

GADSUP PHONEME AND TONEME UNITS

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0. INTRODUCTION

The segmental phonemes and the phonemic tones of Gadsup will be described in this paper.¹

The segmental phonemes each occur with two or more allophones (except the bilabial nasal and glottal stop) which have similar phonetic characteristics and occurrences. The description of the distribution of the phonemes is based upon the four types of syllables observed. The four phonemic tones (two levels, two glides) are described in terms of their contrast and of their distinctive distributional and allophonic characteristics.

The existence of tones was at an early date highlighted to us through the fairly frequent use of "whistle talk". In Gadsup whistle talk, not only are the tones conveyed, but also the segmental phonemes of the utterance are articulated.

1. SEGMENTAL PHONEMES

The segmental phonemes of Gadsup consist of nine consonants: p, t, k, ʔ, b, d, m, n, y; and six vowels: i, ʌ, u, e, a, o.

1.1. Attestation of Phonemes. Consonants consist of two series of stops, a series of nasals, and a continuant. These contrast in identical and analogous environments as indicated in the following examples:

p/t/k/b/m/n/y pũ̀nì 'name of a tree'; tũ̀nì 'my face'; kũ̀mĩ
'he comes down'; bũ̀nì 'I went and they ...';
mũ̀mĩ 'pimple'; nũ̀mĩ 'lice'; yũ̀nì 'ashes'.
p/t/b/d/m/n/y pẽ̀nì 'old'; tẽ̀mĩ 'he talks'; bẽ̀mĩ 'he goes';

	děmì 'he puts'; ménì 'shoulder blade'; némì 'he eats'; yémì 'he comes'.
d/k/m	dúndè'í 'I bore through and then I ...'; kùndémì 'he arrived'; mùnděmì 'mushroom'.
k/?	màkè 'now'; ná'é 'why'.
?/m/n	àmà'í 'meat'; àmànì 'barbs'; àmàmì 'shadow'.

Vowel phonemes contrast in identical and analogous environments:

i/ʌ/u	àndimì 'bark'; àndǎnì 'scaling skin'; àndũnì 'hollow in tree'.
e/a/o	
i/e	ì'ídé'ú 'I sing/dance'; è'ídè'ú 'I don't want it'.
ʌ/a	bǎ 'rat'; bǎ 'you stay'.
u/o	kú'í 'gourd'; kò'í 'bean root'.

1.2. Description. Non-vocoids contrast as to points of articulation: bilabial vs. alveolar vs. velar vs. glottal. They contrast as to type of articulation: stop vs. nasal vs. continuant, and as to voicing vs. non-voicing. Vowels contrast as to high, mid, and low and as to front, mid, and back tongue positions.

1.21. The voiceless stops occur at the bilabial, alveolar, velar, and glottal points of articulation. These stops (except glottal) fluctuate between unaspirated and slightly aspirated. Aspiration tends to be more frequent and pronounced before high vowels. The alveolar stop, articulated with the blade of the tongue, also fluctuates initially to the alveolar affricate [ts]: tìbámì [tsibami] [t^hibami] 'a plate'. A fricative allophone occurs intervocalic for the three stops respectively: [p] ápùmí [apumi] 'his/your shoulder'; [s] àtì'í [asi'i] 'his/your nose'; [x] àkúmí [axumi] 'his/your muscle'. The fricative allophones will fluctuate to aspirated stops with some speakers. The voiceless glottal stop occurs with one allophone.

The voiced bilabial stop /b/ has two allophones [b] and [b̥]. The stop occurs following a bilabial nasal, íyébémì [iysmbemi] 'he/it is not here'. The fricative [b̥] occurs elsewhere: bémì [bemi] 'he goes'; ùbìkǎnò [ubixano] 'you fill it up!'. With some speakers [b̥] fluctuates with [b] utterance initial, bánùdámì [banuřami] [banuřami] 'morning'. The fricative allophone [b̥], when preceding the

vowels a, ʌ, and o has less friction, fluctuating to a flat [w] with some speakers: bónò [bono] [wono] 'you go!', báni [bani] [wani] 'a long while'. The voiced alveolar stop /d/ has a flapped allophone [ɾ] occurring intervocalic, tídēmi [t^hirēmi] 'he hits me'.

The nasals occur at bilabial and alveolar points of articulation. The bilabial nasal has one allophone. The alveolar nasal has allophones: [ŋ] occurring preceding velar stop, únkámí [uŋkami] 'snore'; [n] occurring elsewhere: mʌníʔi [mʌniʔi] 'legend'; ʌnduni [ʌnduni] 'hole'.

The high, close, front, unrounded frictionized non-syllabic continuant /y/ varies to an allophone with more prominent friction when preceding high vocoids, and to an affricate [dʒ] following an alveolar nasal: [ɣ] kôʔyí [koʔɣi] 'lizard', [dʒ] ʌʔnònyóì [ʌʔnondʒoi] 'his/your hair of head'; [y] ʌyámí [ayami] 'his/your hand'.²

1.22. Vowels. /i/ the high front unrounded vowel has three allophones: [ɪ] open, occurs preceding a nasal or in fluctuation with [i] when following a nasal and preceding glottal stop, índèʔú [ɪndeʔu] 'I hear'; mʌníʔi [mʌniʔi] / [mʌniʔi] 'legend'; [i] close, occurs elsewhere; dùmítēmi [dumiseɪmi] 'he spits'; iyónémi [iyonemi] 'it is cold'; [i] voiceless, close varies with [i] utterance final, kʌmámí [kʌmami] / [kʌmami] 'sweet potato'.

/ʌ/ the central unrounded vowel has two allophones: [a] low, open, central occurs utterance initial, ʌkúmi [axumi] 'his/your muscle'; [ʌ] mid, open, occurs elsewhere, iyámí [iyami] 'a dog'; pʌʔkʌ [pʌʔka] 'he holds'.

/u/ the high, back, slightly rounded vowel has two allophones: [u] open, occurs preceding a nasal, ʌmùni [amuni] 'top of'; ʌndēmi [undemi] 'he has arrived (come up)'; [u] close, occurs elsewhere, pùkèʔú [puxeʔu] 'I die'.

/e/ the mid, front, unrounded long vowel has two allophones: [ɛ] open, occurs preceding a nasal, ʌmèni [ameni] 'tail'; [e] close, occurs elsewhere, tápè [tape] 'taro'; èʔi [eʔi] 'banana'.

/a/ the low, open, front, unrounded long vowel, ʌʔkámí 'bark'; ʌpʌʔi 'forest area'.

/o/ the mid, close, back slightly rounded long vowel, óyámí 'new'; ʌmóʔi 'young shoot'.

1.3. Inter-Phonemic Distribution. A syllable consists of a single vowel nucleus plus an optional onset and an optional coda: V, VC, CV, CVC. No more than one toneme may occur on any single vowel.

1.31. All consonants except glottal stop occur syllable and utterance initial (see Section 1.1.). Only nasals and glottal stop occur syllable or utterance initial.
 bēm 'it is'; nán 'rope'; má?kímí [ma?.kimi] 'in the house';
 blámpémí [blám.pemi] 'yellow colour or plant from which this colour is made'; nándè [nan.de] 'how much'. Consonant clusters are only possible across syllable boundaries, namely pre-nasalization (at same point of articulation) or pre-glottalization of all consonants except glottal stop:
 ámpímí 'rotten'; òmbâdá 'you sleep'; íntémí 'he smiles';
 ándání 'scaling skin'; ánkémí [ankemi] 'he thrusts'; ánnómí 'grass binding at head of arrow shaft'; ùmmémí 'a ground beetle'; á?nònyóí 'hair of head'; à?pémí 'his/your under-arm'; á?bémí 'a boil'; á?tání 'a grass'; bà?díní 'fly'; á?kámí 'bark'; á?mémí 'he is sick'; á?némí 'he threw away'; à?yámí 'dead (dried) tree'.

Pre-nasalised and pre-glottalized contoids are interpreted as sequences of two phonemes and not as complex units for the following reasons: (1) These contoid clusters occur only medial, never initial or final. (2) All consonants but glottal stop may be preceded by a nasal of the same point of articulation or by glottal stop. (3) The morphophonemic changes which occur when two consonants are juxtaposed by affixation support the thesis that the clusters are sequences of two phonemes.³

1.32. All vowels occur utterance initial, medial, and final contiguous to any consonant.

Two vowel sequences have been charted in initial, medial, and final positions. In initial position, only the sequences ai, au, ao, ui, ei, ea, eu, eo, ai, ao, and oi occur. In medial position the following have been observed: /i/, /a/, and /u/ preceded by any vowel; ae, oa, io, ao, eo. In final position clusters are limited by obligatory affixation; thus only /i/ and /o/ preceded by any vowel occur.

The phonetically long vocoids [e], [a], [o] (of approximately two moras of length) never occur short. It might be possible to interpret them as geminate occurrences of the vowels /i/, /a/, and /u/; however, they are here interpreted as single vowel units for the following reasons:

(1) Sequences of the short vowels /i/, /a/, and /u/ contrast in analogous environments with the long vowels /e/, /a/, and /o/.

ii/e yá?.kí.ì.ní⁴ 'it is a small stick'; pl?.kè.ní 'they held and they ...'; á.nà.tí.ì.ní 'it is a married woman'; kò?.tè.mí 'lime gourd's thing'.

Λ/a bən.tà.à.mà 'tall man'; pèn.dǎ.m
'a long taro'; λ.bǎ.nì 'flat area'.

uu/o tá.tù.ú?.'ì 'axes'; tí?.tǒ?.ì 'small thing'; à.pù.ú?.'
'ripe things'; ò.pǒ?.'ì

(2) No more than one toneme occurs on any long or short vowel.

(3) Tone perturbation on short and long vowels is parallel in occurrence.

1.4. Frequency. Frequency of phonemes was determined from a study of four texts comprising approximately 5926 segments and 1500 grammatical words. The consonants occur with a slightly higher frequency than the vowels. Text four contained 513 consonants and 451 vowels.

Each of the nasals occurs more frequently than any one of the stops or the continuant respectively, the ratio being at least two to one. The velar consonant /k/ and glottal stop /ʔ/ each occur one third more frequently than each of the bilabials /p/ or /b/ or the continuant /y/; and also occur more frequently (almost one fourth) than either one of the alveolar phonemes /t/ or /d/. The bilabial stops and the continuant, /p/, /b/, and /y/, are the least frequent of the consonants.

The front vowel /i/ is the most frequent, occurring three times more than each of the back vowels /u/ and /o/, and twice as much as each of the two front vowels /e/ and /a/ and the central vowel /ʌ/.

2. SUPRASEGMENTAL PHONEMES

Four contrastive tones have been noted in Gadsup: /´/ high, /`/ low, /ˆ/ up-glide, and /˘/ down-glide. We shall first indicate the various contrasts, and then proceed to amplify why it appears advisable to analyze the glides as units and not as sequences of two level tonemes. Finally we will state some of the distributional characteristics of the tones.

2.1. Contrast between the four tones is as follows:

(1) Contrast between /´/ high and /`/ low: mǎkùní 'earthquake', mǎkùní 'village'; bé?ú 'I go', bè?ú 'I stay'.

(2) Contrast between /´/ high and /ˆ/ up-glide: yǎpúmi 'a grasshopper', kǎbǎni 'a frog'; kátǒni 'type of grasshopper', kǒnǎmi 'a fog or cloud bank'.

(3) Contrast between /´/ high and /˘/ down-glide: ódémì

'a small animal', *ôdémí* 'he is abstaining'; *índè* 'I hear', *ândl* 'trunk of a tree'.

(4) Contrast between /' / low and /~/ up-glide: *ʎ'němí* 'he throws away', *ö'ěmí* 'spirit'; *ʎpù* 'ripe', *ʎpù* 'knot hole in tree'.

(5) Contrast between /' / low and /^ / down-glide: *ʎnòní* 'the securing knot for bark skirts', *ʎnôní* 'obese'; *àní* 'a path', *âní* 'the point of ...'.

(6) Contrast between /~/ up-glide and /^ / down-glide: *únǎ* 'a bag', *yùnǎ* 'food'; *ʎkǎm* 'name of a tree', *ákǎm* 'his/your ear'.

2.2. Gliding Tones. As analysis of tone has proceeded, it has been noted that members of the grammatical classes of noun and verb manifest opposing tonal characteristics. Verb stem tones are perturbed only through affixation, whereas noun stem tones may also be perturbed by association with other word bases.⁵

The gliding tonemes are here set up chiefly on the basis of evidence from nouns since glides on verbs are very limited in occurrence. The factors listed below related to the functioning of glides in Gadsup make it appear preferable to interpret them as gliding tonemes.

(1) The extent of the pitch difference between the start of the glide and the end point of the glide is less than that between the phonemic high and low tones in a similar environment: *káúyámí* [*káúyámí*] 'a drum', *á'yúmí* [*á'yúmí*] 'that which is set aside or designated for a particular reason'; *òpǒ'í* [*òpǒ'í*] 'leaf used with betel nu [*àpùú'í*] 'ripened foods'; *índě̀nò* [*índě̀nò*] 'you listen!', *índǎó̀nò* [*índǎó̀nò*] 'you ask!'; *ítǎndǎú'í* [*ítǎndǎú'í*] 'bows', *ʎnǎpù'í* [*ʎnǎpù'í*] wife'; *ʎnǎtíí* [*ʎnǎsíí*] 'a woman (married)', *àní* [*àní*] 'a path'.

(2) Glides occur on all vowels, with only one glide occurring on any single vowel. When the glide occurs on the ultima on a phonetically short vowel preceding a nasal, the particular nasal is lengthened and carries part of the glide tone.⁶ However, in the same position preceding a glottal, the vowel takes the whole glide. For example: *ákǎmí* 'his/your ear'; *mǎní'í* 'legend'.

(3) The starting point of a glide is conditioned by the

preceding tone: (a) following a low tone a rising glide begins at low, *iyǎmì* [iyǎmì] 'a dog'; (b) following a high tone a rising glide begins at mid, *káɓɓǎní* [káɓɓǎní] 'a frog'. In rapid speech, the rising glide is shortened, and may be easily mistaken for a phonetic mid tone; (c) following a low tone a falling glide begins at mid, *ákúʔí* [áxúʔí] 'his/your thigh'; (d) following a high tone a falling glide begins at high, *mémêmì* [mémémì] 'a goat'. The high and low tonemes are not conditioned in this way by preceding t

(4) When occurring utterance final, an up-glide may fluctuate to a level allotone, the pitch of which is the same as the starting pitch of the glide. For example: a mid to high glide fluctuates to a mid tone, [káyō] / [káyō] 'an ant'. An up-glide or a down-glide preceded by silence begins at low and at mid respectively, [kǒnǎmì] 'fog or cloud bank', [ɔpémì] 'his/your mouth'.

(5) The up-glide toneme has a level allotone occurring medially between two high tones which contrasts with the high, down-glide and low tonemes. (*kátǒní*-sg.) [kásōyúʔí] 'type of grasshopper', (*báʔdóní*-sg.) [báʔdòyúʔí] 'clothes', (*mémêmì*-sg.) [mémémúʔí] 'goats', *tópádóʔí* 'a machete'.

(6) To summarize, gliding tones are here interpreted as unit tonemes for the following reasons:⁷ glides are of shorter range than sequences from one tone level to another; the starting point of glides is conditioned by the preceding tone in a manner not paralleled by sequences of high and low tones; the up-glide has level allotone; glides occur on all single vowels, and can occur before all consonants including glottal stop.

2.3. Distribution. All tonemes have been observed in utterance initial, medial, and final positions. *óní* 'stone', *ǒní* 'face', *òní* 'ditch', *ǎní* 'a point of', *ápù* 'ripe', *ápǔ* 'knot hole in a tree', *áyô* 'his/your hair', *báʔyí* 'tree kangaroo', *kátǒní* 'a grasshopper', *báʔdóní* 'wearing apparel', *yúpúmì* 'type of a grasshopper', *mémêmì* 'goat'. Sequences of three or more high or low tones have been observed in utterances, however sequences of no more than three glides occur.

Of the sixteen possible sequences of two contiguous tones, only two have not been observed: up-glide high, and up-glide down-glide. *yápúmì* 'a grasshopper', *kátǒní* 'type of grasshopper', *ákúmì* 'his/your calf of leg', *mémêmì* 'a

goat', *m̀lkùní* 'village', *iỳámí* 'dog', *àyámí* 'wing', *ǒ'ěmí* 'a spirit', *ônémi* 'he chokes', *ádă* 'you call out for him'.

The following summary of the distribution of glides is based on their occurrence on noun stems. They are even more limited in occurrence on affixes and on verbs. Because of the rather severe limitations on the distribution of glides (below), it was not helpful to chart tone sequences on longer than two syllable words.

Glides occur with one out of every three noun stems (36%). Chart 1 indicates for each stem group (according to the number of syllables in a stem) the total number of stems analyzed (Total Stems), those stems with glides (Stems with Glides) and their percentage (Percent Glides) in relation to the total number of stems, and finally the total number of glides observed (Total Glides).

Chart 1
OCCURRENCE OF GLIDES WITH NOUN STEMS

<i>Number of Syllables</i>	<i>Total Stems</i>	<i>Stems with Glides</i>	<i>Percent Glides</i>	<i>Total Glides</i>
1	42	9	20	9
2	139	49	35	54
3	82	28	34	30
4	18	12	67	13
5	4	4	100	5
TOTALS:	285	102	36	111

Of the total number of noun stems which have glides, 91% of them have glides on the ultima, 9% have glides elsewhere (involving 17 stems and 18 glides). Nine stems have more than one glide, one of which does not have a glide on the ultima. Chart 2 indicates a breakdown of the total glides above, showing the number of glides which occur on each syllable of the stem in relation to the ultima (*U*); where *P* is penalt, *aP* is antepenalt, and *X* is the syllable preceding the antepenalt.

Chart 2
LOCATION OF GLIDES WITHIN NOUN STEMS

<i>X</i>	<i>aP</i>	<i>P</i>	<i>U</i>
3	2	13	93

2.4. Stress. Stress is nonphonemic. In analogous environments syllables: (1) with *a*, *e*, or *o* have more stress than those with *ɪ*, *i*, or *u*; (2) with high, rising, or falling tones have more stress than those with low; (3) with a phonetic stop onset have more stress than those with nonstop onset. Combinations of these features lead to varying degrees of non-contrastive stress.

NOTES

1. This paper was prepared under the auspices of the Summer Institute of Linguistics. The material for it was collected over a period of two years residence at the village of Ommomunta. Much of the detailed checking of this paper was done with the help of two informants, Aupi and Yaduma, both young men of about 18 years of age. The authors gratefully acknowledge the assistance and encouragement of Howard McKaughan and the editorial help of Alan Pence given in the preparation of this paper.

According to Wurm (1960), (1961) and (1961), Gadsup is a member of the Gadsup-Auyana-Tairora language family. It is spoken in the Eastern Highlands near Kainantu by over 7000 people constituting about three major dialects.

2. The high front vocoid [i] / [ɪ] occurs as a syllable nucleus in numerous utterances. As a syllable onset this vocoid occurs with friction [ɣ]. For example: diyî 'he opens', iyãmi 'a dog', yî'î 'sickness (their)', î'î 'song or dance'.

3. Refer to Frantz (1962) pp.46-7.

4. The lowered dot (.) is used to indicate the phonemic syllable break.

5. This contrast is apparently a characteristic of the group of languages of which Gadsup is a member. Bee and Glasgow (1962) found morphophonemic perturbation of tone on Usarufa nouns and noun phrases to be of a type distinct from that on verbs (p.117). McKaughan has in conversation mentioned that Tairora nouns and verbs manifested an obvious contrast after only preliminary analysis. There is also indication of the same sort of dichotomy in other New Guinea Highland languages (see in this volume Loving on Awa and Steinkraus on Tifalmin). We do not attempt to predict what may be the conditioning factors of such a contrast.

6. As implied in Section 1.31., nasal clusters do occur: ãnómî 'important man', ãnnõmî 'area at small of back'; ùmõnî 'theft', úmmómî 'day after tomorrow'. Geminate clusters of nasals on nouns do not occur at stem final positions. Length of nasals at such morpheme boundaries is

conditioned by the preceding vowel; long following i, A, or u; and following e, a, or o short.

7. A possible alternative to this analysis is to consider the glides to be close-knit tone sequences of the high and low tonemes, having special distributional characteristics. This interpretation would seem to present advantages in the description of the level allotones of the up-glide, and in correlating data from nouns with that from verbs. However, it is felt that total complexity is reduced by the analysis presented.

