

Nasal behaviour in Yami: a constraint-based analysis

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Yami is an Austronesian language spoken in Lanyu Island, southeast of Taiwan. In this language, the nasal in the verbal prefixes, such as *maŋ-*, *paŋ/paŋʔ-* and *ŋ-*, exhibits peculiar phonetic realization in relation to the following segments. The aim of this paper is twofold: (1) to describe this phenomenon in a set of data taken from Ho (1990) and the textbook by Tung and Rau (2000), and (2) to provide a theoretical analysis based on Optimality Theory (Prince and Smolensky 1993).

Observation of the behaviour of the prefixal nasal in Yami reveals the following points: (1) nasal coalescence takes place when the nasal is followed by voiceless obstruents [NB the glottal stop is not an obstruent]. (2) When the nasal in *maŋ-* is followed by voiced labial obstruents, such as [b] or [v], it exhibits free variation: either coalesced into [m] or realized independently, as [n][b] or [n][v]. (3) The nasal in *maŋ-* is realized as the coronal nasal [n] when followed by voiced consonants or approximants. (4) The velar nasal remains unchanged when followed by vowels. (5) After the deletion of the glottal stop in *paŋʔ*, no coalescence applies even when the nasal [n] is followed by a voiceless obstruent. (6) Unlike the prefix *maŋ-*, the prefix *paŋ-* coalesced with any following obstruent, regardless of its voice quality.

An optimality-theoretical account is provided to analyse the behaviour of the nasal, and the following conclusions are reached: (1) nasal coalescence has been considered as an instance of the *NC̣ effect, by which the nasal-voiceless obstruents are prohibited from being adjacent across morpheme boundary. Yet *NC̣ can also be replaced by CRISPEDGE [PW] (Ito & Mester 1999, Pater 2001) for the analysis of Yami nasal behaviour. (2) The coalescence of the nasal with the voiced labial obstruents is a consequence of the satisfaction of nasal assimilation and coda condition, which promotes coronal preference. (3) The realization of the nasal as [n] when preceding voiced consonants is due to coda condition. (4) Deletion/retention of the glottal stop in *paŋʔ* before obstruents/glides is subject to the syllable structure.

Nasal behaviour in Yami is prosodically-defined. The final ranking is proposed to account for nasal behaviour aforementioned.

1. Introduction

The aim of this paper is describe and analyse the phonological patterns and constraints of nasal-consonant (hence NC) sequence in Yami, a language spoken in Orchid Island, or Lanyu, or Betel Tobago, which is located in the Pacific Ocean about seventy kilometers of south eastern Taiwan. ‘Yami’ is also called ‘Tao’ nowadays. Recent ethnic awareness of the younger generations led the change of the name from ‘Yami’ to ‘Tao’, which in the language means ‘person, people, or human’.

In terms of subgrouping, the language is considered a member of the Batanic languages, the Philippine language group in the Austronesian family (Ho 1990, from Asai 1936). Li (1995) also points out that Yami is considered ‘non-Formosan’ because of a phonological process called ‘nasal accretion’, which is prevalent in western Austronesian languages but not found in any Formosan language. The following examples are taken from Li (1995: 653), presenting the nasal behaviour to be discussed in this paper:

p alas-en	m alas	‘tell a lie’
t ovis-an	m anovis	‘answer’
t awag-an	m anawag	‘call’
k ekeR-en	m aŋekeR	‘plant other crops’

The discussion of this paper is divided as follows: in the next section we present the data taken from Ho (1990) and the Yami textbook by Tung and Rau (2000; hence T & R), and describe the phonological patterns of the nasals and their following consonants in the language in terms of feature interaction. Section 3 provides an analysis of the data based on the Optimality theoretical account (Prince and Smolensky 1993). Then the ranking of these constraints involved is proposed to yield the optimal output.

2. Description and discussion

In the Yami phonemic inventory there are three nasals: /m/, /n/, /ŋ/. Each can be at the onset and coda position, such as [ka.ŋay] ‘then’, or [a.moŋ] ‘fish’. The coronal [n] is usually palatalized before the high vowel [i] (Ho 1990: 20; T&R 2000: 3).

The data concerned show the nasal alternations in some prefixes with respect to the following segment across the morpheme boundary. In the following data the morpheme *maŋ*² is used to mark irrealis agent-focused verbs, and *ŋ*- to mark irrealis subjunctive mood.³

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² In the textbook (T&R 2000) the nasal in the prefixes is transcribed as /N/ to indicate that the phonetic form of the nasal depends on the place feature of the following segment. However, the underlying form

No.	Input	Output	Gloss
(1)	maŋ-pili	ma.mi.li	‘choose’
(2)	maŋ-şazaŋ	ma.na.zaŋ	‘buy’
(3)	maŋ-ciriŋ ⁴	ma.ni.riŋ	‘speak; talk’
(4)	maŋ-tba	man.ba	‘chop’
(5)	maŋ-koad	ma.ŋa.od	‘row’

In these examples /ŋp/ is realized as [m]; /ŋs/, /ŋc/, and /ŋt/ are realized as [n], and /ŋk/ as [ŋ]. The other set also exhibits the same patterns.

No.	Input	Output	Gloss
(6)	ŋ-pancian	man.ci.an	‘speak nonsense’
(7)	ŋ-toroan	no.ro.an	‘divide’
(8)	ŋ-cita	ni.ta	‘see’
(9)	ŋ-kala-a	ŋa.laa	‘visit’

Rather than being two separate processes of assimilation and deletion, as described by Ho (1990), this phenomenon is better termed as ‘nasal coalescence’, in which two input segments—the nasal and its following voiceless obstruent—are ‘fused’ into one output segment, which is the result of retaining the manner feature of the nasal and the place feature of the voiceless obstruent. The representation is as follows:

of the nasal is /ŋ/ (Victoria Rau 2003, p.c.), as in other genetically-related languages, such as Tagalog *maŋ-* (Schachter 1972), Indonesian *məŋ-* (see Pater 2001), or Malay (Zaharani 1998, Mataim 2001). Therefore, in this article the data are presented in the underlying form, hence *maŋ-* and *ŋ-*.

³ In Ho (1990: 54), this prefix *ŋ-* is attached to a verb in an imperfective negative clause, thus co-occurs with the negative form *ji-*, as in her example (37):

ji-ku ŋitəkək ‘I will not sleep’ from *ŋ+itəkək* ‘to sleep’.
not-1sg sleep

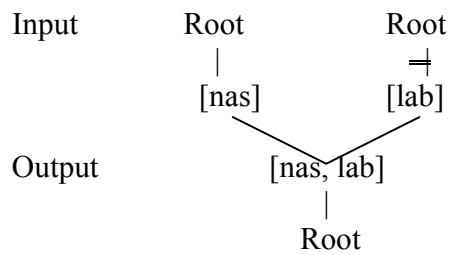
However, this prefix will also undergo coalescence when followed by a voiceless obstruent, as in her example (38b):

ji-ku manigi su kađai ‘I will not sift millet.’ from *ŋ+panigi* --> *manigi* ‘to sift’
not-1sg sift CM millet

(Abbreviations: 1sg=first person singular; CM= case marker)

⁴ The symbol [c] and [j] represents [ts] and [dz], respectively. Here we adopt the former to indicate the phoneme as an individual segment. Thus the glide [j] is replaced by [y] in this article for distinction.

(10) Nasal Coalescence in Yami: e.g. /ŋ+p/ → [m]



Nasal coalescence as (10) affects voiceless obstruents and voiced labials. The following examples show that nasal coalescence also occurs when the underlying nasal is followed by a voiced labial obstruent.

No.	Input	Output	Gloss
(11)	maŋ-bəḍbəḍ	ma.məḍ.bəḍ	‘tie’
(12)	maŋ-vono	ma.mo.no	‘prick (into eyes)’
(13)	maŋ-vacivaci	man.va.ci.va.ci	‘chop into few parts’
(14)	maŋ-valaŋ	man.va.laŋ/ma.ma.laŋ	‘hot’

Yami displays rather different nasal behaviour regarding the sequence of nasal and voiced labial consonants. The data above shows that when the nasal is followed by a voiced labial fricative [v], there occur two variants. One is to coalesce into one segment [m]; the other is to surface with two segments as [n][v]. It is quite possible that the same rule applies when the nasal is followed by a voiced bilabial [b], though we have not been able to find an example that confirms /ŋb/ to be realised as [n][b].

Padgett (1994: 469) states that there are three alternations when nasals are followed by fricatives shown as follows:

- (15) When a nasal is followed by a fricative, either
- a. The nasal does not assimilate but receives a default place.
 - b. The nasal is deleted.
 - c. The nasal assimilates but also hardens the fricative to a stop or an affricate.

Clearly Yami displays the (15a) alternation when a nasal is followed by a fricative, as exemplified by (13) and (14) with [n][v] sequence. However, Yami

even shows another alternation that Padgett (1994) assumes to be unattested—when the nasal precedes the retroflex fricative [ʂ], the output is a coalesced [n].

This nasal behaviour in (13) and (14) suggests that the prefix nasal is targeted by the default place rule. Padgett (1994) states that generally, the nasal is placeless and receives coronal place by a default rule as the following:

(16) Default place rule (Kenstowicz 1994: 517)

Place → Place
|
Coronal

The default place has been recognized as coronal, whose special status is discussed in Paradis & Prunet eds. (1991). Another example in Yami also suggests that the default place is coronal. If the stem begins with the glottal stop [ʔ] or an approximant, the placeless nasal is realized as [n] by default, which provides another instance for coronal being more unmarked than labials and velars.⁵

No.	Input	Output	Gloss
(17)	maŋ-ʔaŋat	man.ʔa.ŋat	‘lift’
(18)	maŋ-wagwag	man.wag.wag	‘cause...deserted’
(19)	maŋ-mama	man.ma.ma	‘chew betel nut’

This treatment also accounts for the fact that when the nasal is followed by a voiced obstruent, the nasal is realized as [n] and the output form of the stem is faithful to the input form, as shown in the following data:

No.	Input	Output	Gloss
(20)	maŋ-gazot	man.ga.zot	‘being cut by reef’
(21)	maŋ-ɖokɖok	man.ɖok.ɖok	‘knot’

⁵ The status of the glottal stop [ʔ] in this language has been discussed by Ho (1990:22-4), who considers it phonemic, as shown by the example /panʔ+apiʂ/ --> [panʔapiʂ]. On the other hand, since this segment is a hiatus breaker by default, it is often omitted in the phonemic transcription. The example in (17) below also suggests that the glottal stop is a phoneme in Yami.

(22) maŋ-zuɡazuɡa man.zu.ɡa.zu.ɡa ‘bark furiously’

However, the prefix *ŋ-* employs coalescence as the only strategy, even if the stem begins with a sonorant. Since the nasal *ŋ-* coalesces with the following voiceless consonant, as we have seen above, here it is also considered as coalesced instead of being deleted.⁶ Thus the place of the segment in the stem is retained in the alternation. This also suggests that in this language a consonant cluster with two sonorants across morpheme boundary is not preferred, though it can be found within a stem, as in /anŋət/ ‘sweat’, /murni/ ‘breadfruit’ (Ho 1990: 31).

No.	Input	Output	Gloss
(23)	ŋ-mimin-a	mi.mi.na	‘drink’
(24)	ŋ-maka-itkəh	ma.kayt.kəh	‘sleep’

This underlying nasal, on the other hand, does not undergo any change when attaching to vowels.

No.	Input	Output	Gloss
(25)	maŋ-itəm	ma.ŋi.təm	‘cohere; fix’
(26)	ŋ-aŋay	ŋa.ŋay	‘lead; accompany’

Observation reveals that in Yami the nasal as the last segment of the verbal prefix interacts with the prosodic pattern of the whole word. The velar nasal [ŋ] after syllabification functions as the onset of the second syllable, as shown in (25) and (26). On the other hand, when followed by voiced consonants and approximants, the nasal is realized as [n], which suggests that the coda of the verbal prefix, if there is one, must be [coronal]. This explains why **maŋ.ɡa.zot* or **mam.vo.no* is unacceptable. A theoretical account of this observation is provided in the following section.

⁶ Tung and Rau (2000: 79) state that when the prefix *N-* (*ŋ-*) is followed by voiced labial obstruents [b] and [v], the surfaced form is [m] only. However, in their textbook I haven’t found these examples.

Ho (1990:47) provides evidence of nasal behavior regarding the two verbal prefixes *panʔ* and *paŋ*.⁷ Though being free variants, only *panʔ* rather than *paŋ* is allowed when followed by glides, thus *panʔwaɸwaɸ-i* (**paŋwaɸwaɸ-i*) ‘Clean (imperative)’ and *panʔʒukay-i* (**paŋʒukay-i*) ‘Wake up (imperative)’ in her examples (27a) and (27b).

The prefix *panʔ*, if followed by obstruents and non-glide sonorants, will undergo the deletion of the glottal stop, resulting in a nasal plus voiceless obstruent sequence. This is a violation of *NC̣ at the expense of satisfying *COMPLEX, as will be analyzed in the following section. See the following examples taken from Ho (1990: 48) in her example (28):

No.	Input	Output	Gloss
(27)	panʔ-pəkək	pan-pəkək	‘snatch away’
(28)	panʔ-bakbak	pan-bakbak	‘hit’
(29)	panʔ-vuyəw	pan-vuyəw	‘drive away’
(30)	panʔ-tələm	pan-tələm	‘jump over’
(31)	panʔ-ɸəŋɸəŋ	pan-ɸəŋɸəŋ	‘cook’
(32)	panʔ-ʂidun	pan-ʂidun	‘help’
(33)	panʔ-zəkək	pan-zəkək	‘catch’
(34)	panʔ-cigi	pan-cigi	‘sift’
(35)	panʔ-kətəkət	pan-kətəkət	‘wash hair’
(36)	panʔ-gulgul	pan-gulgul	‘cut hair’
(37)	panʔ-mamak	pan-mamak	‘chew’
(38)	panʔ-linaʂ	pan-linaʂ	‘wipe’

⁷ According to Ho (1990), these two prefixes are used when the Patient argument affected by the action of a two-argument verb is indefinite, as shown in her example (26a):

panʔuvay-i (= *paŋuvəy-i*) *ʂu uviɸ* ‘Untie strings!’
 untie CM string

- | | | | |
|------|-------------|-------------|---------|
| (39) | panʔ-rigrig | pan-rigrig | ‘shake’ |
| (40) | panʔ-yucut | panʔ-yucut | ‘suck’ |
| (41) | panʔ-waɖwaɖ | panʔ-waɖwaɖ | ‘clean’ |

In this long list of examples some interesting points emerge. First, after the deletion of the glottal stop, the nasal and the following voiceless obstruent does not undergo further coalescence process, resulting in a sequence which violates *NC_ɔ (see the discussion in (53) below). Nor does the nasal undergo further assimilation with the following voiced obstruent, as normally expected in other languages, hence **pam-bakbak* and **paŋ-gulgul*. Secondly, the glides are considered part of the onset by Ho, who proposes the syllable template for Yami as (C)(G)V(C)⁸, in which the onset cluster is permitted as long as the second element is a glide. This fact accounts for the retention of the glottal stop in (40) and (41). Once resyllabified, the forms aforementioned should be *pan.ɽyu.cut* and *pan.ɽwaɖ.waɖ*.

The prefix *maŋ-*, as we have seen, only coalesces with the following voiceless obstruent to satisfy *NC_ɔ, and is realized as *man-* if followed by voiced consonants and the glottal stop. The other variant *paŋ-*, however, manifesting different nasal behaviour from the prefix *maŋ-*, coalesces with the following obstruent regardless of its voice quality.

No.	Input	Output	Gloss
(42)	paŋ-pəkəkɕ	pa.məkəkɕ	‘snatch away’
(43)	paŋ-bakbak	pa.mak.bak	‘hit’
(44)	paŋ-vuyəw	pa.mu.yəw	‘drive away’
(45)	paŋ-tələm	pa.nələm	‘jump over’
(46)	paŋ-ɖəŋɖəŋ	pa.nəŋ.ɖəŋ	‘cook’
(47)	paŋ-ɕiɖuŋ	pa.ni.ɖuŋ	‘help’

⁸ This template for the time being is considered linear. Ho (1990) does not provide further information regarding Yami syllable structure, which, pending more data, is an issue worth exploring for further study.

- | | | | |
|------|------------|------------|-------------|
| (48) | paŋ-ʒakəp | pa.na.kəp | ‘catch’ |
| (49) | paŋ-cigi | pa.ni.gi | ‘sift’ |
| (50) | paŋ-kətkət | pa.ŋət.kət | ‘wash hair’ |
| (51) | paŋ-gulgul | pa.ŋul.gul | ‘cut hair’ |

The prefix *paŋ-*, in Ho’s analysis, undergoes two rules in a feeding order: assimilation and obstruent deletion when attaching to non-glide consonants. However, in our analysis there is only a process—coalescence involved, thus the nasal [m], [n], or even [ŋ] is the result of combining the feature [nasal] and the place feature of the following obstruent, as the process shown in (10) above.

All these examples listed above suggest that the nasal in these verbal prefixes *maŋ-*, *ŋ-*, and *paŋ/panʔ* displays different behavior in relation to their following segment. To recapitulate our discussion, the observed nasal behaviour in Yami is as follows:

(52) Observed nasal behaviour in Yami

- a. The nasal in the prefixes *maŋ-* and *ŋ-* coalesce with the following voiceless obstruent into a homorganic nasal; while that in *paŋ-* coalesces with the following obstruent, whether voiced or voiceless.
- b. The nasal in *maŋ-*, if followed by a voiced labial obstruent [b] or [v], is either coalesced with the voiced labial obstruent and realized as [m], or it surfaces with the following segment as [n][b] or [n][v].
- c. When the nasal in *maŋ-* is followed by voiced obstruents and approximants, it receives the coronal place as [n].
- d. The nasal, if followed by a vowel, remains as a velar nasal [ŋ], which in turn functions as the onset of the following syllable.
- e. No coalescence applies after the deletion of the glottal stop in the prefix *panʔ-*, even if the nasal [n] is thus followed by a voiceless obstruent.

Nasal coalescence like (52a), as having been discussed in Pater (1996, 1999), Zaharani (1998) for Malay, and Mataim (2001) for Brunei Malay, is considered the

effect of avoiding nasal-voiceless obstruent sequence (hence NC_◌), proposed by Pater (1996) as a contextual markedness constraint—*NC_◌.

(53) *NC_◌ (Pater 1996, 1999; also discussed in Kager 1999)

No nasal plus voiceless obstruent sequences.

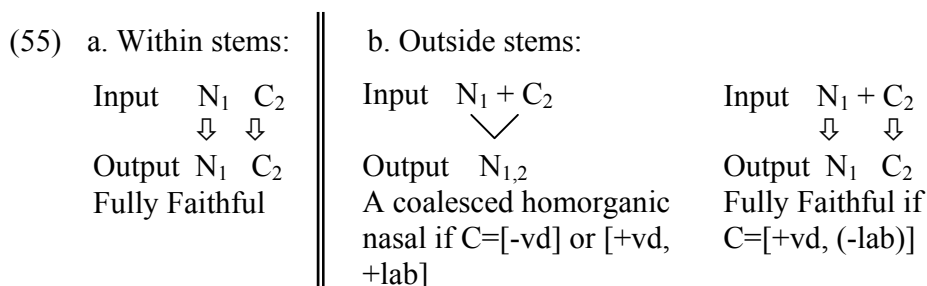
This constraint, however, does not operate on the prefix *panʔ* after the glottal stop is deleted, as discussed above. We have seen that this constraint operates across the morpheme boundary. Within a stem such an NC sequence is allowed, regardless of the consonant being voiced or voiceless.

(54) Nasal-obstruent sequence within stems in Yami

- | | | |
|----|-------------------------------|-------------------------|
| a. | ni.p <u>an</u> .ci | ‘call;say (past tense)’ |
| b. | a.li.ba <u>n</u> .ba <u>n</u> | ‘kind of fish’ |
| c. | pi <u>n</u> .sa <u>n</u> | ‘order’ |
| d. | pa <u>n</u> .ta <u>w</u> | ‘outside’ |
| e. | pa <u>n</u> .ba | ‘used for axing’ |

These examples show that the nasal and the following obstruent belong to different syllables: The nasal is the coda of the preceding syllable, while the obstruent is the onset of the following one. They are not required to be place-identical like those in Diola Fogy, such as *bunt*, *mba*, *famb*, *ndaw*, etc. (Sapir 1965; cited in Kenstowicz 1994: 526, 518).

In sum, we present the co-occurrence restrictions of nasal-obstruent sequences in Yami as follows (applicable to the prefixes *maŋ-* and *ŋ-*):



The figure in (55) shows an asymmetry of NC sequence in stems and across morpheme boundaries. More restrictions are imposed on the latter. Clearly, labial

consonants play a determinant role in the tug of war between markedness and faithfulness.

3. Analysis

In this section we offer an Optimality-theoretic account based on the observations stated in (52) and examine the constraints involved to see how the rankings of these constraints yield the optimal output.

We have seen that nasal coalescence is considered by Pater (1999) as the effect of *NC_◌, a constraint which prohibits co-occurrence of nasal and voiceless obstruent sequence. Pater uses the term ‘nasal substitution’ instead and argues for this ‘fusion’ assumption as having the advantage for being treated as ‘a one-step Input-Output mapping’, instead of having to set up an intermediate and ‘invisible’ stage for derivational account. His argument is based on typology and the internal phonology of Indonesian.⁹

Nasal coalescence is only one of the strategies that languages employ to satisfy *NC_◌. In order to comply with the constraint *NC_◌ the trade-off is violation of the other constraint UNIFORMITY, proposed by McCarthy & Prince (1995) as one of the constraints operating in Correspondence Theory against coalescence.

(56) UNIFORMITY

No element of S₂ has multiple correspondences in S₁

Therefore, example (1) [ma.mi.li] from /maŋ-pili/ ‘choose’ is the result of *NC_◌ outranking UNIFORMITY.

(57) *NC_◌ » UNIFORMITY

/maŋ+pili/	*NC _◌	UNIFORMITY
☞ ma.mi.li		*
maŋ.pi.li	*!	

However, we also need to take the stem-internal NC_◌ sequence into account, otherwise example (6) [man.ci.an] from /ŋ-pancian/ ‘speak nonsense’ will not be yielded successfully. As noted above, NC_◌ is allowed in a stem which provokes

violation of *NC̥. This means that another constraint is needed to outrank *NC̥ for preserving the phonotactic integrity within a stem. Pater (1999) proposes the constraint at work here as ROOTLIN, which requires the faithfulness of the output to the input within the root/stem. Kager's (1999:77) alternative analysis shows no need of appealing to any root/stem specific faithfulness constraint. Kager's account is based on the notion that 'all root-internal occurrence of nasal and obstruent has an input linear ordering', thus the constraint blocking nasal coalescence root-internally is LINEARITY-IO.

(58) LINEARITY-IO (Kager 1999: 63)

The output reflects the precedence structure of the input, and vice versa.

Thus the ranking of the constraints yielding the optimal output of the example (6) is LINEARITY-IO » UNIFORMITY and is shown in the following tableau:

(59) LINEARITY-IO » *NC̥ » UNIFORMITY

/ŋ+pancian/	LINEARITY-IO	*NC̥	UNIFORMITY
ɸmancier		*	*
manian	*!		*
ŋpancian		**!	

Pater (2001) revises his previous analysis in Pater (1999) regarding the NC̥ sequence, adopting UNIFORMITY for LINEARITY in (1999) and proposing UNIFORMITY -RT to replace ROOTLIN, in order to make the analysis more consistent. However, the difference in these constraints is just a matter of terminology, as they still show the same ranking and similar effects. Following Pater's (2001) terms, we can attain the same result by applying the ranking to the same data:

(60) UNIFORMITY -RT » *NC̥ » UNIFORMITY

/ŋ+pancian/	UNIFORMITY -RT	*NC̥	UNIFORMITY
ɸmancier		*	*
manian	*!		*
ŋpancian		**!	

⁹ This argument is later challenged by the counter examples shown in Pater (2001:171) and leads to a reanalysis. The interested reader is referred to the original paper.

As mentioned, nasal coalescence is only one of the strategies that language employs to comply with *NC̥ constraint. Another strategies, known as the NC̥ conspiracies (first mentioned by Kisseberth 1970) and stated by Pater (2001), are illustrated by the following languages:

(61) NC̥ conspiracies (Pater 2001: 161)

Modern Greek	NT→ND	MPS→ PS	post-nasal voicing & deletion
Karpathos Greek	NT→ ND	N#T→T#T	post-nasal voicing & denasalisation
Oshikwanyama	NT→ND	N#T→N	post-nasal voicing & nasal substitution
Kihehe	NT→ N	NS→ S	nasal substitution & deletion

Therefore, satisfying *NC̥ by post-nasal voicing means having to violate IDENT[OBSVOI], a faithfulness constraint which requires the voice value of the output being the same as the input. Deletion and denasalisation, on the other hand, violate MAX and NASMAX, respectively (see Pater 1999 for detailed discussion). All these constraints must be outranked by *NC̥. Another way of satisfying *NC̥ which is not mentioned above and perhaps unattested so far is by epenthesis—inserting a vowel between the nasal and the voiceless obstruent, which in turn violates DEP (McCarthy & Prince 1995). In the Yami case, DEP needs to outrank *NC̥ in order to yield the optimal output.

(62) DEP » *NC̥ » UNIFORMITY

/maŋ+pili/	DEP	*NC̥	UNIFORMITY
☞ ma.mi.li			*
maŋ.pi.li		*!	
ma.ŋ□.pi.li	*!		

UNIFORMITY -RT and DEP are in the same ranking over the constraint *NC̥ so that the phonotactic sequence in a root can remain unaffected. Since DEP requires no epenthesis either in the root or across the morpheme boundary, and UNIFORMITY-RT prohibits coalescence within the root, neither of them is in conflict.

(63) UNIFORMITY-RT, DEP » *NC̣ » UNIFORMITY

/ŋ+pancian/	UNIFORMITY-RT	DEP	*NC̣	UNIFORMITY
☞ mancian			*	*
manian	*!			*
ŋpancian			**!	
ŋpan□cian		*!	*	
ŋ□pan□cian		**!		
man□cian		*!		*

We have argued that the place default rule plays a role in determining the phonetic form of the nasal. This mechanism thus operates when the nasal is followed by a voiced consonant. In this environment the *NC̣ constraint is of no relevance since there is no violation of it. Therefore, the nasal is realized as [n] even when followed by a non-coronal voiced consonant.

Prince & Smolensky (1993:181) formulate one universal Harmony scale regarding ‘Coronal Unmarkedness’ as follows:

(64) Coronal Unmarkedness: Harmony Scale.

PL/Cor » PL/Lab

(65) Coronal Unmarkedness: Dominance Hierarchy.

*PL/Lab » *PL/Cor

(Note: it is for notation simplification that Lab represents any other non-coronal place features.)

We can apply the ranking (65) to the data of the examples (17) to (22) in which the nasal is followed by a voiced consonant. The result indicates that the preference is for unmarkedness.

(66) *PL/Dor » *PL/Cor

/maŋ+gazot/	*PL/Dor	*PL/Cor
☞ man.ga.zot		*
maŋ.ga.zot	*!	

(67) *PL/Lab » *PL/Cor

/maŋ+wagwag/	*PL/Lab	*PL/Cor
☞ man.wag.wag		*
mam.wag.wag	*!	

This coronal preference can be the basis for setting up the coda condition in Yami in this morphophonemic context. As mentioned above, the nasal in the verbal prefix interacts with the prosodic pattern of the whole word, thus the phonetic form of the nasal is determined not only by the following segment, but also by its licensed position within the syllable. The pattern can be shown as follows:

(68) The prosodic pattern with the nasal

a. N + C => n. C

b. N + V => .NV.

Stipulating the coda condition constraint for Yami, therefore, can capture syllabification after prefixation as shown in (68). This constraint states that only the coronal nasal is allowed in this environment.

(69) CODACONDITION (CODACON)

$$\begin{array}{c} * N]_{\sigma} \\ | \\ [-cor] \end{array}$$

In Yami this CODACONDITION constraint is considered better than *PL/Cor in that the former takes the syllable structure into account. Unlike the low-ranked *PL/Cor, this constraint outranks other constraints such as NASASSIM, the tendency which produces a homorganic nasal before voiced obstruents.

(70) NASASSIM (Pater 2001: 175)

A nasal must share place feature with a following consonant.

This ranking, CODACON » NASASSIM, can explain why *mangazot* is favoured over *mangazot*.

(71) CODACON » NASASSIM

/maŋ+gazot/	CODACON	NASASSIM
☞ man.ga. zot		*
maŋ.ga. zot	*!	

Moreover, with this ranking the free variation of *manvalaŋ* and *mamalaŋ* can also be accounted for. CODACONDITION rules out possibilities such as *mamvalaŋ* or *maŋvalaŋ*. Since in this language UNIFORMITY is the most dominated, *mamalaŋ*

proves to be the optimal candidate, and *manvalaŋ* the suboptimal, marked by ☺. This result corresponds to the current use in this language. Even though free variants such as *manvalaŋ* and *mamalaŋ* and the like are both acceptable in this language, it is the coalesced form that is more commonly used. Therefore, I propose that when both forms are acceptable, the two constraints NASASSIM and UNIFORMITY are equally ranked and dominated by CODACON, as shown in (72). On the other hand, when the speaker prefers using the coalesced form, the ranking becomes CODACON » NASASSIM » UNIFORMITY, in which *manvalaŋ* is ruled out, as in (73).

(72) CODACON » NASASSIM, UNIFORMITY

/maŋ+valaŋ/	CODACON	NASASSIM	UNIFORMITY
☺man.va.laŋ		*	
☞ma.ma.laŋ			*
mam.va.laŋ	*!		
maŋ.va.laŋ	*!	*	

(73) CODACON » NASASSIM » UNIFORMITY

/maŋ+valaŋ/	CODACON	NASASSIM	UNIFORMITY
man.va.laŋ		*!	
☞ma.ma.laŋ			*
mam.va.laŋ	*!		
maŋ.va.laŋ	*!	*	

With the verbal prefix *ŋ-*, only the coalesced form is allowed. Under this circumstance the constraint CODACON is inactive. The reason why only the coalesced form is allowed appears to satisfy *COMPLEX, which disallows consonant clusters at onset and coda position (Prince and Smolensky 1993). However, recall that the syllable template in Yami does allow CG sequence at onset position (as discussed in footnote 7). So far it is not confirmed whether the status of the glide is part of the onset cluster or diphthongal—further research is needed to clarify the status of glides in this language. Due to this consideration a tentative analysis is proposed by modifying the constraint *COMPLEX into a context-free constraint *CC, which, for language-specific purposes, specifies that no consonant cluster is allowed

in a syllable domain. In this way the occurrence of CG sequence in this language creates no difficulty.¹⁰

This constraint outranks both UNIFORMITY and NASASSIM; while UNIFORMITY must be outranked by NASASSIM. We take the datum (23) *ŋ-minim-a* as an example.¹¹ As the following tableau shows, this ranking also conforms to the ranking we proposed in (63), in which both UNIFORMITY –RT, and DEP outranks UNIFORMITY, if more candidates are taken into evaluation.

(74) UNIFORMITY–RT, DEP , *CC » NASASSIM » UNIFORMITY

/ŋ+minim+a/	UNIFORMITY-RT	DEP	*CC	NASASSIM	UNIFORMITY
ŋmi.ni.ma			*!	*	
ɸmi.ni.ma					*
ŋi.ni.ma	*!			*	
ŋ□.mi.ni.ma		*!			

We have seen that the constraint *NÇ is ranked below UNIFORMITY –RT and DEP in the tableau (63) to preserve the stem-internal sequence of NÇ. Again this constraint is violated even across the morpheme boundary regarding the affixation of the prefix *panʔ*. The resulting NÇ does not undergo further coalescence after the deletion of the glottal stop. The relevant examples are repeated here for the reader’s convenience (the numbering of the examples is retained):

No.	Input	Output	Gloss
(27)	panʔ-pəkəʂ	pan-pəkəʂ	‘snatch away’
(30)	panʔ-tələm	pan-tələm	‘jump over’
(32)	panʔ-ʂidun	pan-ʂidun	‘help’
(34)	panʔ-cigi	pan-cigi	‘sift’

¹⁰ Here since we simply follow Ho’s (1990) linear segmental template for the time being, the constraint *COMPLEX, built on metrical syllable structure, is not suitable for the context. The constraint *CC, adopted here, only considers the linear segmental sequence in a syllable.

¹¹ Admittedly this is not an ideal example to illustrate this alternation and the ranking. More examples beginning with [b] or [v] need to be found, yet for the time being, the data (23) managed to provide the general picture. The optimal output *minima* violating UNIFORMITY is based on the assumption that the nasal *ŋ*- is coalesced with the following segment.

(35) panʔ-kətkət pan-kətkət ‘wash hair’

The deletion of the glottal stop is to satisfy *CC, which outranks *NÇ. Deletion of any segment in the input, either in the root or in the affix, violates the constraint MAX, which militates against loss of any segment in the input. *CC must rank above MAX, in this way either deletion or retention of the glottal stop is subject to satisfaction of *CC. The constraint CODACON also outranks MAX, since the deletion of the glottal stop violates the latter in order to comply with the former.

On the other hand, as any change—deletion, coalescence, and epenthesis—within the stem is considered more fatal than satisfying any aforementioned constraints, the constraints—UNIFORMITY-RT, DEP, and MAX-RT (No deletion in the root/stem) are considered undominated, along with the constraints *CC and CODACON.

Therefore, the ranking of the constraints is UNIFORMITY-RT, DEP, MAX-RT, *CC, CODACON » MAX » NASASSIM, *NÇ » UNIFORMITY. Based on our previous analysis in (72) and (73), NASASSIM is ranked below CODACON, and it has no conflict with *NÇ. With this ranking, we can account for the nasal behaviour of the prefix panʔ, as shown in the following two tableaux.

(75a)

/ panʔ-pə.kəʃ /	UNIFORMITY-RT, DEP, MAX-RT, *CC, CODACON	MAX	NAS	*NÇ	U
panʔ.pə.kəʃ	*! *CC, CODACON				
☞ pan.pə.kəʃ		*	*	*	
pan.ʔpə.kəʃ	*! *CC				
paʔ.pə.kəʃ	*! CODACON	*			
pan.ʔə.kəʃ	*! MAX-RT	*			

(75b)

/ panʔ-yucut /	UNIFORMITY-RT, DEP, MAX-RT, *CC, CODACON	MAX	NAS	*NÇ	U
panʔ.yu.cut	*! *CC, CODACON				
☞ pan.ʔyu.cut			*	*	
pan.ʔu.cut	*! MAX-RT	*			
paʔ.yu.cut	*! CODACON	*			
pan.yu.cut		*!			

This analysis leaves no doubt that the coalesced form, such as *pa.mə.kəʃ*, resulting from the affixation of *paŋ+pəkəʃ*, is an optimal output, since it violates no constraints mentioned above but UNIFORMITY, which is very low-ranked. Due to space limitations the inactive constraints, such as UNIFORMITY–RT, DEP, MAX–RT, and MAX are left out.

(76a) *CC » CODACON » NASASSIM , *NÇ » UNIFORMITY

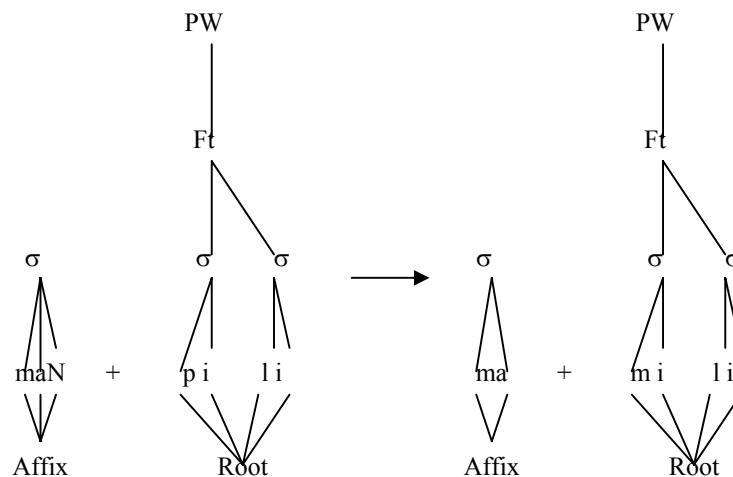
/paŋ+pəkəʃ/	*CC	CODACON	NASASSIM	*NÇ	UNIFORMITY
paŋ.pə.kəʃ		*!	*	*	
pam.pə.kəʃ		*!		*	
pa.mə.kəʃ					*

(76b)

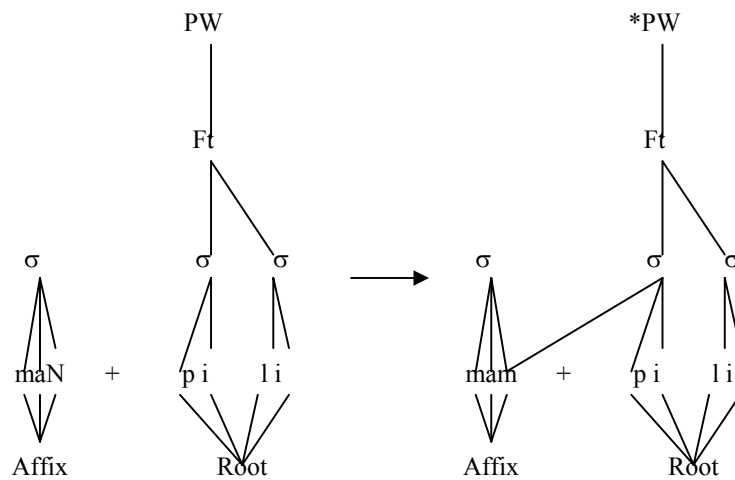
/paŋ+bakbak/	*CC	CODACON	NASASSIM	*NÇ	UNIFORMITY
paŋ.bak.bak		*!	*		
pam.bak.bak		*!			
pa.mak.bak					*

The data above has demoted the effect of *NÇ in this language. An alternative analysis is Pater's (2001: 174) suggestion of replacing *NÇ with CRISPEGE [PW] (Ito & Mester 1999), requiring that 'no element belonging to a prosodic word may be linked to a prosodic category external to that prosodic word (PW)'. Therefore, as Pater points out, Indonesian nasal substitution at PW-initial position is motivated by satisfying both nasal assimilation and the constraint CRISPEGE [PW]. We apply this mechanism to the Yami data /maŋ+pili/. The following figures illustrate how the constraint is satisfied (77) with [ma.mi.li] and violated (78) by *[mam.pi.li]:

(77) Satisfying CRISPEGE [PW] with [ma.mi.li]



(78) Violation CRISPEGE [PW] by **mam.pi.li*



The figure in (78) indicates that only assimilation is not enough to satisfy the structure. Assimilation leaves the affected nasal, which is place-linked to the following obstruent, dangling outside the range of the prosodic word. The affected nasal cannot be shared by two syllables; and the onset cluster of **mp* in the second one is also illicit. The way Yami makes things right is by coalescence, merging the two segments into one homorganic nasal.

Since **NÇ* has no effect on nasal coalescence of a voiced obstruent as seen in (76b) *paŋ+bakbak* as *pamakbak*, it cannot be considered as the motivation of this process. Yet nasal coalescence of voiced obstruent can be accounted by CRISPEGE [PW]. The winning candidate in (75) *paŋpəvəs*, though violating **NÇ*, is also motivated by CRISPEGE [PW]. All this suggests that the constraint **NÇ* is not so powerful an effect as previously considered.

The advantage of CRISPEGE [PW] over **NÇ* is that there is no need to take stem-internal *NÇ* sequence into account. **NÇ* provides a segmental approach, while CRISPEGE [PW] appeals to the requirement of prosodic well-formedness. Nasal behaviour in Yami is subject to syllable structure, the constraint CRISPEGE [PW] plays a more active role than the constraint **NÇ* in realizing the prefixal nasal with regard to the following segmental sequence.

4. Concluding remarks

We thus conclude that nasal behaviour in Yami is syllable-defined. The discussion in this paper invites further research interest, suggesting that Yami syllable structure is an issue worth pursuing, especially the status of the glides in relation to the syllable structure. The result of this issue might shed some light on the discussion in this paper and thus yield revision for the current analysis.

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