vowel is present, accentuation can fall on that vowel, as in (206).

7.2.2 Inner stem level suffixes

The suffixes listed in (208) are also attached at the inner stem level.¹ This group of nine suffixes is minimally productive: most are rarely found and occur in highly lexicalized contexts. Loosely speaking, these morphemes encode direction, manner, or resulting state.

(208) a. *-chak* ‘closing up’ [D]

b. *-sap* ‘closing up’ [D]

c. *-fip* ‘completely’ [D]

d. *-kiri* INSTRUMENTAL; MOTION(?)² (Bright 1957:108)

e. *-rih* ‘up’ [D]

¹These include suffixes from Bright (1957)’s position classes 2 and 4.

²Bright (1957) describes two suffixes which are segmentally identical, but display different morphophonemic behavior when a certain suffix (PLURACTIONAL *-va*, which he labels PLURAL ACTION) is added outside. The more common one is an instrumental, which adds an argument on which or by means of which an action is performed. The other is rare and its semantics are unclear, but it seems to have something to do with motion. Bright & Gehr (2005) collapse these into a single morpheme. For our purposes here, both can be considered together as Level 1 suffixes.

- f. *-sar* ‘along with, together with’ [D]
 g. *-tarar* ‘fastening’ [D]
 h. *-tanmah* ‘for nothing, in vain’ [D]
 i. *-úùr* ‘for a long time’ (Bright 1957:111)

As in reduplication, when these suffixes attach to a stem at Level 1, penultimate accentuation results, regardless of syllable structure or morpheme boundaries. Any accentuation on the input stem is erased.³ Examples are given in (209–212).

The examples in (209–210) show that accentuation is penultimate when monosyllabic Level 1 suffixes attach to bipartite verb stems with either closed or open final syllables. The example in (211) shows penultimate accentuation with a monosyllabic stem. The examples in (212) show that the accentuation pattern described here is, in fact, penultimate rather than stem-final, because with a disyllabic Level 1 suffix, accentuation falls on the first suffix syllable.

(209) Bipartite stem with closed final syllable

- a. *asímchak*
ásiv *-chak*
 go.to.bed -closing.up
 ‘to close ones eyes’ [D:*asímchak*]
- b. *ikrúpsap*
ikrup *-sap*
 pierce/sew -closing.up
 ‘to sew together’ [D:*ikrúpsap*]
- c. *ishtúkfiṗ*
ishtuk *-fiṗ*
 pick -completely
 ‘to pick completely’ [D:*ishtúkfiṗ*]
- d. *ihvithkir*
ihwith *-kiri*
 clean.fish -INSTR

³Three exceptional roots have been found which appear to retain root accentuation in a ‘protected’ configuration (see Chapter 6) after derivation with a Level 1 suffix (*áhachak* ‘withhold from’, *sômkir* ‘(woman) offer herself in marriage’, *íshavrihva* ‘(round object) hang in the air’), although there are no unsuffixed examples of these roots. However, Level 1 suffixes clearly erase the ‘protected’ accent configurations in other instances (see (209a), (212b), and (214a) for example), so I assume the exceptions are idiosyncratic forms in which accentuation has become lexicalized.

- ‘to clean salmon on’ [D:*ihvítthkir*]
- e. *ikyútrih*
ikyut -*rih*
 be.gathered.into.pile -up
 ‘to plow’ [D:*ikyútrih*]
- f. *ishtúksar*
ishtuk -*sar*
 pick -along.with
 ‘to pick with’ [D:*ishtúksar*]
- (210) Bipartite stem with open final syllable
- a. *kifúchak*
 **kifu* -*chak*
 -closing.up
 ‘to plug something with’ [D:*kifúchak*]
- b. *kuhíkír*
kúhi -*kiri*
 be.sick -INSTR
 ‘to become ill by eating something’ [D:*kuhíkír*]
- (211) Monosyllabic stem
víkshar
vik -*sar*
 weave -along.with
 ‘to weave something in together with’ [D:*víkshar*]
- (212) Disyllabic Level 1 suffix
- a. *ikyaatánmah*
ikyav -*tanmah*
 make -for.nothing
 ‘to make for nothing’ (Bright 1957:110)
- b. *eehtánmah*
éèh -*tanmah*
 give -for.nothing

‘to give for nothing, gratis’ (Bright 1957:110)

c. *iftánmah*

if -*tanmah*
grow -for.nothing

‘(plant) to grow as volunteer, without having been planted’ (Bright 1957:110)

The examples in (213) show Level 1 suffixes triggering a regular vowel shortening process described by (Bright 1957) as taking place when a disyllabic root with a long first vowel and short second vowel is suffixed with any derivative suffix. The examples in (214) show Level 1 suffixes attaching to other non-canonical lexical verb stem shapes with no shortening, due to a stem shape other than long-short, and/or to a doubled vowel.

(213) Vowel shortening

a. *umatánmah*

uuma -*tanmah*
go -for.nothing

‘to go in vain’ (Bright 1957:110)

b. *ihyárih*

íhya -*rih*
(long.object).stand -up

‘(animate) to stand, be standing’ [D:*ihyárih*]

(214) No vowel shortening

a. *iheeráfip*

ihéèra -*fip*
smoke -completely

‘to smoke all up’ [D:*iheeráfip*]

b. *taayvaaráfip*

tááyvaara -*fip*
spoil -completely

‘to spoil completely’ [D:*taayvaaráfip*]

The suffix *-úùr* ‘for a long time’ results in irregular HL accentuation on the suffix itself, as shown in the examples in (215). It is included here because it otherwise behaves like a disyllabic Level 1 suffix: it erases input stem accentuation, resulting on a H on the first mora of the suffix in the output, and it has not been found outside of other derivative suffixes.

Many (if not all) long vowels in Karuk are the result of diachronic intervocalic consonant deletion, so it is likely that the suffix *-úúr* was once disyllabic and triggered penultimate accentuation historically, and then became lexicalized as bearing HL accentuation as the consonant was lost.

- (215) a. *ikyavúúr*
ikyav -*úúr*
 make -long.time
 ‘to make for a long time’ [D:*ikyavúúr*]
- b. *vikúúr*
vik -*úúr*
 weave -long.time
 ‘to weave for a long time’ [D:*vikúúr*]

7.2.3 Ordering of morphology

Co-occurrence of Level 1 morphology

Level 1 suffixes and reduplication occasionally co-occur. Reduplication can either take place inside (216) or outside (217) of the Level 1 suffix, the difference being scopal. No instances of two Level 1 suffixes occurring together have been found.

- (216) *vupakpákír* Root - Reduplication - Level 1 suffix
vúpak -*pak* -*kírí*
 cut.up -RED -INSTR
 ‘to cut up on’ [D:*vupakpákír*]
- (217) *asimchákchakveenach* Root - Level 1 suffix - Reduplication
asímchak -*chak* -*veen* -*ach*
 close.eyes -RED -AGT -DIM
 wren sp. [lit.: ‘little one which repeatedly closes its eyes’] [D:*asimchákchakveenach*]

Co-occurrence of Level 1 morphology and outer morphology

There are no instances of reduplication or Level 1 suffixes outside of post-Level 1 derivational suffixes. We do find outer derivational suffixes attaching outside of reduplication and Level 1 suffixes, as shown in (218)–(221). As Bright (1957:94) notes, the suffix *-tarar* ‘fastening’ is, in fact, found only with one of two derivative suffixes (*-ishrih* ‘down, result’ or *-ku* ‘onto’) following, as in (221).

- (218) *toomsúsurishuk*
*ta= u- *imshu -su -rishuk*
 PERF= 3s(>3)- -RED -out.of
 ‘it (smoke) came out’ [D:*imshúsurishuk* lexicon entry example (KV)]
- (219) *axaychákish*
áxay -chak -ishrih
 take.away -closing.up -down/result
 ‘to grab, seize, catch’ [D:*axaychákish*]
- (220) *ihyárihship*
íhya -rih -sipriv
 (long.object).stand -up -up/begin
 ‘to stand up’ [D:*ihyárihship*]
- (221) *ikruptárarish*
ikrup -tarar -ishrih
 pierce/sew -fastening -down/result
 ‘to sew down’ [D:*ikruptárarish*]

Level 1 suffixes at Root Level

Several Level 1 suffixes can also be attached at the root level, that is, acting as the final element of a bipartite stem themselves, as shown in (222)–(223).

- (222) Initial stem element with closed syllable
- a. *akchak*
ak- -chak
 do.with.hands -closing.up
 ‘to close one’s hands’ [D:*akchak*]
- b. *sivshap*
**siv- -sap*
 -closing.up
 ‘to plug, seal up’ [D:*sivshap*]

(223) Initial stem element with open syllable

a. *táchak***ta-* -*chak*
-closing.up

‘to clip, cut (with scissors)’

[D:*táchak*]b. *tháfip***tha-* -*fip*
-completely

‘to devour, eat up’

[D:*tháfip*]

When these suffixes are attached at the root level, they follow the morpheme structure constraint against accentuation on an initial closed syllable discussed in Chapter 4. Compare with the monosyllabic stem *vik* ‘weave’, which is a complete inflectable stem as is, unlike the other initial elements shown in (222)–(223). As seen above in (211), accentuation when one of these suffixes attaches to *vik* ‘weave’ follows the Level 1 penultimate pattern, whereas when one of these suffixes attaches to the ‘submorphemic’ elements shown in (222), the root accentuation pattern results.

7.2.4 Evidence for intermediate assignment of prominence

How certain is it that prominence is assigned at this intermediate level of derivation? In principle, it would be possible for these processes to erase input accentuation but not to assign any at this stage; words would receive default prominence at the end of derivation and inflection. There are relatively few examples of inflected words with Level 1 derivation, and the overwhelming majority of them would come out to the same pattern of prominence whether accent were assigned at Level 1 or not until word level. However, there are a couple of telling cases. In reduplication, we have the example in (218), reproduced here as (224).

(224) *toomsúsurishuk*

<i>ta=</i>	<i>u-</i>	* <i>imsu</i>	- <i>su</i>	- <i>rishuk</i>
PERF=	3s(>3)-		-RED	-out.of

‘it (smoke) came out’

[D:*imshúsurishuk* lexicon entry example (KV)]

Were prominence assigned at word level, it would fall on the penultimate syllable: **toom-susuríshuk*. Since it does not, we know input accentuation was already in the protected configuration⁴ before inflection. If prominence were assigned by the Level 2 derivational suffix *-rishuk*, which also does not erase accent in a protected configuration, it would fall on the stem-final syllable: **toomsusúrishuk*. Since it does not, it must have fallen into the

⁴See Chapter 6.

protected configuration at or before Level 1, and it is exactly where we would expect it if it were assigned at Level 1: penultimate in the reduplicated stem.

Another small piece of evidence from the Level 1 suffixes shows that placement of accent at this level is subject to different constraints than that at word level. In particular, the placement of prominence at Level 1 is not sensitive to vowel length, while placement of prominence at word level is. For instance in (212a), reproduced here as (225), accent is placed in penultimate position even when there is a long vowel elsewhere in the word. If accent were assigned at word level, it would be placed on the vowel preceding the long vowel, although it would similarly be penultimate in a word with no long vowels. We have no examples of reduplication of stems containing long vowels, but based on the premise these two morphological processes occur at the same level of derivation, there is no reason to assume they do not follow the same constraints on the placement of prosodic prominence, in absence of any evidence to the contrary.

(225) *ikyaatánmah*

ikyav -tanmah

make -for.nothing

‘to make for nothing’

(Bright 1957:110)

7.2.5 Discussion

In summary, Level 1 morphology is suffixed closest to the root or bipartite lexical verb stem. Stems which pass through this level are subject to the following prosodic phonological processes. Any input accentuation is erased (with a very few lexical exceptions), and penultimate accentuation is assigned to the output stem. Extrametrical final vowels do not count for the assignment of penultimate accentuation. Regular vowel shortening is triggered in stems of certain configurations, and vowel lengthening is never triggered.

While Level 1 processes are phonologically and morphologically distinct from the formation of bipartite stems, they are intimately tied up with them. Reduplication clearly depends on the morphological reality of the subparts of a bipartite stem, and in some cases the same morphemes that act as Level 1 suffixes can act as the final element of a bipartite verb stem themselves.

The morphological processes which take place at Level 1 are on the border between being wholly lexical and wholly productive. Bright (1957) describes the subparts of bipartite stems as “submorphemic elements”, and Haas (1980) calls these stems frozen sequences of morphemes, indicating that the strings involved do not have synchronic status as morphemes. Yet Macaulay (1993:80-81) shows that the bipartite nature of the stems has synchronic relevance in that it is the basis for reduplication. She calls reduplication a “highly productive process” and found fluent speakers able to create new forms, although they were not consciously aware of the bipartite nature of the stems and considered them as single words (Macaulay 1993:80). The consistency of the semantics of reduplication (Conathan & Wood 2003) also point to a productive process. Whether bipartite stems and stems bearing Level 1

morphology are basically lexical or whether there is a synchronic reality to the lexical prefixes and roots within bipartite stems is open to debate. I believe this represents an interesting case of a set of processes that is on the cusp, historically speaking, of shifting from being productive to being completely lexicalized. The morphological status of the subparts of bipartite stems, and by extension the level of productivity of reduplication and possibly other Level 1 morphology varies by speaker. In the current situation of language endangerment and attrition, a process which may have been productive relatively recently could be rapidly transitioning to a non-productive one.

7.3 Level 2: Derivational morphology

Level 2 derivational morphology is tightly integrated with the stem in that it always becomes part of the prosodic stem. Karuk uses a handful of derivational prefixes and a large number of derivational suffixes. Derivational prefixes do not affect the placement of prominence, though they can bear prominence themselves. Derivational suffixes form part of the prosodic domain for accentuation when additional suffixes are added, but are rarely accented themselves. Derivational suffixes have a somewhat weak effect on stem prominence, placing HL tone at the right edge of the input stem unless blocked by a protected HL structure in the input. At this level, prominence is sensitive to syllable CV structure and tone/syllable alignment, and vowel lengthening occurs as a repair for the H tone on a short vowel in a closed syllable.

7.3.1 Derivational prefixes

The derivational prefixes are listed in (226). Positionally, they fall between the agreement prefixes and the verb root, following the template given in (227).

(226) a. *kupa-* MODE

b. *ip-* ITERATIVE

c. *iru-* PLURAL

(227) *Derivational prefix positions*

AGREEMENT- *kupa-* *ip-* *iru-* ROOT

kupa- The prefix *kupa-* MODE indicates ‘the way in which something is done’, but not any sense of grammatical modality. It is always used in combination with suffixal *-ahi*, as in example (228). Bright (1957:89) characterizes this combination as a circumfix, although there is no clear distinction between this *-ahi* and the ESSIVE *-ahi* used without the MODE prefix. I consider the two homophonous suffixes as a single morpheme here.

(228) *peekupeekrêehitiheesh*

pa= *i-* *kupa-* *ikriv* *-ahi* *-tih* *-avish*
 NOMZ= 2s(>3)- MODE- live -ESS -DUR -PROSP

‘you will live well’

[JS WB_KL-16:7]

ip- The ITERATIVE prefix *ip-* has four allomorphs that are clearly phonologically related, given in (229) (my featural interpretation of the description in Bright 1957:88-89). The choice of allomorph is phonologically conditioned, but not well-motivated by cross-linguistic phonological constraints.

(229) /*ip-*/ → *pa-* /__ *i*{C[+labial], *xv*}; (*i* → ∅)
 → *p-* /__ (ʔ)V; (ʔ → ∅)
 → *pi-* /__ *p*;
 → *ip-* elsewhere

When the iterative is attached to a stem beginning with *i* followed by a labial consonant (*p*, *f*, *v*, *m*) or the sequence *xv*, the *i* is deleted and the allomorph *pa-* is used. When it is attached to any other vowel- or glottal stop-initial stem, the glottal stop is deleted, and the allomorph *p-* is used. If the stem begins in *p-*, the allomorph *pi-* is used. Before consonants other than *p* or ʔ, the allomorph *ip-* is used.

The iterative is used very commonly in Karuk. In addition to expressing the repetition of an action, it frequently has the semantics of returning to a prior state or location. It does not normally express rapid repetition of an action (this is instead expressed by the PLURACTIONAL *va-*). The iterative is also often used with actions typically expressed by reflexives cross-linguistically, such as getting dressed. Examples are given in (230).

(230) a. *kunpirukúùrish*

kun- *ip-* *iru-* *kúùrish*
 3pl(>3s)- ITER- PL- sit.down

‘they sit down again’

[CP WB_KL-52:61]

b. *kunípvitship*

kun- *ip-* *vit* *-sipriv*
 3pl(>3s)- ITER- paddle -up/begin

‘they started to paddle back’

[MO WB_KL-05:131]

c. *kunpithxunátihva*

kun- *ip-* *ithxuuna* *-tih* *-va*
 3pl(>3s)- ITER- put.on.head -DUR -PLURACT

‘they wear them on their heads’

[LB WB_KL-30:25]

iru- The use of *iru-* PLURAL is described in Bright (1957:113) as taking the place as the PLURAL suffix *-(vu)naa* when one of his Class 2/3 suffixes is present. It indicates plurality of object with transitive verbs and subject with intransitive verbs. It can co-occur with PLURACTIONAL *-va*. It is found infrequently in the corpus. An example is given in (231)

(231) *kuniruváramnih*

kun- *iru-* *va* *-ramnih*
3pl(>3s)- PL- go -into

‘they got in [multiple people, one boat]’

[NR WB_KL-57:92]

Prominence Derivational prefixes do not place or change tone on a stem. They are always part of the prosodic stem and can bear tone when basic derived accentuation places it on them, as in the examples in (232).

(232) a. *kukupá'aapunmaheesh*

ku- *kupa-* *aapunmu* *-ahi* *-avish*
2pl(>3)- MODE- know -ESS -PROSP

‘you will know it (in) that way’

[JS WB_KL-21:42]

b. *kunítuunsip*

kun- *ip-* *tuunsip*
3pl(>3s)- ITER- load.up

‘they packed up their pack baskets’

[PM JPH_KT-05:36]

c. *kunirúviishrih*

kun- *ip-* *iru-* *viishrih*
3pl(>3s)- ITER- PL- descend

‘they came back down’

[LB WB_KL-35:43]

7.3.2 Derivational suffixes

The bulk of Karuk suffixes, all of them derivational, are attached at Level 2, and positionally fall just outside of roots or inner stem morphology. These suffixes are grouped together because they have the same prosodic effects on the stem, with very few exceptions, and fall in a consistent position class. In addition, they fall into relatively coherent semantic

groupings. They typically encode meanings such as direction and manner, and also include valence-changing morphology. Directional suffixes are obligatory with several bound roots, and are used very commonly otherwise, although they are semantically or morphologically incompatible with some roots. Some examples are given in (233). Altogether, 52 separate suffixes fall into this level, listed in Table 7.1.

- (233)
- | | | |
|----|--|----------------------------|
| a. | <i>ishkak</i> ‘to jump’ | [D: <i>ishkak</i>] |
| b. | <i>ishkáákfaku</i> ‘to jump down from uphill’ | [D: <i>ishkáákfaku</i>] |
| c. | <i>ishkákishrih</i> ‘to jump and land’ | [D: <i>ishkákishrih</i>] |
| d. | <i>ishkáákurih</i> ‘to jump into water’ | [D: <i>ishkáákurih</i>] |
| e. | <i>ishkáákmu</i> ‘to jump to (a place)’ | [D: <i>ishkáákmu</i>] |
| f. | <i>ishkáákramnih</i> ‘to jump into’ | [D: <i>ishkáákramnih</i>] |
| g. | <i>ishkáákrishuk</i> ‘to jump out’ | [D: <i>ishkáákrishuk</i>] |
| h. | <i>ishkáá kroovu</i> ‘to jump away upriver’ | [D: <i>ishkáá kroovu</i>] |
| i. | <i>ishkáákrupuk</i> ‘to jump outdoors’ | [D: <i>ishkáákrupuk</i>] |
| j. | <i>ishkááksipriv</i> ‘to jump upward (from a standing position)’ | [D: <i>ishkááksipriv</i>] |
| k. | <i>ishkááksuru</i> ‘to jump off’ | [D: <i>ishkááksuru</i>] |
| l. | <i>ishkááktaku</i> ‘to jump onto’ | [D: <i>ishkááktaku</i>] |
| m. | <i>ishkákunih</i> ‘to jump downhill from here’ | [D: <i>ishkákunih</i>] |
| n. | <i>ishkákuraa</i> ‘to jump up (to a considerable height)’ | [D: <i>ishkákuraa</i>] |
| o. | <i>ishkákavraa</i> ‘to jump over a ridge’ | [D: <i>ishkákavraa</i>] |
| p. | <i>ishkákavruk</i> ‘to jump down over’ | [D: <i>ishkákavruk</i>] |

My Level 2 suffixes include all of Bright (1957)’s position class 3, and some suffixes from his position classes 2 and 4. Bright bases his position classes on combinatoric restrictions, yet the classes are partially semantically determined and not wholly reflective of combinatorics. I consider suffixes that fall into the same basic position in the stem that have consistent prosodic effects on the stem to be in the same level. Co-occurrences within this level are fairly rare and are often lexicalized. An analysis of affix ordering is left to future research; for now, co-occurrence restrictions on suffixes within the level are assumed to be semantic.

Table 7.1: Level 2 suffixes

Directional suffixes	
1. <i>-eep</i>	‘away from (a person)’
2. <i>-faku</i>	‘hither from uphill’
3. <i>-furuk</i>	‘into an enclosed space’
4. <i>-ishrih</i>	‘down (from the height of a man or less)’, RESULTATIVE
5. <i>-kara</i>	‘horizontally toward the center of a body of water’
6. <i>-kath</i>	‘hence across a body of water’
7. <i>-kirih</i>	‘into or onto fire’
8. <i>-kiv</i>	‘out through a tubular space’
9. <i>-ku</i>	‘onto a vertical surface’
10. <i>-kurih</i>	‘into water’
11. <i>-mu</i> ~ <i>-vu</i>	‘thither, to, toward’
12. <i>-path</i>	‘around in a circle’
13. <i>-raa</i>	‘hither’
14. <i>-ramnih</i>	‘in or into a container’
15. <i>-rav</i>	‘in, into’
16. <i>-rina</i>	‘hither across a body of water’
17. <i>-rip</i>	‘off, out’
18. <i>-ripaa</i>	‘horizontally across a body of water’
19. <i>-rishuk</i>	‘out of a container’
20. <i>-roovu</i>	‘hence upriverward, around a basket’
21. <i>-rupaa</i>	‘out of one’s mouth’
22. <i>-ruprav</i>	‘out through a solid’
23. <i>-ruprih</i>	‘in through a solid’
24. <i>-ruprin</i>	‘through’
25. <i>-rupu</i>	‘hence downriverward’
26. <i>-rupuk</i>	‘out of an enclosure’
27. <i>-sipriv</i>	‘up (to the height of a man or less)’, INITIATIVE
28. <i>-suru</i>	‘off, away’
29. <i>-taku</i>	‘on or onto a horizontal surface’
30. <i>-thuna</i>	‘here and there, in various places’
31. <i>-tunva</i>	‘toward each other, together’
32. <i>-uk</i>	‘hither’
33. <i>-unih</i>	‘down from a considerable height, hence downhillward’
34. <i>-uraa</i>	‘up from a considerable height, hence uphillward’
35. <i>-vara</i>	‘in through a tubular space’
36. <i>-varak</i>	‘hither from upriver’
37. <i>-varayva</i>	‘here and there within an enclosure’
38. <i>-vraa</i>	‘over’
39. <i>-vrath</i>	‘into a sweathouse, over’

Table 7.1: Level 2 suffixes (continued)

40.	<i>-vrin</i>	‘in opposite directions’
41.	<i>-vruk</i>	‘down over the edge of something’
Manner & motion suffixes		
42.	<i>-ahi</i> ~ <i>-va</i>	ESSIVE
43.	<i>-ahiv</i>	‘on some occasion’
44.	<i>-ar</i>	‘to go in order to’
45.	<i>-iruv</i>	‘too much’
46.	<i>-mara</i>	‘to finish Xing’
47.	<i>-riv</i>	‘at rest’
48.	<i>-vrik</i>	‘in response to motion’
Valence-changing suffixes		
49.	<i>-ara</i>	INSTRUMENTAL
50.	<i>-ihi</i>	BENEFACTIVE
51.	<i>-math</i> ~ <i>-vath</i>	CAUSATIVE
52.	<i>-unis</i>	‘to, at, about’

Stem-final H tone

Level 2 suffixes all place a H tone on the final syllable of the stem they attach to, unless blocked by a protected structure in the input (stem-final target syllables are underlined in the following examples). The examples in (234) show Level 2 suffixes assigning a final H tone to underlyingly toneless roots.

(234) Stem-final H assigned by Level 2 suffix

a. *ikyívish*

ikyiv -*ishrih*
fall -down/result

‘to fall down’

[various D:*ikyívish*]

b. *ixyákurih*

ixya -*kurih*
throw.(pl) -into.water

‘to throw (plural objects) into water’

[MO D:*ixyákurih*]

c. *thivrúhish*

thivruh -*ishrih*
float -down/result

‘to float ashore’ [CP D:*thivráhish*]

d. *iyúruraa*

iyur -*uraa*
put.(long.object) -up

‘to raise (long object) up’ [D:*iyúruraa* (KV)]

Tone assigned by Level 2 suffixes overrides input tone that is not in a protected HL structure, as in the examples in (235). A protected HL structure (discussed in Chapter 6) on the input blocks stem-final tone assignment by Level 2 suffixes, as in the examples in (236).

(235) Stem-final H not blocked

a. *pivaxráhish*

piváxrah -*ishrih*
dry.up -down/result

‘(water) to go down’ [D:*pivaxráhish*]

b. *ikrivrúhunih*

ikrívruh -*unih*
roll -down

‘to roll downhill from here’ [D:*ikrivrúhunih*]

c. *axaychákish*

axáychak -*ishrih*
take.away-closing.up -down/result

‘to grab, seize, catch’ [various D:*axaychákish*]

d. *tapakpákahi*

tapákpak -*ahi*
slice -ESS

‘to be sliced’ [JS WB_KL-86:8]

e. *oonváfuruk*

óónva -*furuk*
take.(people) -indoors

‘to take (two or more) people inside’ [CP WB_KL-52:23]

(236) Stem-final H blocked by HL on root

a. *tátuyish*

tátuy -ishrih

sweep -down/result

‘to sweep’

[VS D:tátuyish]

b. *súrukurih*

súru -kurih

make.hole -into.water

‘to make a hole into (something)’

[JS D:súrukurih]

c. *áànvath*⁵

áànva -vath

paint.one’s.(own).face -CAUS

‘to paint (someone’s) face’

[MC D:áànvath]

Vowel lengthening in stem-final syllables

In all the examples of stem-final H tone assigned by Level 2 suffixes seen in the preceding section, either the stem-final syllable was open, or the suffix was vowel-initial, resulting in the H tone falling on an open syllable after syllabification. When a consonant-initial Level 2 suffix is attached to a consonant-final stem, however, the final syllable will be closed. If a H tone assigned by a Level 2 suffix falls on a closed syllable with a short vowel, it will violate the constraint against H tone on a CVC syllable that was shown to be active in Karuk roots (Chapter 4). The same *(C)VC constraint is active at this level of verbal derivation as well, but it does not prevent placement of stem-final H tone. Instead, vowel lengthening in the closed syllable takes place, as seen in (237). Final vowel lengthening avoids the dispreferred *(C)VC structure while maintaining stem-final prominence.

(237) Stem-final H with lengthening

a. *ikyúmkurih*

ikyiv -kurih

fall -into.water

‘to fall into water’

[various D:ikyúmkurih]

b. *ikfúksipriv*

ikfuk -sipriv

climb -up/begin

⁵Underlying /va-va/ sequence reduced by haplology.

- ‘to get up (from a lying position)’ [various D:*ikfúuksip*]
- c. *iyúúnkurih*
iyur -*kurih*
 put.(long.object) -into.water
 ‘to put it [pencil]’ [VS D:*iyur-*]
- d. *ikrivrúúhsur*
ikrívruh -*suru*
 roll -off
 ‘to roll away’ [D:*ikrivrúhsur*]
- e. *vupakpáákmar*
vupákpak -*mar*
 cut.up -finish.doing
 ‘to finish cutting up’ [PM D:*vupákaakmar*]

The vowel lengthening process cannot simply be attributed to vowel lengthening in stressed syllables, because no lengthening takes place when the result is a stressed H on a CV syllable. Avoidance of prominence on a (C)VC syllable is better motivated for tone than for stress, as discussed in Chapter 4. There, CV was shown to be a better target for H tone than CVC, while CVV is even better than CV.

Treatment of stem-final short vowels

An epenthetic vowel inserted between the root and the suffix (see §3.2.2) does not receive H tone; the H tone is placed on the actual stem-final vowel, as in (238).

- (238) a. *ukyíviv^hrath*
u- *ikyiv* -*v^hrath*
 3s(>3) fall -into.sweathouse
 ‘he fell in (to the sweathouse)’ [NR WB_KL-02a:9]
- b. *nikpúh^huthunavish*
ni- *ikpuh* -*thuna* -*avish*
 1s(>3)- swim -around -PROSP
 ‘I am swimming around’ [VS VS-12:15]

The avoidance of H tone on epenthetic vowels could be explained by their being added after the assignment of H tone to the stem. This explanation will not work, however, for some stem-final vowels which also avoid H tone, as seen in (239).

(239) *tanuthyúrufak*

ta= nu- ithyuru -faku
 PERF= 1pl(>3)- drag -from.uphill

‘we dragged them downhill’

[VSu VSu-04:4]

These vowels must be present underlyingly, and not epenthetic, because they are unpredictable and surface with consonant-initial suffixes. These are vowels which can be deleted word-finally, as discussed in §3.3.1. The avoidance of H tone on these vowels has to do with tone-syllable structure alignment and is not related to their deletability, however. H tone is placed preceding a final vowel only when it can form a HL protected structure, that is, when the root ends in (C)VCV. If the root ends in (C)VVCV, however, as in the example in (240), the protected HL structure could not be formed with these syllables. Accordingly, in stems with this syllable structure, the final vowel can receive a H tone when followed by a suffix even though this vowel would be deleted word-finally.⁶

(240) *ithiinatih*

i- thiina -tih
 2s(>3)- have -DUR

‘(do) you have (one?)’

[VS VS-17:2]

There are thus three distinct possibilities for the placement of prominence with Level 2 suffixes: HL across the morpheme boundary, H on lengthened stem-final syllable, and HL on final two stem syllables). In order for these three patterns to arise, there must be a limited window for evaluation of placement of H tone. This is distinct from the window for evaluation of a HL structure on the input, which must include the entire input stem. The window of evaluation for stem-final tone assignment is a moraic trochee (coda consonants counting as moraic), as shown in brackets in (241).

(241) a. *ith[yuru]-faku → ith(yúru)faku*b. *i[yur]-uraa → i(yúru)raa*c. *i[yur]-kurih → i(yúún)kurih*d. *thii[na]-tih → thii(náti)h*e. *oon[va]-furuk → oon(váfu)ruk*

⁶Examples of this structure with Level 2 suffixes have not been found, as roots of this shape are rare, but roots with final vowels combined with *-tih* DURATIVE show the pattern described here. Accentual patterns with *-tih* are more complex than those with directionals, the fact that these vowels can bear H tone shows that they are not extrametrical or otherwise not present at assignment of prominence.

If a bimoraic HL foot can be built in this window, it is (241a). If only one TBU is contained within the window, and a bimoraic HL foot can be created with the addition of the suffix vowel, it is (241b). If this is not possible due to an intervening coda consonant, as in (241c), vowel lengthening is triggered. In a stem such as (241d), the moras of the long vowel cannot be split between the window and outside the window, so H tone must be placed stem-finally and the first mora of the suffix completes the bimoraic trochee. Similarly, a closed first syllable in the root will result in H tone on the final vowel, as in (241e). Evaluation of placement for stem-final tone assignment must be limited to this local environment because otherwise, a HL elsewhere on the stem would be expected to be preferred over lengthening the final vowel and still not creating a HL structure, as in *i(yúún)kurih* vs. **(íyun)kurih*.

Differences from previous analysis

Bright (1957) describes the effects of the suffixes discussed here as three different processes, of which each suffix triggers some combination: ‘presuffixal accentuation’, ‘progressive accentuation’, which moves accent one syllable to the right, and ‘potential lengthening’ of a stem-final vowel. However, there is no evidence for this set of affixes moving accent to anywhere but the final syllable of the stem (deregarding the final vowels discussed above, and the vowel lengthening process can be defined solely in terms of syllable structures, without any need to specify which of these suffixes trigger it. For these reasons, I analyze these processes as parts of a single phenomenon.

Evidence for intermediate placement of prominence

Because of basic derived accentuation (Chapter 5) driving placement of H tone *preceding* a long vowel, the process of final vowel lengthening described here becomes quite opaque. What evidence is there that H tone on these syllables actually triggers the vowel lengthening, since it rarely surfaces there? Circumstantial evidence is fairly strong. The lengthening only occurs in stems where tone movement is not blocked by a protected HL structure. There is evidence of H tone moving to and staying in the stem-final position on an open syllable with the same suffixes that trigger lengthening when the stem-final position is a closed syllable. Moreover, there is motivation for vowel lengthening with a H on (C)VC based on other patterns in the language, and no discernable motivation for stem-final vowel lengthening otherwise.

Additionally, (very limited) evidence for the intermediate placement of stem-final H tone comes from the zero-prefixed parts of the inflectional paradigms. In the absence of a prefix, the high-before-long accentuation pattern does not apply (see §8.5.2). In these cases, underlying accentuation would be expected to surface, which in the case of (242) would be on the long vowel.

(242) *chími ikfúúksipriv!* (**íkfuuksipriv*, cf. *níkfuuksipriv* [VS JL-VS-01:16])

chími ikfuk -sipriv
soon climb -up/begin

‘[It’s time to] get up!’

[CT CT-01:45]

7.3.3 Summary

At this level, there is a preference to place a HL tone sequence aligned with a bimoraic trochee at the right edge of the stem preceding the suffix. This preference is in tension with input tone on the stem and tone-syllable alignment restrictions, which are resolved in the following way. If there is a protected HL structure in the input, it is retained, and no tone is placed stem-finally. If a stem-final HL moraic trochee can be built, it is, recruiting suffixal material if necessary. If the stem-final syllable is closed, its vowel lengthened due to the prohibition $*(C)\acute{V}C$ and a H falls on that syllable.

7.4 Level 3: Semi-derivational morphology

A small set of suffixes occurs on the border between derivation and inflection, both in terms of semantics and in terms of inclusion in the prosodic stem. These are listed in (243) and occur in a fixed order, given in (244). These suffixes normally fall outside of the prosodic domain for accentuation, and either have similar weak effects on stem prominence as Level 2 suffixes, but with some inconsistencies, or have no effect on prominence.

(243) a. *-naa* ~ *-vunaa* PLURAL

b. *-tih* DURATIVE

c. *-ach* DIMINUTIVE

(244) *Semi-derivational suffix positions*

ROOT -DERIVATION *-(vu)naa -tih -ach* -INFLECTION

There are many examples of PLURAL and DURATIVE co-occurring, a few of DURATIVE and DIMINUTIVE co-occurring, although there are no examples of PLURAL with DIMINUTIVE or all three together.

7.4.1 Prosodically weak suffixes

-(vu)naa It may make sense to consider *-(vu)naa* PLURAL as one of the derivational suffixes. There is a co-occurrence restriction between the suffixal allomorph of this morpheme and the directionals, in which case it is replaced by the prefixal version of the morpheme, *iru-*. *-naa* follows vowels, while *-vunaa* consonants. It can trigger vowel lengthening in the final stem syllable, but its effects are inconsistent. See Bright (1957) for more on the allomorphy and use of this morpheme. In any case, its long vowel is excluded from the

prosodic stem, so it is not counted for basic derived accentuation placement. The exception is with unaccented monosyllables, when it can be recruited into the prosodic word and bear tone. Semantically, plurality is a category that is commonly considered inflectional when it refers to agreement. In a language such as Karuk, however, where plurality of either objects or subjects can be integral to the semantics of the verb (indeed, several verbs in Karuk use completely different roots for singular and plural versions of an action), it can be seen as derivational.

- (245) a. *u'áànvathvunaaheen*
u- áànvath -vunaa -aheen
 3s(>3)- paint.someone's.face -PL -ANT
 'he painted their faces' [JS WB_KL-10:33]
- b. *kuníthtiitvanaa*
kun- ithtit -vanaa
 3pl(>3s)- gamble -PL
 'they gamble' [ED WB_KL-82:19]

-ach Bright states that the DIMINUTIVE suffix *-ach* is on the border between derivation and inflection. This morpheme triggers consonant symbolism in the stem (Haas 1970). It is prosodically neutral and has no effect on stem prominence.

- (246) a. *u'ínihnamnihach*
u- írihramnih -ach
 3s(>3)- drip.into -DIM
 'it dribbled in' [MO WB_KL-33:7]
- b. *uxnánatihach*
u- ixrara -tih -ach
 3s(>3)- cry -DUR -DIM
 'he was crying a little' [LB WB_KL-61:7]

7.4.2 Variable effect suffix

-tih The DURATIVE suffix *-tih* is on the boundary between derivation and inflection because while it encodes an aspectual meaning, and it is generally very productive, it can occur inside of any other tense or aspect marking, and in some stems it is lexicalized as part of the root. It is normally outside of the prosodic stem for accentuation, although it can be sometimes

be included in the window and bear tone with certain monosyllabic roots, or with certain outer inflectional suffixes.

The DURATIVE suffix has variable effects on prominence. For the most part, *-tih* DURATIVE behaves the same way as a Level 2 suffix when it comes to stem-final tone placement and vowel lengthening, as shown in (247), and it will not override a protected HL configuration in the input. However, its triggering of vowel lengthening is inconsistent, and words containing *-tih* DURATIVE in combination with certain syllabic structures, certain agreement prefixes, and/or words containing a prosodically strong affix are subject to a sub-pattern discussed in §7.6. This subpattern is found in approximately 2% of verb tokens in the corpus.

- (247) a. *fikríptih*
 fikrip *-tih*
 pick.out -DUR
 ‘to be sorting’ [MD GD-MD-VSu-01:30]
- b. *uumútih*
 uumu *-tih*
 arrive -DUR
 ‘to be going to’ [NR WB-KL-11:17]

7.5 Multi-level strong affixes

7.5.1 Accent-erasing suffixes

A small set of derivational suffixes, listed in (248), erase all input accentuation and derived vowel length, resulting in basic derived accentuation at the surface. These suffixes are the PLURACTIONAL *-va* and suffixes which are lexicalized combinations of Level 2 suffixes and the PLURACTIONAL. The *-va* suffix pluralizes participants or events and marks event-external semantics (Bright 1957; Conathan & Wood 2003; see also Mithun 1988). The composed affixes can be considered Level 2 suffixes, positionally and semantically, but have the same strong effect on prominence as the PLURACTIONAL, due to the presence of PLURACTIONAL *-va*. This would be expected for a Level 2 suffix followed by PLURACTIONAL *-va*, but since these suffixes are lexicalized as single affixes and are not fully decomposable synchronically, they are listed here. These affixes have a strong effect on stem prominence in that they override even a protected HL configuration in the input.

- (248) a. *-va* PLURACTIONAL
- b. *-koo* ‘to’ (directional) ← *-ku* ‘onto a vertical surface’ + *-va* PLURACTIONAL
- c. *-iichva* ‘in play, in pretense’ (manner) ← *-ich* DIMINUTIVE + *-va* PLURACTIONAL

- d. *-oo* HABITUAL (manner) ← *u?* + *-va* PLURACTIONAL
- e. *-vaana* ‘oneself’ (valence-changing⁷) ← *vaa?* + *-va* PLURACTIONAL

The examples in (249) show PLURACTIONAL *-va* in combination with stems of various shapes, all resulting in basic derived accentuation on the surface. The examples in (250) show PLURACTIONAL *-va* in combination with stems of various shapes that have a protected HL structure on the input. The strong effect of PLURACTIONAL *-va* on these stems erases input tone, resulting in basic derived accentuation on the surface even in these stems. Examples of the same stems without PLURACTIONAL *-va* are given to show that the protected HL surfaces otherwise.

(249) Stems without protected HL

<i>Stem</i>	without <i>-va</i>	with <i>-va</i>
a. <i>piytúuykar</i> ‘kick out into river’	<i>upíytuuykar</i> ‘he kicked it into the river’	<i>upiytúykaanva</i> ‘he kicked it into the river’
b. <i>ááhka</i> ‘set fire to, burn’	<i>tu’ááhka</i> ‘he lit it’	<i>tu’ááhkoo</i> ‘he set fire to them’
c. <i>imship</i> ‘cool off, be extinguished’	<i>úmsip</i> ‘it was extinguished’	<i>kunímshiiipva</i> ‘they went out’
d. <i>av</i> ‘eat’	<i>u’av</i> ‘he ate it’	<i>u’áámva</i> ‘he ate them’

(250) Stems with protected HL

<i>Stem</i>	without <i>-va</i>	with <i>-va</i>
a. <i>inhûshrih</i> ‘tie down’	<i>unhûshrih</i> ‘he tied it to’	<i>unhíshriihva</i> ‘she tied them down’
b. <i>vítishrih</i> ‘beach a boat, land’	<i>kunvítish</i> ‘he beached it’	<i>kunvitíshriihva</i> ‘they beached them’
c. <i>árihishrih</i> ‘sing’	<i>kun’árihishrih</i> ‘he sang’	<i>kun’arihíshriihva</i> ‘they sang’

7.5.2 Note on variable placement of *-va*

The *-va* PLURACTIONAL suffix is unique among Karuk morphology because it can attach at any level of the derivation. Its placement seems to be determined by scope. Aside from its

⁷Used with ITERATIVE prefix for reflexive meaning.

strong input tone erasing effect, its effects on prominence generally follow those typical of the level. As noted by Bright (1957:91-93), *-va* PLURACTIONAL appears to be lexicalized in a number of Karuk verb roots. When attached at Level 1, vowel shortening but not lengthening is triggered on the stem, and prominence is not sensitive to closed syllables, as expected.

When attached at Level 2 (in place of or outside of other Level 2 suffixes and before DURATIVE *-tih*), several factors conspire to create a long vowel at the right edge of the stem, before which a H tone will be placed in basic derived accentuation. The *-va* PLURACTIONAL suffix, when alone, will often create a long vowel in coalescence with a vowel-final stem. Many of the Level 2 suffixes in combination with *-va* PLURACTIONAL have suppletive allomorphs. In consonant-final stems, where no suppletive allomorphy takes place, *-va* PLURACTIONAL triggers final vowel lengthening the same as any other Level 2 suffix. The composed suffixes listed in (248) all contain long vowels, which count for the high-before-long pattern. In all these cases, a long vowel is created at the right edge of the stem with basic accentuation placing a H tone before it. Finally, *-va* PLURACTIONAL can also attach at Level 3, outside of DURATIVE *-tih*, as shown in the examples in (251).

- (251) a. *uthvúytiihva*
u- ithvuy -tih -va
 3s(>3)- be.named -DUR -PLURACT
 ‘it is called’ [PM JPH_TKIC-III.2:1]
- b. *kunpithxunátiihva*
kun- ip- ithxuuna -tih -va
 3pl(>3s)- ITER- put.on.head -DUR -PLURACT
 ‘they wear them on their heads’ [LB WB_KL-30:25]
- c. *kun’ativútiihva*
kun- ’ativu -tih -va
 3pl(>3s)- carry.in.burden.basket -DUR -PLURACT
 ‘they were carrying it in burden baskets’ [NR WB_KL-57:116]

7.6 Flipped feet and ‘unstable accent’

Two related subpatterns are found in 2-3% of all tokens in the corpus (this accounts for about half of all the unexplained prominence in the corpus). These patterns are flipped stem-initial feet (i.e., high following long), and unexpected HL accentuation on long vowels. Collectively, these correspond to Bright’s ‘Special Progressive Accentuation’ and his ‘Unstable Accent’. Bright (1957) describes these phenomena and attributes them to a particular accentual classes and special accentual effects of certain morphemes. I mention these sub-patterns and

provide a brief description with a few observations here for completeness, following Bright's observations and categories. I believe the explanation lies with footing and syllable structure, but a full analysis is left to future research.

7.6.1 Flipped initial-heavy feet

As shown in Chapter 5, in words with only one long vowel at the left edge of the prosodic stem, prosodic prominence normally falls on that vowel. However, a second pattern is seen in words of this shape in which prominence falls on the syllable following the stem-initial long vowel, as in the examples in (252). This 'flipped' pattern is distinct from the stem-final accent seen with TAM suffixes in certain contexts (see Chapter 8), although in short stems it can appear the same.

- (252) a. $u[{}^{\prime}iikiv]_P tih$
 u- *{}^{\prime}iikiv* *-tih*
 3s(>3)- wear.necklace -DUR
 'he was wearing (it) as a necklace' [NR WB_KL-34:70]
- b. $ni[xuushúnish]_P tih$
 ni- *xushunish* *-tih*
 1s(>3)- think.something.about -DUR
 'I think she looks like... ' [D: JPH ani 06:815]
- c. $u[{}^{\prime}aapúnma]_P$
 u- *{}^{\prime}áapunmu*
 3s(>3)- know
 'she found it out' [MO WB_KL-28:21]

These words appear to contain truly flipped feet, that is, one in which high tone aligns with the right edge of the foot and a long vowel aligns with the left edge. This is because while prominence is often penultimate, it is not consistently so, but in all cases, prominence falls immediately after the stem-initial long vowel. It is unclear what causes the 'flipped' pattern to prevail over heavy initial prominence. Because the shapes of these words are similar or even identical to those found in §5.2.4), the morphology must be active in determining different constraint rankings. This pattern occurs as part of the 'unstable accent' pattern described in the following section, but may be more widespread than the stems that follow that pattern.

7.6.2 'Unstable accent'

The so-called 'unstable accent' pattern seems to be triggered by the presence of the DURATIVE *-tih*, with a certain subset of agreement prefixes (which cross-cuts the cohering/non-cohering

distinction), and the presence of PLURACTIONAL *-va* (or one of its derivative affixes). A small set of roots which do not ostensibly contain any of the suffixes listed in (248) also follow the same variable accentual patterns with the two classes of prefixes and DURATIVE *-tih* present.

The stems described in this section display unexpected accentuation with certain outer suffixes, only in combination with one subset of the agreement prefixes. Karuk agreement prefixes can be divided into two classes based on the accentual behavior of words of this type, as listed in (253-254). These are Bright's 'non-post-accenting' and 'post-accenting' prefixes, respectively. Note that these categories cross-cut the cohering/non-cohering distinction discussed in §8.4.2.

(253) *Class 1 Prefixes*

- a. *ni-* 1s (> 3)
- b. *i-* 2s (> 3)
- c. *u-* 3s (> 3)
- d. *ku-* 2pl (> 3)
- e. *na-* 2s/3s > 1s
- f. *nu-* 1 > 2s (optative); 1pl (> 3) (optative)
- g. *kam-* 3s (> 3) (optative)

(254) *Class 2 Prefixes*

- a. *nu-* 1 > 2s (indicative); 1pl (> 3) (indicative)
- b. *kun-* 3pl (> 3s)
- c. *kii(k)-* 1/3 > 2pl (positive)
- d. *kin-* 2/3 > 1pl / 3pl > 3pl (positive)
- e. *kana-* 2pl/3pl > 1s (positive)
- f. *kan-* 1s (> 3)

With Class 1 prefixes, stems which ended their derivation with the strong input tone-erasing suffix surface with basic derived accentuation. However, when certain additional suffixes are added outside the tone-erasing suffix, tone appears to move a single mora rightward from the basic position. This effect is absent with Class 2 prefixes. Stems of this type with Class 2 prefixes always surface with basic high-before-long accentuation. A minimal set showing the same verb root with prefixes of each class, with and without the durative *-tih* suffix, is given in (255). In (255a), the short vowel preceding the rightmost long vowel in the word bears H tone, as expected, with both classes of prefix. However, in (255b), when the DURATIVE suffix *-tih* is present, expected basic derived accentuation is found only with the Class 2 person prefix, while with the class 1 person prefix, the H tone appears to be shifted a single mora to the right, resulting in a HL falling tone on the long vowel

- (255)
- | | <i>Prefix Class 1</i> | <i>Prefix Class 2</i> |
|----|--|---|
| a. | <i>upakúriihva</i>
'(s)he sings songs' | <i>kunpakúriihva</i>
'they sing songs' |
| b. | <i>upakurûhvutih</i>
'(s)he is singing songs' | <i>kunpakúriihvutih</i>
'they are singing songs' |

In (256)-(257), additional examples of each combination of morphemes are provided, although minimal sets for each verb root are not always attested. These additional examples show that stems of various lengths and syllable shapes behave the same way, only resulting in the HL pattern when both *-tih* and a Class 1 prefix are present.

- (256) Bare stems showing basic derived accentuation with both classes of prefix

	<i>Prefix Class 1</i>	<i>Prefix Class 2</i>
a.	<i>ukyámiichva</i> '(s)he plays'	<i>kunúpuunva</i> 'they rested'
b.	<i>uhvaníchviichva</i> '(s)he teases them'	<i>kun'uhyániichva</i> 'they chatted'
c.	<i>upixivshúroo</i> '(s)he ripped them off'	<i>kunihvaníchviichva</i> 'they tease it'
d.	<i>upichakúvaan</i> '(s)he was proud'	<i>kunthataktakúraan</i> 'they were tattered'
e.	<i>nathurirúvuukva</i> 'I am urinating all over myself'	<i>kun'ixipúniichva</i> 'they drifted down'

- (257) Stems with DURATIVE *-tih* showing different accentuation with each prefix class

	<i>Prefix Class 1</i>	<i>Prefix Class 2</i>
a.	<i>ukyavîichvuti</i> '(s)he works'	<i>nukyáviichvuti</i> 'we are working'
b.	<i>utaprûhvuti</i> '(s)he likes to live there'	<i>kunikyáviichvutih</i> 'they are working'
c.	<i>uchiihvîichvuti</i> '(s)he is singing love songs'	<i>kun'îhmootih</i> 'they dance to'
d.	<i>nipakurûhvutih</i> 'I am singing songs'	<i>kuniptákootih</i> 'they added (water) again'
e.	<i>u'ahavishkâavutih</i> '(s)he fishes'	<i>kunithyivúniichvutih</i> 'they fell down'

7.6.3 Roots following 'unstable' pattern

A small set of roots which do not ostensibly contain any of the suffixes listed in (248) also follow the same variable accentual patterns with the two classes of prefixes when outer suffixes are present. These roots are listed in (258).

- (258) a. *áápunmu* ‘know’
 b. *áramsipriv* ‘start out, come from’
 c. *ávikva* ‘carry (something light)’
 d. *tápkuup* ‘like’
 e. *thívkee* ‘go along’

While *ávikva* appears to contain the accent-erasing pluractional suffix *-va*, it is listed separately here because all other lexicalized roots which seem to contain *-va* have a long vowel. Examples of surface accentuation for these forms with the two classes of prefixes are given in (259)–(262).

- (259) *Prefix Class 1* *Prefix Class 2*
 a. *utápkuup* *kuntápkuup*
 ‘(s)he likes’ ‘they like’
 b. *utapkûuputi* *kuntápkuuputih*
 ‘(s)he likes’ ‘they like’
- (260) *Prefix Class 1* *Prefix Class 2*
 a. *nithívkee* *kanthívkee*
 ‘I go along’ ‘let me go along’
 b. *nithivkéèti* [no examples]
 ‘I am going along’
- (261) *Prefix Class 1* *Prefix Class 2*
 a. *ni’aapúnma* *kun’áápunma*
 ‘I know’ ‘they know’
 b. *ni’aapúnmuti* *kun’áápunmutih*
 ‘I know’ ‘they know’
- (262) *Prefix Class 1* *Prefix Class 2*
 a. *ni’ávikva* [no examples]
 ‘I carry’
 b. *u’avíkvutih* [no examples]
 ‘(s)he is carrying’

7.7 Discussion

In this chapter I have presented a new characterization of derivational morphology based on effects on stem prominence and shape, organized into three levels. Some morphemes

are characterized as strong, meaning that they erase any input tone and impose a set tonal pattern. Others are weaker, and will not override a protected HL on the input, but will erase other input tone. Some are weak and have no effect on stem tone. Vowel lengthening takes place in certain levels of derivation in order to avoid an illicit tone-syllable alignment.

Many of the effects seen here are not obvious at the surface. Much derivational morphology places tone stem-finally, which in many cases is penultimate, so is indistinguishable from both basic penultimate accentuation and stem-final accentuation sometimes placed by inflectional suffixes. When vowel lengthening is associated with this tone placement, the tone almost always moves off the long vowel to the preceding syllable in the high-before-long pattern. Despite this opacity, the processes described here are the most consistent and motivated explanations for the derived protected HL configurations, and for the stem-final vowel lengthening.

It is clear that, in Karuk, not all surface prosodic prominence can be attributed to a single set of phonological constraints. Different morphology must be associated with different constraint rankings to account for the patterns found. Reference to purely morphological information is necessary to account for some accentual alternations in identical phonological contexts.

Chapter 8

Interaction of inflectional morphology and prominence

8.1 Introduction

The accentuation pattern described in Chapter 5 applies very broadly in Karuk words, but has important morphological exceptions. One complication is that the basic pattern only applies within a window, and that certain inflectional morphology can fall outside of this window: a seemingly arbitrary subset of agreement prefixes, and almost always all inflectional suffixes. In this chapter, I show that divergent patterns of accentuation on verbal inflectional affixes is best explained by their inclusion or exclusion in the prosodic stem. The apparently exceptional patterns are unified with basic derived accentuation under this account. I present a revised inverse hierarchy and agreement paradigms with integrated evidence from prosody and morphosyntax which accounts for the groupings of agreement prefixes. Most prosodic prominence in verbs with inflectional suffixation can also be explained by basic derived accentuation when the suffixes are excluded from the stem, with some additional exceptionality relating to weak prosodic effects of the suffixes and minor as-yet unexplained patterns.

In the following sections, I first introduce the concept of the prosodic stem in Karuk, and provide an overview of Karuk inflectional morphology. I then present the exclusion of prefixes from the prosodic window as a mismatch between the morphological word and the morpho-prosodic word. A phenomenon by which normally excluded prefixal material is incorporated into the prosodic stem provides further support for a prosodic window as the explanation for the “accentability” of these morphemes, and the prefixes subject and not subject to exclusion are characterized in morphosyntactic terms. Effects of inflectional suffixation on prominence and the right edge of the prosodic stem are discussed. Finally, alternative possible analyses and the implications of this approach are addressed.

8.2 The prosodic domain window

Following prosodic domains theory (Inkelas 1989, 1993a,b), a prosodic domain window delimits the morpho-prosodic constituent corresponding to the morphological word. In many Karuk words, the entire morphological word is coterminous with the prosodic domain window, as in the examples in (263)–(264), where the window is indicated by square brackets with a subscript *p* (parentheses indicate metrical feet). All nouns and some verbs fall into this category. In these cases, whenever there is a long vowel in the word, the high-before-long pattern applies (263). When there is no long vowel, H falls on the penult (264), as discussed in the preceding chapter. Accentuation may fall on any of the inflectional prefixes seen in these examples, but it need not (compare *mu-* 3sPOSS in (263d) and (264c), and *kin-* 3pl>3pl in (264a) and (264b)).

- (263) a. $[(ná'íin)]_p$
na- íin
 2s/3s>1s- have.wrong
 ‘it’s wrong with me’ [CP WB_KL-14:9]
- b. $[(ná'aath)va]_p$
na- 'ááthvu
 2s/3s>1s- be.afraid
 ‘I am afraid’ [LA LA-01:1]
- c. $[(núpii)kivmath]_p i$
nu- piikívmath -i
 1pl(>3)- put.necklaces.on -OPT
 ‘let’s put necklaces on him’ [NR WB_KL-42:6]
- d. $[(mútaat)]_p$
mu- taat
 3sPOSS- mother
 ‘his mother’ [VS D:táat]
- e. $[ku(máthuuf)]_p$
kuma- thuuf
 3sPOSS- creek
 ‘some creek or other’ (Bright 1957:57)
- (264) a. $[(kínmah)]_p$
kin- mah
 3pl>3pl- see

- ‘they see them’ [NR WB_KL-65:1]
- b. $[ki(níykar)]_P$
kin- *iykar*
 3pl>3pl- beat/kill
 ‘they are killing them’ [DJ WB_KL-20:1]
- c. $[mu(píkship)]_P$
mu- *pikship*
 3sPOSS- shadow
 ‘his shadow’ (Bright 1957:49)

By contrast, certain verbal inflectional prefixes do not bear high tone when expected, based on the basic high-before-long pattern, as in the examples in (265), or the penultimate pattern when attaching to a short-voweled monosyllabic stem, as in (266). About half of the verbal inflectional prefixes fall into this group.¹ These verbal inflectional prefixes are excluded from the prosodic stem, indicated in the examples in (265)–(266) by square brackets. Any material outside of the prosodic stem cannot bear prominence itself, and is disregarded in the determination of the placement of prominence relative to word edges. Thus, basic derived accentuation does in fact apply in these words, but it is limited to the material contained within the prosodic stem.

- (265) a. $i[(íin)]_P$ ([*(íiin)]_P)
i- *iin*
 2s(>3)- have.wrong
 ‘have something happen to you’ [JS WB_KL-16:32]
- b. $kun[(ááth)va]_P$ ([*(kún’aath)va]_P)
kun- *’ááthvu*
 3pl(>3s)- be.afraid
 ‘they are afraid’ [JS WB_KL-92:65]
- c. $kun[(píi)kivmath]_Paheen$ ([*(kúnpii)kivmath]_Paheen)
kun- *piikívmath* *-aheen*
 3pl(>3s)- put.necklaces.on -ANT
 ‘they put necklaces on him’ [NR WB_KL-42:7]

¹Bright (1957) refers to this set of prefixes as “unaccented” and the set which can bear accent as “accented”. I disagree with this characterization for reasons discussed below in §8.6.2.

- d. $[uk(rívruuh)sip]_P$ reeheen (*[ukrivruuhsi(prééheen)]_P)
u- *ikrívruuh* *-sipriv* *-aheen*
 3s(>3)- roll -up/begin -ANT
 ‘he started to roll’ [WB_LA78.1-019:56]
- e. $kun[vuh(vúhiich)va]_P$ naatih (*[kunvuhvuiich(vánaa)tih]_P)
kun- *vuhvúhi* *-iichva* *-naa* *-tih*
 3pl(>3s)- do.jump.dance -PRETENSE -PL -DUR
 ‘they do the imitation deerskin dance’ [WB_KL-82:16]
- (266) $kun[(máh)]_P$ (*[(kúnmah)]_P)
kun- *mah*
 3pl(>3s)- see
 ‘they see it’ [VS VS-19:14]

Note that example (265c) shows certain suffixes are excluded from the prosodic stem, as well, at the right edge of the word, as will be discussed below in §8.5.

Certain affixes in Karuk are essentially invisible to rules for the placement of accentuation. Invisibility of a string to certain rules or processes has been modeled in various ways (e.g., extrametricality [Lieberman & Prince 1977; Hayes 1985]). Invisibility with regard to prosodic prominence is found at both the left and right edges of the verb stem in Karuk. The patterns at each edge are somewhat different, but each are linked to specific sets of morphology. At the right edge, invisibility is persistent and cumulative and could benefit from an extrametricality approach such as that in (Buckley 1994a,b). At the left edge, an extrametricality explanation is dispreferred because the segments are not extrametrical with regard to syllabification or other phonological processes, and because they can be incorporated into the prosodic stem under regular phonological processes unrelated to metricality. Neither invisibility is regular, in the sense of counting syllables or segments, as both extrametricality and recent alternative explanations (e.g., Buckley 2014; Hyde et al. 2012) assume.

I follow the domains approach (as proposed by Inkelas (1989, 1993a,b) here to model the invisibility of affixes to accentuation. Using a stem-anchored window to define the prosodic stem can account for both sets of invisible morphemes, thus unifying the right-edge phenomena with the left-edge phenomena. The window of application of assignment of prosodic prominence in Karuk is different from the edge-tropic windows (as in Kager 2012), because neither prominence nor the window for assignment of prominence are reliably a certain number of syllables from one edge or the other, as analyzed for Greek (Steriade 1988) or Choguita Rarámuri (Caballero 2008). The window for assignment must be defined in terms of alignment with a prosodic stem, and edge-tropic assignment of prominence takes place with reference to edges of that prosodic stem. Since a diacritic explanation of some sort linked to the specific subset of agreement prefixes is required, direct reference to the

edge of the prosodic stem is preferred to using extrametricality in this context.²

8.3 Level 4: Inflectional morphology

Inflectional morphology in Karuk consists of tense, aspect, modality and other such suffixes, and agreement prefixes and suffixes. Inflectional affixes normally fall outside of the domain for prosodic prominence, although they can be recruited into it under certain conditions.

8.3.1 Inflectional suffixes

The inflectional suffixes are listed in Table 8.1. My glosses and descriptions of these affixes are based on Bright (1957) with the following exceptions. I follow Macaulay (1989)'s reanalysis of Bright's 'syntactic postfixes' as suffixes. Peltola (2008) reanalyzes the suffix *-ahaak*, which Bright glosses as a relative 'when', as an irrealis subjunctive marker. I presume this analysis and a similar analysis for *-irak*. Begay (2014) reanalyzes *-avish* as prospective aspect, rather than future tense.

Table 8.1: Inflectional suffixes

Tense/aspect		
1.	<i>-avish</i>	PROSPECTIVE ASPECT
2.	<i>-aheen</i>	ANTERIOR TENSE
3.	<i>-anik</i>	ANCIENT TENSE
4.	<i>-at</i>	PAST TENSE
Modality/subordinating		
5.	<i>-ahaak</i>	IRREALIS
6.	<i>-an</i>	PARTICIPIAL
7.	<i>-irak</i>	'where'
Agreement/inverse/negative		
8.	<i>-ara</i>	NEGATIVE
9.	<i>-ap</i>	INVERSE/NEGATIVE
10.	<i>-i ~ N</i>	OPTATIVE

²Note that extrametricality, in the conventional sense, is likely at play in other parts of the Karuk grammar. For instance, final coda consonants seem to be extrametrical in the context of the moraic trochee of the protected HL structure, where medial coda consonants are not (§6.2.3). Similarly, final vowels that can be deleted word-finally (§3.3.1) can be analyzed as being left unsyllabified, so can be considered extrametrical. The phenomena discussed in this chapter are clearly distinct from these in their being tied to morphological boundaries rather than phonological units.

Tense/aspect marking is not obligatory in Karuk. Most of the inflectional suffixes never co-occur, although some combinations are possible. The aspectual suffix *-avish* occurs closest to the stem and can be followed by other inflectional suffixes.

The optative, inverse and negative suffixes are grouped together because these fulfill a role in the agreement paradigms and do not co-occur. None of the other inflectional suffixes can co-occur with the optative. The optative has two allomorphs: a single vowel, or nasalization of certain consonants (see §2.3.4).

For the most part, inflectional suffixes normally allow basic derived accentuation to surface, but sometimes have weak effects on stem prominence, placing tone at the right edge of the stem. Some exceptional behavior of these suffixes is similar to those seen in §7.6 and are not well-understood. The *-i* optative suffix can trigger a lengthening and accentuation pattern that is distinct from those seen in derivational suffixes, while the allomorph that is expressed by nasalization has no other effects on the stem.

8.3.2 Agreement prefixes

Person and number agreement is marked by agreement prefixes in Karuk, and is obligatory, although some cells in some paradigms are zero-marked for prefix. The prefixes are presented in tabular form by paradigm, along with the corresponding inverse, optative, and negative suffixal markers, in Table 8.2. Agreement varies along several dimensions: paradigm, person and number, object vs. subject control, and inverse vs. direct contexts. These are elaborated on in the following sections. See Bright (1957), Macaulay (1992, 2000), Béjar (2003), Béjar & Rezac (2009), and Campbell (2012) for additional analysis and reanalysis of the morphosyntax of the agreement system. Here, I focus discussion of these prefixes on features which bear on the placement of prosodic prominence in inflected verbs.

Agreement paradigms

Karuk agreement can be organized into three different paradigms for plain (positive) indicative, optative, and negative (the main vertical columns in Table 8.2).³ There is overlap between cells in each of these paradigms for each of the other dimensions, but there are enough differences to necessitate separate paradigms. The indicative paradigm is consistently marked by prefixes only, except for inverse contexts, in which an inverse suffix is used.

The optative paradigm normally consists of an agreement prefix and the optative suffix *-i*.⁴ The 2nd person singular subject, likely the most frequently used with an optative, is

³I follow Bright (1957)'s divisions of affixes into paradigms, but use the term *optative* in place of his *imperative*, after Campbell (2012), because it is used for persons other than the second person (the verb form has properties of both imperatives and optatives, see Payne 1997:245,303). While I have significantly rearranged and merged identical cells to simplify the description of the various person categories, I do not change the contents of any cell except one. In the negative paradigm, Bright is inconsistent in whether 3pl>3pl includes a prefix. Based on evidence from the corpus, the prefix is included here.

⁴The morph *-i* is used here as shorthand for either allomorph of the optative suffix.

Table 8.2: Agreement paradigms

		Indicative		Optative				Negative			
A. OBJECT AGREEMENT											
Obj	Subj	s	pl	s	pl		s	pl			
1s		na-	kana-	na-	-i	kana-	-i	na-	-ara	kana-	-ap
1pl		kin-		kin-	-i			kin-	-ap		
2s		i-	-ap	i-	-ap			∅-	-ap		
2pl		kii(k)-	-ap	kii(k)-	-ap			kii(k)-	-ap		
B. SUBJECT AGREEMENT											
Subj	Obj	s	pl	s	pl		s	pl			
	2nd										
1		nu-	n/a	nu-	-i	n/a	kin-	-ara		n/a	
	3rd/intransitive										
1s		ni-		kan-	-i		na-	-ara			
2s		i-		∅-	-i		∅-	-ara			
3s		u-		kam-	-i		∅-	-ara	∅-	-ap	
1pl		nu-		nu-	-i		kin-	-ara			
2pl		ku-		kii(k)-	-i		∅-	-ap			
3pl		kun-	kin-	kun-	-i	kin-	-i	∅-	-ap	kin-	-ap

^a Unless marked *n/a*, when no entry is given in the plural column, the agreement affixes listed in the singular column apply for both singular and plural.

zero-marked for prefix. In inverse contexts, the optative suffix is blocked by the inverse marker.

The negative paradigm normally consists of an agreement prefix and the negative suffix *-ara*. The dedicated negative suffix *-ara* is blocked in inverse contexts by the inverse marker. In some cells of the paradigm, the inverse marker *-ap* is used in place of *-ara* to mark negation in direct contexts. This is a case of syncretism, and the suffix should not be thought of as an inverse marker in direct contexts, but a purely negative marker (see Bright 1957; Macaulay 1992).⁵ Several parts of the negative paradigm are zero-marked in the prefixal slot, but one of the negative or inverse suffixes are always present.

Object-controlled agreement

According to Béjar (2003) and Béjar & Rezac (2009), Karuk has preferential internal argument-controlled agreement, that is, object agreement is most important, although subject agreement occurs as well. As can be seen in Table 8.2, for the object agreement prefixes, in A., agreement is sensitive to both the person and number of the object, but the person of the subject does not matter, and the number of the subject matters only for the 1s object. By contrast, for the subject agreement prefixes, in B., agreement is sensitive to both the person

⁵The use of *-ap* in direct negative contexts seems to correlate with plurality, but not in a wholly consistent manner.

and number of the subject, and the number of object only matters for the 3pl subject and for a 3s subject in the negative paradigm. It appears that person matters for object here, but syncretism between 1>2 and 1pl(>3) suggests that the person of the object is not really important. The fact that there are different markers for 1s(>3), however, make the markers difficult to characterize without reference to the object.

Béjar (2003) and Béjar & Rezac (2009) propose a Distributed Morphology theory of agreement in which cycles of internal argument-controlled agreement and external argument-controlled agreement result in different spell-outs of morphology. Using Karuk as a case study, they show how this theory can account for many of the features of Karuk agreement, however, the prosodic features of Karuk agreement prefixes are not taken into consideration. Campbell (2012)'s categorization of Karuk agreement prefixes into first and second cycle agreement groupings is more complete and precise than that in Béjar (2003:160), but does not fundamentally change the categories of any prefixes. Campbell adds the optative paradigm to the analysis; neither Bejar nor Campbell analyzes the negative paradigm. My divisions of prefixes into object and subject agreement largely correspond to those in Campbell (2012), with the main differences being that I do not separate plural agreement and my treatment of the split in 2nd person object agreement.

The person hierarchy and inverse marking

To explain when object vs. subject agreement is used, it is necessary to make reference to a person hierarchy. Subject agreement is used in direct contexts while object agreement is used in inverse contexts. Macaulay (1992) proposes a 2PL>1>2SG>3 person hierarchy for Karuk, and Campbell (2012) proposes a simplified 2>1,3 hierarchy. I follow Macaulay (1992) in splitting the 2nd person, because inverse marking, prosodic behavior, and placement of the prefixes in the paradigms do not align as well otherwise. I consider 2pl and 1 to be essentially tied at the top of the hierarchy, as shown in (267).

(267) Person hierarchy:

$$2\text{PL},1 > 2\text{SG} > 3$$

Direct contexts are when a person higher on the hierarchy acts on a person lower on the hierarchy. In Karuk, these are 2pl or 1 acting on 2s or 3, and 2s acting on 3, and are expressed by the agreement patterns in B. Subject Agreement. Inverse contexts are when a person lower on the hierarchy acts on a person higher on the hierarchy. These are 2pl or 1 being acted on by 2s or 3, or 2s being acted on by 3, and require use of the agreement patterns in A. Object Agreement. First person objects are specially marked and do not use the inverse suffix with any subject, while 2pl objects always use the inverse suffix, thus avoiding the problem of which of these two objects would be marked inverse when acting on one another.

8.4 Prefixes and the prosodic stem

As shown in §8.1, certain affixes in Karuk are essentially invisible to rules for the placement of accentuation. Under prosodic domains theory, each morphological (M) constituent has a corresponding phonological (P) constituent. For visible affixes, the morphological and phonological constituents are coextensive, as in (268a). Invisibility is due to a mismatch between a morphological constituent and a phonological constituent, as in (268b).

- (268)
- | | <i>M-structure</i> | <i>P-structure</i> | |
|----|---------------------------|----------------------------|-----------------------|
| a. | [history] _M | [history] _P | |
| b. | [historical] _M | [historic] _P al | (after Inkelas 1993b) |

Under this approach, each affix has distinct P- and M-subcategorization frames. The inner brackets of a subcategorization frame represent the category of the stem with which the affix may combine, and the outer brackets represent the category of the output stem. The subcategorization frames for visible and invisible suffixes are shown in (269).

- (269)
- | | | | | |
|----|--------------------------|--|---|-----------------------|
| a. | <i>visible suffix:</i> | [[] _M suffix] _M | [[] _P suffix] _P | |
| b. | <i>invisible suffix:</i> | [[] _M suffix] _M | [[] _P] _P suffix | (after Inkelas 1993b) |

For a “normal” (visible) affix, the affix is contained within the outer prosodic frame, as in (270a). For an invisible affix, the affix falls outside of the P-constituent created by its subcategorization frame, as shown in (270b).

- (270)
- | | | |
|----|--|-----------------------------|
| a. | [stem] _P + [[] _P suffix] _P → [word] _P | |
| b. | [stem] _P + [[] _P] _P suffix → [stem] _P suffix | (after Inkelas 1989 p. 122) |

The parallel pattern at the left edge of the word is also possible, resulting in prefixes falling outside the output P-constituent. The subcategorization frames of visible and invisible prefixes, respectively, are shown in (271).⁶

- (271)
- | | | | |
|----|--------------------------|---|---|
| a. | <i>visible prefix:</i> | [prefix [] _M] _M | [prefix [] _P] _P |
| b. | <i>invisible prefix:</i> | [prefix [] _M] _M | prefix [[] _P] _P |

⁶The domains approach was originally proposed within the framework of Lexical Phonology, but it is very easily translated into an Optimality Theoretic framework using alignment constraints (see, for example, Inkelas 1993a; Downing 1998a,b). In the Karuk case, a visible prefix would require the left edge of a P-constituent to align with its left edge, while an invisible prefix would require the left edge of a P-constituent align with its right edge.

- (272) a. $[\text{stem}]_P + [\text{prefix } []_P]_P \rightarrow [\text{word}]_P$
 b. $[\text{stem}]_P + \text{prefix } [[]_P]_P \rightarrow \text{prefix } [\text{stem}]_P$

In the case of Karuk inflectional prefixes, one set follows the visible affix pattern with normal P-subcategorization frames like those shown in (271a) that match their M-subcategorization frames. These inflectional prefixes combine with a P-stem and output a P-word which includes the prefix. In these cases, default high-before-long or penultimate accentuation applied to the prosodic domain results in prominence falling on the prefix when the prefix precedes the long vowel, as in (273a), or when the prefix is penultimate in the word, as in (273b).

- (273) a. $[(n\acute{a}'aath)va]_P$
 $[na- \quad \acute{a}áthvu$
 2s/3s > 1s- be.afraid
 'I am afraid' [LA LA-01:1]
- b. $[(kínmah)]_P$
 $[kin- \quad mah$
 3pl > 3pl- see
 'they see them' [NR WB_KL-65:1]

Another set of inflectional prefixes follows the invisible affix pattern, with P-subcategorization frames like those shown in (271b). These prefixes combine with a P-stem and output a P-word which excludes the prefix. The misalignment of the morphological word and the phonological word results in the prefix falling outside the accentable domain window. In these cases, prominence cannot fall on the prefix, even when it precedes the long vowel, as in (274a), or when it is penultimate in the word, as in (274b). Both sets of prefixes are listed exhaustively in Table 8.3.

- (274) a. $kun[(\acute{a}áth)va]_P$
 $kun[- \quad \acute{a}áthvu$
 3pl(>3s)- be.afraid
 'they are afraid' [JS WB_KL-92:65]
- b. $kun[(máh)]_P$
 $kun[- \quad mah$
 3pl(>3s)- see
 'they see it' [VS VS-19:14]

Table 8.3: Cohering and non-cohering agreement prefixes

Prefix	Gloss	Paradigm(s)
Cohering Prefixes		
a.	<i>kan-</i>	1s(>3) (optative)
b.	<i>na-</i>	1s(>3) (negative)
c.	<i>kam-</i>	3s(>3) (optative ⁷)
d.	<i>nu-</i>	1pl(>3) (optative)
e.	<i>kin-</i>	1pl(>3) (negative)
f.	<i>nu-</i>	1>2s (optative)
g.	<i>kin-</i>	1>2s (negative)
h.	<i>na-</i>	2s/3s>1s (all)
i.	<i>kana-</i>	2pl/3pl>1s (all, negative with ‘inverse’)
j.	<i>kin-</i>	2/3>1pl (all, negative with ‘inverse’)
k.	<i>kin-</i>	3pl>3pl (all, negative with ‘inverse’)
Non-cohering Prefixes		
l.	<i>ni-</i>	1s(>3) (indicative)
m.	<i>i-</i>	2s(>3) (indicative ⁸)
n.	<i>u-</i>	3s(>3) (indicative)
o.	<i>nu-</i>	1pl(>3) (indicative)
p.	<i>ku-</i>	2pl(>3) (indicative)
q.	<i>kii(k)-</i>	2pl(>3) (optative ⁹)
r.	<i>kun-</i>	3pl(>3s) (indicative/optative ¹⁰)
s.	<i>nu-</i>	1>2s (indicative)
t.	<i>i- ~ ∅-</i>	3>2s (all, with inverse)
u.	<i>kii(k)-</i>	(any)>2pl (all, with inverse)

Approximately half of Karuk agreement prefixes can bear prominence, and approximately half cannot. I call the prefixes that can bear prominence COHERING, and those that cannot NON-COHERING, following the terminology introduced by Booij (1985).¹¹ These terms are used because of the fact that cohering prefixes in Karuk form a prosodic word with the stem they combine with. Non-cohering prefixes in Karuk do not form their own prosodic

⁷In the negative paradigm, 3s(>3s) is zero-marked, and 3s>3pl is zero-marked for person and has the ‘inverse’ suffix marking negative.

⁸2s(>3) in the optative and negative paradigms is zero-marked.

⁹2pl(>3) in the negative paradigm is zero-marked for person and has the ‘inverse’ suffix marking negative.

¹⁰3pl(>3s) in the negative paradigm is zero-marked for person and has the ‘inverse’ suffix marking negative.

¹¹The distinction between cohering and non-cohering prefixes, in combination with the default accentuation pattern established above, account for Bright (1957)’s Accented and Unaccented verbal inflectional prefix categories.

words, as they do in Dutch, however. Karuk non-cohering prefixes are excluded from higher prosodic structure (i.e., the accentual phrase) unless they are incorporated into the prosodic stem that follows (as in §8.4.1), or join with a clitic which precedes them to form another accentual phrase.¹²

8.4.1 Incorporation of prefixes into the prosodic stem

As I will show in this section, the statement that non-cohering prefixes can never bear prosodic prominence is a slight overgeneralization. While some of the non-cohering prefixes never bear prosodic prominence, some of them can, in fact, be accented on the surface, but only under a very specific condition. When a non-cohering prefix becomes incorporated into the phonological stem by vowel replacement, it then falls within the prosodic window, and only then can bear prominence. Whether or not prefixes can become incorporated into the stem in this way is wholly dependent on general vowel hiatus resolution constraints in the language, as discussed in §3.4, and is independent of the prefix's coherence status. This phenomenon supports the analysis that a prefix's accentability is due to its alignment with a prosodic window, and is not a characteristic of the morph itself.

Non-cohering prefixes

Consonant-final non-cohering prefixes, as in (275), are never part of the stem's prosodic domain window, so can never bear prosodic prominence. Vowel-final non-cohering prefixes cannot bear prosodic prominence when they are attached to a consonant-initial stem, as shown in (276).

(275) Consonant-final non-cohering prefixes

a. *kun*[(*máh*)]_P

kun[- *mah*

3pl(>3s)- see

'they see (it)'

[VS VS-19:14]

b. *kun*[(*'ááth*)*va*]_P

kun[- *'ááthvu*

3pl(>3s)- be.afraid

'they are afraid'

[JS WB-KL-92:65]

¹²Prefixes which fall closer to the root than the agreement markers are always cohering (i.e., iterative *ip*-, 'mode' *kupa*-, plural *iru*-). Material which falls to the left of agreement prefixes are clitics. Clitics may bear their own accentuation and can form an accentual phrase with prefixal material left out of the stem accentual phrase.

- c. $ku(n[ímnish])_P$
kun[- imnish
 3pl(>3s)- cook
 ‘they cook (it)’ [NR WB_KL-74:21]

(276) Non-cohering prefixes with consonant-initial stems

- a. $u[(máh)]_P$
u[- mah
 3s(>3)- see
 ‘he saw (him)’ [CP WB_KL-03:13]

- b. $u[(’ááth)va]_P$
u[- ’ááthvu
 3s(>3)- be.afraid
 ‘she is afraid’ [NR WB_KL-29:24]

- c. $ni[(tháruv)]_P$
ni[- ’tháruv
 1s(>3)- peel
 ‘I peel them’ [ED WB_KL-85:18]

However, there are cases in which prosodic prominence occasionally falls on vowel-final non-cohering prefixes, as shown in (277). All of these cases are ones in which the prefix is attached to a vowel-initial stem, where the stem vowel deletes under vowel hiatus resolution rules. When vowel-final non-cohering prefixes are attached to vowel-initial stems in this way, the vowel segment of the prefix is incorporated into the phonological stem, and therefore into the prosodic domain window. Only under these circumstances can a non-cohering prefix bear prominence.

(277) Non-cohering prefixes with vowel-initial stems

- a. $[(ímnish)]_P$
u[- imnish
 3s(>3)- cook
 ‘(s)he cooks (it)’ [VS VS-23:17]

- b. $[(níkrav)]_P$
ni[- íkrav
 1s(>3)- grind
 ‘I pounded acorns’ [NR WB_KL-83:1]

- c. $[(úxyar)]_P$
 $u[- \quad axyar]$
 3s(>3)- fill.container
 ‘it overflows (it)’ [MH (de Angulo & Freeland 1931:204)]

Schematic representations of the three syllable structure combinations of non-cohering prefixes and stems discussed above are given in (278).

- (278) a. Consonant-final non-cohering prefix + any stem

$$\begin{array}{ccc} \sigma & \sigma & \\ \backslash & / & \\ kun- & [imnish]_P & \rightarrow & \sigma & \sigma & \sigma \\ & & & / & / & \backslash & / & \backslash \\ & & & kun[ímnish]_P & & & & \end{array}$$

- b. Vowel-final non-cohering prefix + consonant-initial stem

$$\begin{array}{ccc} \sigma & & \sigma & \sigma \\ / & \backslash & | & / & \backslash \\ u- & [mah]_P & \rightarrow & u[máh]_P & \end{array}$$

- c. Vowel-final non-cohering prefix + vowel-initial stem

$$\begin{array}{ccccc} \sigma & \sigma & & \sigma & \sigma & & \sigma & \sigma \\ \backslash & / & & / & \backslash & / & \backslash & / & \backslash \\ u- & [imnish]_P & \rightarrow & u[ímnish]_P & \rightarrow & [úmnish]_P & \end{array}$$

In the vowel deletion process, the mora of the second (stem) vowel is preserved, while its features are deleted and it receives the features of the first (prefixal) vowel. In this way, because the second vowel mora is within the prosodic window, a prefix vowel can be incorporated into the prosodic window. This process would be uninteresting to implement, so I simply stipulate it here.

Cohering prefixes

The reader will recall from §3.4.4 that high vowels in prefixes trigger vowel deletion on the stem, while low vowels in prefixes trigger vowel coalescence. When the prefix vowel is low, both the prefix and stem vowel moras are preserved, but two vowels of different quality cannot be adjacent in Karuk. As a result, the two short vowel segments coalesce, resulting in a single long vowel on the surface. All vowel-final non-cohering prefixes end in high vowels, so no non-cohering prefixes trigger vowel coalescence with stem vowels. Cohering prefixes can end in high and low vowels, so examples of both are given here for comparison.

As with the non-cohering prefixes, vowel deletion is triggered when a cohering prefix ending in a high vowel combines with a vowel-initial stem, as shown in (279a). When a prefix ending in a low vowel is attached to a vowel-initial stem, vowel coalescence takes

place, as shown in (279b). In the case of (279b), coalescence results in a long mid front vowel on the surface.

(279) Cohering prefix with vowel-initial stem

a. $[(n\acute{u}vyih)ship]_P$

$[nu- \quad ivy\acute{i}hship]$
1>2s.OPT- (pl.)go.away

‘let’s go’

[SD SD-VS-02:21]

b. $[(n\acute{e}kfuyy)shur]_P$

$[na- \quad ikf\acute{u}yshur]$
2s/3s>1s- be.tired

‘I’m tired’

[CT CT-01:47]

With a cohering prefix, prominence falls where expected within the prosodic stem, which would include the prefix vowel in any case. In the example in (279b), prosodic prominence falls on the coalesced vowel. The schematic representation developed above is extended in (280) to cover the phenomenon of prefix vowel coalescence. Two adjacent vowels cannot be heterosyllabic, so without vowel deletion, they coalesce into a single bimoraic vowel. Prominence is assigned by a H tone associated to the syllable preceding the last long vowel in the word. The H tone is assigned to the rightmost mora in the syllable and must spread leftward, for a level H on the entire syllable, as rising tones are not permissible in Karuk.

(280) Vowel-final cohering prefix + vowel-initial stem

$$\begin{array}{ccc} \sigma & \sigma & \sigma \\ \backslash \ / \ / \ / \ / \ / \ / \\ na- [ikf\acute{u}yshur]_P & \rightarrow & [\naikfuyyshur]_P \end{array} \quad \rightarrow \quad \begin{array}{ccc} \sigma & \sigma & \sigma \\ \ / \ / \ / \ / \ / \ / \ / \\ [n\acute{e}kfuyyshur]_P \end{array}$$

Ordering

The apparent order of layering of these operations is as follows: the morphemes are combined, then prominence is assigned, and then the phonology resolves vowel hiatus in predictable ways (with the concomitant incorporation of material into the prosodic stem). This ordering is necessary because in words with no other long vowels, these initial long coalesced vowels do not count as long for the placement of prominence. This requires that a H tone or accent must remain with the mora of a deleted vowel and relink to the vowel that takes its place.

Why a window?

It should now become clear why reference to a *prosodic window* is necessary, rather than simply referring to the prosodic word as the domain for placement of prominence. In (278a),

the final segment of the prefix is syllabified with the stem, and thus must be part of the prosodic word that the stem is part of, in the sense of a “metrical” prosodic word which dominates feet, syllables, and (possibly) moras (Nespor & Vogel 1986; Selkirk 1986, 2011; McCarthy & Prince 1996). Yet the prefix is still excluded from the domain for accentuation associated with the stem it combines with. Similarly, in (278b), since it is syllabified (and pronounced), the prefix must be part of some “metrical” prosodic word, but it is excluded from the stem prosodic domain window. However, in (278c), the prefix segment is not only syllabified with the stem, but actually takes the place of the initial stem vowel. In this case, the prefix vowel becomes part of the accentable domain. I propose this is because the vowel segment becomes part of the phonological word (in the sense of the phonological constituent which dominates a phonological stem and phonological root [Inkelas 1989]), so it is incorporated into the prosodic domain associated with that constituent. In the Karuk examples, it is equally possible to characterize the domain for accentuation as the phonological word in this sense, or as a prosodic window. I use the term prosodic window here, to avoid confusion with the “metrical” prosodic word, and in acknowledgement of the possibility that the phonological word and the prosodic domain window may not be identical in all languages (e.g., Inkelas 1993a).

8.4.2 Cohering vs. non-cohering prefixes

Inflected Karuk verbs require one of several person/number agreement prefixes, which can be organized into distinct but overlapping indicative, optative, and negative paradigms (a few cells in these paradigms are zero-marked), as described above in §8.3.2. What determines whether a prefix is cohering or non-cohering? The possibilities are a phonological distinction, a morphosyntactic distinction, or an arbitrary, lexical distinction. There are some intriguing tendencies when both the phonology and the morphosyntax are examined more closely, as detailed below. I analyze the split as morphosyntactically based, but lexical prosodic subcategorization frames of the prefixes are needed to explain the actual patterns of accentuation.

Phonological basis for grouping?

It can be noted in Table 8.3 that the non-cohering prefixes tend to be phonologically smaller (and to have high vowels, which are not as heavy in Karuk as /a/), as compared to cohering prefixes. However, these phonological characteristics are not categorical, and one prefix with the same segmental form, *nu-*, occurs in both categories. For this reason, there can be no plausible phonological explanation for the distinction. One could speculate that there may have been a phonological basis for the two categories of prefix historically, perhaps with accentability being correlated with syllable weight, and that subsequent changes in the paradigm have obscured this division. Notwithstanding, the difference between these two sets of prefixes cannot be analyzed phonologically at present, without employing a diacritic notion of “accent”.

Morphosyntactic basis for grouping?

The morphological and prosodic constituents selected for are identical between the two groups of prefixes. In fact, the two different classes of prefixes can combine with identical stems, as seen in (273)-(274). Is it possible that the two prefix groups are distinguished by different types of morphological output? At first glance, the groupings of prefixes into cohering and non-cohering categories do not seem to be consistent by morphosyntactic features. Each contain elements of subject and object agreement, singular and plural number, and three different paradigms, and both result in a fully inflected stem which is identical for use in the syntax. Yet when they are viewed in light of the key characteristics of Karuk agreement described in §8.3.2, including paradigms, object agreement, and inverse marking, some striking patterns come into relief. Table 8.2 is reproduced here as Table 8.4, with shading in the cells indicating non-cohering prefixes. The label INV calls out the rows bearing inverse marking.

Table 8.4: Agreement paradigms with prefix coherence

		Indicative		Optative				Negative			
A. OBJECT AGREEMENT											
Obj	Subj	s	pl	s	pl		s	pl			
1s		na-	kana-	na-	-i	kana-	-i	na-	-ara	kana-	-ap
1pl		kin-		kin-	-i			kin-	-ap		
2s	INV {	i-	-ap	i-	-ap			∅-	-ap		
2pl		kii(k)-	-ap	kii(k)-	-ap			kii(k)-	-ap		
B. SUBJECT AGREEMENT											
Subj	Obj	s	pl	s	pl		s	pl			
2nd											
1		nu-	n/a	nu-	-i	n/a	kin-	-ara		n/a	
3rd/intransitive											
1s		ni-		kan-	-i		na-	-ara			
2s		i-		∅-	-i		∅-	-ara			
3s		u-		kam-	-i		∅-	-ara	∅-	-ap	
1pl		nu-		nu-	-i		kin-	-ara			
2pl		ku-		kii(k)-	-i		∅-	-ap			
3pl		kun-	kin-	kun-	-i	kin-	-i	∅-	-ap	kin-	-ap

^a Unless marked *n/a*, when no entry is given in the plural column, the agreement affixes listed in the singular column apply for both singular and plural.

^b Shading indicates cells containing non-cohering prefixes. No shading indicates cells containing cohering prefixes.

When organized in this way, it becomes apparent that cohering prefixes are those used in first person object agreement and those that co-occur with optative or negative suffixes. Non-cohering prefixes are those that occur with inverse marking and those that are unsuffixed. There are only three exceptions: *kii(k)-* in the 2pl(>3) optative and *kun-* in the 3pl(>3s)

optative are unexpectedly non-cohering, and *kin-* in the 3pl>3pl indicative is unexpectedly cohering. These anomalies are likely due to paradigm leveling (Bybee 1985; Steriade 2000). The morph *kii(k)-* occurs in three other cells in the paradigm (each of which cover a number of person/number combinations) that are all non-cohering. Similarly, *kin-* occurs in six other cells in the paradigm (each of which also cover a number of person/number combinations) that are all cohering. Frequency likely plays a role in paradigm leveling as well. The morph *kun-* appears in only one other cell in the paradigm, but it is extremely high frequency: the non-cohering 3pl(>3s) indicative.

Thus there is support from morphosyntax that the division of the inflectional prefixes into two classes is not completely arbitrary. The set of instances that use non-cohering prefixes can conceivably be seen as the basic or unmarked cases: the object is lower than the subject on the person hierarchy (following Macaulay (1992)¹³), or no object is being acted upon (i.e., intransitive verb), in the indicative; or the object is higher than the subject on the person hierarchy, and an inverse marker is used. The set of instances using cohering prefixes can be seen as the marked cases. The optative and negative are marked in comparison to the indicative, as is a first person object, and – perhaps because plurality is marked, or because there is not a clear hierarchical ranking in this case – 3PL subject acting on a 3PL is likewise marked in this language. However, it is unclear why these particular groupings should behave differently with respect to the prosodic stem. A cohering prefix is not particularly good way to call attention to marked agreement, since inclusion in the prosodic stem does not mean the prefix *always* bears accentuation, only that it *can*. Further, it is possible for some of the non-cohering prefixes to bear accent under certain conditions (see §8.4.1), making it less likely that the distinction is a functional one.

If the cohering/non-cohering groupings aligned with cycles of agreement (as proposed in Campbell 2012), this would provide a clear framework for understanding the classes of prefixes, as well as support for the theory of cyclic syntactic agreement from prosody. Yet, while the two cycles of agreement help to make sense of the two accentual groupings, the prefix classes do not align simply along the lines of object-controlled and subject-controlled agreement when taking all three paradigms into consideration. Therefore, the lexical sub-categorization frame is the best mechanism to explain the prefix classes at this stage.

8.5 Suffixes and the prosodic stem

Similar to cohering prefixes, when Level 1 and 2 suffixes are attached to a stem, the output is a phonological stem which is aligned with the morphological stem, resulting in the suffix being included in the accentable domain window. This means that the suffix is taken into account in the placement of prosodic prominence relative to the right edge and/or rightmost long vowel of the word. In the example in (281), prominence falls on the penult, which is also before the rightmost long vowel, including the suffix *-koo* ‘to’.

¹³These divisions are harder to make sense of under the simplified person hierarchy in Campbell (2012).

- (281) $[chuphu(níshkoo)]_P$
chúphuunish -koo]
 talk.to -to
 ‘to talk to (someone)’ [D: *chuphuníshkoo; chuphûunish*]

When Level 3 or 4 suffixes are attached, however, like with the non-cohering prefixes, the output is a phonological stem which excludes the suffix, so the suffix remains outside the accentable domain window. This means that the suffix is invisible to the placement of prosodic prominence relative to the right edge and/or rightmost long vowel of the word. In the example in (282), the outer suffix *-naa* ‘plural’ is excluded from the prosodic stem, so the high-before-long accentuation falls in the same location as when *-naa* is not present.

- (282) $[chuphu(níshkoo)]_P naa$
chuphuníshkoo -]naa
 talk.to.(someone) -PL
 ‘to talk to (people)’ [VS VS-29:50]

While Level 3 suffixes have some weak effects on the prosodic stem (as described in §7.4), the inflectional suffixes (Level 4) typically do not. When inflectional prefixes and suffixes are present, as predicted by the basic derived accentuation pattern, when there is a long vowel in the prosodic stem, H tone will be placed before it, falling on a cohering prefix when necessary, as in (283). It can be seen that the high-before-long pattern applies only within the derived stem; long vowels in inflectional suffixes do not “count” in the calculation of the rightmost long vowel, often giving the appearance of a “default-to-opposite” pattern (see Gordon 2000).

- (283) a. $pee[píkyaar]_P ahaak$
pa[= i[- píkyaar -]ahaak
 NOMZ= 2s(>3) finish -IRR
 ‘when you finish’ [MO WB_KL-58:22]
- b. $[kaná'aam]_P tiheesh$
[kana- av -]tih -]avish
 2pl/3pl>1s eat -DUR -PROSP
 ‘they will eat me’ [NR WB_KL-31:11]
- c. $u[ééthkaanv]_P aheen$
u[- eethkaanva -]aheen
 3s(>3) shuffle.cards -ANT
 ‘he shuffled [the ‘cards’]’ [CP WB_KL-13:13]

d. *kun[’iruvoorúraan]_Paheen*

kun[- iru- vóðruraa -va -]aheen
 3pl(>3s)- PL- crawl.up -PLURACT -ANT

‘they crawled up’

[JS WB_KL-08:30]

As the analysis in Chapter 5 predicts, when the only long vowel in the prosodic stem is at the left edge of the stem, H tone surfaces on it, as in the examples in (284).

(284) a. *i[’áám]_Ptiheeshap*

i[- av -]tih -]avish -]ap
 2s(>3) eat -DUR -PROSP -INV

‘they will eat you’

[LB WB_KL-30:23]

b. *u[sáánfuruk]_Pi*

u[- sar -]furuk -]i
 3s(>3) carry.(things) -indoors -OPT

‘bring it inside’

[CT CT-01:38]

c. *kun[píikivmath]_Paheen*

kun[- íikiv -math -]aheen
 3pl(>3s)- wear.as.necklace -CAUS -ANT

‘they put necklaces on him’

[NP WB_KL-42:7]

8.5.1 Exceptions

Recruitment of suffixes into stem

If the input stem is too small to form a proper foot, material from certain inflectional suffixes can sometimes be recruited into the prosodic stem and bear prominence, as shown in (285). This is uncommon (26 examples in the corpus) and which suffixes can do this must be lexically indicated.

(285) *pu[’axhá]_Pra*

pu[= ax -]ara
 NEG= bite -NEG

‘she couldn’t kill him’

[NR WB_KL-14:11]

Variability

When the only long vowel is at the left edge of the prosodic stem, and even when there is a TBU to the left of it, some variability in the placement of prominence is seen when an inflectional suffix is present. In these cases, when tone can be placed after the long stem vowel to create a surface high-before-long including the inflectional suffix, it sometimes is, as shown in (286). The variability in this pattern indicates that the location of the right edge of the prosodic stem differs for some speakers. It also shows that the evaluation of the rightmost high-before-long must take place at the very end of the derivation or postlexically, because in these instances, long vowels created by glide deletion at the addition of suffixes (as in (286b)) count as long, which they do not do earlier in the derivation.

- (286) a. *[upthivkéé]_Pheen*
u[- ip- thivkee -]aheen
 3s(>3)- ITER- go.along -ANT
 ‘he went along again’ [NR WB_KL-02a:41]
- b. *u[’iifshípre]_Penik*
u[- iif -sipriv -]anik
 3s(>3)- grow -up/begin -ANC
 ‘he had grown up’ [MO WB_KL-54:27]

Stem-final prominence with all short vowels

If in an inflected verb with both an inflectional prefix and suffix, there is no long vowel in the prosodic stem, another subpattern is seen. In these cases, as in (287), prominence falls at the very right edge of the prosodic stem. This indicates that the basic derived pattern is true right alignment when no long vowel is present, but that a highly ranked constraint against non-finality pushes prominence to the penult when right-alignment would result in a word-final H tone. While the inflectional suffixes are outside of the accentable stem, their presence allows prominence to surface at the right edge of that stem.

- (287) a. *u[’imtúp]_Peeshahaak*
u[- imtup -]avish -]ahaak
 3s(>3)- be.ripe -PROSP -IRR
 ‘when it will be ripe’ [PM JPH_TKIC-III.5.A.a:13]
- b. *kun[imuskír]_Panik*
kun[- imuskir -]anik
 3pl(>3s)- admire -ANC
 ‘they had admired him’ [NR WB_KL-57:122]

8.5.2 Stem-final prominence with zero-prefixation

As shown in Table 8.2, certain cells in the agreement paradigms are marked suffixally only, and have no agreement prefix. In these cases, prominence also falls at the right edge of the prosodic stem, as shown in (288). This pattern is distinct from the case of prefixed verbs with only short vowels, because it applies even when a long vowel is present in the derived stem (288b). This sub-pattern accounts for approximately 5% of the verbs in the corpus.

- (288) a. *pu[’ipmáh]_Para*
 pu[= ip- mah -]ara
 NEG= ITER- see -NEG
 ‘she didn’t find him’ [LB WB_KL-61:13]
- b. *[pikyáar]_Peeshara*
 pikyaar -]avish -]ara
 finish -PROSP -NEG
 ‘you won’t finish’ [MD GD-MD-VSu-01:75]

This pattern indicates two things. First, inflectional suffixes generally have a weak effect on stem prominence which places H tone stem-finally.¹⁴ Secondly, it shows that the basic derived pattern is linked specifically to the inflectional prefixes.

8.6 Alternative analyses

8.6.1 Level ordering

Another way to represent differential behavior of prefixes and suffixes that are and are not included in the prosodic stem is level ordering. In a level ordering account, cohering prefixes would be attached, accentuation would be assigned, and then non-cohering prefixes would be attached. In this way, accentuation cannot fall on non-cohering prefixes because they are not present at the time accentuation is assigned. It is hard to argue that there is any logical or functional reason the two sets of prefixes should be added at different points in the derivation. As we saw above, they do not line up with the object and subject agreement cycles. Without a compelling reason to think the two sets of agreement prefixes would be added separately, prosodic windows are the most straightforward way to represent the data. However, recognizing that windows and levels are largely different ways of representing the same patterns, for the sake of argument, I will explore the level ordering account a bit further. For suffixes, a level ordering account makes more sense, because suffixes can more obviously be grouped into levels than can prefixes. Yet even in the case of suffixation, the prosodic

¹⁴The phonologically smallest of them (*-i* OPTATIVE, *-at* PAST) trigger vowel lengthening in certain cases, and the OPTATIVE has exceptional accentual effects on phonologically small stems.

window is a better explanation, because of the interaction between the patterns imposed by prefixes and suffixes.

Agreement ordering paradox

In order to explain the prosodic window at the left edge of the stem by derivation, the following order would be required:

1. Prospective aspect (incompatible with optative context)
2. First round of agreement (cohering): 1st person object agreement prefixes and all inverse and negative *-ap* suffixes (block *-ara*).
3. Second round of agreement (cohering): direct 2nd and 3rd object agreement prefixes (optative and negative paradigms only) and corresponding optative *-i* and negative *-ara* suffixes (where not blocked by *-ap*), and the rest of the tense/aspect suffixes.
4. Basic derived accentuation placed.
5. Third round of agreement (non-cohering): 2nd and 3rd object agreement prefixes where missing (that is, indicative non-1st objects and inverse-marked 2nd objects)

This explanation is rejected for two reasons. It does not flow from the insights gained by separating agreement into object and subject cycles, and it creates an ordering paradox with inflectional suffixation. At least some of the inflectional suffixes must be added before prefixes, yet they fall outside the prosodic stem for accentuation.

For suffixation, the simplest explanation for where the right edge of the prosodic stem falls would seem to be levels, so that basic derived accentuation would apply before Level 3 and 4 suffixes are attached.¹⁵ However, it makes little sense to assume agreement prefixation would be added before the debatably derivational Level 3 suffixes, and it becomes paradoxical when *-tih* DURATIVE creates a protected HL configuration on the stem.

Stem-final vowel deletion

Another issue for a serial account is the question of stem-final vowels. In a simple case, as exemplified in Table 8.5, levels will work to explain the distinction between cohering and non-cohering prefixes. In step 1, cohering agreement prefixes are added. Then in step 2, high-before-long accentuation is assigned. In the prefixed verb, H will fall on the prefix, since it precedes a long vowel. In the unprefixed verb, H can only fall on the stem-initial long vowel. After this, the non-cohering agreement prefixes are added in step 3. In the simple case of *ááthva* ‘to be afraid’, it does not matter when the final vowel deletion/mutation step occurs because it has no effect on accent placement in a word of this shape. However, this phonological process becomes a confound in other words.

¹⁵In cases where outer inflectional material is recruited into the stem, or of *-va* PLURACTIONAL falling outside of *-tih* DURATIVE, the prosodic window would have to be ‘reset’.

Table 8.5: Derivation of prefix accent by levels (simple case)

<i>Stem</i>	'aathvu	'aathvu
1. <i>Agreement I (cohering)</i>	na-'aathvu	—
2. <i>Accent assignment</i>	(ná'aath)vu	('ááth)vu
3. <i>Agreement II (non-cohering)</i>	—	kun-('ááth)vu
4. <i>Final vowel deletion/mutation</i>	(ná'aath)va	kun('ááth)va
	ná'aathva	kun'ááthva
	'I am afraid'	'they are afraid'
	[LA LA-01:1]	[JS WB_KL-92:65]

As discussed in §3.4.3, vowel hiatus resolution takes place cyclically upon affixation throughout the derivation, while word-final vowel deletion/mutation takes place at the end of derivation only. Stem-final vowels are crucially present for suffixation, as in (289a). Yet word-final vowels that end up being deleted on the surface do not count for the placement of penultimate accent, as in (289b).

(289) a. *upáratih*

u- para -tih
3s(>3)- bite -DUR

'he bit it'

[JS WB_KL-78:8]

b. *nápar_*

na- para
2s/3s>1s- bite

'it bit me'

[LA LA-04:19]

This indicates that high-before-long accentuation must occur after, or simultaneously with, final vowel deletion. For high-before-long accentuation to take place at the very end of derivation, as was assumed in Table 8.5, far more complicated rules for accent placement than the high-before-long pattern are required to exclude final vowels in the calculation of penultimate syllables: rules such as those found in Bright (1957), which recapitulate the process of final vowel deletion. To avoid these complications, it is possible to attach the non-cohering prefixes subsequent to final vowel deletion and accentuation, but this raises several other issues.

In Table 8.6, vowel hiatus resolution takes place following each attachment of agreement prefixes, in steps 3 and 6. Final vowel deletion and mutation takes place after the first round of prefixation and before accentuation, obtaining the proper accental outcomes with this small sample set of data.

It seems unintuitive to require such a final, surface-sensitive process such as final vowel deletion to occur in the middle of affixation. This account must also assume all inflectional suffixation be in place before step 2 based on its effects on stem accentuation. Some of these

Table 8.6: Derivation of prefix accent by levels (complicated)

<i>Stem</i>	para ‘bite’		iykara ‘beat, kill, catch (fish)’	
1. <i>Agreement I (cohering)</i>	na-para	—	na-iykara	—
2. <i>V hiatus resolution</i>	—	—	neeykara	—
3. <i>Final vowel deletion/mutation</i>	napar	par	neeykar	iykar
4. <i>Accent assignment</i>	(nápar)	(pár)	(nééy)kar	(íy)kar
5. <i>Agreement II (non-cohering)</i>	—	nu-pár	—	kun-íykar
6. <i>V hiatus resolution</i>	—	—	—	—
	nápar	nupár	nééykar	kuníykar
	‘it bit me’	‘I bit you’	‘you killed me’	‘they caught it’
	[LA LA-04:19]	[VS VS-11:14]	[LB WB_KL-18:69]	[MC WB_KL-68:5]

suffixes block one another; others can be stacked, so the picture within step 1 affixation would be complex. This is not to say it would be impossible, but again, it would be unexpected to split some of the agreement prefixes from the others, when they are all intimately tied up with agreement suffixes.

Basic derived accentuation triggered by prefixes

Another more serious issue with a level ordering account is the question of the trigger for high-before-long accentuation. Penultimate/high-before-long accentuation must be associated with both sets of the agreement prefix morphemes, not just with inflection more generally. This detail is incompatible with a level ordering account where accentuation occurs at a given step in the derivation.

Evidence that high-before-long accentuation must be associated with the agreement prefixes specifically and not with inflection in general comes from inflected verbs that are zero-marked for prefix. As noted in §8.4.2, some parts of the optative and negative paradigms in Karuk are zero-marked in the prefixal slot, although verbs in these categories are undoubtedly inflected vis-à-vis the syntax. If the serial account is correct, any inflected verb would pass through each of the levels shown in Table 8.6, regardless of whether an overt agreement prefix of either the cohering or non-cohering type were added. These verb forms would be expected to display high-before-long accentuation (in the absence of a protected configuration), yet they do not, as described above in §8.5.2. Additional examples are given in (290).

(290) Unprefixed inflected verbs without penultimate/high-before-long prominence

a. *chími ikfúúksipriv!* (**ikfuuksipriv*, cf. *nákfuuksipriv*)

chími ikfuk -sipriv
soon climb -up/begin

‘[It’s time to] get up!’

[CT CT-01:45]

- b. *vúra puharíxay pikyááreesh pamívik.* (**pikyaareesh*, cf. *peepíkyaarahaak*)
vúra pu= haríxay pikyaar -avish pa= mi- vik
 INTS NEG= ever finish -PROSP DET= 2sPOSS- weaving.work
 ‘You’ll never finish your weaving.’ [MD GD-MD-VSu-01:75]
- c. ...*púxay vúra fíkríptihara.* (**fíkriiptihara*, cf. *kunfíkriiptih*)
púxay vúra fíkrip -tih -ara
 not.yet INTS pick.out -DUR -NEG
 ‘...she doesn’t sort them out.’ [MD GD-MD-VSu-01:30]
- d. *purafáàt vúra káru kuma’úhish uhthaamhítihaphanik* (cf. *kun’úhthaamhitihirak*)
purafáàt vúra káru kuma- ’úhish uhthaamhi -tih -ap -anik
 nothing INTS also 3sPOSS- seed plant -DUR -NEG -ANC
 ‘And they never sowed any kinds of seeds...’ [PM JPH_TKIC-IV.4:2]

As can be seen in these examples, intermediate accentuation imposed by either an earlier cycle of derivation or by the inflectional suffix itself surfaces when no agreement prefix is present. Accentuation in these cases is typically root-final, explained by a weak trigger for pre-suffixal accentuation imposed by many suffixes. Accentuation will often fall on a long vowel, which could be underlying or may be created by a lengthening process triggered with the placement of a stem-final H. The verb forms in (290) all contain a syllabic configuration which would allow for high-before-long accentuation, yet it is not applied to them. Inflected, unprefixed verbs cannot simply pass through the stages in Table 8.6, or they would undergo the shift to high-before-long accentuation at step 4.

Only when an agreement prefix is present, is any intermediate accentuation (which is not in the protected HL configuration) overridden by high-before-long accentuation. Thus the high-before-long accentuation I have thus far been calling basic accentuation is in fact tied to particular morphemes (albeit exceedingly common ones: only approximately 5% of verb tokens in the corpus lack agreement prefixes).

Not only is this accentual pattern tied to agreement prefixes, but it is crucially tied to *both* sets of agreement prefixes, cohering and non-cohering. As we have seen in a great number of surface verb forms, such as those given in (291)-(292), the high-before-long pattern undoubtedly applies in inflected verb forms prefixed with both cohering and non-cohering prefixes. When combined with the evidence that this pattern does not apply in inflected verb forms without prefixes (293), it can be concluded that the trigger for high-before-long accentuation is linked to the agreement prefix morphemes.

(291) Cohering agreement prefixes

- a. *kanípthiithtih*
[kan- ipthith -]tih
 1s(>3).OPT- finish.weaving -DUR

‘let me finish it’ [VSu GD-MD-VSu-01:85]

b. *núpthith*

[nu- *ipthith*
1pl(>3)- finish.weaving

‘we finished weaving’ [LB WB_KL-30:9]

(292) Non-cohering agreement prefixes

a. *kunípthith*

kun[- *ipthith*
3pl(>3s)- finish.weaving

‘they finished weaving’ [LB WB_KL-30:6]

b. *nípthith*

ni[- *ipthith*
1s(>3)- finish.weaving

‘I finished weaving’ [MO WB_KL-54:19]

(293) No agreement prefixes

a. *ipthíítheeshara*

ipthith *-]avish* *-]ara*
finish.weaving -PROSP -NEG

‘you will not finish it’ [MD GD-MD-VSu-01:73]

b. *ipthííthi*

ipthith *-]i*
finish.weaving -OPT

‘finish it’ [MD GD-MD-VSu-01:77]

If accent assignment is fixed to a morphological construction, then level ordering cannot explain the window that excludes some of that construction from accentuation. As I have shown in the case of inflection without overt prefixation, the high-before-long accentuation pattern must be fixed to the agreement prefixes to avoid incorrect accentuation in forms that do not bear these prefixes. Therefore, for this particular area of Karuk morphology, level ordering is not the most compelling explanation for the patterns seen.

8.6.2 Accented/unaccented prefixes

Bright (1957) calls cohering prefixes *accented* and non-cohering prefixes *unaccented*. Taking this appellation at face value, these labels do not fit the data. If non-cohering prefixes were

simply unaccented, there should be nothing to prevent them from gaining accent in cases such as *u'ááthva* or *kunmáh*, yet they do not. These prefixes are crucially not unaccented but *unaccentable*.

Turning to the cohering prefixes, considering these to be underlyingly accented does not help to explain the Karuk data either. It would be trivial to work out an accent competition scheme in which when both prefix and stem bear accent, only one can surface, and the stem accent wins out. However, this would predict that underlyingly accented prefixes would only surface with accent when attached to unaccented stems, and that they would always surface with accent when attached to unaccented stems, neither of which is the case. The best predictor of whether prefixes bear accent is the syllabic shape of the stem, regardless of whether the stem is underlyingly accented or not. Stem accentuation surfaces when input accent is in the protected HL configuration. When input accent is not in the protected configuration, prefixes only receive accent when they happen to fall in penultimate position or preceding a long vowel in a stem, otherwise, accentuation will fall on the stem.

8.6.3 Non-cohering prefixes place accent on initial stem syllable

Another accent competition possibility is that cohering prefixes are accented while non-cohering prefixes place accent on the initial stem syllable. This explanation encounters the same problem as does the account using accented and unaccented prefixes, in that syllabic shape ultimately determines the placement of accentuation. Accent immediately following non-cohering prefixes is common enough, but this is a byproduct of how common both disyllabic roots and suffixation which triggers final vowel lengthening in them are. It is only when the initial stem syllable happens to be in the position for penultimate/high-before-long accentuation that it will receive accentuation, so there is no case to be made that non-cohering prefixes impose accent on the following syllable.

8.6.4 Non-cohering prefixes outside Accentual Phrase

Another possibility is that the prosodic stem actually represents an Accentual Phrase (AP), in the sense of the intonational phonology hierarchy (Pierrehumbert & Beckman 1988; Jun 2014) (see §2.5.2). This would serve to exclude non-cohering prefixes from what does eventually form the AP containing the accented word, and would leave them free to be recruited into a preceding AP. This would be consistent with the accentual behavior of clitics, prefixes, and stems in Karuk, but the problem is that high-before-long accent must be assigned lexically, and the AP is by definition postlexical. The high-before-long accentuation pattern must be lexical because it is associated with one set of morphology (the agreement prefixes). Furthermore, it is distinct from the final/heavy pattern seen on underived, unaccented words. It makes sense to consider the latter a default pattern assigned at the level of the AP, and both accentuation patterns cannot be an AP-level default; one must be lexical. Finally, non-cohering prefixes which are not recruited into a preceding AP bear the left edge boundary tone for the AP, indicating that they must be part of the stem AP.

8.7 Discussion

In this chapter I have shown that both certain prefixes at the left edge of the word and suffixes at the right edge of the word are excluded from the accentable domain in Karuk verbs. I have introduced the notion of a prosodic window, from which certain affixes may be excluded in a mismatch between morphological and phonological constituents. I proposed that the set of Karuk agreement prefixes and inflectional suffixes which are normally “unaccentable” avoid prosodic prominence because they are excluded from the prosodic stem in exactly this way. The two sets of prefixes, which I label non-cohering and cohering, can be explained by morphosyntactic properties unique to Karuk’s agreement cycles, paradigms, and person hierarchy, which I have presented in a newly integrated format. Nonetheless, a clear morphosyntactic motivation for accentual differences between the two groups remains elusive, so they are attributed to lexical subcategorization distinctions. I have shown how inflectional suffixes also fall outside the prosodic stem, and how they can impose stem-final accentuation in limited contexts. Finally, alternative analyses to the rather diacritic explanation of affixal invisibility followed here were considered. A level ordering account seems plausible at first glance, but is not supported by the data in the end. Accentuation in stems where agreement is zero-marked for prefix show that the basic derived high-before-long pattern is in fact tied to the prefixal morphology themselves and not to inflection in general, so a stratal explanation for prefix inclusion in the prosodic stem is impossible. Accent competition explanations also fall short given the patterns discussed in previous chapters.

While the following order cannot explain the prosodic window strictly by levels, it best captures the positions and co-occurrences of the inflectional morphology:

1. Prospective aspect (incompatible with optative context)
2. First round of agreement: Object agreement prefixes. 1st person object are inside prosodic stem, inverse-marked 2pl object are outside. Inverse and negative *-ap* (blocks *-ara*).
3. Second round of agreement: Subject agreement prefixes, optative *-i*, negative *-ara* (where not blocked by *-ap*), and the rest of the inflectional suffixes. Optative and negative prefixes are inside prosodic stem, indicative are outside (with minor exceptions due to paradigm leveling).

The accentual categories of agreement prefixes both provide support for the cyclic agreement theory put forth by Béjar (2003); Béjar & Rezac (2009); Campbell (2012) and defy its power to explain their prosodic status. This demonstrates that reference to purely morphological categories are required, in addition to syntactic and phonological factors.

This data brings up the question of the interface between what is lexical and what is postlexical. While accent placement is largely phonologically determined within a given window, some diacritic is required to insert what is essentially an accentual phrase boundary into the lexical representation of a word.

While the general patterns described for inflectional suffixing are quite robust, there are quite a few exceptional examples. They could be due to the explanations I have given

here, at least in part, but it is also possible that there are more complex morphological interactions at play that are not captured by the sorting of inflected verbs in the corpus by levels I have completed thus far. Bright (1957) describes a complicated accentual pattern that he labels “unstable accent” that interacts with certain sets of prefixes (cross-cutting the cohering/non-cohering distinction discussed here). and certain sets of suffixes (including the Level 3 DURATIVE and some – but not all – inflectional suffixation). I have attempted to explain away these complicated interactions as epiphenomenal, and while some of them do seem to be, the system I present here cannot account for all of them. A complete accounting of these subpatterns, including the exceptional behavior in inflectional suffixes and that described in §7.6 are left to future research.

Chapter 9

Conclusion

9.1 Summary of findings

This study has four major findings. First, the placement of prominence in a Karuk word is largely dependent on CV-skeleton syllable structure. Second, while one ('basic') tone-syllable alignment is the unmarked output of constraints, a different ('protected') tone-syllable structure alignment on the input blocks its surfacing. Third, various sets of morphology interfere with the basic placement of prominence by triggering stem-final prominence, sometimes with concomitant changes to CV structure or creation of a protected structure. Fourth, the predictable placement of basic prominence only applies within the prosodic stem, from which certain morphemes are excluded.

The influence of syllable structure on the placement of prominence in Karuk is found throughout the grammar, although the particulars of this influence and its realization vary by level. In Chapter 4, possible tone patterns on roots were examined, and it was found that lexical tone is predictable to a large degree by syllable structure in verb roots. A combination of non-finality of H tone and avoidance of H tone on a short vowel in a closed syllable drives the pattern, the latter of which is modeled by a $*(C)\acute{V}C$ tone-syllable alignment constraint. The constraint is motivated by a gradient scale of appropriateness of various syllable structures as tone bearing units.

Turning to surface accentuation in Chapter 5, I showed that a great deal of accentuation in inflected Karuk words is predictable by syllable structure alone, in particular, by the presence and position of long vowels. The preferred tone-syllable alignment in Karuk is high tone on a syllable *preceding* a syllable with a long vowel, creating a new type of metrical foot, the high-before-long trochee. When this configuration is not possible, prominence is placed based on general and predictable alignment and non-finality constraints. These accentual patterns are called basic derived accentuation. These data show some of Karuk prominence can be placed in parallel and based solely on phonological factors, but major exceptions to basic derived accentuation are found which complicate the picture.

One major exception to basic derived accentuation, discussed in Chapter 6, is a tone-syllable alignment which, when present on the input, blocks the basic pattern. This alignment is a series of HL tones realized over exactly two moras with no intervening coda

consonant, which is called a protected HL structure. This structure must be defined phonologically, and requires specification of both tone and syllable structure alignment. It cannot be ascribed to a special tonal or accentual class, or to underlying tone only. The blocking of the basic derived pattern needs to be modeled using a special faithfulness constraint, because while the structure is protected, it is not the unmarked output of other constraints at the word level. The source of the protected HL structure can be underlying, as seen in roots in Chapter 4, but it can also arise through derivation, showing that additional levels are needed to explain surface prominence. I model the protected HL structure in terms of tone-syllable structure alignment, and the high-before-long structure in terms of a metrical foot, indicating that these two prosodic systems are active at different parts of the derivation. Even if it is possible to model both tone-syllable alignments as tonal or as metrical, which it may be, two different sets of prosodic constraints would have to active to obtain the differential preference for these two structures at different points in the derivation.

Karuk verbal morphology can be organized into four levels, the first three of which are considered derivational. Levels are determined by regular prosodic effects of affixes on the stem, as well as by affix position and semantics. The various effects of verbal derivational morphology on stem prominence are described in Chapter 7. In general, these effects demonstrate a tension between a drive to place prominence stem-finally, on the one hand, and a drive to place prominence in a good tone-syllable alignment. Some of the same constraints seen elsewhere in Karuk prosody relating to tone-syllable alignment are active in derivation, but repairs vary by morphological level. Derivational morphology can create a protected HL structure. When a protected HL structure is not created, vowel lengthening is one repair for $*(C)\acute{V}C$. As vowel lengthening feeds the high-before-long configuration, it is rendered opaque, because its trigger (final prominence in an illicit tone-syllable configuration) is no longer present. While prosodic effects of derivational morphology on the stem are quite consistent by levels, exceptionality demonstrates that in some cases, phonological effects must be tied to individual morphemes.

The other apparent major exception to basic derived accentuation, seen with some inflectional morphology, is explored in Chapter 8. I find that inflectional suffixes and certain inflectional prefixes fall outside the prosodic stem for accentuation, but that the basic derived pattern does apply as expected within a prosodic window. Accentibility of agreement prefixes is predictable by their morphosyntactic status in Karuk's complex system of agreement paradigms, agreement cycles, and person hierarchy. Yet level ordering still cannot account for inclusion in and exclusion from the prosodic stem, so the phenomenon is analyzed as a mismatch between phonological stem and morphological stem specified in the subcategorization of the affixes, evaluated in parallel within the level for inflection. Evidence from zero-prefixed forms shows that the basic derived pattern is actually linked to agreement prefix morphology.

Syllable structure is key to the placement of prominence throughout the Karuk grammar; it determines whether verb roots can bear tone, it determines the placement of basic derived accentuation, and a tone-syllable alignment constitutes the input structure which blocks basic derived accentuation. Reference to morphology is necessary, however, at every level. The preferred tone-syllable alignment, as well as repairs for illicit tone-syllable alignments vary by

morphological level. In suffixation, marking the right edge of the stem drives the placement of prominence, although this morphological alignment of prominence can be disrupted by tone-syllable alignment. In turn, when stem-edge marking happens to fall into the protected HL structure, this morphological alignment blocks phonologically-driven tone-syllable alignment at the word level. As certain morphemes are excluded from the prosodic stem, morphology also plays a role in delimiting the prosodic window within which basic derived accentuation applies.

The placement of prominence in Karuk is thus a complex interaction of phonological and morphological factors. It is far more predictable than previously thought, with practically all derived nouns and verbs following the same high-before-long footing pattern, when the underlying HL structures and the prosodic stem are taken into consideration. A summary of the patterns found and the portion of verbs in the corpus they account for is given in Table 9.1. Details regarding how verb forms were sorted into these categories are provided in Appendix B.

Table 9.1: Patterns of prominence found in corpus

Pattern	number	% of tokens
Basic derived accentuation	3283	50
Protected HL	2324	35
Stem-final	312	5
Known exceptional	220	3
Unaccented default	32	<1
Unexpected/unknown	456	7
Total	6627	100

One potential problem with these numbers is that they count tokens, which can include repeated copies of the same word form, which may skew the counts. I do not believe that the overall patterns are affected greatly, because the most frequent verbs are phonologically very small and/or irregular (see Appendix B), so they do not tell us much about the placement of prominence. However, in future work, proportions of patterns by type rather than by token will be determined.

9.2 Directions for future research

Topics that have been touched on, but not resolved, in the present study are left to future research. These fall into three main categories: extension of the present analysis, phonetic analysis, and intonation.

Extension of the present analysis includes recalculating proportions of accent patterns by unique verb forms, rather than tokens, as noted above. In future work, I hope to incorporate

an account of the so-called “unstable accent” minority pattern mentioned in §7.6, which involves the interaction of several morphemes for an unexpected prosodic alignment, into the analysis. I also plan to add nominal suffixation to the analysis. All nominal prefixation conforms to the basic derived pattern, but nominal suffixation (which is far less extensive than verbal suffixation) has not yet been incorporated into the analysis. Preliminary observations suggest that the prosodic stem approach will be useful in explaining accentuation in these forms. A large-scale pattern in which “prefixing” morphology patterns one way (basic derived accentuation) while “suffixing” morphology patterns another way (scare quotes are used here because “prefixing” in this context includes compounding and possibly one suffix), is beginning to emerge, which will be explored further.

It is possible that not all the derivational processes presented in Chapter 7 are needed to explain surface prominence and that more of them could be epiphenomenal, as I have found many of those proposed by Bright (1957) to be. It would be worthwhile to push the analysis even further to attempt to do away with the need for some of these processes. In addition, I am skeptical that roots listed with underlying accentuation other than HL are actually accented underlyingly (§4.4), but more work remains to be done to show that this is not needed.

Phonetic work will be important in evaluating whether any secondary stress, and by extension, any footing independent of tone, is present. It will also be important in gaining a better understanding of gemination. These topics are touched on in §2.1.4. Experimental phonetics might be able to help confirm actual syllabification, which would have important ramifications for the analysis of processes which relate to syllable structure, especially across morpheme boundaries, such as those seen in §2.1.4, Chapter 3, and §7.3. See, for instance, recent work on the treatment of intervocalic consonants in syllabification in Irish by Ní Chiosáin et al. (2012). Another topic for future phonetic research could be to investigate generational differences in production of word prosody, to determine how much and in what ways prosodic features of Karuk may be changing in the contexts of language attrition and revitalization.

Finally, there is a great deal to be done in the study of Karuk prosody at the phrasal level, which was touched on only briefly in §2.5.2, such as further exploration of the role of tone in intonation and how intonation at the phrasal level interacts with word accentuation.

9.3 Typological implications

As discussed in Chapter 1, there is disagreement as to how best to describe and classify the prosody of languages that do not display canonical stress or tone. Karuk clearly falls into the non-canonical group, as it has a sparse tonal system that also includes stress. While some of the details are different, Karuk bears a number of significant resemblances to other languages which have been categorized as “pitch accent” languages. Like Tokyo Japanese and Bizkaian Basque, Karuk has a contrast between accented and unaccented roots, there is a H*L pattern at the AP level and AP boundary tones, morphological rules manipulate the position of accent, and suffixes are pre-accenting. Like Basque, a default pitch accent

is supplied for an unaccented AP. Like Japanese, Karuk has an utterance-final L boundary tone and a constraint against a LH contour tone within in a syllable. Significant differences exist as well, such as phonetic stress on the accented syllable, and the significance of syllable structure in its interaction with tone placement in conjunction with morphology.

Thus to the extent that properties common to these languages defines a type, Karuk can be considered an accent language in both the sense of Hulst (2011) and Hualde (2012). Of course, it is far more illuminating to describe it as a language with both sparse lexical tone and stress. I find that, throughout the grammar, both tone and metrical structure are necessary to explain prominence, even though they coincide the majority of the time. It is interesting that while stressed syllables are good positions for tonal contrasts (Gussenhoven 2004), the evidence in Karuk thus far points to tone being primary, and stress being supplied to the location with the tone or accent.

Karuk displays some strong tendencies that are internally consistent but which seem to be typologically unusual for sparsely tonal languages (or languages in general). Its two preferred alignments of tone and metrical structure, the high-before-long foot and the protected HL structure, are unusual. The high-before-long foot is not a known foot type (Hayes 1995), although it is perceptually motivated, perhaps especially for an “accent language” in which a single drop from high to low pitch is the most salient characteristic of word prosody. The HL structure, on the other hand, is in many ways a perfect moraic trochee (Hayes 1995), but due to gemination in stressed syllables, it is surface-opaque, as is the $*(C)\acute{V}C$ constraint that indirectly feeds both these structures. All of these tendencies indicate the influence of syllable structure on placement of tone in ways that are not related to stress being drawn to heavy syllables. In addition to this phonologically-driven placement of prominence, morphology also drives and limits the placement of prominence in Karuk. The tension between these two forces, and the complexity of their interaction makes this system a challenging one to model.

9.4 Theoretical implications

Major questions regarding the interface of phonology and morphology are whether phonology can be evaluated in parallel or whether some sort of serial derivation is needed, and relatedly, to what degree phonology is bound up with particular morphology. The Karuk system of prosody speaks to these questions because it presents a complex system which lends itself to a constraint-based analysis in many respects, but requires morphology-specific rankings in a number of places.

An Optimality Theoretic approach is far better able to explain alternations than a rule-based approach when it comes to various repairs for dispreferred structures, and “second best” alignments of prosody when the preferred alignment is not available in a given stem. The constraints required to model the avoidance of H tone on a closed syllable (introduced in example (126) and the alignment of a foot with a long vowel (see example (152)) are new but not particularly problematic. However, the need for faithfulness to a specific structure in the input (the protected HL), which is not the default output of constraints, is problematic

for an Optimality Theoretic approach in which markedness rather than faithfulness should in principle be the driver.

I have attempted to analyze prominence in Karuk as much as possible in a flat, surface-oriented manner, in order to ascertain how much can be attributed to surface phonological factors. This approach found that while a great deal of phonological regularity at the surface, exceptions require on the one hand, derived levels (i.e., presence of derived protected HL structures), and on the other hand, reference to morphology in a parallel context (i.e., cohering vs. non-cohering prefixes). Thus both constraints and levels are needed. Morphological exceptions within levels, and the fact that the basic derived pattern is tied to specific morphology rather than inflection in general, makes a cophonology approach more attractive than a Serial OT one. Large groupings of morphemes, many of which can be organized by level, must have related but slightly different constraint rankings associated with them. Under a cophonology approach, individual affixes can also have a separate cophonology, which we need to explain exceptional behavior of affixes such as the pluractional, which would not make sense to attribute to one particular level. A Serial OT approach would require a proliferation of levels to capture the idiosyncrasies of individual morphemes which would miss the generalizations that make levels a useful way to organize the morphology in the first place. It also would be unable to handle the ordering paradoxes that arise with the inflectional morphology.

Finally, accentuation patterns in inflectional prefixation demonstrate that on the one hand, a Distributed Morphology analysis of Karuk agreement accurately captures distinctions in the grammar, but on the other hand, it cannot account for the particular accentual patterns associated with those distinctions. Thus Karuk represents a language which requires reference to morphology, independent of syntax and phonology, to account for surface patterns of prominence.

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Appendix A

List of texts in corpus

Text identifier	Year	Speaker(s)	Title
ALK_14-35	1903	Mrs. Bennett	Screech Owl and Coyote
CT-01	2013	Charlie Thom, Sr.	Sentences from Now You're Speaking Karuk
CT-02	2013	Charlie Thom, Sr.	How Charlie Grew Up
DAF_KT-05b	1927	Benonie Harrie	How I Found Gold
GD-MD-VSu-01	1989	Violet Super, Grace Davis, Madeline Davis	Conversation: Weaving
JL-CR-VS-01	2011	Julian Lang, Crystal Richardson, Vina Smith	Conversation
JL-CR-VS-02	2011	Julian Lang, Crystal Richardson, Vina Smith	Conversation: vacuum cleaner story
JL-VS-01	2011	Julian Lang, Vina Smith	Conversation: Julian's Day
JPH_KT-01b	1930	Yaas	How Buzzard Became Bald
JPH_KT-12	1930	Fritz Hansen	Coyote Falls through the Living-House Roof Hole
JPH_PHM-24-343a	1929	Phoebe Maddux	Bluejay Myth
JPH_TKIC-III.2	1932	Phoebe Maddux	The Name of Tobacco
JPH_TKIC-III.3	1932	Phoebe Maddux	Black Nightshade
JPH_TKIC-III.4	1932	Phoebe Maddux	Downslope and Upslope Tobacco
JPH_TKIC-III.5.A	1932	Phoebe Maddux	Morphology of the Tobacco Plant: The Plant
JPH_TKIC-III.5.A.a	1932	Phoebe Maddux	Sense Characteristics
JPH_TKIC-III.5.A.b-g	1932	Phoebe Maddux	Parts of the Tobacco Plant
JPH_TKIC-III.5.A.h	1932	Phoebe Maddux	Leaf
JPH_TKIC-III.5.A.i	1932	Phoebe Maddux	Gum
JPH_TKIC-III.5.A.j.a1'	1932	Phoebe Maddux	Phases of Flowering
JPH_TKIC-III.5.A.k	1932	Phoebe Maddux	Seed
JPH_TKIC-IV.3	1932	Phoebe Maddux	They Knew That Seeds Will Grow
JPH_TKIC-IV.4	1932	Phoebe Maddux	But They Never Packed Seeds Home
JPH_TKIC-IV.5	1932	Phoebe Maddux	Practices Bordering on a Knowledge of Tillage
LA-01	2009	Lucille Albers	Sentences about fear and going places
LA-02	2010	Lucille Albers	Sentences about acorns, weather
LA-03	2012	Lucille Albers	Sentences about morning activities
LA-VS-01	2010	Vina Smith, Lucille Albers	Sentences with verb paradigms
SD-01	2010	Sonny Davis	Sentences about body parts, etc.
SD-02	2010	Sonny Davis	Sentences about speaking Karuk
SD-VS-01	2010	Vina Smith, Sonny Davis	Sentences about perception, animals, verb tenses
SD-VS-02	2010	Vina Smith, Sonny Davis	Sentences about driving and directions

Text identifier	Year	Speaker(s)	Title
VS-01	2010	Vina Smith	Sentences: questions and answers
VS-02	2010	Vina Smith	Sentences about asking name, adjectives
VS-03	2011	Vina Smith	Sentences: questions
VS-04	2011	Vina Smith	Sentences about personal states
VS-05	2011	Vina Smith	Sentences about personal states
VS-06	2011	Vina Smith	Sentences about personal states
VS-07	2011	Vina Smith	Sentences with words for accent
VS-08	2011	Vina Smith	Sentences about possession, location
VS-09	2011	Vina Smith	Sentences with relative clauses, negation, commands
VS-10	2011	Vina Smith	Sentences with words for accent
VS-11	2011	Vina Smith	Sentences with verb paradigms, words for accent
VS-12	2011	Vina Smith	Sentences about putting and motion
VS-13	2011	Vina Smith	Sentences about spatial relations
VS-14	2010	Vina Smith	Sentences about animals, questions
VS-15	2010	Vina Smith	Sentences about animals, questions
VS-16	2010	Vina Smith	Sentences: questions
VS-17	2010	Vina Smith	Sentences: questions and answers, verb tenses
VS-18	2013	Vina Smith	Sentences about comparisons
VS-19	2010	Vina Smith	Avansáxiich káru Chishíh káru Xanchííhich
VS-20a	2012	Vina Smith	Sentences from Now You're Speaking Karuk
VS-20b	2012	Vina Smith	Sentences from Now You're Speaking Karuk
VS-20c	2012	Vina Smith	Sentences from Now You're Speaking Karuk
VS-20d	2012	Vina Smith	Sentences from Now You're Speaking Karuk
VS-21	2013	Vina Smith	Sentences: actions and instrumentals
VS-22	2015	Vina Smith	I'll Never Forget Those Days
VS-23	2015	Vina Smith	Biscuits
VS-24	2015	Vina Smith	Washing
VS-25	2012	Vina Smith	Sentences about jewelry, hair, and clothes
VS-26	2012	Vina Smith	Sentences: pretty sisters
VS-27	2012	Vina Smith	Sentences: adjectives
VS-28	2012	Vina Smith	Sentences: adjectives
VS-29	2010	Vina Smith	Sentences: questions, answers, possessives
VS-30	2013	Vina Smith	Sentence: cooking fish
VSu-01	2004	Violet Super	Violet Cooking
VSu-02	2004	Violet Super	Violet's Picture
VSu-03	1989	Violet Super	Violet's Dog
VSu-04	2004	Violet Super	Violet Working
WB.KL-0	1957	Julia Starritt	Swearing
WB.KL-01	1957	Nettie Ruben	Coyote's Journey
WB.KL-02	1957	Nettie Ruben	Coyote's Homecoming
WB.KL-02a	1957	Nettie Ruben	Coyote's Homecoming (second telling)
WB.KL-03	1957	Chester Pepper	Coyote's Journey
WB.KL-04	1957	Julia Starritt	Coyote's Journey
WB.KL-05	1957	Mamie Offield	Coyote's Journey
WB.KL-06	1957	Julia Starritt	Coyote Goes to a War Dance
WB.KL-07	1957	Nettie Ruben	Coyote Trades Songs
WB.KL-08	1957	Julia Starritt	Coyote Goes to the Sky
WB.KL-09	1957	Mamie Offield	Coyote Trades Songs and Goes to the Sky
WB.KL-10	1957	Julia Starritt	Coyote Steals Fire
WB.KL-11	1957	Nettie Ruben	Coyote as Doctor
WB.KL-12	1957	Chester Pepper	Coyote Tries to Reach the Sun
WB.KL-13	1957	Chester Pepper	Coyote's Gambling Song
WB.KL-14	1957	Chester Pepper	Coyote Eats His Own Excrement

Text identifier	Year	Speaker(s)	Title
WB_KL-15	1957	Nettie Ruben	Coyote As Lawmaker
WB_KL-16	1957	Julia Starritt	Coyote Marries His Own Daughter
WB_KL-17	1957	Mamie Offield	Coyote Gives Salmon and Acorns to Mankind
WB_KL-18	1957	Lottie Beck	The Perils of Weasel
WB_KL-19	1957	Mamie Offield	The Perils of Weasel
WB_KL-20	1957	Daisy Jones	The Perils of Weasel
WB_KL-21	1957	Julia Starritt	The Hair in the Soup
WB_KL-22	1957	Lottie Beck	Old Man Turtle Dances
WB_KL-23	1957	Lottie Beck	The Greedy Father
WB_KL-24	1957	Mamie Offield	The Greedy Father
WB_KL-25	1957	Lottie Beck	Duck Hawk and His Wife
WB_KL-26	1957	Chester Pepper	Duck Hawk and His Wife
WB_KL-27	1957	Mamie Offield	Duck Hawk and His Wife
WB_KL-28	1957	Mamie Offield	Blue Jay As Doctor
WB_KL-29	1957	Nettie Ruben	Blue Jay As Doctor
WB_KL-30	1957	Lottie Beck	The Story of Tan Oak Acorn
WB_KL-31	1957	Nettie Ruben	The Story of Tan Oak Acorn
WB_KL-32	1957	Julia Starritt	The Bear and the Deer
WB_KL-33	1957	Mamie Offield	How Deer Meat Was Lost and Regained
WB_KL-34	1957	Nettie Ruben	Lizard and Grizzly Bear
WB_KL-35	1957	Lottie Beck	The Story of Madrone
WB_KL-36	1957	Nettie Ruben	Why Towhee Has Red Eyes
WB_KL-37	1957	Mamie Offield	Eel and Sucker
WB_KL-38	1957	Mamie Offield	The Story of Slug
WB_KL-39	1957	Nettie Ruben	The Adulterers Discovered
WB_KL-40	1957	Nettie Ruben	The Story of Bear
WB_KL-41	1957	Nettie Ruben	The Creation of Eels
WB_KL-42	1957	Nettie Ruben	The Story of Crane
WB_KL-43	1957	Nettie Ruben	Mockingbird and Swamp Robin
WB_KL-44	1957	Nettie Ruben	Why Lightning Strikes Trees
WB_KL-45	1957	Mamie Offield	Victory Over Fire
WB_KL-46	1957	Nettie Ruben	The Story of Skunk
WB_KL-47	1957	Chester Pepper	The Origin of the Pikiawish
WB_KL-48	1957	Nettie Ruben	The Origin of the Pikiawish
WB_KL-49	1957	Nettie Ruben	Medicine for the Return of a Sweetheart
WB_KL-50	1957	Nettie Ruben	Medicine to Get a Husband
WB_KL-51	1957	Chester Pepper	Love Medicine
WB_KL-52	1957	Chester Pepper	Medicine for the Return of Wives
WB_KL-53	1957	Chester Pepper	Deer-hunting Medicine
WB_KL-54	1957	Mamie Offield	Shinny Game Medicine
WB_KL-55	1957	Mamie Offield	Wrestling Medicine
WB_KL-56	1957	Mamie Offield	The Flood
WB_KL-57	1957	Nettie Ruben	The Boy from Itúkuk
WB_KL-58	1957	Mamie Offield	A Trip to the Land of the Dead
WB_KL-59	1957	Nettie Ruben	The Pool in Big Rock
WB_KL-60	1957	Daisy Jones	The Snake People
WB_KL-61	1957	Lottie Beck	The Kidnapped Child
WB_KL-62	1957	Mamie Offield	The Devil Discovered
WB_KL-63	1957	Mamie Offield	The Devil Who Died Laughing
WB_KL-64	1957	Mamie Offield	The Devil and the Girl
WB_KL-65	1957	Nettie Ruben	The White Man's Gifts
WB_KL-66	1957	Julia Starritt	How the Rube Family Was Named
WB_KL-67	1957	Julia Starritt	A Quack Doctor
WB_KL-68	1957	Maggie Charley	Indian Food

Text identifier	Year	Speaker(s)	Title
WB_KL-69	1957	Julia Starritt	Salmon Fishing
WB_KL-70	1957	Nettie Ruben	Deer Hunting
WB_KL-71	1957	Nettie Ruben	Bear Hunting
WB_KL-72	1957	Nettie Ruben	Elk Hunting
WB_KL-73	1957	Julia Starritt	Making Acorn Soup
WB_KL-74	1957	Nettie Ruben	Making Acorn Soup
WB_KL-75	1957	Julia Starritt	Soaking Acorns
WB_KL-76	1957	Julia Starritt	The Sweathouse
WB_KL-77	1957	Julia Starritt	The Living-house
WB_KL-78	1957	Julia Starritt	The Shinny Game
WB_KL-79	1957	Nettie Ruben	Work Contests
WB_KL-80	1957	Julia Starritt	The Sucking Doctor
WB_KL-81	1957	Julia Starritt	The Sweating Doctor
WB_KL-82	1957	Emily Donahue	The Pikiawish at Katimin
WB_KL-83	1957	Nettie Ruben	The Pikiawish at Katimin
WB_KL-84	1957	Maggie Charley	The Pikiawish at Clear Creek
WB_KL-85	1957	Emily Donahue	Preparing Basket Materials
WB_KL-86	1957	Julia Starritt	Indian Clothes
WB_KL-87	1957	Julia Starritt	Tattoos
WB_KL-88	1957	Emily Donahue	Professor Gifford's Visit
WB_KL-89	1957	Julia Starritt	A Birthday Party
WB_KL-90	1957	Julia Starritt	Smoke
WB_KL-91	1957	Julia Starritt	A Blow-out
WB_KL-92	1957	Julia Starritt	Responses to Pictures
WB_KV	ca. 1949	Various speakers	Miscellaneous Sentences
WB_LA78.1-001	1949	Nettie Ruben, Lottie Beck	Conversation and stick game medicine story
WB_LA78.1-002	1949	Nettie Ruben, Lottie Beck	Kunâach'aa
WB_LA78.1-003	1949	Nettie Ruben, Lottie Beck	Conversation about doctors
WB_LA78.1-004a	1949	Nettie Ruben	Blue Jay as Doctor
WB_LA78.1-004b	1949	Nettie Ruben	Old Man Turtle
WB_LA78.1-006	1949	Nettie Ruben	The Boy from Itúttuk
WB_LA78.1-007	1949	Nettie Ruben, Lottie Beck	Conversation (mostly relating to the írahiv)
WB_LA78.1-013	1949	Chester Pepper	Klamath Lakes Young Man
WB_LA78.1-015	1949	Chester Pepper	The First Sweathouse Spirit
WB_LA78.1-016a	1949	Chester Pepper	Deer-hunting Medicine
WB_LA78.1-016b	1949	Chester Pepper	Coyote and the Sun
WB_LA78.1-016c	1949	Chester Pepper	Coyote as Priest
WB_LA78.1-018	1949	Nettie Ruben	The Story of Evening Star
WB_LA78.1-019	1950	Julia Starritt	How Coyote Stole Fire
WB_LA78.1-020	1949	Nettie Ruben	How Coyote Traded Songs

Appendix B

Sorting of verb forms into accentual categories

Table 9.1 is reproduced here. Notes decisions made regarding ambiguous forms follow, with reference to sections where the categories in question are described.

Pattern	number	% of tokens
Basic derived accentuation	3283	50
Protected HL	2324	35
Stem-final	312	5
Known exceptional	220	3
Unaccented default	32	<1
Unexpected/unknown	456	7
Total	6627	100

Basic derived accentuation Includes: high-before-long on stem with or without inflectional suffixes (§5.2.2), initial long with no high-before-long possible (§5.2.4), flipped for high-before-long including inflectional suffix (§8.5.1), penult on a prefixed stem with no long vowels and without inflectional suffixes (§5.2.1). Prefixed degenerate are also included here (§5.2.4).

Protected HL Includes only lexical HL from the root or from an earlier stage in derivation blocking otherwise expected surface accentuation (Ch. 6). In unprefixed stems this includes HL blocking stem-final but not stem-final that happens to be HL. In prefixed stems this is any HL blocking high-before-long, including a stem-final HL. In the case of penultimate HL, if it is on a short-voweled root that was not HL underlyingly, it is counted as basic, if it is stem-final in a context for stem-final, it is counted as stem-final.

Stem-final Includes only stem-final accentuation in prefixed stems with all short vowel stems with final before an inflectional suffix (§8.5.1), and unprefixed stems with final before

an inflectional suffix (§8.5.2).

Known exceptional Includes irregular forms such as those containing the verb root *ku-uphi* ‘to do’, or those with final HL on long pattern imposed on short unaccented stems by the optative (§8.3.1).

Unaccented default Includes only apparently uninflected verbs which display final or no H (§2.5.2).

Unexpected/unknown Includes forms which are unexpectedly stem-final, unexpectedly unaccented, unprefixed or all-short stems which do not display the stem-final pattern, prefixed stems with long vowels which do not display the basic pattern, and the apparent ‘unstable’ or ‘flipped’ patterns (§7.6).

Most frequent verb roots in corpus

1. *piip* (irregular) ‘to say’
2. *xus~xu-* (irregular) ‘to think, to know, to realize; to feel’
3. *av~am-* ‘to eat’
4. *ikyav~ikyaa-* (irregular) ‘to make, make into; to do; to fix; to prepare; to gather, to acquire (things other than food)’
5. *mah* ‘to see; to find’
6. *ikrii~ikriv-* (irregular) ‘to live, sit, stay, be; to be at home’
7. *kuuphi~kupi* (irregular) ‘to do’
8. *ipéèr~ípeen-* (irregular) ‘to say to, to tell; (rarely) to call’
9. *uumu* ‘to arrive (there); to go (to a place)’
10. *váàaramu* ‘to go, to go away, to leave’