5 Mora and Syllable Accentuation

Typology and Representation

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1 Introduction

It is commonly assumed that in stress languages, the stress-bearing unit is the *syllable*. Hayes (1995: 401) states this assumption explicitly as follows: "*Stress-Bearing Unit* = the syllable, universally. Stress contrasts may not occur within heavy syllables, nor may syllables be split between feet." From this assumption, three solid predictions are derived. First, there can be no contrast of first mora versus second mora stress within heavy syllables; for example, *_t**áa**.ta_ versus _t**aá**.ta_.[1] Second, syllables cannot be split by metrical feet – an observation referred to as "syllable integrity" (Prince 1976; Hayes 1995: 121 vv.), which prohibits metrical parsings such as *(_ta.**tá**_)(_**a**.ta_). Third, only syllables, but not morae, can be extrametrical (Hayes 1995: 58 vv.), prohibiting metrical parsings such as *(_tá.t**a**_)<_**a**_>, in which the second mora of a final heavy syllable is extrametrical. Some earlier analysts have explicitly challenged the SBU=σ assumption (Halle and Vergnaud 1987 on Winnebago; Steriade 1991 on Palestinian Arabic; Buller, Buller, and Everett 1993, Everett 1996, 1997 on Banawá; Blevins and Harrison 1999 on Gilbertese).

Since an overwhelming amount of evidence for SBU=σ has been accumulated from stress languages, and relatively little evidence from non-stress

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[1] Clearly, this does *not* prohibit a language with stress from also having lexical tone, allowing a $\mu_1 \sim \mu_2$ *tonal* contrast on bimoraic syllables, as found in Swedish or Serbo-Croatian.

languages (e.g. tonal systems), a question arises concerning SBU=σ. Is this (a) an exclusive property of stress systems, or (b) a property intrinsically connected to metrical structure (applying equally to languages with metrical structure, stress, and non-stress)? Under option (a), non-stress languages with metrical structure are expected to disrespect SBU=σ. Alternatively, under option (b), at least some non-stress languages with metrical structure are expected to respect SBU=σ. This article will explore evidence from stress and non-stress languages to assess the merits of syllable versus mora-based metrical parsing.

First we will reassess the SBU=σ assumption based on evidence from Gilbertese, a Micronesian language mostly spoken in the Republic of Kiribati. Gilbertese is particularly interesting because it has both stress and metrically restricted tone. (Yet this property is not typologically unique; for example, Björn Köhnlein (Chapter 9 this volume) proposes an analysis of metrically conditioned pitch accent in Uspanteko.) All examples and generalizations regarding stress, syllabification, and tone in this chapter are taken from Blevins and Harrison's (1999) study, which is based on Harrison's original fieldwork. According to these authors, in Gilbertese, high pitch falls on the antepenultimate mora and on every third mora preceding it. Stress, described as "an intensity or loudness peak," falls on the penultimate mora and on every previous third mora (Blevins and Harrison 1999: 217). All rime-internal elements (i.e. vocoids and nasals) are moraic. Tri-moraic and quadri-moraic syllables are freely allowed and nasals can be syllabic. In the following examples in (1), we indicate stress with an acute accent and a high tone with a <^{H}> superscript.[2]

(1)	a.	. . . $\sigma_{\mu}\ \sigma_{\mu}\ \sigma\ _{\mu}$ #	
		a^{H}.rá.na	'his/her name'
		n^{H}.ná.ka.ra^{H}.kí.na	'I will recount s.t.'
	b.	. . . $\sigma\ _{\mu\mu}\ \sigma_{\mu}\ \sigma_{\mu}$ #	
		te^{H}. tá.kaa^{H}. ká.ro	'the/a leisure activity'
		ŋke e^{H}. má.tuu^{H}.ná.ko	'when he fell asleep'
	c.	. . . $\sigma_{\mu\mu}\ \sigma_{\mu}$ #	
		a^{H}ń.ti	'spirit, ghost'
	d.	. . . $\sigma_{\mu}\ \sigma_{\mu\mu}$ #	
		ma^{H}. túu	'to sleep'
		pu^{H}. kín	'end of'

[2] We have generally used the standard orthography to present the data, except in three cases: (i) we have exchanged the grapheme for its phonetic value [p], (ii) the velarized-labial consonants are represented as [p^{w}, m^{w}, β^{w}] (although in the orthography they are represented as <bw, mw, w> respectively) and (iii) the velar nasal has been represented by its phonetic value [ŋ] rather than the orthographic digraph <ng>. Stress contours reported for Gilbertese are impressionistic, based on natural and elicited speech collected by the second author before the interest of the stress pattern was apparent (Blevins and Harrison 1999: 205).

e. . . . $\sigma_{\mu\mu}$ $\sigma_{\mu\mu}$ #
ma^{H}á.ki. pa^{H}.ná.ko. ni^{H}.ká.**kaa^{H}.**é a — 'and they flew off in search of him'

f. . . . $\sigma_{\mu\mu\mu}$ #
a^{H} ó i — 'dew'
p^{w}a.ka^{H} m^{w}.**naa^{H}**. kí i.**ko^{H}ó**.ko.re^{H} á i — 'so that you will not cut me up'

The mora is the *tone-bearing unit*, as well as the *stress-bearing unit*, since high pitch and stress can fall either on the first or second mora of a heavy syllable, depending on its position in the string (see underlined examples in (1)); the mora is also the *counting unit*, since the distance between two high-pitched morae or between two stressed morae is always two morae. Even though there is no abundant evidence for the syllable as a phonological constituent in Gilbertese, Blevins and Harrison report that speakers have clear intuitions about syllables and syllable boundaries in the language ("native speakers have little difficulty in identifying the number of syllables in a word, and can, on demand, break a word into its constituent syllables," 1999: 206–207). Beyond native speaker intuitions, additional support for the syllable comes from: (i) a syllable-based morphophonological pattern of reduplication, (ii) a process of vowel assimilation which seems to be syllable based (it applies to tautosyllabic vowels, although alternative explanations are also available), and (iii) several distributional generalizations related to the sonority profile of segments as well as the observation that rhotic *r* is excluded from syllable rimes (see Blevins and Harrison 1999: 206–208 for further details). In sum, following the original source, we will assume that Gilbertese has syllables.

As can be inferred from the data in (1), Gilbertese has the mora both as its tone/stress-bearing unit and as its counting unit. A complete analysis of the ternary metrical pattern will be presented in Section 3. This analysis will have two main representational ingredients: (a) a representation of metrical foot structure based on the internally layered foot (Martínez-Paricio 2012, 2013; Martínez-Paricio and Kager 2015), which offers a principled representation of ternary foot structure, and provides the prosodic domain for high pitch distribution; (b) a prosodic representation in which morae can be occasionally immediately dominated by the foot, rather than the syllable. In order to guide the parsing of morae into feet, three sets of constraints will be proposed: foot well-formedness constraints that restrict the moraic size of foot heads and foot dependents; constraints regulating the distribution of metrical feet of different sizes within a prosodic word, which bring about ternarity; and constraints that state requirements on the parsing of morae by feet. Our analysis of Gilbertese will show how syllable integrity disrespecting metrical parsing emerges under duress of foot shape constraints, which take priority over constraints that disfavour metrical parsing of morae immediately dominated by feet.

Next we will embed our analysis of Gilbertese in a broader typological discussion of metrical systems that target the antepenultimate mora, in particular, systems which place a prominence (high tone, pitch fall, or stress) on the *syllable that contains the antepenultimate mora*, such as Tokyo Japanese loanword accentuation (McCawley 1968; 1978; Kubozono 2006) and Dihovo Macedonian stress (Groen 1977; Crosswhite 2001a, 2001b). Some typical Tokyo Japanese examples are presented in (2), illustrating how the accent falls either on the antepenultimate mora (2a) or on the pre-antepenultimate mora in which case this forms a heavy syllable together with the antepenultimate mora (2b).

(2)	a.i	$\ldots \sigma_{\mu}\ \sigma_{\mu}\ \sigma_{\ \mu}$ #	gú.ra.su	'glass'	
	a.ii	$\ldots \sigma_{\mu\mu}\ \sigma_{\mu}$ #	gu.róo.bu	'glove'	
	a.iii	$\ldots \sigma_{\mu}\ \sigma_{\mu\mu}$ #	a.má.zoN	'Amazon'	
	b.i	$\ldots \sigma_{\mu\mu}\ \sigma_{\mu}\ \sigma_{\ \mu}$ #	dóo.na.tu	'donut'	(*d**<u>oó</u>**.na.tu)
	b.ii	$\ldots \sigma_{\mu\mu}\ \sigma_{\mu\mu}$ #	aN.dáa.soN	'Anderson'	(*aN.d**<u>aá</u>**.soN)

In such antepenultimate mora systems, distances from the word edge are counted in terms of morae, while the syllable remains the accent/stress-bearing unit, since no prominence contrasts occur within heavy syllables (i.e. prominence is always placed on the first mora of a heavy syllable, **d*<u>oó</u>*.na.tu*). Hence, such metrical systems share characteristics with, on the one hand, purely mora-based metrical systems (such as Gilbertese), where the stress/tone-bearing unit is the mora, while the distribution of stress and tone totally disregards syllable boundaries, and, on the other hand, metrical systems in which the stress/tone-bearing unit is the syllable (such as antepenultimate/penultimate stress in Latin). This partial overlap of "counting units" and "bearing units" poses an interesting theoretical challenge, which we take up here, aiming at a unification of antepenultimate prominence systems by (a) identifying the principles from which the observed dimensions of "mora-counting" versus "syllable-counting" and "syllable integrity respecting" versus "syllable integrity disrespecting" emerge, and (b) formalizing these principles into a constraint-based account in which they interact as violable constraints. Such a unification will yield a continuum of metrical systems (similar to McCawley's 1978 classification) ranging from "mora counting and syllable integrity disrespecting" (e.g. Gilbertese), through "mora counting and syllable integrity respecting" (e.g. Tokyo Japanese, Dihovo Macedonian), to "syllable counting and syllable integrity respecting" (e.g. Latin). This chapter will make an attempt at such a unification. We will argue that all principles sought for are already provided by the constraints in the analysis of Gilbertese. That is, "mora counting and syllable integrity respecting" systems (e.g. Tokyo Japanese) minimize the violation of mora-based foot well-formedness constraints while disallowing morae to be immediately parsed by feet.

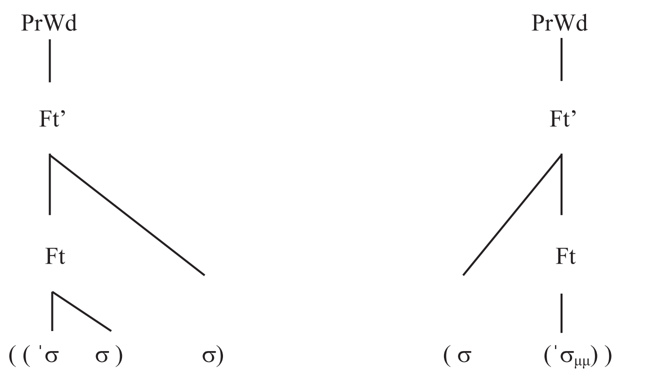
This chapter is organized as follows. Section 2 introduces the model of IL feet, which will be needed for our analysis of mora accentuation in Gilbertese, Tokyo Japanese loanwords, and Dihovo Macedonian. Section 3 illustrates this model by the analysis of Gilbertese high pitch placement and stress. Section 4 analyses Tokyo Japanese loanword accentuation, in two varieties, a conservative pattern (in which the accent falls on the syllable containing the antepenultimate mora) and an innovative pattern (which retracts the accent to the antepenultimate syllable in forms ending in light–heavy). Section 5 analyses the stress system of Dihovo Macedonian, which turns out to be an exact stress counterpart to the Tokyo Japanese conservative pattern. The conclusions are given in Section 6.

2 A Framework with IL Feet

An internally layered (IL) foot consists of a binary (bisyllabic (3a) or bimoraic (3b)) foot with a left- or right-adjoined syllable (vertical lines indicate headedness):

(3) Examples of IL feet

a. Trisyllabic IL foot b. Disyllabic IL foot



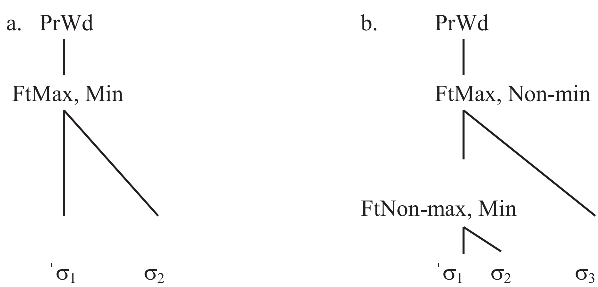
This type of IL foot, in which a single foot layer is occasionally stacked on top of another foot, was originally proposed in seminal studies on foot structure in the early 1980s (Selkirk 1980; Prince 1980) and it has since occasionally been invoked in the analysis of particular languages (see, for example, McCarthy 1982; Withgott 1982; Grijzenhout 1990; Hewitt 1992; Rice 1992; Kager 1994). Still, standard metrical theory and prosodic hierarchy theory have traditionally banned these structures reasoning they incur a violation of two inviolable universal restrictions: (i) feet should be maximally disyllabic and (ii) feet should be immediately dominated by prosodic words according to the Strict Layer Hypothesis (Selkirk 1984).

In light of new compelling stress and non-stress cross-linguistic evidence for this type of minimally recursive foot, and given that the inviolable nature of the Strict Layer Hypothesis has been called into question in subsequent research (Selkirk 1995), recent metrical studies have argued for the rehabilitation of IL feet in phonological representations. On the typological side, for instance, Martínez-Paricio and Kager (2015) have demonstrated that reference to IL feet allows for a unified and insightful account of the typology of binary and ternary quantity-insensitive rhythmic stress patterns. Moreover, postulating IL feet enables a restrictive account of the maximal size of stress and accentual windows (see Kager 2012, based on Caballero 2008; cf. Hyde 2015). Beyond the typology of metrical stress patterns, a large number of studies have shown that IL feet are equally necessary to explain a wide range of metrically governed phenomena related to phonotactics and tonotactics (see Martínez-Paricio 2013 for specific arguments and references). In this chapter we follow these studies and propose that IL feet are also necessary to account for mora-counting and syllable-counting antepenultimate patterns of accentuation. Along the lines of Martínez-Paricio (2013) and Martínez-Paricio and Kager (2015), we will assume that each projection of the foot can be defined as *minimal* (or *non-minimal*) and *maximal* (or *non-maximal*) based on its particular dominance relations, following Itô and Mester's theory of prosodic recursion (2007, 2009a, 2009b, 2013). The definitions of (non-)minimal/(non-)maximal feet are given in (4) and they are illustrated in (5).

(4) Projections of a metrical foot Ft (based on Itô and Mester 2007 *et seq.*)

a.	Maximal:	Ft not dominated by Ft	The largest projection of Ft
b.	Minimal:	Ft not dominating Ft	The smallest projection of Ft
c.	Non-maximal:	Ft dominated by Ft	
d.	Non-minimal:	Ft dominating Ft	

(5)



Within an Optimality Theory framework, the assumption is that constraints can refer to these different foot projections (see Martínez-Paricio and Kager 2015 for a small set of universal constraints in a model with IL feet). In this chapter we will go one step further and propose that not only syllables but also morae can be terminal elements of IL feet. In particular, under duress of foot well-formedness constraints, layered and non-layered metrical feet can immediately dominate morae, which may cause syllable integrity violations. This is the case in Gilbertese, whose metrical representation we discuss in the following section.

3 IL Feet in Gilbertese

Stress and pitch are rhythmic in Gilbertese (they are not culminative or demarcative). Interestingly, we saw in Section 1 that Gilbertese is a language in which the mora plays a crucial role in tone and stress placement. In particular, based on the descriptions and generalizations reported in the source (Blevins and Harrison 1999), Gilbertese was characterized as a MORA-ACCENTING and MORA-COUNTING language: (i) a high tone is located on the antepenultimate mora and on every third mora preceding it; (ii) stress falls on the penultimate mora and on every preceding third mora. Based on these generalizations, Blevins and Harrison posited that Gilbertese contains tri-moraic feet which are "*characterized by an intensity or loudness peak* [= stress] *on the penultimate mora, a pitch peak* [= high pitch] *on the antepenultimate mora*" and an unmarked "*lowered pitch and intensity*" on the final mora (1999: 217). That is, according to the source, morae and not syllables seem to be terminal elements of feet in Gilbertese. Assuming stress to be the manifestation of a foot head (Liberman and Prince 1977; Selkirk 1980; Halle and Vergnaud 1987; Hayes 1995), the reanalysis of the Gilbertese data in a model with IL feet leads to the metrical representations in (6), where IL feet consist of a bimoraic iamb with a monomoraic right-adjunct ((μ_w $\boldsymbol{\mu_s}$) μ_w) assigned from right to left (Martínez-Paricio 2013). (Parentheses signal foot boundaries and dots syllable boundaries; remember that vowels, coda nasals, and geminate nasals are the only moraic segments in Gilbertese.) Crucially, as can be inferred from the examples in (6), once morae are analyzed as terminal elements of feet, foot boundaries might dissect a syllable (violations of the syllable integrity principle are in bold and underlined in 6, for example 6b).

(6) IL feet in Gilbertese

a. . . . $\boldsymbol{\sigma_\mu}$ $\boldsymbol{\sigma_\mu}$ $\boldsymbol{\sigma}$ $\boldsymbol{_\mu}$ #
((a^H. rá).na) 'his/her name'
((n^{H}ná).ka). ((ra^H. kí).na) 'I will recount s.t.'

b. . . . $\boldsymbol{\sigma}$ $\boldsymbol{_{\mu\mu}}$ $\boldsymbol{\sigma_\mu}$ $\boldsymbol{\sigma_\mu}$ #
((te^H.tá).**ka) ((a$^{\mathbf{H}}$.** ká).ro) 'the/a leisure activity'

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ŋke ((e^{H}. má).**tu) ((u^{H}**.ná).ko) ‘when he fell asleep’

c. . . . $\boldsymbol{\sigma_{\mu\mu}\ \sigma_{\mu}}$ #
((a^{H}ń).ti) ‘spirit, ghost’

d. . . . $\boldsymbol{\sigma_{\mu}\ \sigma_{\mu\mu}}$ #
((ma^{H}. tú)u) ‘to sleep’
((pu^{H}. kí)n) ‘end of’

e. . . . $\boldsymbol{\sigma_{\mu\mu}\ \sigma_{\mu\mu}}$ #
((ma^{H}.á).ki). ((pa^{H}. ná).ko). ((ni^{H}.ká).**ka) ((a^{H}**. é)a) ‘and they flew off in search of him’

f. . . . $\boldsymbol{\sigma_{\mu\mu\mu}}$ #
((**a^{H} ó**)**i)** ‘dew’
p^{w}a.((ka^{H}m^{w}).**na) ((a^{H}**. kí)i). ((**ko^{H}.ó**).ko). ((re^{H} **á**)**i)** ‘so that you will not cut me up’

The forms in (6) and (7) from Blevins and Harrison (1999) further corroborate the idea that Gilbertese stress/pitch patterns are mora-based rather than syllable-based. For instance, the data in (7) show that trisyllabic (7a, b), bisyllabic (7c, e), and monosyllabic words (7d) all display identical pitch and stress patterns, since the parsing and accenting unit is the mora, not the syllable.

(7)
a. ((a^{H}. rá).na) ‘his/her name’
b. ((ka^{H}.mé).a) ‘dog’
c. ((m^{H}.ná).o) ‘kind of lobster’
d. ((a^{H}ó)i) ‘dew’
e. ((pu^{H}. kí)n) ‘end of’

The fact that bimoraic heavy syllables can display different stress patterns, having either their first or second mora stressed (8a, b versus 8c) confirms the idea that terminal elements of feet are occasionally morae in Gilbertese and contradicts the principle by which the syllable is the stress-bearing unit in all languages.

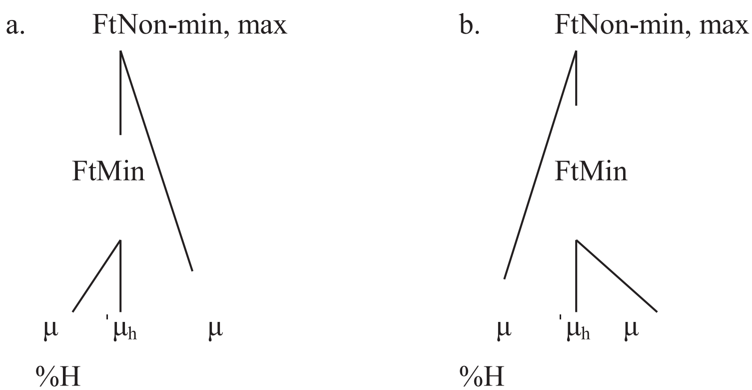
(8) Contrastive v́v ~ vv́
a. ma^{H}.**túu** v́v
‘to sleep’
b. a^{H}.í.ka.ka^{H}ḿβ^{w}o.ŋo^{H}.**ráa** v́v
‘those of you who are listening’
c. p^{w}a.ka^{H}ḿ^{w}.naa^{H}. kíi. **ko^{H}ó**.ko.re^{H}ái vv́
‘so that you will not cut me’

Crucially, Blevins and Harrison, drawing on Harrison’s fieldwork, describe a clear contrast between these two types of stressed syllables. More importantly, and despite the fact that syllables do not play an apparent role in the accentuation patterns in the language, we saw in Section 1 that syllabifications in Gilbertese are supported by native speakers’ intuitions and various distributional facts and morphophonological patterns.

3.1 Foot-initial Strengthening

Throughout this section we have assumed that IL feet in Gilbertese consist of a bimoraic iamb with a right adjunct ((μ_w $\boldsymbol{\mu_s}$)μ_w), but note that an alternative analysis with bimoraic trochees and a left adjunct (μ_w ($\boldsymbol{\mu_s}$ μ_w)) could also be posited for the language (cf. 9a versus 9b). In these two IL feet, the second mora of the trimoraic sequence corresponds to the head of a foot, which is realized with stress, hence the two metrical representations are descriptively equivalent for Gilbertese stress. However, we will adopt representation (9a) over (9b) based on a phonological argument: the former allows a simpler and more straightforward account of the distribution of high pitch. In particular, we propose that high pitch placement in Gilbertese amounts to inserting a boundary tone in a foot-initial position as a means of strengthening the initial boundary of the metrical foot (Martínez-Paricio 2013). That is, following Davis and Cho (2003), Rice (1992), and Bennett (2012, 2013), among others, we assume that the initial constituent of a foot, similar to initial constituents in other prosodic categories, may exhibit particular strengthening effects. In Gilbertese, this greater strength is realized as a boundary H tone foot-initially.[3] Note that the representation in (9a) has only one foot-initial position, since the left edges of FtMin and FtNon-min coincide, while (9b) has two foot-initial positions, only one of which carries high pitch. If we had adopted the representation in (9b) instead, we would need to include an additional specification saying that strengthening only occurs at the left edge of some foot projections but not others (in this case, the left edge of a FtNon-min). This specification would be required to avoid a configuration like (9b) receiving two highs at the left edge of each foot projection: one on the first mora and another one on the second mora.

(9) Foot-initial strengthening in Gilbertese



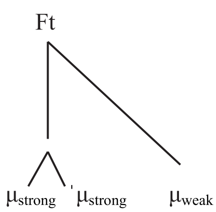
[3] See Bennett (2013) for further cross-linguistic support for the idea that iambic feet can undergo strengthening effects at their left edge.

To clearly determine which of the structures in (9) corresponds to this system, the particular pitch and stress patterns of bimoraic sequences in Gilbertese would be enlightening, since these could help us determine the exact shape of non-layered feet (i.e. feet that are minimal and maximal simultaneously); of particular interest would be the pitch/stress patterns of (i) bimoraic prosodic words and/or (ii) forms with a 3*n*+2 number of morae (e.g. $(\mu\ \mu)_{Ft}\ (\mu\ \mu\ \mu)_{Ft}$). If in these cases the non-layered foot displays a H pitch on the first mora, this would be evidence for the representation in (9a), which exhibits a H on the left edge of the FtMin, which coincides with the FtNon-min. The representation in (9b) would be less adequate since again the rule (or constraint) for H pitch placement would need to specifically refer to FtMax. Unfortunately, bimoraic prosodic words are rare, since these generally undergo a lengthening process to fulfill a trimoraic minimal requirement (Section 3.3). Also, no acoustic measurements of the leftover bimoraic sequences in 3*n*+2 structures are available. When we asked Harrison (per.comm.) about the realization of bimoraic words and the first two morae in 3*n*+2 sequences, the author reported some variation/uncertainty: sometimes these sequences seemed to be realized as $(\mu^{H}\ {}^{\prime}\mu)$, with a high initial pitch and a stress on the second mora, giving support to the representation in (9a), whereas in other cases, there seemed to be a *coincidence of pitch and intensity on the first mora, and something more neutral on the second*, matching better with (9b) (Harrison, per.comm.; Blevins and Harrison 1999: 218). Future experimental research will be needed to determine more specifically which of these two structures is instantiated in Gilbertese. For the time being and the sake of simplicity, we will assume (9a), but note that any of the two structures could in principle be posited for the language.

3.2 Binary Head versus Unary Head

As mentioned earlier in the introduction to this section, Blevins and Harrison (1999) had already proposed that Gilbertese metrical representations consist of trimoraic feet. However, the internal structure of these feet was slightly different from the ones proposed here: it consists of a bipartite head and a unary non-head (i.e. foot dependent) (1999: 217, based on Rehg 1993):

(10) Blevins and Harrison's trimoraic feet with bipartite heads (1999: 217)
I. <u>Bipartite head</u>



Although some studies have postulated the existence of feet with bipartite heads (Kager 1996; Bye 1996), we assume that the foot is a relational and rhythmic category that arises from combining a unique head (strong element) with one (or various, in the case of IL feet) optional non-head (weak element), this unique head being its defining property. This is why feet with only a head (i.e. unary feet) occasionally occur (but not degenerate feet with only a dependent) and, in case two adjacent positions are prominent, these have always been analyzed as each being the head of an independent foot. Another argument against positing a symmetrical bipartite head such as the one in (10) is that it predicts identical behavior for the two morae that compose the head. However, a typological survey on the relative strength of the elements contained in such binary structures (bipartite heads in Blevins and Harrison 1999, minimal feet in our model) reveals that the two constituents in the head clearly behave differently, one of them being phonologically and phonetically stronger than the other (Martínez-Paricio 2013). This is clearly the case in Gilbertese, where the morae in the binary head behave differently: the second mora is the true head of the foot and, hence, the stress-bearing unit, whereas the first mora is the tone-bearing unit. For all these reasons, we believe these structures are better analyzed via an IL foot, where the binary innermost constituent is not flat qua prominence, but it is actually a foot by itself.

3.3 Gilbertese Lengthening and the Minimality Requirement

A final piece of evidence which supports the idea that Gilbertese default feet are trimoraic is reported in Blevins and Harrison (1999: Section 4.1): the overwhelming majority of prosodic words in the language have at least three morae. Whenever this is not the case, there is strong evidence that bimoraic lexical words display lengthening to conform to this restriction. For instance, borrowed names display lengthening to conform to the trimoraic restriction (11a–c). Furthermore, even if it is not uncommon for lexical words (nouns and verbs) to have two morae, they hardly ever surface alone: they are either accompanied by a proclitic article or a possessive suffix (in the case of nouns) or a proclitic subject marker (in the case of verbs). But in bare verbal and nominal forms, like bare plurals (11e–g) or imperative forms (11h–j), the bimoraic lexical word undergoes lengthening. In (11) we indicate every moraic segment with the superscript <$^{\mu}$>; even if we assume that long vowels consist of one vowel linked to two morae, in the following examples we represent each lengthened vowel as two independent vowels, to better illustrate the lengthening pattern.

(11) Lengthening (all data taken from Blevins and Harrison 1999: 213–216)

Borrowed proper names

a.	ta$^{\mu}$a$^{\mu}$m$^{\mu}$	'Sam'
b.	ti $^{\mu}$i$^{\mu}$me$^{\mu}$	'Jimmy'
c.	bi$^{\mu}$i$^{\mu}$ti$^{\mu}$	'Fiji'

In bare plural nouns			Noun phrases		
e.	bwa$^{\mu}$a$^{\mu}$ta$^{\mu}$	'the/some huts'	cf.	te$^{\mu}$ bwa$^{\mu}$ta$^{\mu}$	'the/a hut'
f.	o$^{\mu}$o$^{\mu}$n$^{\mu}$	'the/some turtles'	cf.	te$^{\mu}$ o$^{\mu}$n$^{\mu}$	'the/a turtle'
g.	ba$^{\mu}$a$^{\mu}$i$^{\mu}$	'the/some arms'	cf.	ba$^{\mu}$i$^{\mu}$-u$^{\mu}$	'my arms'

In imperative verbal forms			Verbs+subject marker		
h.	bi$^{\mu}$i$^{\mu}$ri$^{\mu}$!	'run!'	cf.	e$^{\mu}$ bi$^{\mu}$ri$^{\mu}$	's/he ran'
i.	ni$^{\mu}$i$^{\mu}$m$^{\mu}$!	'drink them!'	cf.	i$^{\mu}$ ni$^{\mu}$m$^{\mu}$	'I drank them'
j.	a$^{\mu}$mw$^{\mu}$ara$^{\mu}$ke$^{\mu}$!	'eat!'	cf.	i$^{\mu}$ a$^{\mu}$mwa$^{\mu}$ra$^{\mu}$ke$^{\mu}$	'I ate'

Even if the trimoraic restriction is not completely inviolable, as there are a few exceptional forms that can surface with two morae (12), the lengthening patterns in (11) stand as strong support for feet with moraic terminal elements in Gilbertese. Note that the exceptions occur only in environments in which lengthening would have introduced an extra-long vowel, which are forbidden in the language (12a, b), or a geminate nasal in preconsonantal position, which are also illicit in prevocalic position (12c, d) (Blevins and Harrison 1999: 215). The pitch/stress patterns of these forms are not indicated because these are precisely the ones that were unclear to the authors (see again Section 3.1).

(12) Bimoraic prosodic words (Blevins and Harrison 1999: 215)

Bare plural nouns

a.	ni$^{\mu}$i$^{\mu}$	'some coconut trees'	(cf. sing.: te nii)
b.	ba$^{\mu}$a$^{\mu}$	'some leaves'	(cf. sing.: te baa)
c.	nn$^{\mu}$e$^{\mu}$	'some spots'	(cf. sing.: te nne)
d.	nn$^{\mu}$a$^{\mu}$	'some fleets'	(cf. sing.: te nna)

3.4 Optimality Theory Analysis

We adopt here Martínez-Paricio and Kager's (2015) Optimality Theory analysis of ternary rhythm. Under their view, the emergence of IL feet gives rise to ternary stress alternations. In (13) and (14) we present definitions of the relevant constraints: (13a–e) regulate the location and number of foot projections within a prosodic word, (13f) controls the location of unfooted syllables, banning them when the left and right versions of the constraint are both undominated. Finally, the constraints in (14) determine the location of foot heads and foot dependents within a foot. These metrical constraints were originally proposed to account for quantity-insensitive rhythmic stress, but they also control the location of feet in quantity-sensitive systems.[4]

(13) Constraints regulating the location and number of foot projections and unfooted syllables within a prosodic word (Martínez-Paricio and Kager 2015: 470)

a. ALIGN-L/R([Ftmax]ω, Ft, ω) (ALIGN-L/R_{max})
For every maximal foot Ftmax, assign a violation mark if some foot intervenes between Ftmax and the left/right edge of its containing ω.

b. ALIGN-L/R([Ftmin]ω, Ft, ω) (ALIGN-L/R_{min})
For every foot that is minimal and maximal ([Ftmin]ω), assign a violation mark if some foot intervenes between [Ftmin]ω and the left/right edge of its containing ω.

c. ALIGN-L/R([Ftnon-min]ω, Ft, ω) (ALIGN-L/$R_{non\text{-}min}$)
For every non-minimal foot Ftnon-min, assign a violation mark if some foot intervenes between Ftnon-min and the left/right edge of its containing ω.

d. ALIGN-L/R([Ftunary]ω, Ft, ω) (ALIGN-L/R_{unary})
For every unary foot Ftunary, assign a violation mark if some foot intervenes between Ftunary and the left/right edge of its containing ω.

e. ALIGN-L/R([Ftmain]ω, Ft, ω) (ALIGN-L/R_{main})
For every head foot of a prosodic word (Ftmain), assign a violation mark if some foot intervenes between Ftmain and the left/right edge of its containing ω.
(Based on EndRule-L/R; Prince 1983, McCarthy 2003.)

f. ALIGN-L/R([σ]ω, Ft, ω) (CHAIN-L/R)
For every unfooted syllable (σ)ω, assign a violation mark if some foot intervenes between (σ)ω and the left/right edge of its containing ω.

(14) Constraints regulating the location of foot heads and foot dependents within a Ft (Martínez-Paricio and Kager 2015: 473)

a. TROCHEE For every foot head, assign a violation mark if it is not initial in its containing Ft.

b. IAMB For every foot head, assign a violation mark if it is initial in its containing Ft.

c. ALIGN-L/R(Ftmin, σ, Ftnon-min) ($TROCHEE_{non\text{-}min}$/$IAMB_{non\text{-}min}$)
For every minimal foot Ftmin, assign a violation mark if some footed syllable intervenes between Ftmin and the left/right edge of its containing Ft.

[4] This model predicts that there is a cost for IL feet from two factors. On the one hand, IL feet will be penalized by the alignment constraint ALIGN-L/$R_{non\text{-}min}$ (13c); words that exclusively have a non-minimal foot would not incur a violation of this constraint, but whenever there is an additional foot (minimal or non-minimal) in the word, such candidates will incur a violation of the left or right-version of this constraint. On the other hand, IL feet will be completely excluded when the left- and right-version of (14c) ($TROCHEE_{non\text{-}min}$/$IAMB_{non\text{-}min}$) are both top-ranked. For further details on the specific hierarchies that penalize languages with IL feet, see Martínez-Paricio and Kager (2015: 478).

The following tableaux show how the general constraints in (13–14) model the type and number of IL feet that arise in Gilbertese. Let us start with the simpler forms: those that only contain monomoraic syllables. Assuming that IL feet in Gilbertese consist of iambs with right-adjuncts (see the discussion in Section 3.2), we conclude that TROCHEE$_{\text{non-min}}$ and IAMB must dominate IAMB$_{\text{non-min}}$ and TROCHEE. In (15) we illustrate these ranking arguments with the evaluation of the trimoraic form *a^{H}rána* 'his/her name.' (In this analysis and subsequent ones, we only derive the stress patterns. The placement of a high tone would arise by a high-ranking alignment constraint which aligns a high tone with the left edge of the foot, strengthening the foot-initial position, Section 3.2.)

(15)

Input: /arana/	TROCHEE non-min	IAMB	IAMB non-min	TROCHEE
☞ a. ((a. rá). na)			1	1
b. (a. (rá. na))	1!	1!		
c. (a. (ra. ná))	1!			1
d. ((á. ra). na)		1!	1	

To ensure that *arána* is parsed with an IL foot [((a.rá).na)] rather than a non-layered foot [(a.rá).na], the constraints on unfooted syllables, CHAIN-L and CHAIN-R, must both dominate TROCHEE$_{\text{non-min}}$ and IAMB. As previously mentioned, the main role of these constraints is to chain unfooted syllables toward the right or left edge of the prosodic word, while favoring exhaustive parsings of syllables. This promotion of exhaustivity indirectly favors the emergence of IL feet as shown in (16), where candidate (16a) beats candidates (16b–c). Since some forms do occasionally leave some unfooted material at the left edge of the prosodic word, we will see that CHAIN-L must dominate CHAIN-R (see 18).

(16)

Input: /arana/	TROCHEE non-min	IAMB	CHAIN-L	CHAIN-R	IAMB non-min	TROCHEE
☞ a. ((a. rá). na)					1	1
b. (a. rá). na			1!			1
c. a. (ra. ná)				1!		1

In longer words, alternating ternary rhythmic stresses occur on every third mora preceding the stressed penultimate mora. We propose this is the result of building adjacent IL ternary feet from right to left. The constraint ranking responsible for such parsings is illustrated in (17). ALIGN-L/R_{min} must crucially dominate ALIGN-L/$R_{non\text{-}min}$ so that parsings with IL feet are preferred over parsings with non-layered feet. Here and henceforth, we assume the syllabification patterns reported in Blevins and Harrison (1999); remember that coda nasals and prevocalic long nasals are always moraic.

(17)

Input: /nnakarakina/	TROCHEE$_{non\text{-}min}$	IAMB	ALIGN-R_{min}	ALIGN-L_{min}	CHAIN-L	CHAIN-R	ALIGN-L $_{non\text{-}min}$	ALIGN-R $_{non\text{-}min}$	IAMB$_{non\text{-}min}$	TROCHEE
☞ a. ((nná).ka).((ra.kí).na)							1	1	2	2
b. nna.ka.((ra.kí).na)						2!			1	1
c. nna. (ka.rá).(ki.ná)			1!	1!		1				2
d. (nna. ká).(ra.kí). na			1!	1!	1!					2

CHAIN-L must dominate CHAIN-R because forms with 3*n*+1 morae may leave an unfooted syllable/mora at the left edge of the prosodic word. Furthermore, to ensure that the first mora of these forms does not constitute a unary degenerate foot on its own, ALIGN-R_{unary} must be ranked above CHAIN-R. This is demonstrated in (18).

(18)

Input: /ŋkeematuunako/	CHAIN-L	ALIGN-R_{unary}	CHAIN-R
☞ a. ŋke ((e. má).tu)((u.ná).ko)			1
b. (ŋké) ((e. má).tu)((u.ná).ko)		1!	
c. ((ŋkeé).ma).((tuú).na).ko	1!		

Now that the general metrical constraints responsible for the emergence and distribution of IL feet in Gilbertese have been presented, we need to add a small set of constraints to derive the stress patterns of the language, where moraic information is crucial in the assignment of stress. The list of these constraints and their definition are presented in (19) and (20). First, to promote metrical parsings in which morae rather than syllables are terminal elements of feet, we need to add three high-ranked foot form constraints controlling the particular size of minimal feet (19a-b) and promoting monomoraic adjuncts (19c). The last constraint, which favours IL feet with monomoraic adjuncts, is typologically motivated by the cross-linguistic observation that in ternary stress systems, the syllable in between binary feet must be light (Hayes 1995).

(19) a. FOOT-MIN$\mu\mu_{Min}$ FtMin must be minimally bimoraic.
b. FOOT-MIN$\mu\mu_{Max}$ FtMin must be maximally bimoraic.
c. ADJUNCT=μ The adjunct of FtNonMin must be monomoraic

The constraints in (19a–b) ensure that the maximal and minimal size of FootMin equals two morae and, thus, they can be interpreted as being specific constraints on BINARITY. To predict the ternary stress moraic alternations in Gilbertese, the constraints in (19) together with, NON-FINALITY (banning the head syllable from final position) and ANCHOR-R, two classical metrical constraints defined in (20a,b), must be high-ranked, crucially dominating the WEIGHT-TO-STRESS PRINCIPLE constraint (WSP) and two additional general constraints on prosodic organization (PARSE-μ and EXHAUSTIVITY-Ft, 20d–e). These constraints are all defined in (20). Note that there is an important difference between PARSE-μ (20d) and EXHAUSTIVITY-Ft (20e). On the one hand, PARSE-μ promotes the footing of morae in general. This constraint is needed in addition to CHAIN-L/R because the latter exclusively refers to the chaining of unfooted syllables. That is, in comparison, PARSE-μ is stricter than CHAIN-L/R, since it bans all unfooted morae, also when they belong to *chained* syllables. On the other hand, EXHAUSTIVITY-Ft bans feet that directly dominate morae without an intervening syllable. This last constraint is typologically motivated since feet preferably dominate syllables. In (20) we will see that EXHAUSTIVITY-Ft is only violated in a few cases in Gilbertese (it is violated by candidates containing a heavy syllable in which the two morae belong to different feet). In other forms, it will be assumed that there is a syllable mediating between morae and feet.

(20) Metrical constraints
a. NON-FINALITY No head of FtMin is final in PrWd (restricts the head syllable).
b. ANCHOR-R Every PrWd must end with a foot.
c. WSP Every bimoraic syllable must be head of a foot.
Constraints on prosodic organization, mora parsing constraints
d. PARSE-μ Every mora must be parsed by a foot.
e. EXHAUSTIVITY-Ft No foot immediately dominates a mora. Assign a violation mark for every mora that is directly dominated by a foot.

Regarding (20e), we propose that the pressure to build feet on syllables – not morae – is not exclusive to stress systems, but enforced by a universal constraint that is active in *metrical* systems. The metrical system of Gilbertese strongly suggests the responsible constraint (EXHAUSTIVITY-Ft) to be violable (in the sense of Optimality Theory), and to interact with other constraints on metrical well-formedness, in particular foot shape constraints. In Section 4, we will support this hypothesis by an IL foot-based analysis of

Tokyo Japanese loanword accentuation, showing that its metrical system can be accounted for by a straightforward re-ranking of constraints motivated for Gilbertese. For this analysis to succeed, it will be crucial that metrical feet are IL, not standard moraic trochees.

In (21) we summarize the particular ranking of these constraints in Gilbertese. NON-FINALITY and ANCHOR-R (20a–b) together with ADJUNCT=μ, FtMin=$\mu\mu_{Max}$, and FtMin=$\mu\mu_{Min}$ (19a–c) all dominate WSP to ensure that bimoraic sequences do not always surface with stress – remember that heavy syllables only surface with stress if they contain a mora that is at a ternary interval from another stressed mora or the right edge of the prosodic word. These constraints must also dominate PARSE-μ. Finally, PARSE-μ must dominate EXHAUSTIVITY-Ft, the constraint that bans feet that directly dominate morae.

(21) NON-FINALITY, ADJUNCT=μ, FtMin=$\mu\mu_{Max}$, FtMin=$\mu\mu_{Min}$, ANCHOR-R » PARSE-μ » EXHAUSTIVITY-Ft, WSP

To illustrate this particular constraint interaction, and demonstrate how it can occasionally give rise to IL moraic feet in Gilbertese, tableau (22) presents the evaluation of a form ending in a sequence of HLL syllables such as *te^{H}tákaa-^{H}káro* ‘the/a leisure activity.’ This form, with stress on the penultimate and the peninitial mora, is parsed with two adjacent IL feet; for example, [((te^H.tá).**<u>ka)</u>** **<u>((a^H</u>**.ká).ro)]. Crucially, under the current proposal, the antepenultimate heavy syllable incurs a violation of the Syllable Integrity Principle (henceforth SIP), since the second mora belongs to the final foot and the first mora to the initial. In terms of constraints, this syllable violates EXHAUSTIVITY-Ft, because its morae are immediately dominated by a foot. As for the other morae, we assume they are dominated by syllables, which at the same time are dominated by feet.

(22) Form ending in H . . . LL. SIP Violation: ((te^H. tá).**<u>ka) ((a^H</u>**.ká).ro))

Input: /tetakaakaro/	NON-FINALITY	ADJUNCT=μ	FtMin=$\mu\mu_{Max}$	FtMin=$\mu\mu_{Min}$	ANCHOR-R	PARSE-μ	EXHAUSTIVIT-Ft	WSP
☞ a. ((te.tá).ka)((a.ká).ro)							2	1
b. te.ta.(kaá).ka.ro					1!	4		
c. te.ta.(kaa.(ka.ró))	1!	1!				2		1
d. te.ta.((kaá).ka).ro					1!	3		

In this tableau we see that candidates (22b) and (22d) are ruled out because they violate ANCHOR-R, but note also that they incur a violation of the previously presented constraint CHAIN-R, omitted here for the sake of simplicity.

In Gilbertese, violations of the Syllable Integrity Principle (and, consequently, of Exhaustivity-Ft) only occur to ensure purely moraic ternary rhythmic alternations. Hence, in a HL form like *a*^{H}*ńti*, there is no violation of it; for example, [((a^{H}ń).ti)]. This tableau is also enlightening because it illustrates the ranking argument for Anchor-R and Parse-μ » Exhaustivity-Ft, so that candidate (23a) is selected over candidate (23b).

(23)

Input: /anti/	Iamb	Non-Finality	Adjunct =μ	FtMin= $\mu\mu_{Max}$	FtMin= $\mu\mu_{Min}$	Anchor -R	Parse -μ	Exhaustivity -Ft	WSP
☞ a. ((ań).ti)									
b. (ań).ti						1!	1		
c. ((án).ti)	1!								
d. (an.tí)		1!		1					1
e. (a(ń.tí))		1!						1	

To sum up, along the lines of Blevins and Harrison's (1999) original description, we conclude that a ternary constituent is responsible for the iterative rhythmic patterns in the language and, as such, IL feet of the size of three morae arise as a valid option for their representation. Further support for this metrical layered constituent is presented in the next section.

4 Tokyo Japanese Loanword Accentuation

4.1 General Properties of Accentuation

The accentual pattern of Tokyo Japanese has been the subject of numerous phonetic and phonological studies (McCawley 1968, 1978; Poser 1984; Pierrehumbert and Beckman 1988; Haraguchi 1977, 1991; Kubozono 2006). Traditionally, it is referred to as a "pitch accent system," in which the lexical accent marks the position where a pitch drop (phonetically realized by a High–Low tonal melody; Haraguchi 1977) occurs in a word. The accented syllable is the one just before the pitch drop.[5] See the trisyllabic nouns in (24), accented on

[5] Alternatively, Tokyo Japanese can be viewed as a "restricted tone system" (Hyman 2009) with a single-member tone inventory, obeying "culminativity" (as there is maximally one pitch drop per word), but not "obligatoriness" (as toneless words occur, for example, *sa.ka.na-ga* 'fish-nom'). Although we fully accept Hyman's objections against a typological class of "pitch accent languages," we will use the notion of "accent" as a useful concept in the sense of "abstract location of tonal prominence." The position of this accent is metrically restricted (in loanwords, and other categories) in a way that is highly similar, if not identical, to metrical stress systems. In our analysis, Tokyo Japanese has metrical structure, but radically differs from metrical stress

their first, second, and third syllable, combined with the nominative suffix *-ga* (Kubozono 2012: 1398), where the pair of syllables that shows the pitch drop is underlined.

(24) a. **í.no**.ti-ga 'life-NOM'
b. ko.**kó.ro**-ga 'heart-NOM'
c. o.to.**kó-ga** 'man-NOM'[6]

For our current purposes, the interest of Tokyo Japanese resides in its "blended" prosodic character. McCawley (1978) introduced a distinction between "accent/tone-bearing unit" and "unit of counting," where the former is the unit that bears the prominence peak, while the latter is relevant for measuring distances from either side of the word.[7] In Tokyo Japanese, the prosodic unit that bears the prominence (the "accent-bearing unit") is the *syllable*. This is because no prominence contrasts occur within heavy syllables: in an accented heavy syllable, the H tone is invariably associated with the first mora, and the L tone with the second mora. McCawley argues that the *mora* is the "unit of counting." One of his major arguments is that "accent in recent borrowings goes on the syllable containing the third-last mora." This suggests a reference to morae regardless of the way morae are grouped into sequences of (light and/or heavy) syllables.

Loanwords are mostly accented, and display considerable variation in the position of the accent, partly lexical and partly phonologically conditioned (by patterns of epenthetic vowels, the position of stress in the source language, etc.). Nevertheless, there is a default accentual pattern for loanwords, which is metrically restricted. This pattern will be our focus.

As reported by Kubozono (2006), two patterns of loanword accentuation occur: one dominant among older speakers, which we will refer to as the "conservative pattern," and another one dominant among younger speakers, which we refer to as the "innovative pattern."

4.2 *The Conservative Pattern*

The default pattern for Tokyo loanword accentuation is captured by the well-known "antepenultimate rule" (McCawley 1968, 1978; Yamada 1990; Haraguchi 1991; Kubozono 2006):

(25) **Loanword Accent Rule** ("antepenultimate rule")
"Put an accent on the syllable containing the antepenultimate mora."

systems in its phonetic interpretation of its metrical structure; that is, Tokyo Japanese marks metrical prominence tonally, not by means of stress.

6 All words in which no pitch drop occurs within the first three syllables show a Low–High pitch pattern on the first two syllables, where the High tone runs all the way to the HL pitch drop.

7 See Kubozono (2012) for a typological discussion of Japanese dialects in light of this distinction.

This pattern is reported to be "conservative," being dominant among older speakers (Kubozono 2006: 1142).

In the examples in (26), the first column lists the quantitative structure of the form as a sequence of L(ight) and/or H(eavy) syllables. The second column shows the place of the accent on the mora carrying the H tone, which is abbreviated as APU (antepenultimate mora) or pre-APU (pre-antepenultimate mora).

(26)	a.i	LLL	gú.ra.su	APU	'glass'	K1142
		LLLL	su.tó.re.su	APU	'stress'	K1142
		LLLLL	ku.ri.sú.ma.su	APU	'Christmas'	K1142
	a.ii	HL	páa.ku	APU	'park'	K1142
		LHL	gu.róo.bu	APU	'glove'	Kubozono (2001)
		LLHL	ri.ba.púu.ru	APU	'Liverpool'	K1162
		HHL	man.hóo.ru	APU	'manhole'	K1155
	a.iii	LH	há.wai	APU	'Hawaii'	K1142
		LLH	a.má.zoN	APU	'Amazon'	K1154 (fluctuates)
		LLLH	e.ne.rú.gii	APU	'energy'	K1154 (fluctuates)
	a.iv	HLH	kuu.dé.taa	APU	'coup d'état'	McCawley (1978)
		HLH	kaa.dí.gaN	APU	'Cardigan'	K1154 (fluctuates)
		LHLH	a.koo.dí.oN	APU	'accordion'	K1154 (fluctuates)
	b.i	HLL	dóo.na.tu	pre-APU	'donut'	K1158
		LHLL	e.díN.ba.ra	pre-APU	'Edinburgh'	K1162
		HHLL	pai.náp.pu.ru	pre-APU	'pineapple'	K1152
	b.ii	HH	róN.doN	pre-APU	'London'	K1142
		LHH	wa.síN.toN	pre-APU	'Washington'	K1142
		LLHH	ba.do.míN.toN	pre-APU	'badminton'	K1142
		HHH	aN.dáa.soN	pre-APU	'Anderson'	K1142

The theoretical interest of the Loanword Accent Rule is its *dual* reference to the syllable and the mora: "the *syllable* containing the antepenultimate *mora*," where morae are "counting units" and syllables are "accent-bearing units." Arguably, its reference to "antepenultimate mora" implies a metrical restriction, highly similar to those found in antepenultimate stress systems (such as Latin), which involve metrical foot parsing. Then the question emerges: which prosodic units are such feet built on? The two options are: (a) feet are built immediately on *morae* (thus bypassing the syllable level, possibly disrespecting syllable integrity, as in Gilbertese); or (b) feet are built on *syllables* (respecting syllable integrity, as Hayes 1995 assumes for metrical stress systems).

Under the first view, since Tokyo Japanese is a (metrically restricted) *tone* system, not a stress system, the assumption of SBU=σ (together with implied syllable integrity) might simply be irrelevant. Hence, there would be no obstacle to assuming the mora to be the unit of parsing. However, this assumption predicts that Tokyo Japanese freely violates syllable integrity just like Gilbertese, with the mora being the accent-bearing unit, incorrectly predicting that prominence contrasts occur within heavy syllables.

Let us now turn to the second view, which we will eventually adopt, and consider its implications for standard analysis with bimoraic feet. Considering that the syllable is evidently the accent-bearing unit in Tokyo Japanese, the syllable might be hypothesized to be the unit of foot parsing as well. Although this view correctly predicts that syllable integrity is respected, it cannot properly account for reference to the antepenultimate mora in the Loanword Accent Rule (25). To show this, we eliminate reference to the mora in (25), re-stating the rule in terms of light and heavy syllables:

(27) **Loanword Accent Rule** (syllable-based version)
"Put an accent on the antepenultimate syllable in case the word ends in two light syllables; else on the penultimate syllable."

This statement, while giving the appearance of simplicity, turns out to resist a foot-based analysis into standard moraic trochees, respecting syllable integrity. Although the pattern is seemingly similar to the well-known Latin pattern ("Stress is on the antepenultimate syllable in case the penult is light; else on the penultimate syllable."), the crucial difference resides in the Tokyo Japanese pattern's reference to the weight of the *final* syllable. Unlike Latin, the final syllable cannot be ignored in the assignment of foot structure, that is, be analysed as extrametrical. Two challenges emerge for an analysis in terms of the moraic trochee plus extrametricality. One major challenge is how to parse the material containing the antepenultimate and penultimate mora so as to account for penultimate syllable accentuation in final quantitative sequences as distinct as . . . HL# and . . . LH# (e.g. [gu.róo.bu], [a.má.zoN]). Another major challenge is how to account for the relevance of the final syllable's weight in sequences such as HLL# ([dóo.na.tu], with antepenultimate accent) versus HLH# ([kaa.dí.gaN], with penultimate accent). We will consider these challenges by going through the various weight patterns one by one.

A moraic trochee analysis cum extrametricality is straightforward for cases in which the final syllable is light (e.g. [gúrasu], [guróobu], [dóonatu], [manhóoru]). Note in particular how the assumption that metrical feet are built on syllables correctly rules out antepenultimate mora accentuation (*[doónatu]) in (28c):

(28)

a.	LLL	(gú.ra).su	c.	HLL	(dóo).na.tu	*do(ó.na).tu
b.	LHL	gu.(róo).bu	d.	HHL	man.(hóo).ru	

Next, words ending in two heavy syllables ([wasíNtoN] and [aNdáasoN]) are also correctly predicted under a moraic trochee analysis, assuming extrametricality of either the syllable or mora. Observe how, once more, syllable integrity correctly prohibits a bimoraic trochee parsing the second mora of a heavy penult together with the first mora of the final syllable (*[wasiŃtoN], *[aNdaásoN]).

(29)

		σ extrametricality	μ extrametricality	
			SIP respected	SIP violated
a.	LHH	wa.(síN).toN	wa.(síN).toN	*wa.si(Ń.to)N
b.	HHH	aN.(dáa).soN	aN.(dáa).soN	*aN.da(á.so)N

However, the moraic trochee analysis runs into serious problems when dealing with forms ending in a light-plus-heavy sequence, such as [amázoN] or [kaadígaN], regardless of whether the syllable or the mora is taken to be the extrametrical unit.

(30)

		σ extrametricality	μ extrametricality	
			SIP respected	SIP violated
a.	LLH	*(á.ma).zoN	*(á.ma).zoN	a.(má.zo)N
b.	HLH	*(káa).di.gaN	*(káa).di.gaN[8]	kaa.(dí.ga)N

Suddenly, it becomes evident that syllable extrametricality fails to derive the . . . LH# patterns (30a, b). The moraic trochee analysis combined with syllable extrametricality predicts that the penultimate or antepenultimate syllable are uniformly accented regardless of the weight of the extrametrical syllable: if the penult is light, accent falls on the antepenult; if the penult is heavy, this would attract the accent, as in Latin stress. This prediction evidently *fails* in light of comparing HLL# ([dóonatu]), with accent on the antepenult, and HLH# ([kaadígaN]), where the accent is shifted to the penult. Hence, the final syllable's weight remains invisible under syllable extrametricality. Alternatively, when assuming mora extrametricality, the correct forms with accent on the penult ([amázoN], [kaadígaN],) are, once more, not generated because syllable integrity prohibits moraic trochees whose second mora constitutes the first half of a heavy syllable.[9]

In sum, Tokyo Japanese loanword accentuation has the syllable as its accent-bearing unit, since heavy syllables show no accentual contrast regarding the position of the pitch drop. Yet the "antepenultimate rule" is difficult to capture while maintaining syllable integrity, at least when adopting an analysis of

[8] [kaa.(dí).gaN] with a monomoraic foot before a bimoraic sequence would be inconsistent with [(dóo).na.tu].

[9] Similar foot parsings disrespecting syllable integrity were proposed by Suzuki (1995). An alternative analysis for words ending in a light–heavy sequence, respecting syllable integrity, was proposed by Shinohara (2000).

standard bimoraic feet. One crucial stumbling block is the (unexpected) relevance of the weight of the final syllable in quantitative sequences ending in . . . HL**X**#, where **X** is light versus heavy ([dóo.na.tu] versus [kaa.dí.gaN]). The other problem is how to account for penultimate accent in final three-mora sequences that are mirror-images quantitatively, viz. . . . LH# and . . . HL# ([amázoN] and [guróobu]).

These problems can be immediately solved by adopting IL feet. Under this analysis, feet are uniformly and strictly right-aligned with the PrWd. Whether an IL or non-IL foot will be selected depends on the possible satisfaction of foot well-formedness constraints on the size of FtMin and IL foot's dependent. An IL foot will be selected as a default option, favoring maximal moraic parsing, yet under the strict condition that the dependent of FtMin be monomoraic. This limits its occurrence to cases in which the final syllable is light (31a–b; e–f). In case the final syllable is heavy, a disyllabic non-IL foot will occur (31c–d; g–h) in which FtMin deviates from its bimoraic ideal size. Note that FtMin has bimoraic (31a, b, f), trimoraic (31c, g), and even quadri-moraic (31d, h) shapes.

(31)	a.	LLL	((gú.ra).su)	e.	HLL	((dóo.na).tu)
	b.	LHL	gu.((róo).bu)	f.	HHL	man.((hóo).ru)
	c.	LLH	a.(má.zoN)	g.	HLH	kaa.(dí.gaN)
	d.	LHH	wa.(síN.toN)	h.	HHH	aN.(dáa.soN)

Note how the forms with IL feet (31a, b, e, f) are approximately parallel to the moraic trochee analysis: the final light syllable is either extrametrical (in the moraic trochee analysis) or dependent of FtMin (in the IL foot analysis). However, the parallelism between the analyses breaks down for forms ending in a heavy syllable (31c, d, g, h). Here, as shown in (30), moraic trochees only give the correct result with mora extrametricality while disrespecting syllable integrity; in contrast, our analysis *respects syllable integrity* by parsing such forms with a disyllabic non-IL foot. This particular set of IL and non-IL feet, whose size of FtMin ranges from two to four morae, follows immediately from the principles of foot well-formedness and moraic parsing as outlined in the analysis of Gilbertese; a simple re-ranking of the same constraints suffices to generate the conservative Tokyo Japanese pattern. We assume that feet must be strictly right-anchored with the PrWd, while dependents of FtMin occur on the right of FtMin, due to undominated ANCHOR-R, TROCHEE$_{\text{non-min}}$, constraints which we omit below.

(32) Ranking for Tokyo Japanese loanword pattern (conservative pattern):
NON-FINALITY, EXHAUSTIVITY-Ft, FtMin=$\mu\mu_{\text{Min}}$, ADJUNCT=μ » WSP »
FtMin=$\mu\mu_{\text{Max}}$ » PARSE-μ

In the following tableaux, we show how this analysis predicts the correct accentuations for all eight cases. No candidates that violate undominated ANCHOR-R or $\text{TROCHEE}_{\text{non-min}}$ will be shown.

(33) . . . LLL# PARSE-μ prefers an IL foot ((LL)L) to maximize parsing

Input: /gurasu/	NON-FINALITY	EXHAUSTIVITY-Ft	FtMin= $\mu\mu_{Min}$	ADJUNCT =μ	WSP	FtMin= $\mu\mu_{Max}$	PARSE-μ
☞ a. ((gú.ra).su)							
b. gu.(rá.su)							1!

(34) . . . HLL# WSP » FtMin=$\mu\mu_{Max}$ enforces an IL foot ((HL)L) with a trimoraic FtMin

Input: /doonatu/	NON-FINALITY	EXHAUSTIVITY-Ft	FtMin= $\mu\mu_{Min}$	ADJUNCT =μ	WSP	FtMin= $\mu\mu_{Max}$	PARSE-μ
☞ a. ((dóo.na).tu)						1	
b. doo.(ná.tu)					1!		2
c. do((ó.na).tu)		1!					1

(35) . . . LHL# WSP » PARSE-μ excludes ((LH)L) rendering a perfectly shaped IL foot ((H)L)

Input: /guroobu/	NON-FINALITY	EXHAUSTIVITY-Ft	FtMin= $\mu\mu_{Min}$	ADJUNCT =μ	WSP	FtMin= $\mu\mu_{Max}$	PARSE-μ
☞ a. gu.((róo).bu)							1
b. gu.(róo.bu)						1!	1
c. ((gú.roo).bu)					1!	1	
d. gu.ro(ó.bu)		1!					2

(36) . . . HHL# FtMin=$\mu\mu_{Max}$ » PARSE-μ enforces a perfectly shaped IL foot ((H)L)

Input: /maNhooru/	NON-FINALITY	EXHAUSTIVITY-Ft	FtMin= $\mu\mu_{Min}$	ADJUNCT =μ	WSP	FtMin= $\mu\mu_{Max}$	PARSE-μ
☞ a. maN.((hóo).ru)					1		2
b. maN.(hóo.ru)					1	1!	2
c. ((máN.hoo).ru)					1	1!	
d. maN.ho(ó.ru)		1!			1		3

(37) . . . LLH# ADJUNCT=μ » FtMin=$\mu\mu_{Max}$, PARSE-μ prefers non-IL foot (LH) to IL ((LL)H)

Input: /amazoN/	NON-FINALITY	EXHAUSTIVITY-Ft	FtMin= $\mu\mu_{Min}$	ADJUNCT =μ	WSP	FtMin= $\mu\mu_{Max}$	PARSE-μ
☞ a. a.(má.zoN)					1	1	1
b. ((á.ma).zoN)				1!	1		
c. a.((má).zoN)			1!	1	1		1
d. a.((má.zo)N)		2!			1		1
e. a.ma.(zóN)	1!						2

(38) . . . HLH# ADJUNCT=μ » PARSE-μ prefers non-IL foot (LH) to IL ((HL)H)

Input: /kaadigaN/	NON-FINALITY	EXHAUSTIVITY-Ft	FtMin= $\mu\mu_{Min}$	ADJUNCT =μ	WSP	FtMin= $\mu\mu_{Max}$	PARSE-μ
☞ a. kaa.(dí.gaN)					2	1	2
b. ((káa.di).gaN)				1!	1	1	
c. kaa.((dí).gaN)			1!	1	2		2
d. ka((á.di).gaN)		1!		1	1		1
e. kaa.((dí.ga)N)		2!			2		2
f. kaa.di.(gáN)	1!				1		3

(39) . . . LHH# ADJUNCT=μ » PARSE-μ prefers non-IL foot (HH) to IL ((LH)H)

Input: /wasiNtoN/	NON-FINALITY	EXHAUSTIVITY-Ft	FtMin= $\mu\mu_{Min}$	ADJUNCT =μ	WSP	FtMin= $\mu\mu_{Max}$	PARSE-μ
☞ a. wa.(síN.toN)					1	1	1
b. wa.((síN).toN)				1!	1		1
c. ((wá.siN).toN)				1!	2	1	
d. wa.((síN.to)N)		2!			1	1	1
e. wa.si((Ń.to)N)		3!			1		2
f. wa.siN.(tóN)	1!				1		3

(40) . . . HHH# ADJUNCT=μ » PARSE-μ prefers non-IL foot (HH) to IL ((LH)H)

Input: /aNdaasoN/	NON-FINALITY	EXHAUSTIVITY-Ft	FtMin= $\mu\mu_{Min}$	ADJUNCT =μ	WSP	FtMin= $\mu\mu_{Max}$	PARSE-μ
☞ a. aN.(dáa.soN)					2	1	2
b. aN.((dáa).soN)				1!	2		2
c. ((áN.daa).soN)				1!	2	1	
d. aN.((dáa.so)N)		2!			2	1	2
e. aN.da((á.so)N)		3!			2		3
f. aN.daa.(sóN)	1!				2		4

Crucially, it should be noted that this idea (differentiating the syllable weight of the dependent, while varying the size of FtMin) cannot be transposed to a "moraic-trochee-cum-extrametricality" analysis. On the analogous assumption that only final light syllables are extrametrical (41a–b, e–f), the parsing of the quantitative sequence LH becomes inconsistent. That is, LH is evidently metrified as L(H) – an unparsed light syllable plus bimoraic trochee – in L(H)L# (41b); however, in order to derive the correct output, the same sequence needs to be metrified as (LH) – trimoraic trochee (LH) – in L(LH)# (41c).

(41)	a. LLL	(gú.ra).su		e. HLL	(dóo).na.tu	
	b. LHL	gu.(róo).bu		f. HHL	man.(hóo).ru	
	c. LLH	a.(má.zoN)		g. HLH	kaa.(dí.gaN)	
	d. LHH	wa.(síN.toN)		h. HHH	aN.(dáa.soN)	

The upshot of the IL foot analysis is that it derives the conservative pattern of loanword accentuation from constraints that are independently motivated for Gilbertese, by means of a re-ranking. Crucially, the IL foot analysis succeeds by imposing a strict condition on the maximal size of the dependent. We now turn to the innovative Tokyo pattern, which will provide further evidence for the IL foot analysis.

4.3 The Innovative Pattern

This pattern is innovative, dominant among younger speakers. It is identical to the conservative pattern except that all forms ending in a *light–heavy* sequence undergo an accent shift of *one mora to the left*.[10]

(42)	a.i	LLH	á.ma.zoN	pre-APU	'Amazon'	K1154 (fluctuates)
		LLLH	e.né.ru.gii	pre-APU	'energy'	K1154 (fluctuates)
	a.ii	HLH	káa.di.gaN	pre-pre-APU	'Cardigan'	K1154 (fluctuates)
		LHLH	a.kóo.di.oN	pre-pre-APU	'accordion'	K1154 (fluctuates)

According to Kubozono (2006: 1155), "this kind of age-related variation suggests that the following accent changes have been in progress in Tokyo Japanese and are actually almost complete now, with the new patterns overwhelming the old ones in statistical terms".

a. L**Ĺ**H# → **Ĺ**LH#
b. H**Ĺ**H# → **H́**LH#

[10] "This accent variation has to do with the speaker's age to a certain extent, with young speakers generally permitting the pre-antepenultimate patterns more often than senior speakers. For example, /á.ma.zoN/ and /káa.di.gaN/ are dominant among young speakers, whereas /a.má.zoN/ and /kaa.dí.gaN/ are often permitted in the speech of elderly people" (Kubozono 2006: 1155).

Kubozono (1996, 2006) observes that the innovative pattern is identical to the antepenultimate stress pattern of Latin. This well-known pattern can be captured straightforwardly by a moraic trochee plus syllable extrametricality:

(43)
a. LLL (gú.ra).su   e. HLL (dóo).na.tu
b. LHL gu.(róo).bu   f. LHH wa.(síN).toN
c. LLH (á.ma).zoN   g. HLH (káa).di.gaN
d. HHL man.(hóo).ru   h. HHH aN.(dáa).soN

Analogously to the classical extrametricality/non-finality analysis, we set up an IL foot with a bimoraic FtMin to which the final syllable adjoins into FtMax:

(44)
a. LLL ((gú.ra).su)   e. HLL ((dóo.na).tu)
b. LHL gu.((róo).bu)   f. LHH wa.((síN).toN)
c. LLH ((á.ma).zoN)   g. HLH ((káa.di).gaN)
d. HHL man.((hóo).ru)   h. HHH aN.((dáa).soN)

We may interpret the shift from the conservative pattern to the innovative pattern as a relaxation of the requirement that the dependent of FtMin be monomoraic, which now includes bimoraic dependents as well as monomoraic ones, while still respecting syllable integrity. A relaxation of the dependent's size may be interpreted as bringing about *consistency* in the shape of feet in loanword accentuation; non-IL disyllabic feet, ranging in size from three to four morae, are transformed into IL feet in which FtMin is consistently bimoraic except in (44e, g), where bimoraic FtMin is unattainable due to syllable integrity.

The change from the conservative pattern to the innovative pattern is analysable as a radical demotion of ADJUNCT=μ to the bottom stratum of the hierarchy, increasing the influence of FtMin=$\mu\mu_{\text{Max}}$ and PARSE-μ.

(45) Ranking for Tokyo Japanese loanword pattern (innovative pattern):
NON-FINALITY, EXHAUSTIVITY-Ft, FtMin=$\mu\mu_{\text{Min}}$ » WSP » FtMin=$\mu\mu_{\text{Max}}$ » PARSE-μ, **ADJUNCT=μ**

(46) . . . LLL# PARSE-μ prefers an IL foot ((LL)L) to maximize parsing

Input: /gurasu/	NON-FINALITY	EXHAUSTIVITY-Ft	FtMin= $\mu\mu_{\text{Min}}$	WSP	FtMin= $\mu\mu_{\text{Max}}$	PARSE-μ	ADJUNCT =μ
☞ a. ((gú.ra).su)							
b. gu.(rá.su)						1!	

(47) . . . HLL# WSP » FtMin=$\mu\mu_{Max}$ enforces an IL foot ((HL)L) with a trimoraic FtMin

Input: /doonatu/	Non-Finality	Exhaustivity-Ft	FtMin= $\mu\mu_{Min}$	WSP	FtMin= $\mu\mu_{Max}$	Parse-μ	Adjunct =μ
☞ a. ((dóo.na).tu)					1		
b. doo.(ná.tu)				1!		2	
c. do((ó.na).tu)		1!				1	

(48) . . . LHL# WSP » Parse-μ excludes ((LH)L) rendering a perfectly shaped IL foot ((H)L)

Input: /guroobu/	Non-Finality	Exhaustivity-Ft	FtMin= $\mu\mu_{Min}$	WSP	FtMin= $\mu\mu_{Max}$	Parse-μ	Adjunct =μ
☞ a. gu.((róo).bu)						1	
b. gu.(róo.bu)					1!	1	
c. ((gú.roo).bu)				1!	1		
d. gu.ro(ó.bu)		1!				2	

(49) . . . HHL# FtMin=$\mu\mu_{Max}$ » Parse-μ enforces a perfectly shaped IL foot ((H)L)

Input: /maNhooru/	Non-Finality	Exhaustivity-Ft	FtMin= $\mu\mu_{Min}$	WSP	FtMin= $\mu\mu_{Max}$	Parse-μ	Adjunct =μ
☞ a. maN.((hóo).ru)				1		2	
b. maN.(hóo.ru)				1	1!	2	
c. ((máN.hoo).ru)				2!	1		
d. maN.ho(ó.ru)		1!		1		3	

(50) . . . LLH# FtMin=$\mu\mu_{Max}$ » Adjunct-μ enforces an IL foot ((LL)H)

Input: /amazoN/	Non-Finality	Exhaustivity-Ft	FtMin= $\mu\mu_{Min}$	WSP	FtMin= $\mu\mu_{Max}$	Parse-μ	Adjunct =μ
☞ a. ((á.ma).zoN)				1			1
b. a.(má.zoN)				1	1!	1	
c. a.((má).zoN)			1!	1		1	1
d. a.((má.zo)N)		2!		1		1	
e. a.ma.(zóN)	1!					2	

(51) . . . HLH# WSP » Adjunct-μ enforces an IL foot ((HL)H)

Input: /kaadigaN/	Non-Finality	Exhaustivity-Ft	FtMin= $\mu\mu_{Min}$	WSP	FtMin= $\mu\mu_{Max}$	Parse-μ	Adjunct =μ
☞ a. ((káa.di).gaN)				1	1		1
b. kaa.(dí.gaN)				2!	1	2	
c. kaa.((dí).gaN)			1!	2		2	1
d. ka((á.di).gaN)		1!		1		1	1
e. kaa.((dí.ga)N)		2!		1		2	
f. kaa.di.(gáN)	1!			1		3	

(52) . . . LHH# FtMin=$\mu\mu_{Max}$ » Adjunct-μ enforces an IL foot ((H)H)

Input: /wasiNtoN/	Non-Finality	Exhaustivity-Ft	FtMin= $\mu\mu_{Min}$	WSP	FtMin= $\mu\mu_{Max}$	Parse-μ	Adjunct =μ
☞ a. wa.((síN).toN)				1		1	1
b. wa.(síN.toN)				1	1!	1	
c. ((wá.siN).toN)				2!	1		1
d. wa.((síN.ta)a)		2!		1	1	1	
e. wa.si((á.ta)a)		3!		1		2	
f. wa.siN.(táa)	1!			1		3	

(53) . . . HHH FtMin=$\mu\mu_{Max}$ » Adjunct-μ enforces an IL foot ((H)H)

Input: /aNdaasoN/	Non-Finality	Exhaustivity-Ft	FtMin= $\mu\mu_{Min}$	WSP	FtMin= $\mu\mu_{Max}$	Parse-μ	Adjunct =μ
☞ a. aN.((dáa).soN)				2		2	1
b. aN.(dáa.soN)				2	1!	2	
c. ((áN.daa).soN)				2	1!		1
d. aN.((dáa.so)N)		2!		2	1	2	
e. aN.da((á.so)N)		3!		2		3	
f. aN.daa.(sóN)	1!			2		4	

In sum, the two loanword accentuation patterns of Tokyo Japanese can be straightforwardly analysed by means of IL feet, involving a simple re-ranking of a single constraint set which can be understood to improve the consistency between the shapes of FtMin across the range of weight sequences.

4.4 Comparison with Moraic Trochee

Next, in order to facilitate a comparison with the standard bimoraic foot analysis of Tokyo Japanese, we briefly turn to the bimoraic foot analysis of loanword accentuation, as well as additional prosodic (morphological) phenomena: word minimality, loanword truncation, and lengthening and shortening patterns that are observed in a variety of contexts. We will show that these phenomena can be handled straightforwardly under the new analysis even when permitting IL feet with three or four morae. Note that the crucial element that the two analyses share is a bimoraic unit: the moraic trochee in the standard analysis, and the optimal shape of FtMin (confirming to FtMin=$\mu\mu_{Min}$ and FtMin=$\mu\mu_{Max}$).

Tokyo Japanese loanword accentuation. The traditional strictly bimoraic foot structures for Tokyo loanword accentuation (e.g. Suzuki 1995; Shinohara 2000; Kubozono 2006) were not included in the previous tableaux for the sake of simplicity. The following examples in (54) and (55) explicitly show how these forms are excluded in our analysis. The examples in (54) present the evaluation of forms in the conservative pattern with strictly bimoraic foot structures, whereas those in (55) illustrate the evaluation of bimoraic forms for the innovative pattern. Their fate is sealed by two undominated constraints, ANCHOR-R and ALIGN-R_{MAIN}, and occasionally by EXHAUSTIVITY-FT:

(54) Strictly bimoraic analyses of the conservative pattern

		ANCHOR-R	ALIGN-R_{main}	EXHAUSTIVITY-Ft
a.	(gú.ra).su	*		
b.i	(dóo).(na.tu)		*	
b.ii	(dóo).na.tu	*		
c.	gu.(róo).bu	*		
d.	(maN).(hóo).ru	*		
e.	a.(má.zo)N	*		*
f.	(kaa).(dí.ga)N	*		*
g.i	wa.(síN).(toN)		*	
g.ii	wa.(síN).toN	*		
h.i	(aN).(dáa).(soN)		*	
h.ii	(aN).(dáa).soN	*		

Note that in cases where the accent falls on the pre-antepenultimate mora (/dóo.na.tu/, /wa.síN.toN/, /aN.dáa.soN/), two strictly bimoraic analyses could be proposed: one in which the last two morae are unparsed, which are excluded by ANCHOR-R (54b.ii, 54g.ii, 54h.ii), and another in which the last two morae form a weak foot (which are excluded by ALIGN-R_{main}, 54b.i, 54g.i, 54h.i). Furthermore, as we already argued in Section 4.2, forms ending in . . . LH# (/a.má.zoN/, /kaa.dí.gaN/) are intrinsically problematic for any strictly bimoraic analysis. For example, the analyses proposed in (54e, f) violate syllable integrity (EXHAUSTIVITY-Ft). Alternatives that satisfy syllable integrity must either fall below the bimoraic foot size, thus violating FtMin=μμMin (e.g. /a.(má).zoN/, /kaa.(dí).gaN/) or else, deviate from trochaic foot shape, thus violating $\text{TROCHEE}_{non\text{-}min}$ (e.g. /(a.má).zoN/, /(kaa.dí).gaN/).

The bimoraic analysis of the innovative pattern is identical to (54) except in forms ending in . . . LH#, which are given in (55).

(55) Strictly bimoraic analyses of the innovative pattern

		ANCHOR-R	WIDTH-L/R_{main}	EXHAUST-Ft
a.i	(á.ma).(zoN)		*	
a.ii	(á.ma).zoN	*		
b.i	(káa).di.(gaN)		*	
b.ii	(káa).di.gaN	*		

We thus conclude that our IL foot analysis straightforwardly excludes the forms posited by the strictly bimoraic analysis, and restate our earlier conclusion that antepenultimate mora accentuation in . . . LH# forms in the conservative pattern are intrinsically problematic for the strictly bimoraic analysis.

Word minimality. Derived words in Japanese (such as loanword truncations and hypocoristics) must be at least two morae long (Itô 1990; Poser 1990; Kubozono 1999), for example /su.to.rai.ki/ → /su.to/ 'strike.' The bimoraic minimality effect is straightforwardly accounted for by our analysis due to undominated FtMin=$\mu\mu_{Min}$.

HL versus LH asymmetry in loanword truncation. Loanwords are shortened to forms that are two to four morae in length. In the case of trimoraic outputs a well-known quantitative asymmetry holds: HL and LLL outputs are permitted, not LH outputs (Itô 1990).

(56)	a. /roo.tee.syon/	→ /roo.te/	'rotation'
	b. /pan.fu.ret.to/	→ /pan.fu/	'pamphlet'
	c. /a.ni.mee.shoN/	→ /a.ni.me/	'animation'
	d. /te.re.bi.joN/	→ /te.re.bi/	'television'
	e. /ro.kee.syon/	→ /ro.ke/, */ro.kee/	'location'
	f. /de.mon.su.to.ree.syon/	→ /de.mo/, */de.mon/	'demonstration'

The same HL versus LH asymmetry is found in various phenomena in Japanese including *zuuzya-go* formation and baby talk words (Kubozono 2003). The standard analysis of truncation states that the output must conform to the requirement of a PrWd with a left-aligned bimoraic trochee; this licences trimoraic forms [(H)L] and [(LL)L], while excluding *[L(H)], due to left-edge mis-alignment. Under our IL foot analysis, the HL versus LH asymmetry is straightforwardly accounted for. Crucially, licit trimoraic outputs of truncated loanwords are *unmarked* expansions of the IL foot; for example, HL [((roo).te)], LLL [((a.ni).me)], where "unmarked" means satisfying all major foot form and alignment constraints (FtMin=$\mu\mu_{Min}$, FtMin=$\mu\mu_{Max}$, ADJUNCT=μ, $\text{TROCHEE}_{non\text{-}min}$, CHAIN-L/R). In contrast, LH outputs are *not* unmarked IL feet, since on any possible analysis, one or more foot form or alignment constraints are violated; for example, *[(ro.kee)] (FtMin=$\mu\mu_{Max}$), *[((ro).kee)] (FtMin=$\mu\mu_{Min}$, Adjunct=μ), or *[ro.(kee)] (Chain-R). Given our constraint ranking, the least damaging way to parse LH is by means of a binary foot (LH), which only occurs under duress of foot form constraints, in particular due to the pressure to build a licit foot without deleting any segments or splitting bimoraic syllables (see tableaux 37–38). In loanword truncation, the factors that enforce a marked parsing (LH) are relaxed, as evidently full segmental faithfulness is not required. The "*emergence of the unmarked*" is a well-known phenomenon from prosodic morphology, including truncation (McCarthy and Prince 1995). Without offering a complete analysis, it suffices to observe that Japanese loanword truncations can be viewed as an emergence of the unmarked, driven by markedness constraints in a specific situation in which segmental faithfulness constraints (penalizing deletion) are low-ranked. Hence we feel safe to conclude that the Japanese loanword truncation templates fall out of our grammar as unmarked expansions of the IL foot.

Lengthening and shortening patterns. Kubozono (2003) reports several patterns of lengthening and shortening that are found in a variety of contexts, including loanword truncation, *zuuzya-go* formation, emphatic mimetics, and motherese (baby talk words). These patterns are summarized in (57–58):

(57) Shortenings

a.	LH → LL	truncation	/ro.kee.syon/ → /ro.ke/	'location'
b.	HH → HL	*zuuzya-go*	/koo.hii/ → /hii.ko/, /hii.koo/	'coffee'
		sporadic	/tyoo.tyoo/ → /tyoo.tyo/	'butterfly'

(58) Lengthenings

a.	LL → HL	*zuuzya-go*	/zya.zu/ → /zuu.zya/	'jazz'
		motherese	/ma.ma/ → /mam.ma/	'food, to eat'
		sporadic	/si.ka/ → /sii.ka/	'poem'
		mimetics	/pi.ka.pi.ka/ → /pik.ka.pi.ka/	'shiny'
b.	LH → HH	sporadic	/zyo.oo/ → /zyoo.oo/	'woman king, queen'
c.	L → HL	*zuuzya-go*	/hi/ → /ii.hi/	'fire, cigarette light'
		motherese	/ha/ → /pap.pa/	'leaf'
d.	L → LLL	motherese	/te/ → /o.te.te/	'hand'
e.	H → HL	*zuuzya-go*	/kii/ → /ii.ki/	'love'
f.	H → HH	motherese	/hau/ → /hai.hai/	'crawling'
g.	LH → HL	*zuuzya-go*	/hu.men/ → /men.hu/	'taboo'
		motherese	/o.buu/ → /om.bu/	'a piggyback ride'

Interestingly, the target of a considerable number of changes happens to be HL, a perfectly shaped IL foot ((H)L); see (57b, 58a, 58c, 58e, 58g), and occasionally ((LL)L); (58d). Other changes seem to be driven by an avoidance of LH, a non-IL foot (LH), which occurs only under duress of foot form constraints in our analysis of loanword accentuation; see (57a, 58b, 58g), and (L), a degenerate FtMin; (58c, d). Occasionally, HH seems to be the target (58b, f), which in many instances provided involves segmental reduplication in motherese (Kubozono 2003: 107). Without giving a full analysis, we conclude that both the targets of these changes and the forms avoided are expected from our IL foot model.[11]

5 Dihovo Macedonian

Interestingly, the conservative pattern of Tokyo Japanese loanword accentuation finds an exact counterpart in a genuine stress language. In Dihovo Macedonian (Groen 1977; Crosswhite 2001a, 2001b), stress falls on the syllable that contains the antepenultimate mora. This is the default stress pattern, which holds for native words. Loanwords can have lexical stress within a final three-syllable window (as in Standard Macedonian, for example, Lunt 1952; Hammond 1989; Baerman 1998).

Bimoraic syllables contain (a) long vowels, (b) diphthongs, or (c) a short vowel plus moraic glide /j/.[12] All other CVC syllables (except Cvj) are monomoraic. Nuclear segments are vowels and syllabic /r/.[13]

(59)	a.i	LLL	ˈna.ju.baf	APU	‘most beautiful’	G 26
		LLL	ˈpo.jar.no	APU	‘best’	G
		LLLL	de.ˈse.ti.na	APU	‘the ten’ (collective)	G 89
		LLLL	ba.ˈkr̩.da.nik	APU	‘maize porridge’	G 14
		LLLLL	po.da.ˈro.tsi.te	APU	‘the presents’	G 173
	a.ii	HL	ˈpee.ʃe	APU	‘you sung’	G 24
			ˈvuj.ko	APU	‘uncle’	G 60
		LHL	pro.ˈdaa.ʃe	APU	‘to sell’ (2/3 sg. imp.)	G 181

11 An anonymous reviewer observes that trimoraic (“superheavy”) syllables are generally disfavored in Japanese (Kubozono 1999). For example, many loanwords that would produce trimoraic syllables undergo shortening, for example *foundation* → /fan.dee.syon/, */faun.dee.syon/, *stainless* → /su.ten.re.su/, */su.tein.re.su/. Standard bimoraic foot analyses account for the trimoraic syllable ban as they do not permit trimoraic feet whereas our analysis does not clearly derive it. However, we note that the relationship between maximum syllable size and maximal foot size is not cross-linguistically valid: some languages ban trimoraic syllables without showing evidence of foot structure. Yet another phenomenon that we will not address here because of its complexity is compound accent (Kubozono 1999).

12 Crosswhite (2001a: 12 fn. 9) argues (based on Groen 1977) that glides can have two sources – underlying and derived from vowels: “The phonemicity of the glides in these examples can easily be ascertained by noting, as Groen (1977: 19–22) does, that underlying glides always surface as glides, whereas optionality between [i] and [j] is only noted for underlying /i/. That is, formation of a glide from underlying /i/ is optional, and there is no parallel phenomenon of ‘optional glide vocalization.’ Therefore, the impossibility of *[blúdoi], *[ʃúrei], *[rázboi], *[gológlai], etc., indicates that these forms should be phonemicized with /j/. In contrast, the optionality seen in forms like /naigram/, which can surface as either [náigram] or [nájgram], indicates that these forms should be phonemicized with /i/.”

13 Note that although /r/ may be nuclear, it fails to create weight in coda. See Crosswhite (2001a) for an analysis of syllabicity in Dihovo.

		po.ˈloj.na	APU	‘half’	G 173
	LLHL	a.ra.ˈmii.te	APU	‘the thieves’	G 181
		be.lo.ˈglaj.te	APU	‘the greyhaired’	G 74
a.iii	LH	ˈna.praam	APU	‘I do, make’	G 24
	LH	ˈde.noj	APU	‘days’	G 63
	LLH	a.ˈra.mii	APU	‘thieves’	G 181
	LLH	go.ˈlo.glaj	APU	‘bareheaded’ (pl.)	G 179
	LLLH	a.ʃla.ˈdi.saa	APU	‘to graft’	G 23
b.i	HLL	ˈnaj.po.ke	pre-APU	‘most’	G 77
	LHLL	po.ˈloj.na.ta	pre-APU	‘half’ (pl.)	G 173
	LLHLL	e.di.ˈnaj.se.ti	pre-APU	‘eleventh’	G 89
b.ii	HH	ˈvuj.koj	pre-APU	‘uncles’	G 60
	LHH	o.ˈrao.lii	pre-APU	‘oro-dancer’	G 178

Observe that /CVj/ syllables behave identically to /CVV/ syllables in two ways: (a) in penultimate position, both attract stress ([po.ˈloj.na] ‘half’; [pro.ˈdaa.ʃe] ‘to sell’), blocking antepenultimate default stress; while (b) in final position, both syllable types restrict stress to fall on a light penult ([go.ˈlo.glaj] ‘bareheaded’; [a.ˈra.mii] ‘thieves’). Thus the weight sequences . . . HL# and . . . LH# both limit stress to the penultimate syllable.

The pattern can be summarized as follows to bring out the match with the “antepenultimate mora” rule.

(60)	a. APU-μ	b. pre-APU-μ
	Xˈ**L**LL	Xˈ**H**LL
	Xˈ**H**L	
	Xˈ**L**H	Xˈ**H**H

Note this is the exact stress counterpart of Tokyo loanword accentuation – the conservative pattern. Accordingly, we propose the same metrical structure, using the same mixture of IL and non-IL feet.

(61)	a.	LLLL	((ˈna.ju).baf)	e.	HLL	((ˈnaj.po).ke)
	b.	LHL	pro.((ˈdaa).ʃe)	f.	HHL	*unattested*
	c.	LLH	a.(ˈra.mii)	g.	HLH	*unattested*
	d.	LHH	o.(ˈrao.lii)	h.	HHH	*unattested*

Interestingly, there is some exceptional stress as well as some stress variation in words whose weight make-up (LLH) matches the locus of change in innovative loanwords in Tokyo Japanese.

(62)	a.	LLH	ˈbo.jo.svaj	‘to dye’	G 179
	b.i	LLH	ˈo.bi.tʃaj	‘custom’ (sg.)	G 180
	b.ii	LLH	o.ˈbi.tʃaj	‘custom’ (pl.)	G 180

Exceptional antepenultimate stress in shown in (62a), where stress is shifted one syllable to the left as compared to the standard penultimate pattern. Stress variation within a paradigm is seen in (62b); here the singular form carries antepenultimate stress, while the plural has standard penultimate stress. Such patterns suggest that Dihovo Macedonian is subject to the same incentives to change into a "Latin-like" stress pattern as we proposed for the conservative Tokyo Japanese loanword accentuation pattern: the change results in a more consistent footing pattern, with uniform IL feet in forms of three syllables or longer, and a more consistent size of FtMin.

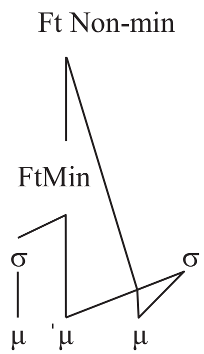
6 Discussion

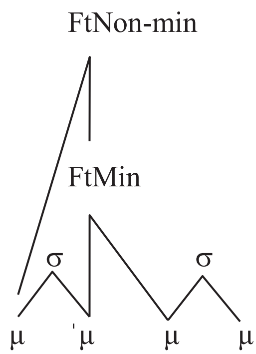
Our analysis of antepenultimate mora patterns in Gilbertese, Tokyo Japanese, and Dihovo Macedonian features the IL foot, a minimally recursive prosodic constituent (Kager 2012; Martínez-Paricio 2013; Martínez-Paricio and Kager 2015) which was originally proposed for binary and ternary rhythmic stress systems and stress window systems. The IL foot unifies antepenultimate mora patterns, creating a link between, on the one hand, metrical systems such as Gilbertese, in which prominence (accent or stress) falls on a particular mora and feet only care about moraic information (occasionally incurring a violation of the Syllable Integrity Principle), and, on the other hand, metrical systems such as Tokyo Japanese loanword accentuation (conservative pattern) and Dihovo Macedonian, where prominence (accent or stress) falls on the syllable containing the antepenultimate mora, while syllable integrity is respected.

For McCawley (1978), the implication of the loanword accentuation rule locating the accent on the syllable containing the antepenultimate mora was that Tokyo Japanese had a *split* prosodic system, in which the syllable is the "accent-bearing unit" while the mora is the "unit of counting." In our analysis, *no such split* needs to be made. Rather, the metrical system is analysed on the basis of the IL foot, where the choice of parsing unit emerges from Exhaustivity-Ft. while foot form constraints make demands in terms of morae favoring trimoraic feet. Regarding McCawley's ternary classification of languages into "mora-counting, mora language," "mora-counting, syllable language," and "syllable-counting, syllable language," we find that although this descriptive terminology is similar to ours, it does not exactly match our account. In particular, we do not assume a binary typological distinction between "syllable language" and "mora language." This distinction carries over into our model as a distinction that is enforced by Exhaustivity-Ft in interaction with other constraints, and hence, becomes soft.

Our representational contribution resides in the prosodic representation of syllable integrity violations: metrical feet can immediately dominate morae under duress of foot well-formedness constraints which enforce maximally bimoraic FtMin and monomoraic dependents (instantiated by the constraints Foot-Minμμ$_{Max}$ and Adjunct=μ, respectively). Crucially we do not assume that morae that are immediately dominated by feet are also undominated by syllables; we assume that morae are universally dominated by syllables. That is, a heavy syllable always dominates two morae, yet one or both of these morae can be simultaneously immediately dominated by metrical feet. This is shown in (63). In (63a), a sequence of a light plus a heavy syllable is parsed by an IL foot; the light syllable's only mora is dominated by the syllable, which is itself dominated by the foot, but the heavy syllable's morae are both immediately dominated by the foot, while being simultaneously dominated by a syllable. In (63b), in a sequence of two heavy syllables, the first syllable's morae are both immediately dominated by an IL foot, which also dominates the first (but not the second) mora of the second syllable.

(63) Feet immediately dominating morae

a. 

b. 

Accordingly, the constraint to enforce syllable integrity (Exhaustivity-Ft) inspects only the mora's immediate mother node(s), and assigns a violation mark in case this category is a foot.

Typologically, our contribution resides in a uniform treatment of antepenultimate mora patterns in the languages we analysed, which could be reduced to three metrical systems. The three metrical systems analysed in this study can be arranged in a table that highlights the similarities and differences in their parsings of different quantitative sequences, considering the last three syllables of the word. The mark 'APU' indicates an antepenultimate mora pattern.

(64)

	"Gilbertese-type" (reversed foot)		Conservative Tokyo, Dihovo Macedonian		Innovative Tokyo, Latin	
. . . LLL	. . . ((ˈLL)L	APU	. . . ((ˈLL)L	APU	. . . ((ˈLL)L	APU
. . . HLL	. . . μ((ˈμL)L)	APU	. . . ((ˈHL)L)		. . . ((ˈHL)L)	
. . . LHL	. . . L((ˈH)L)	APU	. . . L((ˈH)L)	APU	. . . L((ˈH)L)	APU
. . . HHL	. . . H((ˈH)L)	APU	. . . H((ˈH)L)	APU	. . . H((ˈH)L)	APU
. . . LLH	. . . L((ˈLμ)μ)	APU	. . . L(ˈLH)	APU	. . . ((ˈLL)H)	
. . . HLH	. . . H((ˈLμ)μ)	APU	. . . H(ˈLH)	APU	. . . ((ˈHL)H)	
. . . LHH	. . . Lμ((ˈμμ)μ)	APU	. . . L(ˈHH)		. . . L((ˈH)H)	
. . . HHH	. . . Hμ((ˈμμ)μ)	APU	. . . H(ˈHH)		. . . H((ˈH)H)	

Note that these three metrical systems share identical parsings for the quantitative sequences: . . . LLL# and . . . XHL#, which always occur with a perfect IL foot, featuring a bimoraic FtMin and monomoraic dependent. None of the remaining five sequences allow for such a perfect IL foot aligned with syllable boundaries, and this is where the systems start diverging in their parsing strategies (indicated in grey cells). Gilbertese adheres to foot perfection, while giving up on syllable integrity. The conservative Tokyo Japanese pattern values the monomoraic dependent, while sacrificing bimoraic FtMin. The innovative Tokyo Japanese pattern pursues a bimoraic FtMin, while giving up on the monomoraic dependent. These three strategies are logically possible ways of dealing with conflicts between moraic foot shape and moraic parsing; these conflicts arise as a consequence of the presence of the syllable in the prosodic hierarchy between foot and mora.

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