

Cecilia Odé

*Irian Jaya Studies, Leiden University, The Netherlands*

*email: ode@rullet.leidenuniv.nl*

## ABSTRACT

A descriptive study of prosody in Mpur (West Papuan Phylum), an unwritten tone language with perceptually five tone contrasts, is presented, using the stylization method (see 1.). Three issues, observed at prosodic boundaries, are analysed and compared to their occurrence in other positions: 1) realization of tone; 2) vowel lengthening; 3) expression of emotive emphasis by means of repeated words, tail-head constructions, clitics and particles (2 and 3 frequently occur in the oral tradition of peoples of New Guinea). Results show that 1) level tones exhibit clearly audible pitch movements (falling or rising) at prosodic boundaries, sometimes with vowel lengthening; 2) vowels may be lengthened up to more than five times their original duration; 3) words may be repeated up to ten times without any change in the realization of tone; in tail-head constructions a reset (a jump upwards or downwards in the course of  $F_0$ ) may be observed.

## 1. INTRODUCTION

Mpur (West Papuan Phylum (WPP) [1], [2]) has ca. 5000 speakers in the Kebar valley, its surrounding mountains and on the north-east coast of the Bird's Head Area of Irian Jaya, Indonesia. On the basis of production and perception data, analysed by means of the perceptual analysis-by-resynthesis method for the stylization of pitch phenomena [3], a classification into five perceptual lexical tone contrasts has been arrived at: four level tones (high (ˊ), mid (unmarked), midlow (-) and low (ˋ)) and one contour tone (falling&rising (ˊˋ)) (henceforth H, M, ML, L, FR, respectively) [4], [5]; there are some dialectal differences. There is no evidence for phonemic lexical stress in Mpur. So far, the stylization method has successfully been applied to stress languages like English [6], Russian [7] and, recently, to a language with free lexical stress: Indonesian [8]. With the study of Mpur I have demonstrated that the stylization method is applicable to tone languages as well. For the present analysis, digital recordings were made during fieldwork in 1993/94/95. Eighteen speakers (5 female and 13 male between 20-55 years of age), differing in dialectal background, were recorded: prepared speech, i.e. words in isolation and in a small context pronounced after an Indonesian translation, spontaneous speech (daily life stories) and examples of the oral tradition (myths of origin, folk tales). Utterances were stored in a computer. In the examples below, tones are indicated with diacritics (see 1.); measured and compared vowels or syllables are underlined and in the translation the whole word in which these vowels occur is underlined. Prosodic boundaries are marked with /. After the examples, phonetic specifications are given which refer to the realization of the underlined

measured (pitch, duration) and stylized into 'close copies': a reduction of pitch movements to the smallest number of straight-line segments observing the criterion of perceptual equality [3]. Resulting stylized pitch contours can be experimentally verified. With this experimental phonetic approach, a formal description of pitch and duration phenomena can be presented; the data are fully accessible and can be reproduced. For the present analysis use is made of a new software package developed at the Institute for Perception Research, Eindhoven, the Netherlands: Graphical Interactive Processing of Speech (GIPOS) by E. Gigi (under the supervision of L. Vogten), in which the PSOLA (Pitch Synchronous Overlap Add) technique for speech synthesis (based on waveform editing) is implemented. Illustrations in this article are produced with GIPOS.

The analysis of tones in Mpur is still in process; for a final classification into phonemic types of tone, a further verification experiment is required. Yet, the available data supply sufficient evidence, e.g. in minimal tone pairs, for an operational description of perceptual tone contrasts as given above. At present, remaining problems are tones ML and FR; they will be dealt with in Odé [9], in which a production experiment with prepared speech is discussed. Therefore, in the present study I have limited myself to the analysis of words with tonal oppositions H, M and L. The issues analysed here are characteristic for spontaneous speech and for the oral tradition; from both types fragments have been selected.

## 2. PERCEPTUAL ANALYSIS

In this section, the perceptual analysis of the three issues mentioned in the abstract will be discussed: words occurring at prosodic boundaries and in initial or central position of an utterance are measured and compared to one another. Prosodic boundaries occur at a pause, a silence, a hesitation, a reset, and/or as a result of the temporal organization of an utterance, or at the end of a stream of thought. For the analysis utterances were selected from spontaneous speech and from examples of the oral tradition of two female (A, J) and three male speakers (S, M, W). Their initial is marked after each example.

vowel or syllable in Mpur: excursion size of pitch movements in semitones (ST); rate of change of a pitch movement in semitones per second (ST/s) (level pitch can have a slightly rising and/or falling movement of 2 ST or less which is not indicated, see 3.); the duration of the underlined vowel or syllable in milliseconds (ms). These

phonetic specifications are based on the stylized versions of the utterances. In the literal translation Mpur word order is maintained; to obtain a one-to-one translation, words in English are connected with a hyphen.

1) *The realization of tone.* In the examples below, realizations of tone at prosodic boundaries are presented and compared to non-final positions in utterances. Words were selected that occur in minimal tone pairs H vs. M vs. L.

a) H vs. L: *ján* 'house' vs. *jàn* 'not':

(1) *dójàp akú ján akú sór mabwán*/ 'they-two-live in house in mountains deep-inside' (level, 170ms) (M);

(2) *ndó nfo ján*/ 'I-alone I-go-up-into house' (-4 ST, -40 ST/s, 325ms) (M);

(3) *anar jàn àbrwano anar jàn*/ 'you-cry not he-calls you-cry not' (-8 ST, -40 ST/s, 180ms; -10 ST, -35 ST/s, 310ms) (M);

(4) *ján serà*/ 'house empty' (level, 235ms) (W);

(5) *dór jap tutem kú ján*/ 'they-two live together in house' (-12 ST, -40 ST/s, 310ms) (W);

(6) *ndaka pà sèrér jàn*/ 'this finished long not' (-11 ST, -35 ST/s, 325ms) (W);

b) H vs. M vs. L: *bé* 'but' vs. *bé* 'in' vs. *bè* 'fruit':

(7) *bé pér manká tow*/ 'but dog that barks' (level, 200ms) (S);

(8) *bawa út bé tèp*/ 'what stays in plate' (level, 205ms) (S);

(9) *kamàn bé manká út bé*/ 'pumpkin fruit that stays inside' (level, 150ms; -5 ST, -24 ST/s, 350ms) (S);

(10) *tèpò ukò bé*/ 'dishes-and cooking-pots-and but' (-4.5 ST, -12 ST/s, 450ms) (S);

c) H vs. M: *brwán* 'hole' vs. *brwan* 'to call':

(11) *brwán ata mèk*/ 'hole that there' (level, 300ms) (M);

(12) *mamér ata brwán pàre nnkúr è m*/ 's.o. wood that hole then she-enters' (level, 310ms) (M);

(13) *àbrwa àsukwèn mamér brwán*/ 'he-says he-sees s.o. wood hole' (-5.5 ST, -24 ST/s, 400ms) (M);

(14) *àbrwan fer pà*/ 'he-calls again already' (level, 170ms) (M);

(15) *ànar jàn àbrwano ànar jàn*/ 'you-cry not he-calls you-cry not' (level, 190ms) (M);

(16) *àsít súbwem* (5x) *àbrwan*/ 'he-runs follow (5x) he calls' (-12 ST, -50 ST/s, 400ms) (M).

2) *Vowel lengthening.* At a prosodic boundary, vowels in open and closed syllables can be lengthened as a means of boundary marking as well as a means of emphasis (see also 3) below). In the examples below, the durations of vowels occurring at a prosodic boundary are measured and compared to their 'normal' durations as observed in other positions.

(17) *kamàn brwa na Sasuà*/ vs. *brwa*/ 'pumpkin said to Sasual/ vs. *said*' (100ms vs. 500ms) (S);

(28) *...àkòn kú jaswāk/ àkòn kú jaswāke...* 'he-sleeps in hut/ he-sleeps in hut' (upwards reset of 3.5 ST) (S);

(29) *...tìn mpān sre/ tìn mpān sre...* 'sew sleepingmat old/ sew sleepingmat old' (upwards reset of 2 ST) (W);

(30) *...àret ntónà/ àret ntónà...* 'he-eats boychild/ he-eats boychild' (downwards reset of 4 ST) (M);

(18) *èun baín jàn*/ vs. *èun baín*/ 'we-go-to garden not' vs. 'we-go-to garden' (170ms vs. 400ms) (A);

(19) *kú ma Amtur àt è m ka*/ vs. *kú wári àt è m*/ 'at that Amtur mouth-of-river that/ vs. 'at river mouth-of-river' (200ms vs. 810ms) (J);

(20) *nén wór mbàng yaw*/ vs. *ínén wór mbàng*/ 'mama we-two here well' vs. 'my-mother we-two here' (155ms vs. 920ms) (M);

(21) *yèka ma yaw*/ vs. *perawi bàri kú ma*/ 'we that well/ vs. 'origin formerly at that/ (135ms vs. 325ms) (W).

3) *Expression of emotive emphasis.*

a) In everyday narratives and in the oral tradition, words may be repeated from three to ten times to express emotive emphasis. Many examples of such repetitions are found in recordings of all types of speech. Usually, realizations of types of tone do not change in the course of the utterance, except for the last realization at a prosodic boundary. Examples are:

(22) *(pér) tow tow tow tow tow* '(dog) barks' (only in the last realization a falling movement occurs: -7 ST/ -20 ST/s; the total duration is 1380ms) (S);

(23) *tási tási tási tási ké* 'it-didn't-work-out' (only in the suffix -e a falling movement of -8 ST/ -27 ST/s occurs; the total duration is 1750ms) (S);

(24) *téka téka téka téka àput àput àput àput àput* (*té kəwaík kəkú*) 'until he-closed-up (until strong very)' (*téka*: realized on one pitch level during 1100ms; *àput*: in the last realization of the word the pitch level is 5.5 ST higher and the duration two times shorter (250ms) than the first (500ms); the total duration of the utterance is 1900ms) (M);

(25) *àsubwem náw náw náw náw náw náw náw náw náw náw* 'he-chases-her she-runs-and-runs' (during the ten realizations, *F<sub>0</sub>* decreases with -13.5 ST, -3.5 ST/s, 3735ms) (M);

(26) *náw náw náw náw náw náw náw* 'she-runs-and-runs' (during the seven realizations *F<sub>0</sub>* increases with 8 ST, 3 ST/s, in the last realization a falling movement: -13 ST, -66 ST/s; the total duration is 2990ms) (M);

(27) *brwano-brwano-brwano* (*sik*) 'calling (doesn't-help)' (the words are realized on one pitch level, the total duration is 1280ms) (W).

b) Tail-head constructions are a very frequent phenomenon in the oral tradition of languages of New Guinea as a means to keep the flow of a narrative going. In such constructions, an upwards or downwards reset in the course of *F<sub>0</sub>* occurs, that is, the head of an utterance is realized higher or lower in the register of the speaker than the tail; sometimes there is no reset. For example (for clitics -e and -i see c) below):

(31) *...ntón nano anjape/ ntón nan anjap...* 'child you you-stay/ child you you-stay' (downwards reset of 3.5 ST) (M);

(32) *...àmen pér/ àmen pér fón...* 'he-takes-along dogs/ he-takes-along dogs many' (no reset) (S).

c) Another means for expressiveness, also occurring in other languages of the Bird's Head Area, are the emphatic

in hut/ he-sleeps in hut' (upwards reset of 3.5 ST) (S);  
 (29) ...*tìn mpān sre/ tìn mpān sre*... 'sew sleepingmat old/ sew sleepingmat old' (upwards reset of 2 ST) (W);

(30) ...*àret ntónà/ àret ntónà*... 'he-eats boychild/ he-eats boychild' (downwards reset of 4 ST) (M);

(31) ...*ntón nano anjape/ ntón nan anjap*... 'child you you-stay/ child you you-stay' (downwards reset of 3.5 ST) (M);

(32) ...*àmen pér/ àmen pér fón*... 'he-takes-along dogs/ he-takes-along dogs many' (no reset) (S).

c) Another means for expressiveness, also occurring in other languages of the Bird's Head Area, are the emphatic clitics *e* (exclamation; 'repeatedly'), *i* (continuation; 'I have not finished yet') or *o* (enumeration; appeal; 'also'). These clitics do not have an inherent tone and are usually realized with a clearly falling movement, frequently with vowel lengthening up to a duration of 1000ms. Examples are:

(33) *wàrkwa kututē* 'water takes-along' (-5 ST, -5 ST/s, 1010ms) (S);

(34) *mbwa ntón nano anjape* 'she-said child you you-stay' (level, 540ms) (M);

(35) *èjatut ntóni* 'we-give-birth-to child' (-2 ST, -4 ST/s, 460ms) (A);

(36) *bijèò a kotōwò kerēro* 'eel-and eh rat-and couscous-and' (-7 ST, -5 ST, -6 ST, 380ms, 450ms, 425ms, respectively) (A).

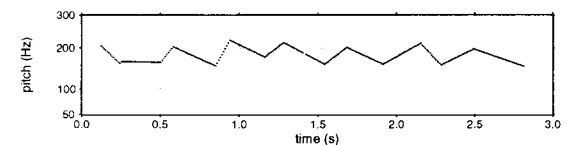
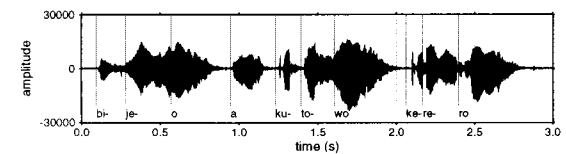
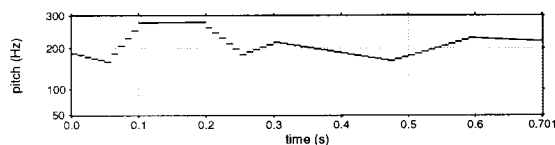
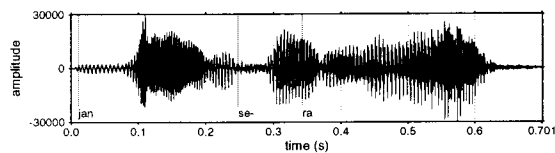
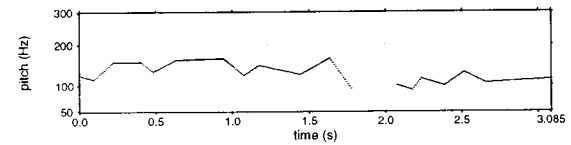
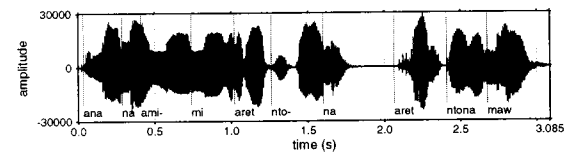
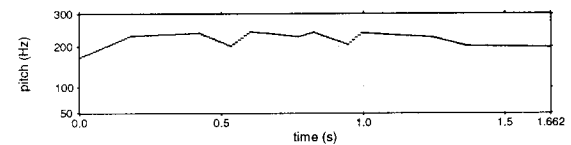
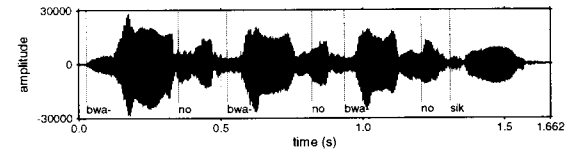
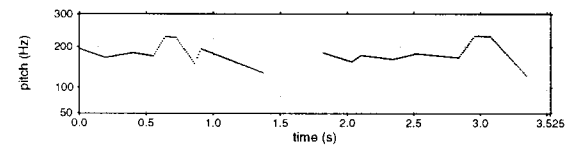
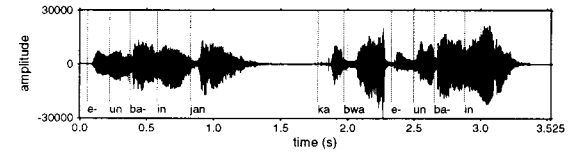
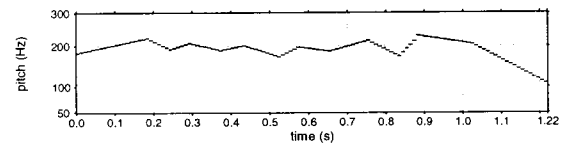
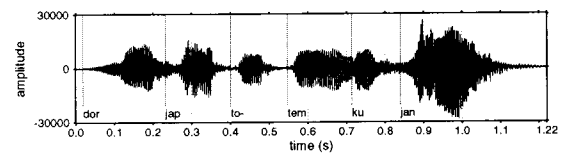
The particle *wa*, used to express disapproval like 'enough, don't, stop it', is realized with a long, low rising movement:

(37) *anar sajar wor jàn wà* 'you-cry reveal us not don't' (5 ST, 9 ST/s, 585ms) (M).

The particle *yaw* '(eh) well' occurs frequently at boundaries to fill (hesitation) pauses. The particle is realized with a falling pitch movement, for example:

(38) *kú wári te yaw* 'at river where well' (-3.5 ST, -18 ST/s, 380ms) (J).

In the illustrations below, produced with GIPOS (see above), waveforms and stylized pitch contours on an ERB-rate scale are presented of examples (4, 5, 18, 27, 30 and 36). In the waveform the text is indicated, labelled at the beginning of syllables.



per second (ST/s), were the results of an unpublished pilot experiment with 15 speakers.

In the perceptual analysis, slightly falling movements (-2 ST or less) with a varying but slow rate of change were classified as level realizations; they can be ascribed either to declination (the involuntary, physiologically determined tendency of  $F_0$  to decline gradually in the course of an utterance (but the rate of declination can be influenced intentionally by the speaker and thus be employed linguistically [3: 121ff.]), or to connecting rising or falling movements. In contrast, pitch movements at prosodic boundaries occur with an excursion size of at least 3 ST and a rate of change of at least 20 ST/s (note that the average values are much higher, see above); they cannot be ascribed to declination, but must be ascribed to intonation overruling the realization of tone. However, in realizations of level tones not at a boundary, rising or falling movements rather than levels were often observed that cannot be ascribed to declination (because of the type of movement, e.g. rising and/or too steep) or intonation (because of the position of the movement in an utterance) and that could not be “stylized away” in the given melodic context without introducing a perceptual difference. Depending on the melodic context, I sometimes needed more than one straight-line segment in syllables with level tones like, for instance, a level plateau before the beginning of the upward or downward segment, the timing of this turning point being rather subtle. According to the aim of stylizing pitch, which is to arrive at a most economic description of perceptually relevant events in the course of  $F_0$ , eventually all realizations will be classified and summarized into perceptually equivalent realizations of one type of tone; standard specifications of types can then be given.

2) *Vowel lengthening*. The results for measured vowel durations show that the vowel duration in a word at a prosodic boundary is three to six times longer than the vowel duration of that same word in other positions:  
 – not at a boundary: 100-200ms, mean duration is 150ms;  
 – at a boundary: 325-920ms, mean duration is 600ms. The longest durations were found in examples of emotive emphasis.

3. *Expression of emotive emphasis*. In sequences of repeated words, realizations of types of level tone are observed either on one pitch level or on a line inclining or declining with (-)5 ST to (-)13 ST; in the last syllable a falling pitch movement is usually observed. In tail-head constructions, a reset in the course of  $F_0$  occurs in most cases. No systematic differences between tail and head were found in the duration, though speakers (M) and (S) tend to increase their speech rate in the head with ca. 33%. Emphatic clitics and the particle *yaw* are realized with falling pitch movements. The particle *wa* is always realized with a rising pitch movement with an excursion size of 5 ST or more and a duration of 600ms or more.

Summarizing the three issues, it appears that the realizations of types of level tone H, M and L and vowel durations are strongly influenced by the position of the

words in an utterance in which they occur and by emotive emphasis. The data of the examples discussed in this article confirm my other data in a larger corpus of Mpur speech.

## ACKNOWLEDGEMENTS

The author wishes to express her gratitude to the Mpur speaking people in Kebar and Amberbaken, with special thanks to Amanda Ajoin, Mince Jambuani, Seppy Wabia, Markus Wabia and Moses Warijo.

\* This research is part of ISIR (Irian Jaya Studies: a programme for interdisciplinary research), a priority programme of NWO (Netherlands Organization for Scientific Research), financed by WOTRO (Netherlands Foundation for the Advancement of Tropical Research).

## REFERENCES

- [1] Voorhoeve, C.L. 1994. *Comparative Linguistics and the West Papuan Phylum*, Maluku & Irian Jaya, E.K.M. Masinambow ed., LIPI Jakarta, 65-90.
- [2] Reesink, G.P. 1996. “Morpho-syntactic features of the Bird's Head Languages”, in *Nusa*, vol. 40, Studies in Irian Languages Part I, ed. by Ger P. Reesink, 1-20.
- [3] Hart, J. 't, Collier, R., Cohen, A. 1990. *A perceptual study of intonation: An experimental phonetic approach to speech melody*, Cambridge, Cambridge University Press.
- [4] Odé, C. 1995. “Tones in Mpur”, in *Proceedings of the XIIIth International Congress of Phonetic Sciences 95*, vol. 4, 216-219, Stockholm.
- [5] Odé, C. 1996. “Mpur tones and intonation in an Amberbaken myth”, in *Nusa*, vol. 40, Studies in Irian Languages Part I, ed. by Ger P. Reesink, 61-96.
- [6] Pijper, J.-R. de 1983. *Modelling British English Intonation*, Dordrecht, Foris Publications.
- [7] Ebing, E.F. 1997. *Form and function of pitch movements in Indonesian*. CNWS Publications, vol. 55, Leiden CNWS.
- [8] Odé, C. *Russian intonation: a perceptual analysis*. Amsterdam/Atlanta, Rodopi.
- [9] Odé, C. 1997 (in preparation). “Intonation and the realization of types of tone in Mpur”, ESCA Tutorial and Research Workshop On Intonation, Athens.