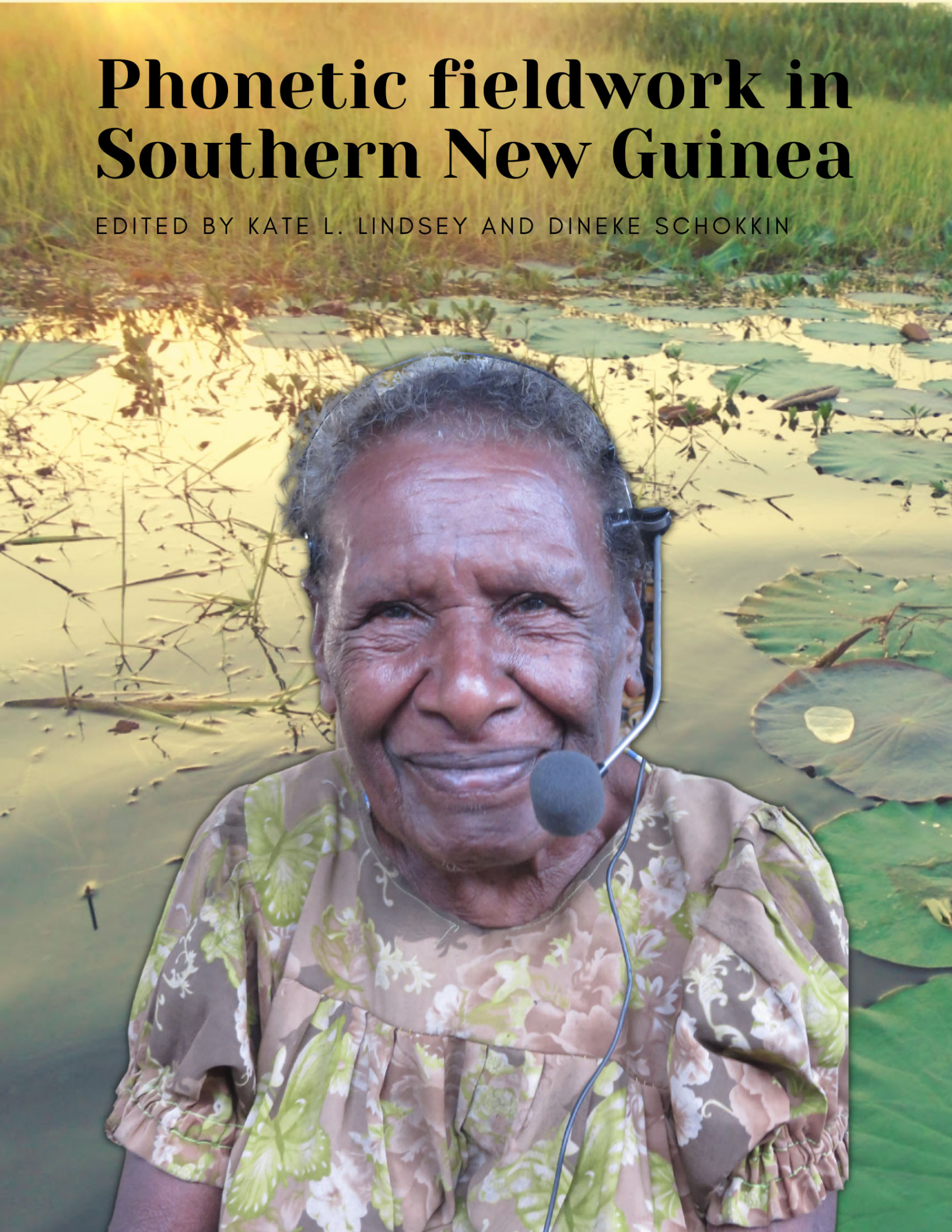
Phonetic fieldwork in Southern New Guinea

EDITED BY KATE L. LINDSEY AND DINEKE SCHOKKIN



Phonetic fieldwork in Southern New Guinea

edited by
Kate L. Lindsey
Dineke Schokkin

Published as a Special Publication of Language Documentation & Conservation

Language Documentation & Conservation
Department of Linguistics, UHM
Moore Hall 569
1890 East-West Road
Honolulu, Hawai‘i 96822
USA

http://nflrc.hawaii.edu/ldc

University of Hawai‘i Press
2480 Kolowalu Street
Honolulu, Hawai‘i 96822
USA

Cover design by Kate L. Lindsey featuring Pingäm Wäziag, an Ende speaker of Limol village.

Library of Congress Cataloging in Publication data
ISBN-13: 978-0-9979673-2-6

http://nflrc.hawaii.edu/ldc
http://hdl.handle.net/24999

Contents

Contributors to this special issue

JASON BROWN is an associate professor in Linguistics at the University of Auckland. His research focuses on theoretical phonology and morphology. He has carried out language documentation projects in British Columbia, Canada, and in the Pacific. His current work is dedicated to the documentation of the languages of Bougainville in Papua New Guinea, with related community projects on literacy and language teaching materials development.

MATTHEW J CARROLL is a postdoctoral fellow in the ARC Centre of Excellence for the Dynamics of Language at the Australian National University (ANU). He is supported by an Endangered Languages Documentation Programme postdoctoral grant to document the Yei branch of the Yam family and his PhD involved the grammatical description of Ngkolmpu, a Yam language spoken in West Papua. In addition to his language documentation and description work, he held a Newton International fellowship hosted at the Surrey Morphology Group working on issues of verbose and distributed exponence as well as on formalising the processes and assumptions of morphological typology.

CHRISTIAN DÖHLER is a researcher at the Leibniz-Centre General Linguistics (ZAS), Berlin, Germany. He has been carrying out fieldwork on the languages of Southern New Guinea since 2010. Between 2010 and 2016 he was one of the principal investigators of the documentation project "Nen and Komnzo - Two languages of Southern New Guinea" funded by the Volkswagen Foundation. He has published a grammar of Komnzo and a number of articles on the verb morphology as well as on sociolinguistic topics of Komnzo. Between 2017 and 2019, he was the principal investigator of the documentation project "A comprehensive documentation of Bine - a language of Southern New Guinea" funded by ELDP. He has collected information on the following languages spoken in the Southern New Guinea area: Anta, Arammba, Bine, Kancha, Komnzo, Gizrra, Nama, Nen, Idi, Blafe, Ranmo, Rema, Wartha Thuntai, Wära, Wérè, Wipi. He is currently working on the topics of language documentation and description, indigenous multilingualism and distributed exponence in verb morphology.

NICHOLAS EVANS is a Distinguished Professor in Linguistics at the Australian National University and directs CoEDL, the ARC Centre of Excellence for the Dynamics of Language. He has carried out wide-ranging fieldwork on indigenous languages of northern Australia (since 1982) and Southern New Guinea (since 2008). In addition to grammars of Kayardild and Bininj Gun-wok, and dictionaries of Kayardild, Dalabon and Nen (the latter in online format), he has edited collections of numerous linguistic topics, including on Non-Pama-Nyungan languages (2003), Insubordination (2016) and Polysynthesis (2017). His crossover book Dying Words: Endangered Languages and What They Have to Tell Us sets out a broad programme for engaging with the world's dwindling linguistic diversity and has been translated into French, Japanese, German and Korean. He has also worked as a linguist, interpreter and anthropologist in Native Title claims in Australia, and a promotor and interpreter of Aboriginal Art.

VOLKER GAST is a Professor of English Linguistics at the Friedrich Schiller University of Jena (Germany). His main research interests are in language comparison, language documentation and language technology. In his typological studies he focuses on function words and the lexicon. He has carried out fieldwork on languages from Mesoamerica (specifically Mayan and Mixe-Zoquean languages) and Southern Papua New Guinea (in a documentation project of the Pahoturi River language Idi). He is also interested in the processing, visualization and quantitative analysis of field data.

TINA GREGOR received her PhD from the Australian National University in 2021. Her thesis is a grammatical description of Wanam-Yelmek, a member of the Yelmek-Maklew family spoken in West Papua. During her fieldwork, she collected material from all four

language varieties of the previously under-described Yelmek-Maklew family. All collected material is archived with the Pacific and Regional Archive for Digital Sources in Endangered Cultures (PARADISEC).

ERI KASHIMA is a postdoctoral researcher at the University of Helsinki, Finland. She received her PhD from the Australian National University in 2020 for her dissertation on Nmbo, a Yam language of Papua New Guinea. Her dissertation was a descriptive sketch grammar of Nmbo combined with quantitative investigations of language variation. Eri is currently part of the European Research Council-funded typological project "Linguistic Adaptation: Typological and Sociolinguistic Perspectives to Language Variation". She is continuing research on variation in Nmbo, and is involved in research of rural multilingualism, and sociolinguistic typology.

KATE LINDSEY is an Assistant Professor of Linguistics and director of the Structures of Under-researched Languages (SULa) lab at Boston University. She has done descriptive, documentary, and sociolinguistic fieldwork internationally, including in northern California, Chuvashia, eastern Estonia, and Southern New Guinea. She has been actively involved with the Pahoturi River-speaking communities of the South Fly (Papua New Guinea) since 2015, most directly with the Ende-speaking community of Limol. In collaboration with the Ende tribe and visiting researchers, she has produced six books for the community (in Ende), one community-directed auto-documentary on Ende ways and the local conversion story (in Ende), and one dissertation that both investigates the phonological structures of Ende and presents a preliminary grammar and dictionary of the language. She has received funding and won awards to continue her work documenting and describing the Pahoturi River languages.

ALEX MUIR is a Ph.D. candidate in Linguistics at the University of Auckland. His research focuses on aspects of the syntax of several Kiwaian (and other) languages. His documentation work on the Urama language has resulted in a jointly authored book, *A short grammar of Urama*, published in 2016.

ROBBIE PETTERSON has worked with various PNG Gulf Province language groups since 1984, assisting with translation and literacy projects under the auspices of SIL-PNG. He has worked at developing literacy materials for the Urama since 2005. He earned an MPhil in Linguistics at Massey University (New Zealand) in 2002.

PHILLIP G. ROGERS is a Ph.D. candidate in the Department of Linguistics at the University of California, Santa Barbara. He has carried out collaborative language documentation and description work with speakers of the Bitur and Abom languages in Southern New Guinea, some of which was supported by a grant from ELDP. In his other research, he uses corpus, computational, experimental, and quantitative methods to investigate a variety of questions in linguistic typology and psycholinguistics. His dissertation is an exploration of the syntactic distributions of words across many languages, revealing how the architecture of the lexicon is structured for efficient use.

DINEKE SCHOKKIN is a Lecturer in Linguistics at the University of Canterbury, Christchurch, New Zealand. She has done fieldwork-based linguistic description and documentation since 2010, and specialises in two typologically distinct languages of Papua New Guinea: Paluai (Oceanic) spoken on Baluan Island in Manus Province, and Idi (Pahoturi River), spoken in Western Province. Her research combines methodologies from language documentation and description, sociolinguistics and corpus linguistics, with the aim to integrate these research fields. Further research interests include language contact and multilingualism, pragmatics and discourse strategies in underdocumented languages, and New Guinea island and its surroundings as a linguistic area.

Language Documentation & Conservation Special Publication No. 24 (2021)
Phonetic fieldwork in Southern New Guinea
ed. by Kate L. Lindsey & Dineke Schokkin, pp. 1–4
http://nflrc.hawaii.edu/ldc/ http://hdl.handle.net/24990

Introduction: Phonetic fieldwork in Southern New Guinea

Kate L. Lindsey
Boston University

Dineke Schokkin
University of Canterbury

This special publication of Language Documentation & Conservation represents a collection of the first available phonetic descriptions of several languages of Southern New Guinea. This area encompasses the southernmost regions of Indonesia and Papua New Guinea. The languages included in this collection belong to multiple non-related, non-Austronesian, and non-Australian families and include Yelmek (Yelmek-Maklew family; by **TINA GREGOR**), Ngkolmpu (Yam family; by **MATTHEW CARROLL**), Nmbo (Yam family; by **ERI KASHIMA**), Idi (Pahoturi River family; by **DINEKE SCHOKKIN** and colleagues), Bitur (Trans-New Guinea family; by **PHILLIP ROGERS**), and Urama (Kiwai family; by **JASON BROWN** and colleagues). Our issue opens with an overview of the region's phonetic systems by **NICHOLAS EVANS** (p. 7), and then each language is detailed in turn. First, we will contextualize the format of this special issue and the methodologies used for collecting, analyzing, and archiving the data in Southern New Guinea.

Format

The linguistic landscape of the Southern New Guinea region is diverse, dense, and widely unexplored (Evans 2012). To facilitate comparative research in this area, we have formatted the phonetic descriptions in this volume to be similar to one another and to the two other published phonetic descriptions of Southern New Guinea languages: that on Nen (Yam; by Evans & Miller [2016]) and Ende (Pahoturi River; by Lindsey [2021]). Each of the articles in this issue describes the language's phonemic inventory and provides minimal pairs for both consonantal and vocalic contrasts. In addition, the phonetic qualities of each phoneme are described, and, where known, allophonic patterns are illuminated. Finally, each description concludes with a phonemically transcribed text with basic morphological glossing.

The symbolic representation used to represent the phonetic variation and phonemic categories for each language adheres closely to the guidelines developed by the International Phonetic Association for the use of the International Phonetic Alphabet (International Phonetic Association 1999). Likewise, the abbreviations used to provide morphological glossing for all language examples are those that have been conventionalized by the Leipzig Glossing Rules (Comrie, Haspelmath & Bickel 2015). Any unconventional glosses are defined in a footnote on first use.

We submitted this issue to the Language Documentation & Conservation journal intentionally because of their open-access policies and willingness to publish sound-based research articles with both embedded audio and supplemental materials. These practices increase the accessibility and quality of our data presentation, which is especially important when handling primary documentation and description materials from isolated language communities. Thus, throughout the following articles, care has been taken to exemplify each analysis with a language datum that has a suitable audio

recording. These recordings have been converted to MP3 files for embedding within the PDF and preserved as WAV files within each article's supplementary materials.

Methods

The analyses presented in this issue are based on data collected by linguistic researchers in collaboration with language experts. The recordings were made over a period of several months in a locale where the language is spoken on a daily basis. This data collection methodology, also called linguistic fieldwork, informed the analyses presented here by allowing the researchers to hear the language as spoken by many members of the community over a substantial period, even though the accompanying audio files may represent only one token as spoken by one speaker on one day. The lead researchers in this collection are not local members of the communities in which the languages under discussion are spoken. Thus, each analysis is somewhat biased by the unique positionalities, linguistic competencies, and theoretical backgrounds of each researcher. Long-term linguistic fieldwork allows for the types of prolonged conversations with linguistic experts that can better inform the analyses and mitigate researcher bias.

Besides these commonalities, there are some critical methodological distinctions among these works. Most notably, the data collections by **ERI KASHIMA** and by **DINEKE SCHOKKIN** and colleagues form part of a broader research effort aiming to explore sociolinguistic variation in small speech communities, the ARC Laureate project *The Wellsprings of Linguistic Diversity* (2014-2019). As such, these two researchers focussed on recording parallel data (including interviews and word lists) from a wide-ranging sample of speakers to capture interspeaker variation within communities. Data collections by other contributors to the volume are more representative of the classic type of language documentation projects, aiming at documentary and descriptive breadth, though not necessarily representing various social groups. In both cases, external researchers spent significant amounts of time familiarizing themselves with the languages as they are naturalistically spoken within the respective communities.

With this special publication, we highlight the importance of community collaboration and the use of fieldwork-based data when studying the phonetics of underdescribed languages. Having access to background knowledge about the language and its speakers enriches these studies in multiple ways. We also honour the speech communities, without whose collaboration this research would not have been possible, by maximising their visibility in each chapter and by explicitly acknowledging individuals who contributed whenever their wish is for us to do so.

This type of linguistic fieldwork methodology, however, comes with particular challenges. For instance, while all authors have taken the utmost care to select audio of suitable quality, available audio recordings reflect noisy field conditions. Recording audio in a strictly controlled environment is not an option for most if not all languages of the Southern New Guinea region. Second, these works reflect the first phonetic and phonological analyses of the languages in question, and for some, the first in the language family. Thus, they are presented without the enrichment from comparison with prior analyses of the language or related languages.

Nevertheless, we believe that the benefits these manuscripts bring to the language documentation enterprise and our understanding of the world's linguistic diversity outweigh these weaknesses. We hope that this special publication will inspire and encourage more linguistic fieldworkers to publish similar phonetic descriptions of under-researched languages.

More information on Southern New Guinea languages

If you would like to learn more about the languages of Southern New Guinea, there are a couple of resources available. First, four authors of this special issue have made all or many of the primary materials collected during fieldwork available through the Pacific and Regional Archive for Digital Sources in Endangered Cultures (PARADISEC) or the Endangered Languages Archive (ELAR). These collections include **TINA GREGOR**'s collection of Yelmek materials (Gregor 2015), **MATTHEW CARROLL**'s collection of Ngkolmpu data (Carroll 2012), **ERI KASHIMA**'s collection of Nmbo (Kashima 2014), **DINEKE SCHOKKIN**'s collection of Idi language (Schokkin 2014) and **PHILLIP ROGERS**' collection of Bitur recordings (Rogers 2018). Another essential resource is Evans and colleagues' (2018) chapter on the languages of Southern New Guinea in the comprehensive guide of *The Languages and Linguistics of Papua New Guinea* (Palmer 2018).

Acknowledgements

We gratefully acknowledge everyone who contributed to the publication of this special issue. From the language experts who worked with the authors of the following chapters, to the authors themselves who spliced hundreds of audio samples and integrated their phonetic observations and phonological analyses into cohesive narratives, to all the reviewers who offered constructive feedback, and of course to the editors of *Language Documentation & Conservation*, we thank you all for helping us produce a vital resource that celebrates the complexity and beauty of the languages of this region. We are very proud of this effort and hope it stimulates more successful collaborations in Southern New Guinea.

References

Carroll, Matthew J. 2012. *Languages of Southern New Guinea Project: Ngkolmpu (LSNG04)*. Collection LSNG04 at the Pacific and Regional Archive for Digital Sources in Endangered Cultures [Open Access]. doi: 10.4225/72/56E979083360E.

Comrie, Bernard, & Haspelmath, Martin & Bickel, Balthasar. 2015. Leipzig Glossing Rules: Conventions for interlinear morpheme-by-morpheme glosses. https://www.eva.mpg.de/lingua/resources/glossing-rules.php.

Evans, Nicholas. 2012. Even more diverse than we had thought: The multiplicity of trans-Fly languages. In Evans, Nicholas & Klamer, Marian (eds.), *Melanesian Languages on the Edge of Asia: Challenges for the 21st Century, Language Documentation and Conservation, Special Publication No 5*, 109–149.

Evans, Nicholas & Arka, Wayan & Carroll, Matthew J. & Choi, Yun Jung & Döhler, Christian & Gast, Volker & Kashima, Eri & Mittag, Emil & Olsson, Bruno & Quinn, Kyla & Schokkin, Dineke & Tama, Philip & Van Tongeren, Charlotte & Siegel, Jeff. 2018. The languages of Southern New Guinea. In Palmer, Bill (ed.), *The languages and linguistics of New Guinea: A comprehensive guide*, 641–774. Berlin: Walter de Gruyter.

Evans, Nicholas & Miller, Julia C. 2016. Nen. *Journal of the International Phonetic Association.* 46(3): 331–349.

Gregor, Tina. 2015. *Yelmek language recordings (TG1)*. Collection TG1 at the Pacific and Regional Archive for Digital Sources in Endangered Cultures [Open Access]. doi: 10.4225/72/57028F945E1A8.

International Phonetic Association. 1999. *Handbook of the International Phonetic Association: a guide to the use of the International Phonetic Alphabet*. Cambridge, U.K.: Cambridge University Press.

Kashima, Eri. 2014. *Recordings from Bevdevn (personal narratives, procedurals, opinions, traditional stories, interviews, future/irrealis narration), South-Fly District, Western Province, Papua New Guinea. (WSEK1)*. Collection WSEK1 at the Pacific and Regional Archive for Digital Sources in Endangered Cultures [Open Access]. doi: 10.4225/72/56E979EC6ED65

Lindsey, Kate L. 2021. Ende. *Journal of the International Phonetic Association*, 1-21. doi: 10.1017/S0025100320000389.

Palmer, Bill (ed.). 2018. *The languages and linguistics of the New Guinea area: A comprehensive guide*. Berlin/Boston: Walter de Gruyter GmbH.

Rogers, Phillip G. 2018. *Documentation and description of Bitur, a Lower Fly language of Papua New Guinea, and preliminary investigation of the moribund Abom language*. London: SOAS, Endangered Languages Archive.

Schokkin, Dineke. 2014. *Recordings of the Idi language (WSDS1)*. Collection WSDS1 at the Pacific and Regional Archive for Digital Sources in Endangered Cultures [Open Access]. doi: 10.4225/72/56E97A18E14F3.

1

Language Documentation & Conservation Special Publication No. 24 (2021)
Phonetic fieldwork in Southern New Guinea
ed. by Kate L. Lindsey & Dineke Schokkin, pp. 5–12
http://nflrc.hawaii.edu/ldc/ http://hdl.handle.net/24991

The phonetics of Papuan languages in Southern New Guinea: an overview

Nicholas Evans
Australian National University

The island of New Guinea and its surrounds remains at once the most linguistically diverse region on earth (with around 1,200 languages, i.e. a sixth of the world's languages in 1% of its land surface) and arguably the least studied.[1] This contrast is even more marked once one peels off the Austronesian languages wrapped around the north, east and west coastal regions and begins to investigate the 43 families and 36 isolates (Palmer 2018: 6) conventionally known as "Papuan," a term which does not entail any phylogenetic or typological unity but simply means "language which is spoken indigenously in the southwestern Pacific, and is neither Austronesian nor Australian." It is becoming increasingly clear that the extreme diversity of this region does not stop at the number of languages or genetic units, but extends out into structural characteristics at all realms of linguistic organisation.

Most relevant for this special issue, there is also great diversity in the phonetics and phonology of Papuan languages. We can use the publications in the 'Illustrations' series of JIPA (Journal of the International Phonetics Association) as a guide to how little we know about Papuan phonetics and phonology. Out of 175 published JIPA Illustrations (as at April 2021), only three are of Papuan languages: Nen (Evans & Miller 2016), Fataluku (Heston & Locke 2019) and Ende (Lindsey 2021).

This special issue focusses on one Papuan region, bringing together phonetic portraits of six languages from the Southern New Guinea (SNG) area. Until recently very little was known about any of the languages of this area (see Evans 2012, Evans et al. 2018 for surveys) but there has been a major research push over the last decade (see e.g., Carroll 2016, Döhler 2018, and Olsson 2017 for recent comprehensive grammars) and two recent JIPA illustrations have also appeared (Evans & Miller 2016 for Nen and Lindsey 2021 for Ende). The time is thus ripe to take stock of what we know of the phonetics of the region's languages.

Southern New Guinea (Figure 1) is a flat, alluvial region, about the size of Czechia and Slovakia combined, stretching from the Maro River to the west (in Indonesian Papua)

[1] For institutional and grant-agency support of my research on the languages of Southern New Guinea since 2008, I would like to thank the Australian Research Council (Grants: Languages of Southern New Guinea and The Wellsprings of Linguistic Diversity), the Volkswagen Foundation (DoBES project 'Nen and Tonda'), the Alexander von Humboldt Foundation (Anneliese Maier Forschungspreis), the Australian National University (Professorial Setup Grant) and the ARC Centre of Excellence for the Dynamics of Language (CoEDL). Most importantly, I thank the entire population of Bimadbn village for their hospitality and friendship, and especially Jimmy Nébni, Michael Binzawa, Yosang Amto and Goe Dibod, as well as speakers of other languages in their region for their patient teaching of the phonetics of Nen, Idi, Nmbo and other languages – it was the direct exposure to these languages, right from the first day of coming to the region in 2008 when Gus Iammata and Goe Dibod began teaching me Idi and Nen along the road from Dimsisi to Bimadbn, that made me realise how much phonetic diversity is present in the region. Finally I would like to thank Kate Lindsey and Dineke Schokkin for their editorial comments, and for giving me the opportunity to publish this brief overview here.

to the Fly River to the east (in Papua New Guinea), and mostly forming low-lying savannah, rainforest or swamp bounded to the north by the two aforementioned rivers and to the south by the Torres Strait. Most languages are small – ranging from a few hundred to a few thousand speakers – but on the PNG side of the region, they remain secure, still being learned by children. On the Indonesian side, they are starting to give way to Indonesian. For most groups, particularly the smaller ones, traditional "egalitarian multilingualism" prevailed (Haudricourt 1961, François 2012), with a significant proportion of marriages being linguistically exogamous and engendering bilingual households. But this has not led to any clear "linguistic area," in the sense of structural features distinctive of the region, and as we shall see below, this is as true for the phonetics as for other realms of grammar.

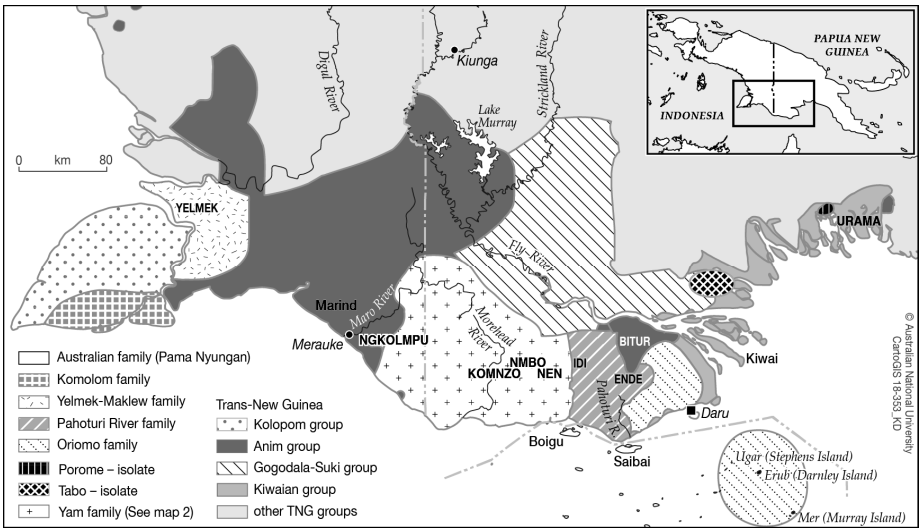


Figure 1. Map illustrating the prominent language families of Southern New Guinea

With around forty languages from seven maximal (i.e. currently unrelatable) clades, Southern New Guinea is arguably the third most diverse region of New Guinea, after the north coast and the Sepik. Four of its seven maximal clades (Evans et al. 2018) are represented in this collection – we did not manage to obtain contributions on the Komolom or Oriomo families, and the seventh clade, the Australian Pama-Nyungan family in the form of Kala Kawaw Ya, is likewise not represented here. For Yelmek-Maklew we have Tina Gregor's article on Yelmek. For Yam we have two of its three branches represented – Matthew Carroll's article on Ngkolmpu (Tonda branch), and for the Nambo branch we have Eri Kashima's article on Nmbo, complementing the recent article on the closely-related Nen in this journal (Evans & Miller 2016). For Pahoturi River we have the article on Idi by Schokkin and colleagues, offering interesting parallels and differences to the JIPA illustration of Ende by Lindsey (2021). For Trans-New Guinea we have two branches represented: Phill Rogers' chapter on Bitur, which belongs to the Lower Fly sub-branch of the Marind-Anim branch, and, for the Kiwaian branch, a description of Urama by Brown and colleagues. Note that the Trans-New Guinea family is very large, with between 300 and 500 languages (Pawley & Hammarström 2018), marking it the towering giant among Papuan language families. The spatial patterning of the Marind-Anim branch, consistent with downstream migration along the Fly and Maro rivers from origins in the Lake Murray region, suggests that they are a recent intrusion into Southern New Guinea, and as we shall see below, Bitur is rather unlike the other SNG languages in its phonological system. It is likely that the Kiwaian languages, including Urama, were also relatively recent downstream migrants into the region, but longer-established than the Marind-Anim languages, since all Kiwaian languages are

found around the Fly River mouth. Like Bitur, Urama has a simpler phonological system than the other languages represented here; it is also the only language represented that has a pitch accent system.

Reflecting on the diversity of the region on the phonological level, it is difficult to identify any typological features of the phonologies of Southern New Guinea, other than absences (e.g., no tone, no pitch accent or distinctive stress except for Urama, no ejectives etc.). The fact that all languages possess a contrast between voiced and voiceless stops[2] is somewhat unusual in the New Guinea context (where it would be more usual to contrast voiceless plain stops with voiced prenasalised stops), but hardly striking by world standards, nor is the fact that all languages in the sample have an /s/ phoneme. The number of linear positions for stops and nasals ranges from three (Yelmek, Bitur) up to five or six (Ende, Idi and Nmbo), depending on whether labial-velars and labio-velars are counted as an additional position, and whether retroflexes are treated as stops or affricates. Among nasals, only /m/ and /n/ are universally present: /ŋ/ is absent from Nmbo, Bitur and Urama (and from Nen), and /ɲ/ is absent from Bitur, Urama and Yelmek.

If we begin by looking just at the size of the consonant inventories, focussing on the six languages of this special issue of LDC plus the two recent JIPA illustrations (Table 1), we likewise see a span from what Maddieson (2005a) considers 'small' (Yelmek, Bitur, Urama) to what he considers 'moderately large' (Nmbo), with the smallest being Bitur and Urama (13 consonant phonemes each[3]) and the largest Nmbo (28). It is worth noting that the baseline for New Guinea consonant inventories is low, since New Guinea languages tend to have smaller-than-average consonant inventories (Maddieson 2005a: 149); it is also worthy of note that the two Trans-New Guinea languages in our sample (Bitur and Urama) have the smallest consonant inventories, typical for Trans-New Guinea languages which typically have consonant inventories in the 10-15 range (Pawley & Hammarström 2017: 82).

Table 1. Phoneme inventory sizes in the languages of this issue (plus Nen and Ende). The 'qualitative' measure places inventory sizes in the proposed brackets for worldwide phonological inventory sizes in Maddieson (2005a,b); note that for vowels, his brackets refer to vowel quality only, not to length, nasalisation, etc.

	C (N)	C (qualitative)	V (N)	V (qualitative)
Yelmek	13	Small	7	large
Ngkolmpu	16	Moderately small	7	large
Nmbo	28	Moderately large	8	large
Nen	23	Average	8	large
Idi	21	Average	8	large
Ende	19	Average	7	large
Bitur	13	Small	5	average
Urama	13	Small	5	average

There is more consistency within the vowel systems, with the range of qualities spanning 5 (Bitur, Urama) to 8 (Nmbo, Nen and Idi). All languages but Bitur and Urama have shorter, centralised vowels whose analytic status is complicated but for which contrastive pairs with other vowels can be found in at least some contexts. The cluster of languages

[2] Though in Ngkolmpu the contrast is not wholly symmetric: there is no contrast among coronal stops, and the voiced velar consonant /g/ is confined to loanwords. This means that the only stop position with an entrenched voicing contrast is the bilabial, /b/ vs /p/.

[3] For Urama this includes /s/, which Brown regards as marginal; omitting it would reduce the Urama C-inventory size to 12.

from the Pahoturi family and the Nambu branch of Yam contrast two short vowels whose quality is more centralised than the others (e.g., /ɐ/ vs. /ɪ/ in Nmbo; /ə/ vs. /ɪ/ in Nen and Idi), and in Idi and Nen these are integrated (especially in Idi) into the system of vowel harmony. The schwa has a marginal status in several of the Yam languages, being predictable (and hence analysable as non-phonemic and epenthetic) in Ngkolmpu and (almost) in Nen (i.e. it is only non-predictable in word-initial position); similar considerations apply in Nmbo, and in the Pahoturi languages Idi and Ende. The Idi system of vowels, described in the paper by Schokkin and colleagues, is a particularly interesting kind of cross-height vowel system, grouping "light vowels" (æ, i, u, ɪ) against "dark vowels" (a, e, o, ə). Urama is the only language in the set to have contrastive vowel length.

Turning to the more distinctive phonemes or phoneme groups of the region, particular mention needs to be made of the following six features.

1. ***Retroflexion*** in the Pahoturi languages Idi and Ende. In both these languages, the retroflex "stops" are actually postalveolar affricates or aspirates, with the point of articulation and the affrication/aspiration each playing a role as acoustic cues (seemingly in different proportions according to the speaker, at least in Idi). It is a moot point whether *place* or *manner* of articulation should be taken as the dominant feature – Schokkin and colleagues focus on place of articulation for Idi (e.g., using /ɖ/), while Lindsey focuses on both simultaneously (e.g., using /ɖʐ/ for what is structurally the equivalent phoneme). Retroflexion does not extend to nasals, but in Ende there is also a retroflex flap contrasting with the alveolar flap/tap – it appears that this contrast has been historically neutralised in Idi. More widely across the region (i.e. sampling into other Yam languages than Nen and Nmbo) retroflex segments are attested in such languages as Namo and Mblafe and probably reconstructable to proto-Yam (Evans et al. 2018, Evans 2019a).

2. ***Labial-velar stops***, voiceless, voiced and prenasalised, are found in Nmbo and Nen – in other words, this phenomenon is confined to (some) languages of the Yam family. They are not found in the other Yam language represented here, Ngkolmpu.

3. ***Rounded bilabial stops***, ***fricatives and nasals*** are found in Nmbo only among the languages of our sample. These contrast with plain bilabial stops, fricatives and nasals.

4. ***Relatively large sets of liquid phonemes*** (>2) are confined to the Pahoturi family: both Idi and Ende have three, augmenting a shared set (/r/, /l/) with a further liquid phoneme in each language (/ɽ/ in Ende and /ʎ/ in Idi); correspondence sets across these languages suggest that proto-Pahoturi had four liquids (*i.e.* all of these). Nmbo and Nen each have two (/r/ and /l/), while Yelmek (/l/ only) and Bitur (/r/ only) have but a single liquid.

5. ***Prenasalised obstruent phonemes*** present a classic difficulty of analysis – when should sequences like /nd/ be treated as unitary and when as clusters? This is particularly acute when certain word-positions, such as word-initial, neutralise the difference between prenasalised and plain obstruents in favour of the plain forms. Part of the reason for the differences in phoneme size for Ende and Idi, on the one hand, and Nen and Nmbo on the other, reflect different analytic approaches: Kashima's article on Nmbo treats these as unitary phonemes, whereas in the article on Idi by Schokkin and colleagues, they are analysed, as in Lindsey's (2021) treatment of Ende, neither as two full segments nor as a unitary segment, but instead the nasal element is treated as an underspecified feature of a particular segment that only surfaces when the segment it is associated with is a non-initial voiced obstruent. In both Idi and Ende this analysis is rendered attractive by the leftward floating of these nasal elements, within a phonological word, when there is a suitable host. In the other analytic direction, Carroll's article marshals evidence for the

unitary status of prenasalised obstruents, drawing on evidence from the general organisation of the phoneme inventory (notably prenasalised velar obstruents, but no velar nasals), phonetics (duration of prenasalised stops is only slightly longer than that of regular stops, whereas combinations of nasal plus stop are nearly double), and phonotactics, adding interesting evidence from the sonority hierarchy as it impacts Ngkolmpu phonotactics. It is clear that much scope remains for deeper investigation, both phonetic and phonological, into the behaviour of phonetic nasal+obstruent sequences across Southern New Guinea, and in our present state of knowledge, we cannot soberly claim that the differences reported on in this special issue always reflect real linguistic differences as opposed to differences of analysis.

6. ***Voiceless prenasalised obstruent phonemes*** are a rare phenomenon worldwide (prenasalised obstruents tending overwhelmingly to be voiced), but in Ngkolmpu the prenasalised obstruents are all voiceless (Carroll this issue), and in Ende there are both voiced and voiceless prenasalised obstruents (Lindsey 2021).

Apart from retroflexion (attested in some Yam languages, though not in any of the three considered here) each of the above features is confined to a single language family and so cannot be used to argue for any kind of diffusion of innovative phonological features. This is shown in tabular form (for consonants only) in Table 2, in which "x" marks the presence of a phoneme in a given language. All consonants found in any language of the sample are included, with some minor adjustments for analytic discrepancies and allophonic ranges.

From this table we can then calculate the similarity of consonant systems using an overlap measure – dividing the number of shared phonemes by some measure of the total number of phonemes. Care has to be taken here in devising the best measure: one could use the number of phonemes in the smallest inventory as the denominator, but that would exaggerate the similarity of languages with small inventories to all the others, e.g. Bitur would end up with a quotient of 1.0 with Nmbo, Nen, Idi and Ende. The phonemes from its very small and non-exotic inventory are a proper subset of the inventories of each of these languages bar Ngkolmpu and Urama – all 13 of its consonants are found in all of the other languages, except that /d/ and /z/ are not found in Ngkolmpu and /z/, /w/ and /j/ are not found in Urama. A partial way of eliminating this effect is to make the denominator the average of the consonant inventory sizes of the two languages being compared; this then lowers the overlap score between Bitur and Nmbo, Nen, Idi and Ende to the range 63.4%–76.5%. An overlap matrix for the languages in our sample is given in Table 3.

As can be seen, the highest overlap scores are between two pairs of related and neighbouring languages – Idi and Ende, which share 90.0% of their consonant inventory, and Nen and Nmbo, which share 86.3%. The third highest score, between Yelmek and Bitur, is likely due to the effects of their small and non-exotic inventories, producing a convergence in shared, ubiquitous segments. The overall range of shared consonant inventories runs from 51.3% (Idi-Urama) to 90.0% (Idi-Ende) with a mean of 68.9%.

Table 2. Matrix showing presence of phonemes across the SNG languages considered here, plus Nen and Ende. For purposes of this comparison, the Idi and Ende retroflex series are treated together, the various allophones of /z/ (fricative and affricated, dental and palatal) are lumped together, and the prenasalised obstruents in Idi and Ende are included in parentheses (though not phonemic, they are accorded a special status in these languages). Urama /s/ is also included in parentheses, though marginal in the language.

	Yelmek	**Ngkolmpu**	**Nmbo**	**Nen**	**Idi**	**Ende**	**Bitur**	**Urama**
p	x	x	x	x	x	x	x	x
b	x	x	x	x	x	x	x	x
^{m}p		x				(x)		
^{m}b			x	x	(x)	(x)		
b^{w}			x					
t	x	x	x	x	x	x	x	x
d	x		x	x	x	x	x	x
^{n}t		x				(x)		
^{n}d			x	x	(x)	(x)		
ʈ~ʈ^{ʂ}					x	x		
ɖ~ɖ^{ʐ}					x	x		
^{ɳ}ʈ						(x)		
^{ɳ}ɖ					(x)	(x)		
k	x	x	x	x	x	x	x	x
g	x	x	x	x	x	x	x	x
ʔ								x
^{ŋ}k		x				(x)		
^{ŋ}g			x	x	(x)	(x)		
k͡p			x	x				
g͡b			x	x				
^{ŋm}g͡b			x	x				
k^{w}					x			
g^{w}					x			
z~dʒ			x	x	x	x	x	
^{n}dz			x	x		(x)		
m	x	x	x	x	x	x	x	x
m^{w}			x					
n	x	x	x	x	x	x	x	x
ɲ			x	x	x	x		
ŋ	x				x	x		
ɸ			x					
β			x					x
ɸ^{w}			x					
β^{w}			x					
s	x	x	x	x	x	x	x	(x)
^{n}s		x				(x)		
h			x					x
r		x	x	x	x	x	x	x
ɽ						x		
l	x	x	x	x	x	x		
ʎ					x			
w	x	x	x	x	x	x	x	
j	x	x	x	x	x	x	x	

Table 3. Overlap matrix, calculated as the ratio of number of overlapping phonemes to the averaged number of phonemes between the two languages

	Yelmek	**Ngkolmpu**	**Nmbo**	**Nen**	**Idi**	**Ende**	**Bitur**
Ngkolmpu	0.759						
Nmbo	0.585	0.545					
Nen	0.667	0.615	**0.863**				
Idi	0.706	0.703	0.612	0.682			
Ende	0.750	0.743	0.638	0.714	**0.900**		
Bitur	**0.846**	0.759	0.634	0.722	0.765	0.687	
Urama	0.654	0.690	0.585	0.556	0.529	0.625	0.769

Apart from filling a significant gap in our phonetic documentation of the 860 or so Papuan languages, what this special issue does – by concentrating on a single region – is to show just how much phonetic diversity there is in languages spoken in close proximity. This is despite the many settings in Southern New Guinea where bi- or multilingual usage would be expected to have led to convergence. (But see Evans 2019b for arguments that contact can also produce divergence). Almost all the most distinctive features found in the region – retroflexion, rounded bilabials, labial-velars, richer sets of liquid phones – are quarantined within particular language families, suggesting there has been no diffusion of unusual features. The only interesting exception is the appearance of voiceless prenasalised obstruents in both Ngkolmpu, at the western extremity of the Yam languages, and Ende, far out of contact at the northern extremity of the Pahoturi languages.

It goes without saying that this small sample of languages just scratches the surface of the region's phonetic diversity – both the local region of Southern New Guinea, which certainly contains many phonological features not represented here, and the broader region of New Guinea as a whole. We hope that this small selection will whet the appetite of our readers to explore further the phonetics of this little-known and fascinating region.

References

Carroll, Matthew J. 2016. *The Ngkolmpu language, with special reference to distributed exponence*. Canberra: Australian National University. (Doctoral dissertation.)

Döhler, Christian. 2018. *A grammar of Komnzo*. Berlin: Language Science Press.

Evans, Nicholas. 2012. Even more diverse than we thought: The multiplicity of Trans-Fly languages. In Evans, Nicholas & Klamer, Marian (eds.), *Melanesian languages on the edge of Asia: Challenges for the 21st century. Language Documentation and Conservation special publication No. 5*, 109–49.

Evans, Nicholas. 2019a. Australia and New Guinea: sundered hemi-continents of sound. In Calhoun, Sasha & Escudero, Paola & Tabain, Marija & Warren, Paul (eds.), *Proceedings of the 19th International Congress of Phonetic Sciences, Melbourne, Australia 2019*, 16–19. Canberra: Australasian Speech Science and Technology Association Inc.

Evans, Nicholas. 2019b. Linguistic divergence under contact. In Cennamo, Michela & Fabrizio, Claudia (eds.), *Selected papers from the 22nd International Conference on Historical Linguistics*, 563–591. Amsterdam/Philadelphia: John Benjamins.

Evans, Nicholas & Miller, Julia C. 2016. Nen. *Journal of the International Phonetic Association.* 46(3): 331–349.

Evans, Nicholas & Carroll, Matthew J. & Döhler, Christian. 2017. Reconstructing the phonology of proto-Yam. (Paper presented at the Australian Linguistic Society conference, Sydney, December 2017.)

Evans, Nicholas & Arka, Wayan & Carroll, Matthew J. & Choi, Yun Jung & Döhler, Christian & Gast, Volker & Kashima, Eri & Mittag, Emil & Olsson, Bruno & Quinn, Kyla & Schokkin, Dineke & Tama, Philip & Van Tongeren, Charlotte & Siegel, Jeff. 2018. The languages of Southern New Guinea. In Palmer, Bill (ed.), *The languages and linguistics of New Guinea: A comprehensive guide*, 641–774. Berlin: Walter de Gruyter.

François, Alexandre. 2012. The dynamics of linguistic diversity: Egalitarian multilingualism and power imbalance among northern Vanuatu languages. *International Journal of the Sociology of Language* 214: 85–110.

Haudricourt, André-Georges. 1961. Richesse en phonèmes et richesse en locuteurs. *L'Homme* 1(1): 5–10.

Heston, Tyler M. & Locke, Stephanie. 2019. Fataluku. *Journal of the International Phonetic Association* 49(3): 419–425.

Lindsey, Kate L. 2021. Ende. *Journal of the International Phonetic Association*, 1-21. doi: 10.1017/S0025100320000389.

Maddieson, Ian. 2005a. Consonant inventories. In Haspelmath, Martin & Dryer, Matthew S. & Gil, David & Comrie, Bernard (eds.), *World atlas of language structures*, 10–13. Oxford: Oxford University Press.

Maddieson, Ian. 2005b. Vowel quality inventories. In Haspelmath, Martin & Dryer, Matthew S. & Gil, David & Comrie, Bernard (eds.), *World atlas of language structures*, 14–17. Oxford: Oxford University Press.

Olsson, Bruno. 2017. *The Coastal Marind language*. Singapore: Nanyang Technological University. (Doctoral dissertation.)

Palmer, Bill. 2018. Language families of the New Guinea area. In Palmer, Bill (ed.), *The languages and linguistics of New Guinea: A comprehensive guide*, 1–19. Berlin: Walter de Gruyter.

Pawley, Andrew & Hammarström, Harald. 2018. The Trans New Guinea family. In Palmer, Bill (ed.), *The languages and linguistics of New Guinea: A comprehensive guide*, 21–195. Berlin: Walter de Gruyter.

2

Language Documentation & Conservation Special Publication No. 24 (2021)
Phonetic fieldwork in Southern New Guinea
ed. by Kate L. Lindsey & Dineke Schokkin, pp. 13–32
http://nflrc.hawaii.edu/ldc/ http://hdl.handle.net/24992

A phonetic description of Yelmek

Tina Gregor
ARC Centre of Excellence for the Dynamics of Language,
Australian National University

Yelmek (pronounced [jel.mek]) is spoken in southern New Guinea on the Indonesian side of the island.[1] The variety under consideration in this paper is one of three distinct varieties of the Yelmek branch of the Yelmek-Maklew language family, a family without a genealogical link to any other language family in New Guinea or elsewhere. The variety in question here is used by people from the village of Wanam, which is the northernmost of the four villages attributed to the Yelmek branch (see map in Figure 1). I will refer to this variety simply as Yelmek, instead of Wanam-Yelmek. The entire language family is endangered due to language shift towards the national language, Indonesian. By my estimate, there are less than a thousand fluent speakers left for the entire family and there is a notable drop in proficiency in the younger generation.

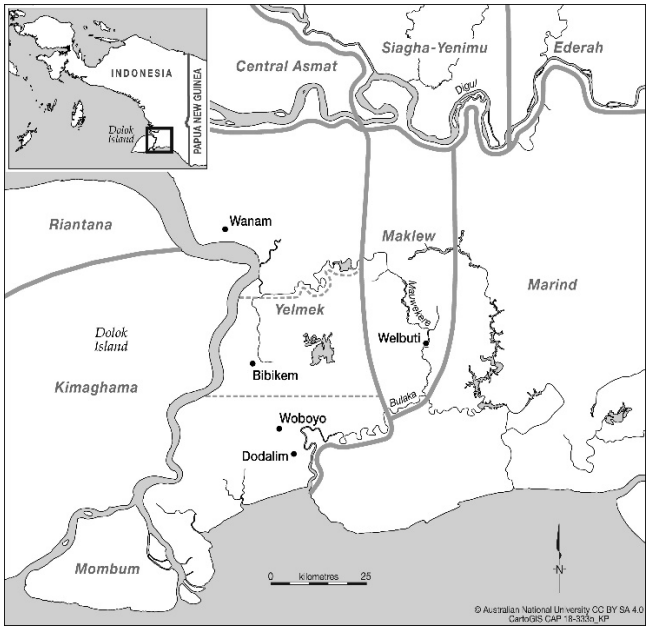


Figure 1. Map of the Yelmek-Maklew speaking villages. The map shows the boundary between the Yelmek branch and the Maklew brach, as well as between other languages, with an opaque line. The boundaries between the Yelmek languages are marked with a dotted line.

To date, there are very few published materials on any of the Yelmek-Maklew languages. Drabbe (1954) and Boelaars (1950) include a short grammatical sketch, and there are

[1] I would like to thank the Yelmek speech community who have generously hosted and supported me during my fieldwork. I am also very grateful to the Australian National University and the ARC Centre of Excellence for the Dynamics of language for generously funding and supporting my research on Yelmek.

some word lists like Lebold, Kriens & de Vries (2010), Geurtjens (1933) and Nevermann (1952). Furthermore, there is an attempt to reconstruct the Yelmek-Maklew phonology by Usher (2014) based on the sources above. Very little phonetic information, however, can be gained from this old material. Therefore, this illustration will provide the first phonetic account for Yelmek and, with it, the first insights into an entire language family.

The data presented here was collected by the author during several trips between 2015-2018 to Wanam and Merauke, the largest urban centre of the region, which many Yelmek speakers have moved to. The bulk of the sound examples are recordings of Liberata Gebze (LG), a Yelmek woman in her mid-twenties, who grew up in Wanam in a Yelmek speaking household. She moved to Merauke to attend boarding school at the high school level and still lives in Merauke today. For sound examples not provided by LG, speaker initials are given. These correspond to the speaker index at the end of the paper. All speakers who provided data for this paper attended school in Indonesian and speak that language fluently as well as Yelmek.

1 Consonants

Yelmek has 13 consonant phonemes (Table 1). This inventory is "small" in terms of the Maddieson (2013) sample in the World Atlas of Language Structures. It is also relatively small compared to other languages of the region. The neighbouring language Coastal Marind, for instance, has 19 consonant phonemes (Olsson 2017). Other languages discussed in this special issue are even richer in phonemes; Nmbo, for instance, has 28 (Kashima this volume).

There are three places of articulation for plosives and nasals: bilabial, alveolar, and velar. There is only one fricative phoneme /s/ and it is only found in very few lexical items. Furthermore, there are two approximants: /j/, /w/ and one lateral /l/. I have not found any evidence of co-articulated phonemes, such as prenasalised or labialised stops. Drabbe (1954: 549) lists prenasalised /mb/ and /nd/ and for Yelmek, but I have not found any convincing examples for this in my corpus.[2]

Table 1. Consonant inventory of Yelmek.

	Bilabial		**Labio-velar**	**Alveolar**		**Velar**	
Plosive	p	b		t	d	k	ɡ
Nasal		m			n		ŋ
Fricative				s			
Approximant			w				j
Lateral approximant					l		

The practical orthography I use in my corpus deviates from the International Phonetic Alphabet (IPA), in some instances. The practical orthography is based on Indonesian, since Yelmek speakers are familiar with it; hence /j/ is spelled <y> and /ŋ/ <ng>. I will use the IPA symbols in this paper to reduce confusion.

[2] Besides the prenasalised stops, Drabbe (1954) list the same consonants that I have found, except that he did not find any fricatives in Yelmek. For the closely related language Maklew, however, he lists /s/, /h/ and /f/.

1.1 Plosives

There are contrasting voiced and unvoiced plosives at three places of articulation: bilabial, alveolar, and velar. The distinction is, however, only made in word-initial and intervocalic positions. In word-final position, the voicing depends on the following segment. Utterance-final plosives show a voicing bar, which indicates that they are voiced by default in this position. Table 2 shows minimal pairs for the voicing distinction in plosives.

Table 2. Minimal pairs for voicing distinction in plosives.

Place of articulation	Voiced		Voiceless	
Bilabial	ba$_{(1)}$[3]	'FUT.N1SG'	pa$_{(2)}$	'3SG.F.REC'
	kiba$_{(3)}$	'cook.PL.SBJ.REC'	kipa$_{(4)}$	'take.PL.SBJ.REC'
Alveolar	da$_{(5)}$	'feet'	ta$_{(6)}$	'enter.REC'
	ŋodo$_{(7)}$	'sound'	ŋoto$_{(8)}$	'fill.PRS'
Velar	gaga$_{(9)}$	'language'	kaga$_{(10)}$	'grandkin'
	agəl$_{(11)}$	'body'	akəl$_{(12)}$	'banana'

The voiceless variant of the plosives has a positive voice onset time (VOT), while the voiced variant has prevoicing. That means there is voicing during the closure of the stop before the actual release. This is exemplified with the spectrograms and waveforms for the two particles *ba* 'FUT.N1SG'[4] and *pa* '3SG.F.REC' (Figure 2). The selection hairs mark the time from the beginning of the voicing until the onset of the vowel for [ba] (141ms). For [pa], it marks the time from the release to the onset of the voicing (12ms). Both figures show a two-second window for easy visual comparison.

The VOT of /k/ can be twice as long as for /p/ and /t/, both in word-initial and in intervocalic position. This could be considered aspiration, but is not contrastive.

In word-final position, the voicing distinction is not contrastive. There are no minimal pairs in which the voicing of the plosives creates a difference in meaning. Rather, the voicing of word-final plosives is determined by assimilation to the voicing of the initial segment of the following word. This pattern is illustrated in Figure 3 for the word /jəp/$_{(13)}$ 'middle'. Figure 3 shows the spectrogram of /jəp ban/$_{(14)}$ 'from the middle'. Because the initial plosive of the postposition is voiced, the final plosive of /jəp/$_{(13)}$ is also voiced, which is visible as continuous voicing in the spectrogram. Even though the release of the final plosive is not audible, there are two plosives present, which is evident from the increased duration. The continuous duration in of /jəp ban/$_{(14)}$ 'from the middle' is 222ms long, compared to a single /b/ as in *kiba*$_{(3)}$ 'cook.PL.SBJ.REC', which is only 102ms. If a final plosive is followed by a word starting in a voiceless consonant, then it is voiceless. Plosives at all places of articulation are subject to this rule of assimilation.

[3] Subscript numbers after examples refer to the accompanying sound files.

[4] Glossing abbreviations conform to the Leipzig Glossing conventions (Comrie et al. 2015). Non-standard abbreviations include: EXCL – exclamative, N1SG – non-first-person-singular.

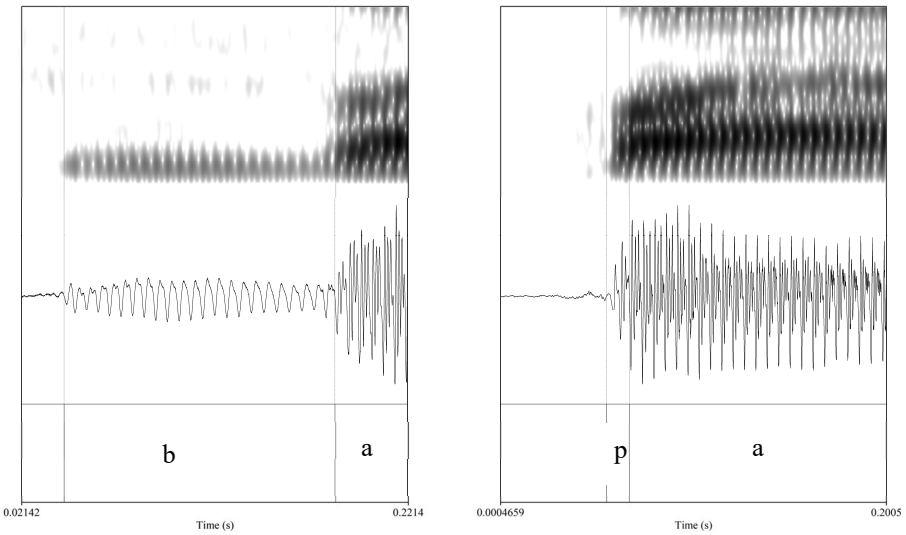


Figure 2. Spectrogram and wave form of *ba* 'FUT.N1SG' and *pa* '3SG.F.REC' (LG)

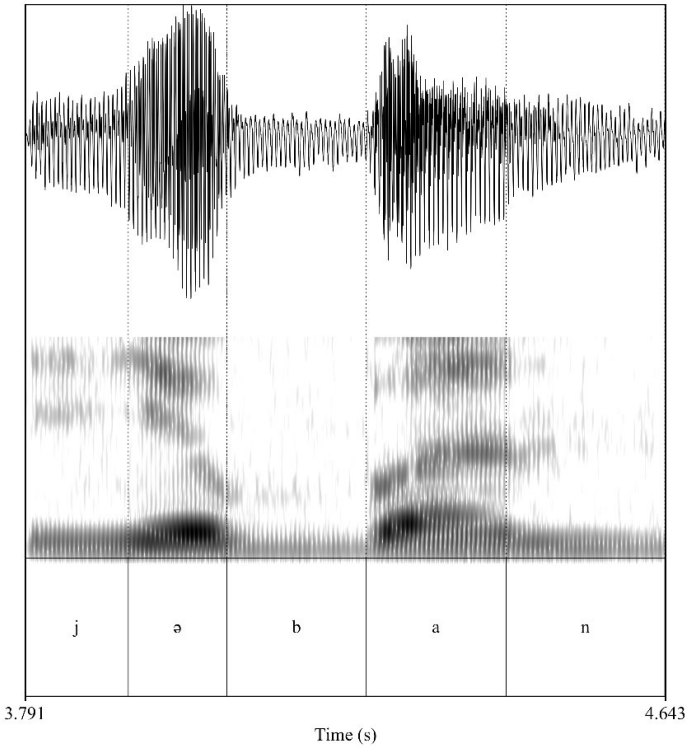


Figure 3. Spectrogram and waveform for /jəp ban/(14) 'from the middle'

There is, however, a peculiarity of alveolar plosives. Alveolar plosives in word-final position tend to be pronounced as alveolar trills when followed by a voiceless consonant, particularly in fast speech. Figure 4 illustrates this for the phrase /kagebed kəm/(15) 'It is his grandfather', pronounced [kaɡeberkəm]. There is some variation between speakers and also intra-speaker depending on speech rate.

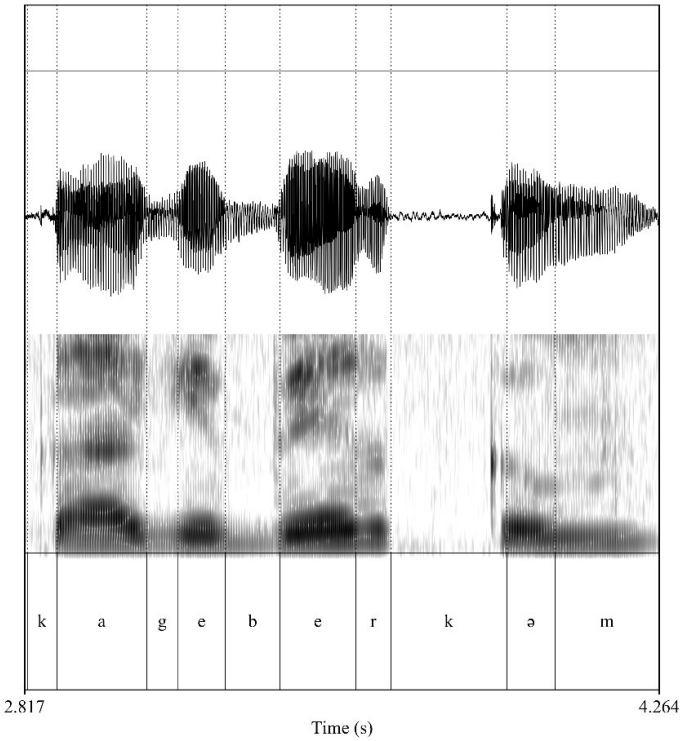


Figure 4. Spectrogram and waveform for [kageber kəm](15) 'It is his grandkin.'

1.2 Nasals

Nasals also contrast at the bilabial, alveolar, and velar places of articulation. All of them can occur word-initially, word-finally, and intervocalically, as illustrated in Table 3.

Table 3. Minimal pairs and near-minimal pairs for the three nasal positions.

	n		**m**		**ŋ**	
Initial	momo(17)	'breast'	noma(16)	'fruit'	ŋomo(18)	'exchange'
	maija(19)	'NEG'			ŋaija(20)	'fall.REC'
Medial	ŋame(22)	'COP.F'	ŋane(21)	'COP.M'		
	ima(24)	'what'	ina(23)	'two'		
	noma(16)	'fruit'			oŋa(25)	'sago, food'
Final	dam(27)	'inside'	dandan(26)	'wok'	daŋ(28)	'stand'
	jam(29)	'cold'			jaŋ(30)	'child'
	dəm(31)	'fish'			dəŋ(32)	'rope'

1.3 Fricatives

Fricatives are very rare in Yelmek. There are only two fricatives, /s/ and /h/, and each occurs in a small number of lexical items. The /s/, for instance, is only found in seven

items (see 1) in my comparative word list of 364 core vocabulary items.[5] Usher (2014) even claims it is only found in loanwords. Examples (1a-c), are very likely loans from Marind (Bruno Olsson p.c.), but the origin of examples (d-g) is presently unclear.

(1) a. meswak$_{(33)}$ ‘old (human)’
b. sendawi$_{(34)}$ ‘east wind’
c. sawok$_{(35)}$ ‘brother-in-law’
d. paswak$_{(36)}$ ‘arrowhead’
e. buinasem$_{(37)}$ ‘tomahawk’
f. sak$_{(38)}$ ‘eagle’
g. kemusu$_{(39)}$ ‘star’

(speaker WK)

The only other fricative that irregularly appears is a glottal /h/. However, the evidence for its phonemic status is rather weak and I do not consider it a phoneme at this stage. Speakers volunteered minimal pairs with and without /h/ word-initially. However, there is considerable variation between speakers and within speakers as to when /h/ is realised and when it is dropped. There are no minimal pairs in the corpus for /h/ in intervocalic or final position.

1.4 Lateral approximants

The lateral approximant /l/ frequently occurs intervocalically, word–finally, and in consonant clusters. It does not, however, occur word-initially. Example (2) contains a list of minimal pairs with /g/, /d/, and /m/. The /l/ in some instances sounds velarised, but the conditioning environment is not yet clear.

(2) a. ele$_{(46)}$ ‘fish bone’
ege$_{(40)}$ ‘tree’
b. alpol$_{(47)}$ ‘hand.ACC’
alpod$_{(48)}$ ‘hand.INS’
c. kəl$_{(49)}$ ‘teeth’
kəm$_{(50)}$ ‘COP.3’

1.5 Approximants

Yelmek also has two non-lateral approximants: labio-velar /w/ and palatal /j/. In (3), minimal pairs for /w/ and /j/ are listed. Phonetically, the difference between /w/ and /u/, as well as between /j/ and /i/ is gradient. This is further complicated by the fact that vowel combinations are very flexible in Yelmek, which makes the distinction between a complex nucleus and a simplex nucleus followed by an approximant not straightforward. Generally, I treat them as approximants if they are syllable-initial, and as vowels if they are syllable-final.

[5] This is a list compiled for the comparative study of Southern New Guinea languages and includes words both from the standard 100 words list and regionally specific vocabulary items (Carroll et al. 2016). It is better known as the Yamfinder word list.

(3) a. wo(51) ‘mouth’
jo(52) ‘say’
b. wawa(53) ‘outside’
jaja(54) ‘aunt’

2 Vowels

Yelmek has seven vowel phonemes: three front vowels, /i/, /e/ and /a/, two central vowels, /ʉ/ and /ə/, and two back vowels /u/ and /o/. Vowel length is non-phonemic. In the practical orthography /a/, /i/, /e/, /o/ and /u/ are written with their respective IPA symbols, /ʉ/ as <uw>, and /ə/ is not written. In this illustration, the IPA symbols are used. In addition to the oral vowels, three marginal nasal vowels, [ẽ], [ã] and [æ̃], are produced by speakers for interactional purposes, as “non-lexical conversational sounds” (Ward, 2006). These nasal vowels are not distinct phonemes within lexical items. Figure 5 illustrates the vowel phonemes in a standardised vowel chart.

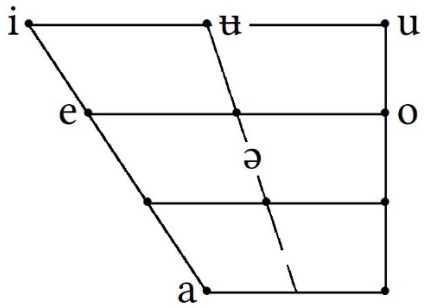


Figure 5. Vowel chart of Yelmek

Figure 6, on the other hand, shows the realisation of a sample of 154 vowel tokens[6] produced by a male speaker during a telling of the “North Wind and the Sun” story (speaker KG, Gregor 2016a). All measurements were done manually using Praat (Boersma & Weenink 2021). All plots were made in RStudio (RStudio Team 2015) using the ggplot2 package (Wickham 2016). The graph in Figure 6 represents the distribution of the vowels with concentric lines. Closeness and quantity of lines represent the density of the vowel token. The graph shows that all vowels cover quite a range of vowel qualities, especially the mid and low vowels. Their quality is heavily influenced by the surrounding segments and the speech rate.

Table 4 shows the vowel phonemes in minimal pairs and near-minimal pairs. The two central vowels differ from the other five vowel phonemes in some respects. For instance, the high-central /ʉ/ only appears in very few lexical items and it is only in contrastive with the high-back vowel /u/ in medial position. There is also a notable absence of a minimal pair between the schwa and the high-central /ʉ/. I attribute this,

[6] There are 154 tokens in total; 43 /a/, 30 /e/, 11 /ə/, 26 /i/, 21 /o/, 16 /u/, 7 /ʉ /. The vowel tokens either follow obstruents or are word-initial in the words they are taken from, except for some of the /ʉ/ tokens. Because of the rarity of /ʉ /, I admitted some tokens into the sample that follow sonorants.

however, to the rarity of /ʉ/. I have not found anything in the environment of schwa and /ʉ/ that would argue for them to be allophones. The schwa is discussed in more detail in the next section.

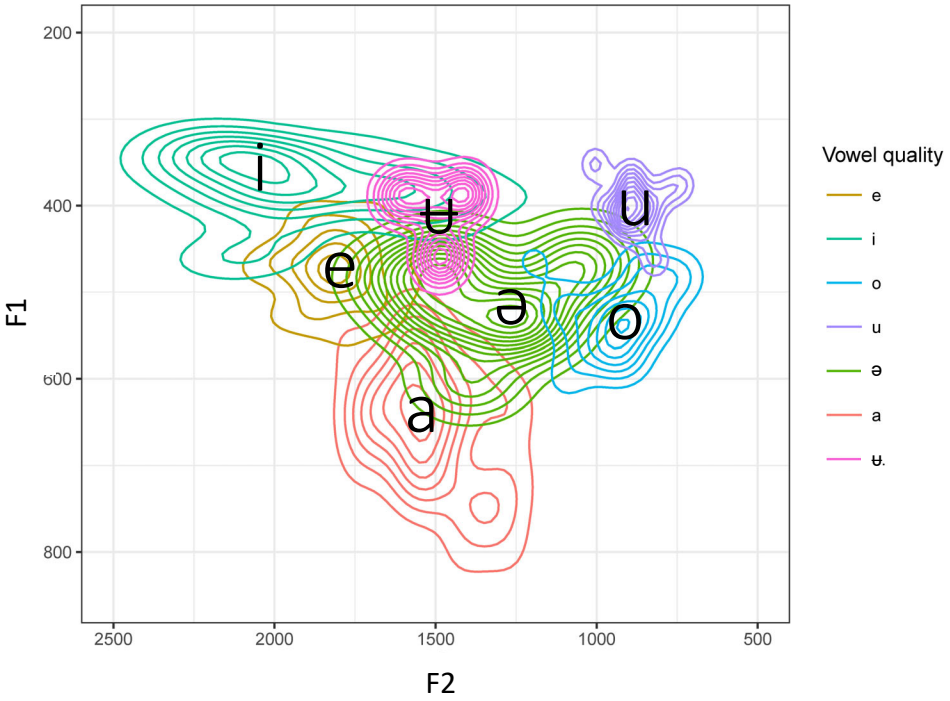


Figure 6. Vowel realisation by a male speaker telling the "The North Wind and the Sun" story

2.2 The status of schwa

The central vowel /ə/ is much more restricted in its environment than the other vowel phonemes. It does not occur word-initially or word-finally. It is also perceptibly shorter. Note that this is not the case for the other central vowel /ʉ/. It is, however, a phoneme and distinct from the schwas that are inserted into illicit consonant clusters. Even though they are phonetically similar, they differ on the level of phonology because the second one is merely epenthetic. Yelmek only allows a very restricted set of consonant clusters in syllable onsets and codas. Clusters are only allowed if the consonant closest to the nucleus is an approximant. Clusters prohibited in the syllabification process are broken up either by a syllable boundary or an epenthetic schwa. Vowel insertion is very salient in the context of affixation. If the affix is not a syllable by itself, it needs to be incorporated into the syllable structure of the stem. The most frequent example of this is the accusative suffix /-l/. Single consonants cannot form syllables by themselves in Yelmek. If /-l/ suffixes to a word that ends in a vowel, it simply becomes the coda of the last syllable, e.g. *alpo* 'hand' and *alpol*$_{(90)}$ 'hand.ACC'. If the stem ends in a consonant, however, an epenthetic vowel must be inserted to split the resulting cluster (see ex. 4b).

(4) a. /alpo/ + {-l} → [al.pol]$_{(90)}$

b. /op/ + {-l} → [o.pəl]$_{(91)}$[7]

[7] The sound files for both (4b) and (5) have the target word in a full phrase. Both utterances are from free narratives. (6) is cut from a free narrative as well.

Table 4. Minimal pairs and near-minimal pairs for vowel phonemes

[i]		**[e]**		**[ə]**		**[a]**		**[u]**		**[ʉ]**		**[o]**	
kilo(55)	‘build’	kela(56)	‘put.REC’	kəl(57)	‘tooth’	kal(58)	‘leaf’	kula(59)	‘cook.REC’			kolku(60)	‘scratch’
mui(61)	‘taro’					mua(62)	‘centipede’						
wi(63)	‘night’											wo(64)	‘opening’
bila(65)	‘throat’					bala(66)	‘big’						
wil(67)	‘grass’			wəl(68)	‘river’								
		bema(69)	‘later’			bama(70)	‘chew.REC’			bʉma(71)	‘nose’		
		webe(72)	‘heavy’									wobo(73)	‘place’
		dem(74)	‘with’	dəm(75)	‘fish’	dam(76)	‘inside’					dom (77)	‘bad’
				jəpəl(78)	‘wet season’							jopəl (79)	‘tomorrow’
		wew(80)	‘roof’	wəw(81)	‘beehive’								
				dəŋ(82)	‘rope’	daŋ(83)	‘stand’						
						balo(84)	‘thick’	bulo(85)	‘heart’				
						oŋa(86)	‘sago’					oŋo(87)	‘urine’
								nua(88)	‘tree spec.’	nʉa(89)	‘people’		

Furthermore, example (5) shows what happens, if another vowel is added to the suffix, here the focus marker /=i/. The clitic /=i/ forms a syllable with the accusative suffix /-l/ and no epenthetic vowel is necessary.

(5) /op/ + {-l} + {=i} → [op.li]$_{(92)}$

In contrast, the phonemic central vowel behaves differently. If the focus marker /=i/ attaches to a word like *akəl* 'banana' which has the [əl] as part of the stem, the schwa is retained, resulting in [a.kə.li] (6).

(6) /akəl/ + {=i} → [a.kə.li]$_{(93)}$ (speaker AK)

More evidence for the phonemic status /ə/ of comes from the first person object prefix /ŋə-/. In contrast to the accusative suffix /-l/ discussed earlier, /ŋə-/ contains the /ə/ as part of its morphological form, rather than being inserted as syllabification requirement. This is evident from the fact that it overrides the initial vowel of the verb root it attaches to.[11] This is exemplified in (7) with the verb 'to wrap', which has the root /oŋumo/. The initial /o/ is preserved when combined with other inflectional prefixes, but in example (7), the /o/ is omitted if the first-person object prefix is present. If the /ə/ were not part of the morphological form of the prefix, then the /ŋ/ would behave similarly to the accusative suffix /-l/; it would attach to the vowel-initial root without any changes since there is no illicit consonant cluster to split up.

(7) **ŋəŋuma**$_{(94)}$
ŋə- oŋumo -a
1OBJ- wrap -REC
'They wrapped me up (with bandages)'
(speaker LG, Gregor 2017)

2.4 Sequences of vowels

The vowel phonemes can combine relatively freely into complex nuclei. Combinations of two vowels are the most common (8-10). Combinations of more than two vowels are also possible (11), but are less frequent. Three segment sequences usually include what could be analysed as an approximant or glide. There is no restriction on the order of the vowels. Example (8) illustrates this for the combination of /e/ and /i/ and example (10) for the combination of /a/ and /u/. The only combinations I have not found in my corpus yet are combinations with schwa. Combinations with the other central vowel /ʉ/ are possible (9). No combination of vowels behaves differently from other combinations in an obvious way, i.e., no combinations have to be split by a glottal stop. Therefore, I am hesitant to call some or all combinations diphthongs.

(8) a. deidik$_{(95)}$ 'afternoon'
b. wieke$_{(96)}$ 'salt'
(9) a. kamʉa$_{(97)}$ 'COP.2SG'
b. bʉinasem$_{(98)}$ 'tomahawk'
(10) a. mau$_{(99)}$ 'absent'
b. nua$_{(100)}$ 'edible tree'
(11) a. wieia$_{(101)}$ 'seek.REC'
b. kedaŋuai$_{(102)}$ 'then'

[11] The vowel in the affix generally overrides the vowel of the root in Yelmek. The suffix in (8), for instance, shows the same morphophonemic process.

3 Prosody

3.1 Word stress

Yelmek does not use suprasegmental features to distinguish words on a lexical level. That is, there is no evidence for lexical tone or contrastive stress. Himmelmann and Ladd (2008: 248) define stress as the greater prominence of one syllable in a word over its neighbouring syllables. Although there are perceptible differences of prominence between syllables in Yelmek words, the prominent syllable varies between instances of the same lexical item. Furthermore, of the three acoustic features stress typically relates to, pitch, intensity and duration (Himmelmann and Ladd 2008: 248), none seem to be the single most important factor. The pitch contour marks intonation rather than word-level stress. The intensity of each syllable in multi-syllable words is often very similar for each syllable, and so is the duration of the vowel. This makes the phonetic reality of word-level stress doubtful.

The question if Yelmek has word-level stress or not cannot be conclusively answered at this stage. It would require much more detailed experimental data, including tests of native-speaker perception. At this stage of research, I conclude that Yelmek does not have word-level stress. The difference in prominence I perceive might relate to a phenomenon that Tabain and colleagues (2014) label as stress ghosting, which means that listeners may be biased by their first language when perceiving stress in another language. In other words, it means hearing stress without phonetic evidence for it (Tabain et al. 2014: 52).

3.2 Intonation

The pitch contour over an utterance typically rises during the first phonological word and then steadily falls during the rest of the utterance. There is no salient difference between declarative clauses, content questions or polar questions when it comes to intonation. The intonation contour of an imperative utterance is typically flat.

Figure 7 shows the spectrogram with the f0 track for the declarative clause in example (12). In Figure 7, the f0 track is rising across the first word *ina* ‘two’ and then steadily falls until the end of the utterance

(12) ina gagal ko ŋonapkai(105)

ina	gaga-l	ko	ŋonapkai
two	language-ACC	PL.SBJ	tell.IPFV

‘The two were talking.’
(speaker LG, Gregor 2016b)

If there is a focussed element in the utterance, the f0 peak coincides with it (ex. 13, Figure 8). In Figure 8, the intonation contour rises until the last syllable of *imanekii* where it peaks. This peak coincides with the syllable that bears the morphological focus marker /=i/.

(13) gaga imanekii ma imkana(106)

gaga	ima-nek-i=i	ma	im-ka=na
speech	something-ATTR.SG-ACC=FOC	FUT.1SG	speak-1SG.IRR=DIS

‘I will tell a story.’
(speaker KG, Gregor 2016a)

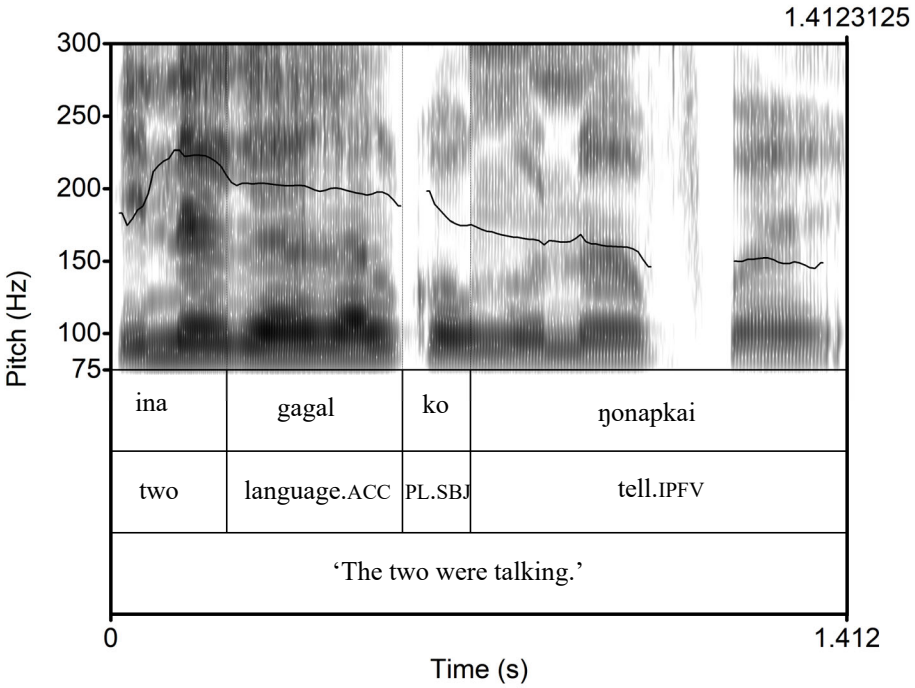


Figure 7. Spectrogram of (12). Intonation contour of a declarative clause by LG.

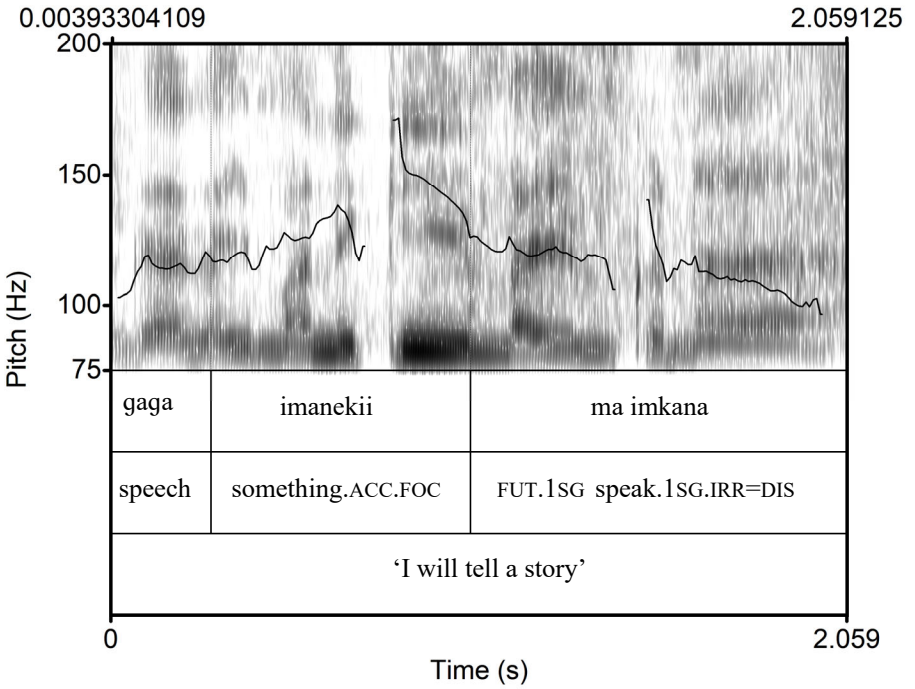


Figure 8. Spectrogram of (13). Intonation contour of an utterance with an element in focus (*imanekii*) by KG.

Comparing the spectrograms of the declarative utterance (ex. 12, Figure 7) to the spectrogram of the content question (ex. 14, Figure 9) and the spectrogram of the polar question (ex. 15, figure 10) shows that the intonation contour is essentially the same in all

three. The contour rises for the duration of the first word (Figure 9 and 10), which is *eko* 'this' in both instances. After this peak, the f0 track steadily falls until the end of the utterance.[12]

(14) eko ima kəm(107)
eko ima kəm
this what COP.3SG
'What is this?'
(speaker LG, elicited utterance)

(15) eko imo bogolonek kəma(108)
eko imo bogolo-nek kəm=a
this vehicle ground-ATTR.SG COP.3SG=Q
'Is this a motorcycle?'
(speaker LG, elicited utterance)

In a typical imperative utterance (16) the intonation contour does not show the distinct fall towards the end, instead, the end of the contour stays level. This is illustrated in Figure 11.

(16) makak jəp ba jaŋepepuge(109)
makak jəp ba j-aŋepe-puge
other middle FUT IMP-hold-2PL.IRR
'(You) other (people) take the middle (of the fishing net)!'
(speaker MK, Gregor 2016c)

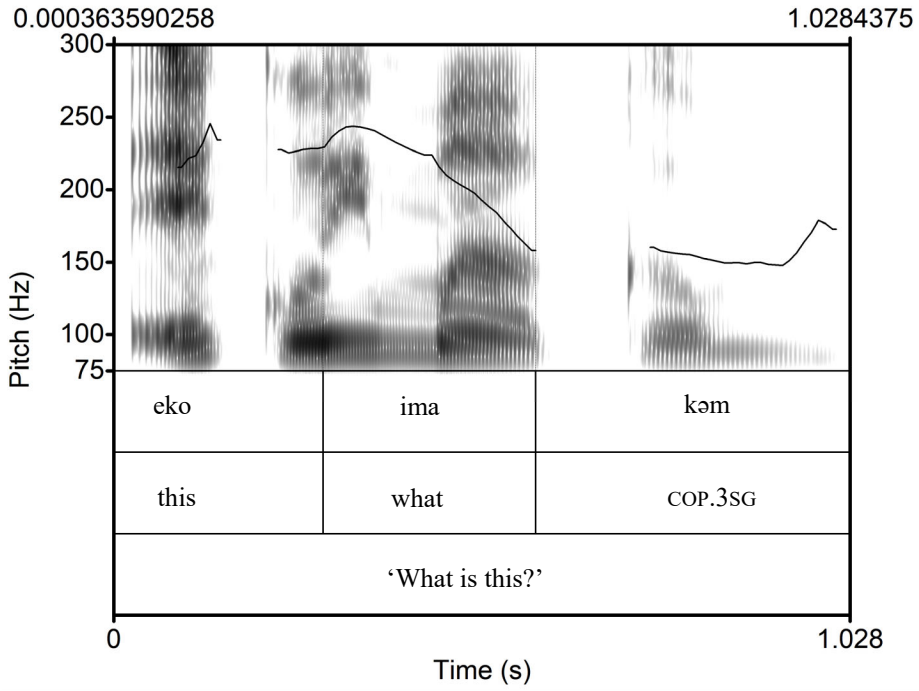


Figure 9. Spectrogram of (14). Intonation contour with question word (*ima*).

[12] Both spectrograms (Figures 9 and 10) show a bit of an upwards tail right at the end of the utterance. This is not audible and seems to be a measurement error of Praat.

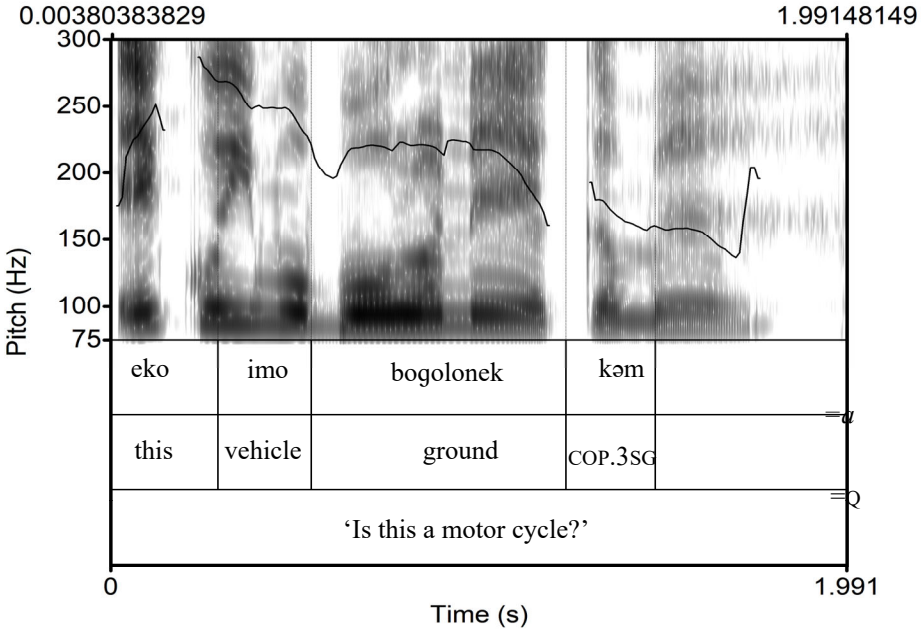


Figure 10. Spectrogram of (15). Pitch contour of a polar question (elicited utterance, LG)

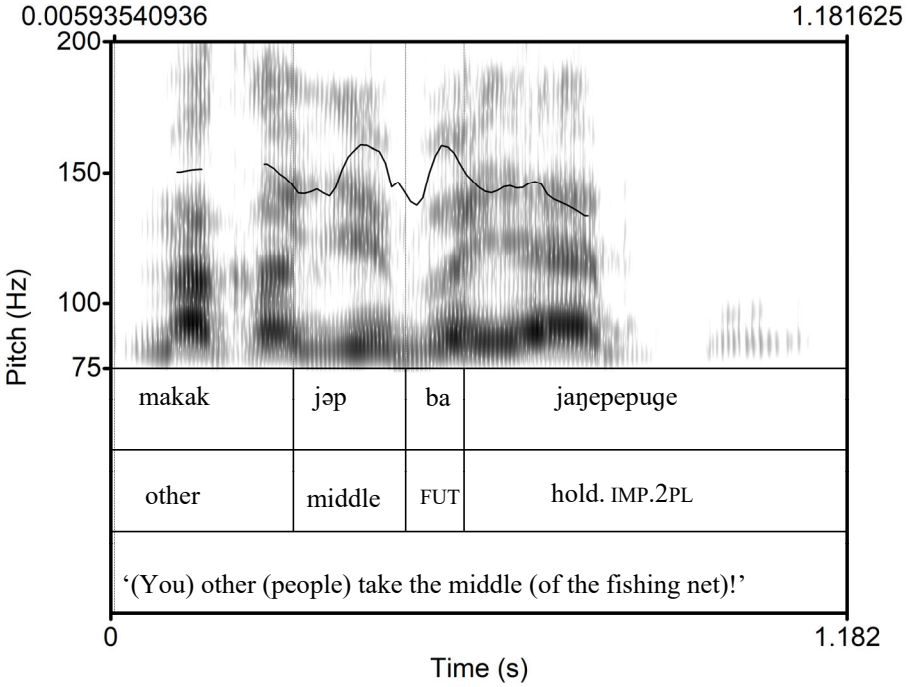


Figure 11. Spectrogram and wave form for the imperative utterance /makak jəp ba jaŋepepuge/ '(You) other (people) take the middle (of the fishing net)!' (16).

4 Illustrative passage

This passage is a free retelling of the "North Wind and the Sun" story narrated by Liberata Gebze. It serves to illustrate the Yelmek phoneme inventory in the context of a narrative. This supplements the single word and single clause examples throughout the paper. All of Yelmek's phonemes are present This narrative is not a direct translation. I explained the story to her in Indonesian. Based on that, she made up a Yelmek version. The content is, however, very close to the original story. Note that this is an abridged version of the original recording; long pauses, repetitions, etc. were cut out. The full recording is archived with and accessible in the Pacific and Regional Archive for Digital Sources in Endangered Cultures (www.paradisec.org.au, see Gregor 2016b). I have added a minimal word gloss and a translation to increase readability. The glosses here do not attempt to do justice to the complex verbal morphology of Yelmek. See Gregor (2021) for more information on morphology.

1	gaga	imaneki	ma	ajumka	alimo	ina
	speech	something.ACC	FUT	tell	sun	two
	sendawi	we				
	east.wind	with				

'I will tell a story about the east wind and the sun.'

2	ina	gagal	ko	ŋonapkai
	two	speech.ACC	PL.SBJ	talk.IPFV

'The two were talking.'

3	inala	ŋaŋaijapa	ah	… kəke	ame	ŋieŋko
	two	compete.REC	EXCL	strength	who	possess

'The two competed about who was the strongest.'

4	kedaŋuai	omgo	ked	wojopu
	then	person	now	pass_by.REM

'Then, that moment, a person passed by.'

5	ina	opo	ah	ba	ajepu	omgo	ku	ba	jopən
	two	eye	ah	FUT	see	person	REL	FUT	do

'The two watch the person do this.'

6	ka	ba	alapaipa	kəke	ame	bak	ked	ba	miepən
	must	FUT	exit	strength	who	GEN	now	FUT	be

'The one that makes the person come out (of his clothes) is the one with the greater strength.'

7	eu	ba	ŋelekepən
	3SG	FUT	win

'The one that will win.'

8	sendawi	ai	jop	ŋəl	ŋi	ma …	ŋəl	ŋi	məkəlaika
	east.wind	PROG	said	1SG	DM	FUT	1SG	DM	go_first

'The east wind said: "I will go first."

9	kedamie	ai	ŋiewlepu
	then	PROG	blow.REM

'Then he was blowing.'

10 balamala kai ŋiewlepu
little PROG blow.REM
'He was blowing just a little.'

11 kedamie ebelabe ai ŋieulepu
then then.more PROG blow.REM
'Then he was blowing more.'

12 omgo eu bata ima …. unugu enelneklaga ŋi ilepepu
person the only something clothes back.just DM lift.REM
'The person … only the back of the clothes lifted.'

13 weu baloneki ebi kai ŋokŋopu
coat thick.ACC it.ACC PROG wear.REM
'The thick coat, he was wearing it.'

14 pata balamalaga ŋi ilepep
only little.just DM lift.REM
'It lifted it just a little bit.'

15 ai kəkelma iblopu ebaki dəŋ ebi
PROG stronger tie.REM his belt the.ACC
'He tied his belt stronger.'

16 kedamie ai ŋiewlepu ked ebelabe
then PROG blow.REM now then.more
'Then, he was blowing more.'

17 kai ŋiewlepue
when blow.REM
'When he was blowing…'

18 teule ika ai iblopu ika unugu ebaki ebi dəŋəl
tie so.then PROG tie.REM so.then clothes his the belt.ACC
'… he tied it harder, his clothes, his belt.'

19 kedamie endakəlma ŋiewlepu
then stronger blow.REM
'Then he blew stronger.'

20 endakəlma kai ŋiewlep
stronger PROG blow.REM
'The harder he was blowing …'

21 omgo eu kedamie məlkuku ai ŋaŋumpu diŋ ebi alilma
person the then tie PROG tie.REM belt the.ACC all
'The tighter he was wrapping, his belt, all the way.'

22 i jamne ŋewle məlkukulma ai ŋaŋumpu
wind cold blow wrap.more PROG tie.REM
'The cold wind blows, he wrapped himself tighter.'

23 sendawi kedamie
eastwind then

‘The east wind continues.’

24 omgo unugu ebaki mau … mau owlo wedepu
person clothes his NEG NEG open AUX
‘The person’s clothes are not ... nothing was opening.’

25 i ŋewlie wedepuma mau owlo wedepu
wind blow AUX NEG open AUX
‘The wind blew and blew, (but) nothing was opening.’

26 eban ai jopu karkaija begi alimol
then PROG say.REM friend towards sun.ACC
‘Then it was saying to his friend, to the sun.’

27 ŋəl maja ŋedekama au japlepu
1SG NEG succeed.REM 2SG IMP.shine
‘I did not succeed. You shine.’

28 au kai ba jabai apad au maba ŋedeke
2SG when FUT try.IPFV how 2SG might succeed
‘When you are trying you might succeed.’

29 kedamie alimo ai jop “kai ma jabaik.”
then sun PROG say.REM when FUT try
‘Then the sun said: “When I am trying …”

30 kai ma japlaika apad mama ŋedekeka
when FUT shine.IPFV how might succeed
‘When I am shining, I might succeed.’

31 bata balamala ŋepepu kai ŋepepu
only little shone.REM PROG shine.REM
‘He shone only a little. He was shining.’

32 kedamie alimo kelalnek ai japlepu
then sun hot PROG shine.REM
‘Then the sun shone hotly.’

33 omgo eu ai wakopu
person the PROG walk.REM
‘The person was walking.’

34 moiwak ŋolilopu
shade.LOC shelter.REM
‘He took shelter in the shade.’

35 ebia mie daŋ mie
there be stand be
‘He stays there, standing.’

36 bemoniki ai wewəlpu
hat PROG open.REM
‘He took his hat off.’

37 kedamie ja kedamie alimo ai …
then EXCL then sun PROG
'Then, then the sun …'

38 eban kəlalnek ai japlepu manek demo kəmanek
from.here hot PROG shine.REM like.this warm EMPH.like.this
'Then the sun shines very hotly like this. This kind of hot.'

39 dəmo dəmo wiaŋ wunugu baloneki ebi kai ŋokŋokpu
warm warm feel clothes thick the PROG wear.REM
'He feels hot (because) he was wearing thick clothes.'

40 kedamie ewle ewle miai
then open open be.IPFV
'Then he opened it.'

41 alponemeki kai wowəlpu kedamie
gloves PROG opened then
'He took his gloves off, then.'

42 ebi wunugu balonek ebi kedamie ewle mie
the clothes thick the then open be
'The thick clothes he then takes it off.'

43 weu baloneki kedamie ewle mie
jacket thick then open be
'The thick jacket, he then took it off.'

44 ai jopu ŋəl eme ŋedekama alimo ai jop
PROG say.REM 1SG already succeeded sun PROG say.REM
'He was saying "I have succeeded" the sun was saying.'

45 ah omgo eko unugu ebaki powla
ah person this clothes his open.REC
'This person has opened his clothes.'

46 eban sendawi ai jopu mauko
then wind PROG said okay
'Then the east wind said: "Okay."'

47 kəke au kəke au kəke kamʉa mauko au ŋedeka
strong 2SG strong 2SG strong you.have okay you won
"You have strength. Okay, you won."

48 ina ebiaka alpo ŋojopai
two there hand shook
'The two shook hands there.'

49 gaga mop eble
speech cut here
'The story ended here.'

Speaker index

AK: Antoneta Kahol, female elder, who grew up and lives in Wanam.
KG: Kasimirus Gebze, born 1966, lives in Wanam.
LG: Liberata Gebze, a Yelmek woman in her mid-twenties, who grew up in Wanam in a Yelmek speaking household. She moved to Merauke to attend boarding school at the high school level and still lives in Merauke today.
MK: Marselus Kahol, born 1955, lives in Wana
SG: Serafinus Gebze, who is in his mid-20s. He grew up in Wanam and currently lives in Merauke.
WK: Weren Kahol, a man in his mid-50s, who was born in Wanam, but lives in Merauke.

References

Boelaars, Jan H. 1950. *The linguistic position of south-western New Guinea*. Leiden: E.J. Brill.

Boersma, Paul & Weenink, David. 2021. Praat: doing phonetics by computer [Computer program]. Version 6.1.41, retrieved 25 March 2021 from http://www.praat.org/

Carroll, Matthew J. & Evans, Nicholas & Arka, I Wayan & Döhler, Christian & Kashima, Eri & Gast, Volker & Gregor, Tina & Miller, Julia & Mittag, Emil & Olsson, Bruno & Schokkin, Dineke & Siegel, Jeff & van Tongeren, Charlotte & Quinn, Kyla. 2016. *Yamfinder: Southern New Guinea Lexical Database.* (http://www.yamfinder.com)

Comrie, Bernard, & Haspelmath, Martin & Bickel, Balthasar. 2015. Leipzig Glossing Rules: Conventions for interlinear morpheme-by-morpheme glosses. https://www.eva.mpg.de/lingua/resources/glossing-rules.php.

Drabbe, Peter. 1954. Talen en dialecten van zuid-west Nieuw-Guinea, deel I. *Anthropos* 45(4–6): 545–574.

Geurtjens, Hendrik. 1933. *Marindineesch-Nederlandsch woordenboek*. Bandoeng: A.C. Nix.

Gregor, Tina. 2021. *A documentation and description of Yelmek*. Canberra: The Australian National University. (Doctoral dissertation.) doi: 10.25911/2GHT-ZP82.

Gregor, Tina (collector). 2016a. *North wind and the sun*. X-WAV/MPEG. TG1-NorthwindSunKasim at catalog.paradisec.org.au. doi: 10.26278/5ecbebbf1e48b.

Gregor, Tina (collector). 2016b. *The North wind and the sun story by Libe*. MPEG/X-WAV. TG1-NorthWindSun_Libe at catalog.paradisec.org.au. doi: 10.26278/5ecbee0689b00.

Gregor, Tina (collector). 2016c. *Fishing film described by Bp. Mars*. MXF/MP4/X-WAV/MPEG. TG1-Fishing_Marsel at catalog.paradisec.org.au. doi: 10.26278/5ecbed267fb71.

Gregor, Tina (collector). 2017. *Family Problems Picture Task by Libe and Bertila*. MPEG/X-WAV. TG1-FPPT_Libe_Bertila at catalog.paradisec.org.au. doi: 10.26278/5ecbed07029d9.

Himmelmann, Nikolaus P. & Ladd, D. Robert. 2008. Prosodic description: An introduction for fieldworkers. *Language Documentation and Conservation* 2(2): 244–274.

Lebold, Randy & Kriens, Ron & De Vries, Peter Jan. 2010. *Report on the Okaba subdistrict survey in Papua, Indonesia*. SIL Electronic Survey Report 2010-008, March 2010.

Lindsey, Kate L. 2021. Ende. *Journal of the International Phonetic Association*, 1-21. doi: 10.1017/S0025100320000389.

Nevermann, Hans. 1952. Die Jabga auf Südneuguinea. *Baessler-Archiv: Beiträge zur Völkerkunde*, N.F. 1: 49–82.

Olsson, Bruno. 2017. *The Coastal Marind language*. Singapore: Nanyang Technological University. (Doctoral dissertation.)

RStudio Team. 2015. RStudio: Integrated Development for R. RStudio, Inc., Boston, MA http://www.rstudio.com/.

Tabain, Marija & Fletcher, Janet & Butcher, Andrew. 2014. Lexical stress in Pitjantjatjara. *Journal of Phonetics* 42: 52–66.

Ward, Nigel. 2006. Non-lexical conversational sounds in American English. *Pragmatics & Cognition* 14(1): 129–182.

Wickham, Hadley. 2016. ggplot2: Elegant Graphics for Data Analysis. Springer-Verlag New York. ISBN 978-3-319-24277-4. (https://ggplot2.tidyverse.org).

3

Language Documentation & Conservation Special Publication No. 24 (2021)
Phonetic fieldwork in Southern New Guinea
ed. by Kate L. Lindsey & Dineke Schokkin, pp. 33–52
http://nflrc.hawaii.edu/ldc/ http://hdl.handle.net/24993

Phonetics and phonology of Ngkolmpu

Matthew J. Carroll
Australian National University

1 Introduction[1]

Ngkolmpu is the westernmost language of the Yam family (Evans et al. 2018); it is one of the few Yam languages spoken entirely in Indonesia (Figure 1). There are two distinct dialects of Ngkolmpu: Ngkontar and Bedi. Ngkontar is the variety traditionally spoken in the vicinity of Yanggandur whilst Bedi is spoken in the coastal region near the contemporary village of Osnggaya.

As indicated in Figure 1, Ngkolmpu is a member of the Tonda-Kanum group within the Yam family. The two other groups are Nambu in the east and Yei in the northwest, see Kashima (this volume) on Nmbo for an example of a Nambu language. The Yei group consists of a single language with multiple dialects based on fieldwork observations in 2019.

Ngkontar Ngkolmpu is spoken by at most 200 people, the majority of whom reside in the village of Yanggandur. There is also a substantial community of speakers, around 50 people from my own observations in 2017, residing in Rawa Biru. The language is used as a means of everyday communication alongside the national language Indonesian, Papuan Malay and other local languages. Unlike Ngkontar, Bedi is no longer spoken as a language of day-to-day communication. A visit to Onggaya in 2017 confirmed six elderly people, the youngest in their 60s, who remembered many words in the language but were no longer using the language. The variety described in this paper is Ngkontar with all data drawn from firsthand fieldwork in Yanggandur.

The primary descriptive resource for Ngkolmpu is Carroll (2016). This article is based on that earlier resource; where there is a contradiction between these two sources this article supersedes. As with most languages of the region, there is very little published on the phonetics and phonology of Ngkolmpu; there is a single paper (Carroll 2019) on the phonetic characteristics of voice in prenasalised stops. Some previous work on the language referred to the language as Kanum (Boelaars 1950; Donohue 2008, 2011, 2015). Since the term Kanum is used by speakers of Ngkolmpu and related languages to refer to at least three distinct but closely related languages (Ngkolmpu, Smerki and Nggarna) the more specific Ngkolmpu term will be used in this article.

In terms of its phonemic inventory, the language is fairly typical of a Yam language. There is a primary distinction between oral and prenasalised stops. Ngkolmpu, like closely related Smerki and Nggarna, lacks the large inventory of fricatives found in the eastern Tonda-Kanum languages (Evans et al. 2018). As has been described for other

[1] I thank the Australian Research Council Discovery Project 'The languages of Southern New Guinea: an unexplored linguistic hotspot' (DP110100307), the ARC Centre of Excellence for the Dynamics of Language (E140100095) and the Endangered Languages Documentation Programme project 'Pan-Dialectal Documentation of the Yei Language (IPF0283) for their financial support during the various stages of this research. Most importantly I would like to thank the everybody in Yanggandur for their hospitality, friendship and patience. I would especially like to thank Karel Dimar, Magdalena Ndiken and Yonas Gelambu for sharing their lives and language with me. Finally, thanks to Kate Lindsey and Dineke Schokkin for their editorial comments and allowing me to participate in this volume.

Yam languages (Evans & Miller 2016; Döhler 2019), the distribution of schwa [ə] is entirely predictable from the phonotactics and is thus treated as non-phonemic (§3.2).

Sound files have been provided for almost all examples. The seven examples which lack a sound file are indicated with a superscript plus sign (⁺). These are morphologically infrequent examples which have been recorded from speakers but for which no suitable sound file is available. All data used in this paper has been recorded from one of three speakers: Karel Dimar (KD), Magdelena Ndiken (MN) and Yonas Gelambu (YG). All three are in their 50s;[2] Karel Dimar and Yonas Gelambu are male and Magdelena Ndiken is female.

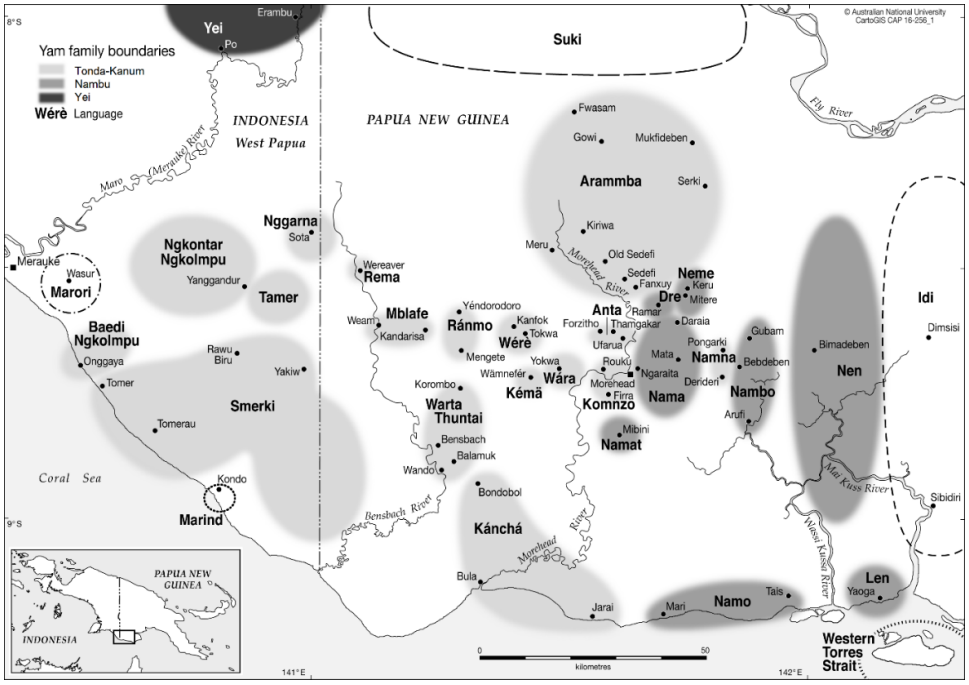


Figure 1. Locations of the Yam languages

2 Consonants

Table 1 presents the inventory of phonemic consonants in Ngkolmpu. Minimal pairs for consonants at similar places of articulation are provided in Table 5 (§2.3).

[2] Providing more precise ages is not possible.

Table 1. Phonemic inventory of consonants[3]

	Bilabial	Coronal	Velar
Voiceless stop	p	t	k
Prenasalised stop	ᵐp	ⁿt	ᵑk
Nasal	m	n	
Voiced stop	b		g
Fricative		s	
Prenasalised fricative		ⁿs	
Trill		r	
Lateral		l	
Glide	w	j	(w)

All but one consonant are at one of just three possible places of articulation: bilabial, alveolar and velar. The single exception is the palatal glide /j/. To enhance readability, the palatal glide and the alveolar consonants are treated as a single coronal column in Table 1. The labiovelar approximant /w/ has been included in both the bilabial and velar positions in the chart as it is a single co-articulated phoneme. Unlike many other Yam languages, e.g., Nen (Evans & Miller 2016) and Yei, Ngkolmpu has no labial-velar coarticulated stops. These have been simplified to the voiced bilabial stop; compare the words for mosquito: /ba/ (Ngkolmpu), /g͡bɐn/ (Yei) and /g͡baŋ/ (Nen).

Phonotactically, there is a core distinction between approximants and non-approximants. The non-approximants are oral and prenasalised stops and fricatives and nasal stops, while approximants are the liquids and glides. Non-approximants may occur in syllable-initial position. They never occur in second position in onset clusters and may only occur in codas word-finally. Approximants are unrestricted in their distribution and may occur in all syllable positions as long as they satisfy the other phonotactic constraints (§4).

The primary distinction in the stop series is not voicing but rather prenasalisation, with a voiceless oral stop series and a prenasalised series at all three places of articulation. The prenasalised stops are articulatorily complex as they are phonetically voiceless for the duration of the oral portion of the stop as discussed in §2.1.2 and Carroll (2019). There are nasal stops at the bilabial and alveolar places, although there is no plain velar nasal. There is a single voiced stop in the bilabial position. There is a voiced velar stop but this is only found in loan words, e.g., *tgu* 'leg' from Marori, *garam* 'salt' from Indonesian. There are two voiceless alveolar fricatives, one of which is prenasalised. The prenasalised fricative has two different orthographic representations based on allophonic realisation conditioned by the following vowel (§2.1.4).

The approximant consonants are either liquids or glides. The liquids include a trill /r/, which is sometimes realised as a tap [ɾ], and a lateral /l/. There are also two glides: the labiovelar approximant /w/ and the palatal /j/.

[3] The orthography largely aligns with the IPA symbols. The differences are: (1) prenasalised stops are written as multigraphs <mp>, <nt>, <ngk>; (2) the prenasalised fricative /ⁿs/ is written differently for its two allophones <ns> for [ⁿs] and <nc> for [ⁿʧ]; (3) /j/ is written as <y>.

2.1 Non-approximants

2.1.1 Oral stops

There are three voiceless stops, /p/ /t/ and /k/, which correspond to three places of articulation: bilabial, alveolar and velar. These occur in syllable-initial position both word-initially and word-medially. They also occur in coda position word-finally. These consonants have a long voice onset time (VOT) (Table 2). However, when following continuant consonants across syllable boundaries, the VOT is reduced and they are realised unaspirated. When occurring word-finally, there is typically an exaggerated release, represented here with a capital H.[4] In all allophones, these elements are phonetically voiceless and the distinction between allophones is a matter of degree of aspiration. The alveolar /t/ is sometimes articulated as a dental [t̪]; this is phonologically unconditioned and certain speakers will typically prefer one or the other but never a single one exclusively.[5]

Table 2. Mean Voice Onset Time (ms) for oral stops

	#_	V_V	C_V
/p/	28.7	31.8	18.1
/t/	30.5	37.9	21.2
/k/	45.0	41.4	23.4

(1) /p/ → [p] / C_ *kolpi* [ˈkɔlpi] ‘fish sp.’(1)
[pᴴ] / _# *ntop* [ⁿtʰɔpᴴ] ‘big’(2)
[pʰ] / *elsewhere* *bopan* [bɔˈpʰan] ‘rice’(3)

(2) /t/ → [t] / C_ *mpltangku* [ᵐpə̆ltaᵑkʰu] ‘fly (n.)’(4)
[tᴴ] / _# *pwt* [pə̆ˈwə̆tᴴ] ‘ashes’(5)
[tʰ] / *elsewhere* *teya* [ˈtʰɛja] ‘banana’(6)
kota [ˈkʰɔtʰa] ‘grass’(7)

(3) /k/ → [k] / C_ *mlku* [mə̆lkɔ] ‘yam for seed’(8)
[kᴴ] / _# *watik* [watikᴴ] ‘enough’(9)
[kʰ] / *elsewhere* *kkae* [kʰə̆ˈkʰæ] ‘melaleuca sp.’(10)

Voiceless stops exhibit a complete occlusion of the vocal tract, which characterises the stop. Once released, there is a period of voicelessness before the onset of voicing for the following vowel (VOT). Spectrograms of each of the voiceless stops in intervocalic position are provided in Figures 3-5, in which the voiceless quality is clearly visible. The average length of the VOT of each of the voiceless stops across the phonotactic environments for a single female speaker in her 40s is presented in Table 2. For the word-initial and intervocalic positions, this is a mean over 20 tokens; following a consonant, only three tokens were available since this is a much more restricted environment. We can see that the length of the VOT is dependent on the place of articulation, with anterior consonants displaying shorter VOT as is typical cross-linguistically (Maddieson 1997). In

[4] I am using a non-standard representation here as there is no existing mechanism in the IPA for representing degree of aspiration.
[5] It seems fairly safe to assume that this is not true free variation and further studies of a larger sample of speakers would be revealing as to the nature of this variation.

addition, we can see that stops following another consonant have a reduced VOT and are best described as unaspirated voiceless stops.

There is a single voiced stop /b/. This occurs in syllable-initial position both word-initially and word-medially. There are no attested examples of it occurring in coda position.[6] Phonetically, it is distinguished from the voiceless stop /p/ as it is voiced throughout the articulation as clearly shown by the spectrogram in Figure 6. It has no allophonic variation. There are numerous minimal pairs between /b/ and /p/, e.g., /br/ 'canoe' vs /pr/ 'tree.' It is the only native voiced stop and historically is cognate with the co-articulated labial-velar stop /g͡b/ found in other Yam languages.

(4) /b/ → [b] / *br* [bər] 'canoe'(14)
kober [ˈkʰɔbɛr] 'fat (n.)'(15)

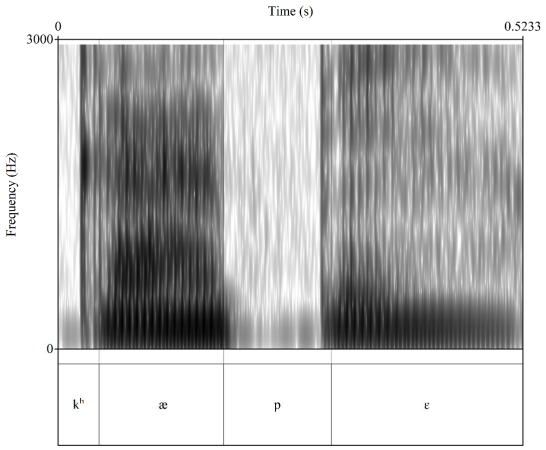
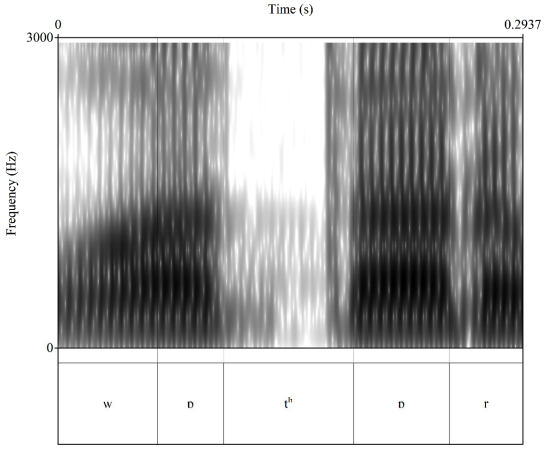


Figure 3. Spectrogram of [ˈkæpɛ] 'cockatoo' spoken by KD(11)



[6] Following a suggestion made by Dineke Schokkin (p.c.), it may be the case that /b/ is neutralised to [p] word-finally. Final devoicing has been reported for related language Komnzo (Döhler 2018) and so this lends credence to the possibility. However, since Ngkolmpu does not possess any other plain voiced consonants in native words, we would require systematic exploration of all [p]-final words followed by an appropriate vowel suffix to find evidence of this. While a systematic exploration has yet to be conducted, current textual data does not provide any evidence in support of this analysis.

Figure 4. Spectrogram of [ˈwɒtɒr] ‘year’ spoken by KD(12)

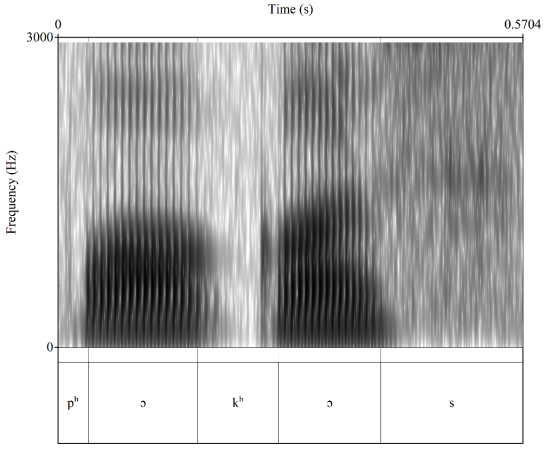


Figure 5. Spectrogram of [ˈpɔkɔs] ‘excellent’ spoken by KD(13)

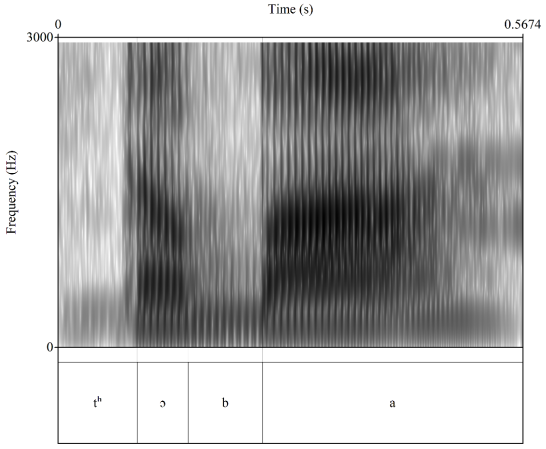


Figure 6. Spectrogram of [tɔˈba] ‘many’ spoken by YG(16)

There is a marginal voiced velar consonant /g/. This is only found in a few loan words, although some of these are very commonly used. These include /tgu/ *tegu* ‘leg’(17) from Marori, /ngu/ *negu* ‘cloth’ from Marind and /garam/ *garam* ‘salt’ from Indonesian. However, speakers are clearly aware of the distinction between the /g/ and the /k/, and any attempt to use /k/ in these words is corrected. This voiced element has clearly entered the system as the voiced member of a pair through the gap in the system. Phonetically, it is characterised identically to the voiceless velar stop except with continued voicing for the duration of the articulation.

2.1.2 Prenasalised stops

There are three prenasalised voiceless stops, /ᵐp/ /ⁿt/ and /ᵑk/, which correspond to three places of articulation, bilabial, alveolar and velar. These display the same distribution as the standard voiceless stops. They occur in syllable-initial position both word-initially and word-medially. They also occur in coda position word-finally. As with the voiceless stops, phonetically these consonants have a long VOT and are aspirated by default. When following continuant consonants, the VOT is reduced and they are unaspirated. Word-finally, they are more heavily aspirated.

(5)	/ᵐp/ →	[ᵐp] / C_	*Ngkolmpu* [ˈŋkʰɔlᵐpu] ‘Ngkolmpu’(18)
		[ᵐpᴴ] / _#	*kongkomp* [ˈkʰɔŋkɔᵐpᴴ] ‘time’(19)
		[ᵐpʰ] / *elsewhere*	*mpowr* [ᵐpʰowə̆r] ‘cassowary’(20)
			smpo [ˈsɛᵐpʰɔ] ‘again’(21)
(6)	/ⁿt/ →	[ⁿt] / C_	*srrnteme* [sərərⁿtɛmɛ] ‘they will work it’(22)
		[ⁿtᴴ] / _#	*pant* [paⁿtᴴ] ‘platform’(23)
		[ⁿtʰ] / *elsewhere*	*ntop* [ⁿtʰɔpᴴ] ‘big’(24)
			sento [ˈsɛⁿtʰɔ] ‘bird’(25)
(7)	/ŋk/ →	[ŋk] / C_	*ngolngkol* [ŋkʰɔlŋkɔl] ‘peak’(26)
		[ŋkᴴ] / _#	*mpngk* [ᵐpʰə̆ŋkᴴ] ‘cold/wet’(27)
		[ŋkʰ] / *elsewhere*	*ngko* [ŋkʰɔː] ‘I (1.SG.ABS)’(28)
			kongko [ˈkɔŋkʰɔ] ‘sun’(29)

Rather unusually, these prenasalised stops are voiceless for the oral portion of the articulation as demonstrated in Carroll (2019). These involve a period in which there is a full oral occlusion at the place of articulation with the soft palate lowered and the velum open for a period of nasal voicing. Before the stop is released, the voicing ceases and the velum rises, stopping the nasalisation. The consonant is then released, and there is a period of time before the voicing begins for the following vowel, the VOT. Spectrograms are provided for these stops in intervocalic position in Figures 7-9. The voiceless quality is clearly visible in the spectrograms. The duration of voicelessness appears shorter than the previous examples; however, this is a result of the longer words used as tokens in these examples. To confirm this, the VOT for prenasalised consonants displays an almost identical duration to the standard voiceless stop. The average VOTs for all phonotactic positions for prenasalised stops are presented in Table 3. These are the average over 20 tokens for word-initial and intervocalic positions and just three of post-consonantal position as these are more restricted examples. These are clearly phonetically voiceless for the oral period. To test if the difference in means represents a significant difference, a two-sample T-test was conducted; the results show that we have insufficient evidence to conclude a definitive difference between the two means (Table 4). Note, however, that the voiceless period is only for the stop part of the phoneme and not for the nasalisation.

It is important to note here that when these sounds are word-medial and follow a consonant, i.e. following a closed syllable, there is a phonetic tendency to lenite the stop, which can drastically reduce the VOT. These clusters are rather infrequent in the language, with only a few tokens of each; however, as we can see in Table 3, there is a shortening of VOT by around 30% compared to word-initial position. In the cases of the bilabial stops, this reduces the VOT to around 15ms. This is extremely short and difficult to hear, but is still greater than zero and therefore characterised as voiceless.

Table 3. Average VOT (ms) of prenasalised stops

	#_	V_V	C_V
/ᵐp/	22.4	29.3	15.9
/ⁿt/	24.6	26.8	17.3
/ŋk/	36.7	34.7	25.9

Table 4. Difference between VOT (ms) of oral and prenasalised stops in intervocalic position

	Oral	Prenasalised	Difference	p	df
Bilabial	31.8	29.3	2.5	0.7825	34
Alveolar	37.9	26.8	11.1	0.9897	34
Velar	41.4	34.7	16.7	0.8519	36

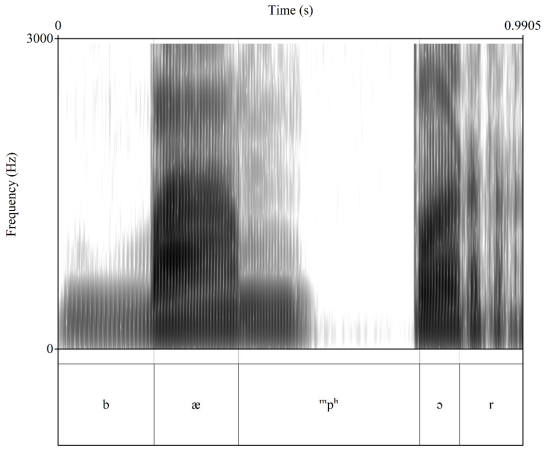


Figure 7. Spectrogram of [ˈbæᵐpər] ‘snake’ spoken by KD(30)

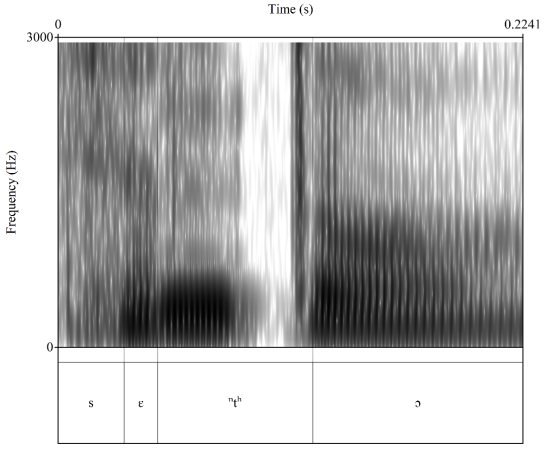


Figure 8. Spectrogram of [sɛˈⁿtɔ] ‘bird’ spoken by YG(31)

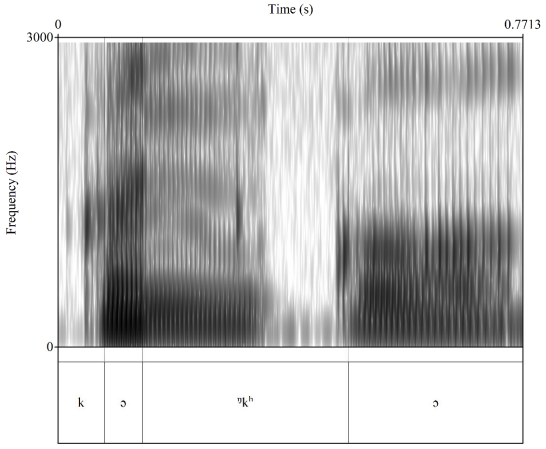


Figure 9. Spectrogram of [ˈkəᵑkɔ] ‘sun’ spoken by KD(32)

Prenasalised elements are single phonemes rather than sequences of a nasal and obstruent.[7] We can see this with evidence from the phonotactics, phonetics and the general organisation of the phonemic inventory. The first simple evidence comes from the fact that /ŋ/ is only found preceding /k/. The second piece of evidence comes from duration. The prenasalised segments are longer than standard voiceless stops, at around 97ms for a prenasalised stop and 89ms for a voiceless stop averaged over 20 tokens from a single speaker. Yet, they are considerably shorter than the combination of a nasal and stop, which is around 167ms. This is fairly typical of prenasalised elements cross-linguistically (Ladefoged 1996: 126). Finally, the most robust evidence comes from the phonotactics, which treat these elements as a single unit. Phonotactics are discussed in §4, where I demonstrate that all clusters must involve elements which are at least two steps apart on the sonority hierarchy. The sequence of a nasal plus stop does not meet such a criterion and would thus be an illicit cluster. However, as we have seen, these frequently occur in the form of prenasalised stops. If these elements were a sequence of nasal plus stop then they should trigger the insertion of an epenthetic vowel and this is what happens when such a cluster does occur, typically as a result of inflection. In example (8), we see that the sequence of nasal plus stop at the same place of articulation occurs phonemically as the result of inflection; however, in the phonetic realisation these are always separated by an epenthetic vowel. Compare this to the prenasalised elements in (9), which are not epenthesised in almost identical contexts.

(8)	a./n-tinpitr/	→	[**nə̆.**ˈ**t**^{h}i.nə̆.pi.t^{h}ə̆r]	‘he/she/it covers you’
	b. /krɛmun-t/	→	[ˈkrɛ.mu.**nə̆t**^{h}]	‘for kremun (a ceremonial food)’
(9)	a. /^{n}tɔp/	→	[^{n}t^{h}ɔp^{h}]	‘big’(33)
	b. /pa^{n}t/	→	[p^{h}a^{n}t^{h}]	‘platform’(34)

2.1.3 Nasals

There are two nasal stops: the bilabial /m/ and the alveolar /n/. There is no corresponding velar nasal. These display no phonologically-predictable allophony. They occur in syllable-initial position word-initially and word-medially. They also occur in codas word-finally.

(10)	/m/	→	[m]	*montena*	[ˈmɔ^{n}t^{h}ɛna]	‘yesterday’(35)
				knume	[ˈkə̆numɛ]	‘Kanum’(36)
				prnm	[ˈp^{h}ə̆rnə̆m]	‘with a stick’(37)
(11)	/n/	→	[n]	*nel*	[nɛl]	‘earth’(38)
				snm	[ˈsə̆nə̆m]	‘betel with lime’(39)
				kamplen	[ˈk^{h}a^{m}plɛn]	‘bag’(40)

Articulatorily, these consist of a full oral closure at the place of articulation with an open velum allowing air to pass into the nasal cavity.

2.1.4 Fricatives

The voiceless alveolar fricative /s/ occurs in syllable onset position word-initially and word-medially. It also occurs in codas word-finally. The /s/ displays no allophony.

[7] A prenasalised alveolar fricative is analysed the same these elements and discussed in §2.1.4.

(12)	/s/	→	[s]	*supl*	[ˈsuːpʰə̆l]	‘yam’(41)
				eser	[ˈɛsɛr]	‘four’(42)
				bos	[bɔs]	‘pandanus sp.’(43)

Phonetically the /s/ is slightly more fricated than /s/ in English. This is not a true affricate in the sense that there is a point of complete occlusion, but the tongue is raised slightly closer to the alveolar ridge than a typical fricative, which creates a higher level of frication.

There is also a prenasalised alveolar fricative /ⁿs/. It occurs in syllable initial position word-initially and word-medially. This phoneme occurs in codas word-finally. It has the allophone [ⁿt͡ʃ] when occurring before the front vowels /i/ and /ɛ/ and before consonants in complex onset clusters; as indicated earlier, it is written <nc> in those environments in conformity to Indonesian orthography.

(13)	/ⁿs/ →	[ⁿt͡ʃ] / _ [+front]	*mpunce* [ˈᵐpʰuⁿt͡ʃɛ]	‘wife’(44)
		[ⁿt͡ʃ] / _ C	*ncuen* [ⁿt͡ʃʷən]	‘1.NSG.DAT’(45)
			krencrntei [krɛⁿt͡ʃrəⁿtɛʲ]	‘they will chew’(46)
		[ⁿs] / *elsewhere*	*nson* [ⁿsɔn]	‘1.SG.DAT’(47)
			konsapor [ˈkʰɔⁿsapʰɔr]	‘day’(48)
			yons [jɔⁿs]	‘meat’(49)

Phonetically, there are two elements worth noting. Firstly, as with the standard alveolar fricative /s/, this prenasalised alveolar fricative is also slightly affricated compared to English. The level to which this occurs appears to vary between speakers. This higher energy frication can easily be explained as due to the nature of prenasalisation. In this consonant, there is a period of oral closure in which the velum is lowered for the nasalisation. After this short period of nasalisation, the oral closure is released and the fricative is articulated. This release naturally has some fortition effect on the quality of the fricative. However, it should be noted that whilst the fricative form is more fortis than in English, it is still considerably less affricated than its allophone [ⁿt͡ʃ].

This phoneme and its allophone are phonetically voiceless. As with the prenasalised stops, there is a period of voiced nasalisation, which is followed by a clear period of voicelessness before the release until the voicing commences again for the vowel. The average VOT over 20 tokens for speaker KD for [ⁿs] was 292 milliseconds and for [ⁿt͡ʃ] was 289 milliseconds. These figures are comparable to the other voiceless consonants.

2.2 Approximants

There is an alveolar trill /r/ which is often realised as an alveolar tap [ɾ] depending on speech rate. It occurs in onset position word-initially and word-medially, and codas word-medially and word-finally. When occurring in the second position of onset clusters, it is always tapped as [ɾ].

(14)	/r/ →	[ɾ] / C_	*prok* [ˈpɾɔkʰ]	‘hunger’(50)
		[r]~[ɾ] / *elsewhere*	*raekum* [ˈrækʰum]~[ˈɾækʰum]	‘fish sp.’(51)
			kure [ˈkʰurɛ]~[ˈkʰuɾɛ]	‘bamboo flute’(52)
			trmpo [ˈtə̆rᵐpʰɔ]~[ˈtə̆ɾᵐpʰɔ]	‘mouth’(53)
			pr [pʰə̆r]~[pʰə̆ɾ]	‘tree’(54)

The lateral approximant /l/ may occur in all positions within the word. It occurs in onsets in both initial and second positions, both word-initially and word-medially. It also occurs in codas word-medially and word-finally. It does not display any allophonic variation.

(15)	/l/ →	[l]	*liko* [ˈlikʰɔ] ‘river’(55) *kelimu* [ˈkʰɛlimu] ‘forest’(56) *kaemplen* [ˈkʰæᵐplɛn] ‘small bag’(57) *Ngkolmpu* [ˈᵑgkʰɔlᵐpu] ‘Ngkolmpu’(58) *nel* [nɛl] ‘earth’(59)

From my observations, the /l/ is pronounced with the tip of tongue slightly further back in the mouth than in English. However, it is never pronounced so far back for it to be considered a retroflex.

The two glides /w/ and /j/ occur in onsets in both initial and second positions both word-initially and word-medially. They also occur in codas word-medially and word-finally. In coda position they are realised as an off-glide. In second position when following a continuant and preceding an inserted epenthetic schwa, /w/ is typically realised as slightly more syllabic, represented here as an on-glide, with the inserted schwa clearly audible. Whilst these are not true diphthongs, they are acoustically very similar.

(16)	/w/ →	[ʷ_] / [+cont]_ə	*ncuen* [ⁿt͡ʃʷən] ‘1NSG.DAT’(60)
		[_ʷ] / V_ |σ[8]	*nyowkoi* [nʲˈɔʷkɔʲ] ‘we see’(61)
		[w] / elsewhere	*wola* [ˈwɔla] ‘sea’(62)
			kwr [kwər̆] ‘pig’(63)
(17)	/j/ →	[_ʲ] / V_ |σ	*taei* [tæʲ] ‘be patient’(65)
		[j] / elsewhere	*yons* [jɔⁿs] ‘meat’(66)
			mpiae [ᵐpjæː] ‘thing’(67)

2.3 Minimal Pairs

Table 5 shows the minimal pairs for consonants at similar places of articulation.

[8] The |σ symbol indicates a syllable boundary. The consonantal position immediately before a syllable boundary is coda final position.

Table 5. Minimal pairs for consonants

Phonemes	Word	Phonemic	Phonetic	Translation
/p/ - /ᵐp/	powr	/pɔwr/	[ˈpʰɔwə̆r]	'wash (n.)'(68)
	mpowr	/ᵐpʰɔwr/	[ˈᵐpɔwə̆r]	'cassowary'(69)
/p/ - /b/	pr	/pr/	[pʰə̆r]	'tree/wood'(70)
	br	/br/	[bə̆r]	'canoe'(71)
/p/ - /m/	po	/pɔ/	[pʰɔː]	'coconut'(72)
	mo	/mɔ/	[mɔː]	'wallaby'(73)
/ᵐp/ - /m/	mper	/ᵐpɛr/	[ᵐpʰɛr]	'husband'(74)
	mer	/mɛr/	[mɛr]	'neck'(99)
/b/ - /m/	bi	/bi/	[biː]	'buttocks'(75)
	mi	/mi/	[miː]	'night'(76)
/t/ - /ⁿt/ - /s/	ni	/ni/	[ni]	'1NSG.ABS'(77)
	nti	/ⁿti/	[ⁿtʰiː]	'sick'(78)
	si	/si/	[siː]	'eye'(79)
/k/ - /ŋk/	kolmpu	/kɔlᵐpu/	[ˈkʰɔlᵐpu]	'jaw'(80)
	Ngkolmpu	/ŋkɔlᵐpu/	[ˈᵑkʰɔlᵐpu]	'Ngkolmpu'(81)
/s/ - /ⁿs/	iso+	/i-sɔ/	[isɔ]	'(He) minces (it)'
	inso	/iⁿsɔ/	[iⁿsɔ]	'mucus'(82)
/r/ - /l/	br	/br/	[bə̆r]	'canoe'(83)
	bl	/bl/	[bə̆l]	'seed'(84)
/w/ - /j/	were+	/wɛrɛ/	[ˈwɛrɛ]	'bright'
	yere	/jɛrɛ/	[ˈjɛrɛ]	'older man (respectful)'(85)

3 Vowels

The vowel inventory of Ngkolmpu is summarised in Table 6. Vowels are divided into three height distinctions with a distinction between front, central and back. The back vowels are all rounded. The mid-central vowel schwa [ə] is included in the charts as it is very prevalent in the language; however, it is important to note that it is non-phonemic. The non-central low vowels /æ/ and /ɒ/ are written as digraphs in the orthography, <ae> and <ao> respectively.

Table 6. Phonemic inventory of vowels

	Front		Back
High	i <i>	(ə)	u <u>
	ɛ <e>		ɔ <o>
Low	æ <ae>	a <a>	ɒ <ao>

There are no diphthongs in Ngkolmpu at the phonemic level. Any diphthong that occurs phonetically is the result of an off-glide or on-glide occurring in either the onset or coda as appropriate. These off-glides and on-glides are typically written as a sequence of two vowels in the orthography; however, phonotactically, they are non-syllabic, as discussed below.

3.1 Phonetic realisation of vowels

There is a certain amount of phonetic variation in the realisation of vowels. The high vowels /i/ and /u/ are sometimes realised as their near-high counterparts [ɪ] and [ʊ] respectively. The mid front and back vowels, /ɛ/ and /ɔ/ show some variation in height, occasionally being realised as [e] and [o] respectively. At the current stage of research, it is not clear if there is any conditioning environment, and if so, what those conditions are. Vowels are typically lengthened in open monosyllabic words without codas, although this is only a tendency. Figures 9 and 10 represent the mapping of the first and second formants of the vowels for a female and male speaker respectively, for approximately 120 tokens across all vowels. The ellipses represent approximately those which fall into 68% confidence level around the mean of each vowel.

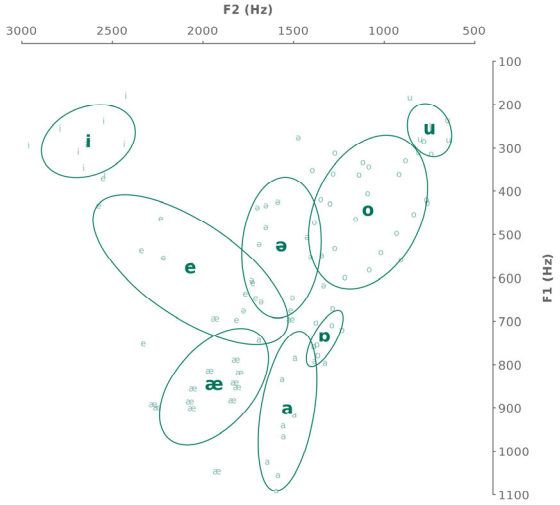


Figure 9. F1 vs. F2 plot for a single female speaker (MN)

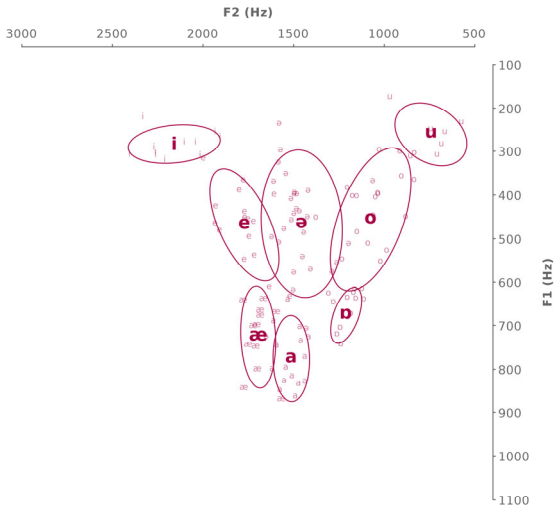


Figure 10. F1 vs. F2 plot for a single male speaker (KD)

3.2 Phonemic status of central vowel

The most frequent phonetic vowel in Ngkolmpu is a short central vowel schwa, [ə]. The occurrence of this vowel is entirely predictable and therefore non-phonemic. The schwa is inserted to create syllable nuclei in otherwise illicit clusters according to a series of phonotactic constraints discussed in §4. In this section, I simply argue for the non-phonemic status of schwa.

Epenthetic vowels such as these have been described for a number of Papuan languages, most famously in Kalam (Pawley 1966, Blevins and Pawley 2010). Similar systems have been described across the Yam family languages, in particular Komnzo (Döhler 2018) and Nen (Evans & Miller 2016). Under the typology presented in Hall (2006), the Ngkolmpu vowels would be considered "epenthetic" rather than intrusive, i.e. the vowels are inserted to repair illicit structures rather than arising from phonetic transitions between consonants.

We can say that schwa is not phonemic in Ngkolmpu since its occurrence is always predictable. Schwa only ever occurs between consonants that otherwise form illicit clusters and never occurs word-finally. It is the only vowel with this distribution. The strongest evidence for these vowels being epenthetic comes from resyllabification of stems in the presence of inflectional morphology. For example, the stem for the verb *onekutrai* 'to kick', /nɛkutr/, ends with the illicit cluster *[tr] |$_{\sigma}$. Typically when the word ends with this cluster, such as in the present tense singular actor form, the illicit cluster is broken up with an epenthetic vowel (18). However, when this cluster is followed by a vowel, such as the present tense plural actor marker /-i/,[9] the /r/ is reanalysed as part of an onset cluster (19). In this case, we can see that the vowel is not present underlyingly; rather, it is inserted where appropriate after morphological material has been added.

(18) /i-nɛkutr/ → [ʔi.ˈnɛ.kʰu.**tə̆r**] 'He kicks him'
(19) /i-nɛkutr-i/ → [ʔi.ˈnɛ.kʰu.**tri**] 'They kick him'

[9] Note that this is actually the segment /J/ which is underspecified as to whether it is a vowel or a glide. However, it is always realised as a vowel in this position before the application of epenthesis so for simplicity's sake I have treated this as a vowel in this section.

3.3 Minimal pairs

Table 7 provides minimal pairs for closely articulated vowels. No minimal pair could be found for the pair /a/ and /ɒ/; however, there is a near minimal pair, as shown in the table, and there does not appear to be any conditioning environment.

Table 7. Minimal and near minimal pairs of vowels

Phonemes	Word	Phonemic	Phonetic	Translation
/i/ - /ɛ/ - /æ/	*mi*	/mi/	[miː]	'night'(86)
	me	/mɛ/	[mɛː]	'sweet'(87)
	mæ	/mæ/	[mæː]	'breath (n.)'(88)
/a/ - /æ/	*kaikai*	/kaikai/	[kʰaʲkaʲ]	'feast (n.)'(89)
	kaeikaei	/kæikæi/	[kʰæʲkæʲ]	'skin'(90)
/a/-/ɒ/	*mpar*	/ᵐpar/	[ᵐpar]	'bone'(98)
	mpaormpoar	/mpɒrmpɒr/	[ᵐpʰɒrᵐpɒr]	'wet season'(97)
/ɒ/ - /ɔ/	*pao*	/pɒ/	[pɒː]	'invitation'
	po	/pɔ/	[pɔː]	'coconut'(91)
/a/ - /ɔ/	*alu*	/al-u/	[ʔalu]	'father-SG.ERG'(92)
	olu	/ɔlu/	[ʔɔlu]	'sago tool'(93)
/ɔ/ - /u/	*iso*⁺	/i-sɔ/	[isɔ]	'(He) minces (it)'
	isu⁺	/i-su/	[isu]	'(He) folds (it)'

4 Phonotactics

The phonotactics of Ngkolmpu are organised around a phonetic syllable structure. The unrestricted maximal syllable structure for Ngkolmpu is $[CCVC]_\sigma$, extended to $[CCVCC]_\sigma$ in word-final syllables. The minimal syllable structure is $[CV]_\sigma$. We can schematise this as in (20).

(20) $[C_1(C_2)V(C_3)(C_4)]_\sigma$

C_1 is obligatory and may be any consonant phoneme in the language; this has already been exemplified for each phoneme in the individual sections above. If C_1 is not phonemically present at the start of the word, a glottal stop is inserted.

C_2 may be any of the approximant consonants, that is, /r/, /l/, /w/ or /j/. C_2 may only occur if C_1 is sufficiently less sonorous than C_2. For example, the liquid consonants /r/ and /l/ may only occur in C_2 position if C_1 is a stop, whereas the glides /w/ and /j/ may occur in C_2 if C_1 is any non-approximant. Thus, this suggests the sonority hierarchy in (21) in which the internal member of any cluster, in this case C_2, must be at least two steps higher along this hierarchy than the external member, i.e. C_1. This use of a sonority scale is in line with works such as Selkirk (1984), Clements (1990) or Blevins (1995), which propose similar hierarchies, or sonority sequencing principles, as a constraint on possible syllable structures. The more unusual two step gradation of sonority distance within clusters, presented here for Ngkolmpu, is what has been called Minimal Sonority Distance (Zec 2007) and is similar to the analysis presented by Selkirk (1984) for Spanish.

(21) vowels > glides > liquids > nasals/fricatives[10] > stops

A vowel must occur in the V position as the syllable nucleus; this may be any vowel in the language. Any illicit clusters are "repaired" by the insertion of an epenthetic vowel as discussed in §3.2.

Word-initially, it often appears that there is no onset and that the syllable consists of only a vowel at the start of a word. In these cases, a consonant is inserted to rectify the syllable structure. Typically, this is a glottal stop [ʔ]; however, high vowels in this position may occur with a short on-glide occurring in free variation with the glottal stop. Thus, phonetically, these words in fact start with a consonant plus vowel sequence.

C_3 may be any of the approximants, i.e. /r/ /l/ /w/ /j/. In word-final position, it is possible to have a C_4 position. If there is a C_4, then it may be filled by any of the non-approximants. This then conforms to the restrictions imposed by the sonority hierarchy in (21). As stated, C_4 is restricted to word-final position only. If it is a stop, there is a phonetic tendency to have an exaggerated release in this position, typically resulting in a heavy aspiration as already discussed. Since C_4 is restricted to word-final position, complex clusters are only present word-finally (22), usually as a result of suffixation to the word (22b-c).

(22) a. /t-rɔwrt/ → [ˈtrɔ.wə̆rtʰ] '(He) follows (him)'(94)
b. /næᵐpr-t/ → [ˈnæ.ᵐpʰərtʰ] 'one at a time'(95)
c. /s-rtrɔw-ᵑk/ → [sər.ˈtɾɔʷᵑk] '(He) destroyed (it) (REM.PERF)'

An interesting result of the above rules is that the approximants /w/ and /j/ may only occur in C_3 if the vowel in the syllabic nucleus is phonologically specified. Otherwise, they become part of the onset in either C_2 or C_1 position. This can be seen in the examples in (23). In (23a) we see the /w/ being realised as the off-glide and occurring in the syllable coda. However, in example (23b), where there is no syllable nucleus, the /w/ is realised as part of the onset.

(23) a. /s-r-trɔw-ᵑk/ → [sər.ˈtɾɔʷᵑk] '(He) destroyed (it) (remote) (perfective)'
b. /kwr/ → [kʷə̆ɾ] 'pig'(96)

5 Transcription of recorded passage

A transcribed and glossed version of the North Wind and the Sun Story has been included to illustrate the elements and processes described in this article. The story was interpreted and translated from Indonesian into Ngkolmpu by Bapak Yonas Gelambu of Yanggandur. The north wind has been changed to the east wind (*wowr kue,* lit. 'monsoon wind') to match local weather patterns. Pak Yonas carefully translated the story by himself over two days. He then showed his translations and the original Indonesian to other members of the community and adjusted the translation based on their comments. He then wrote the story out in Ngkolmpu orthography and was recorded reading the final translation. The transcription below is based on that recording.

There are four lines of glossing. The first line is a broad phonetic transcription of the passage. Phonetic features entirely determined by context, such as aspiration, have been omitted from the transcription. Morphologically complex words are segmented into their constituent morphological formatives, except for verbs which are given a unified gloss.

[10] In this hierarchy fricatives and nasals are treated as a single group which I have simply labelled nasals/fricatives. Prenasalised stops are treated as stops.

This is to ensure readability given the complexity of the verbal morphology. Readers interested in the details of the verbal morphology are encouraged to read Carroll (2016).

(1) [ˈᵐpana ˈwɔwər kʷɛ jə ˈᵐpana ˈkɔᵑkɔ ˈbələ̆t]

mpana	*wowr*	*kue*	*je*	*mpana*	*kongko*
old.man.HON	monsoon	wind	3SG.COP	old.man.HON	sun

bl-t
round.object-COM
'The East Wind and the Sun.'

(2) [ˈɛibɛⁿtai ᵑki ˈᵑkɛnsɛn ˈᵐpəʲæ jə]

eibentai	*ngki*	*ngkensen*	*mpiae*	*jə*
story	this	this.DAT	thing	3SG.COP

'This story is about them.'

(3) [ˈᵐpana ˈwɔwər kʷɛ, ˈᵐpana ˈkɔᵑkɔ ˈbələ̆t ˈᵐpjæwa anəˈkarai ɔrɔ səˈrɔⁿt ˈtɛpɛwa]

mpana	*wowr*	*kue*	*irau*	*mpana*
old.man.HON	monsoon	wind	3SG.REM.COP	old.man.HON

kongko	*bl-t*	*mpyae-wa*	*ankarai*
sun	round.object-COM	thing-CAUS	RECP.NSG.REM.contradict

oro	*sront*	*tepe-wa*
who	3SG.REM.PFV	strong-ADJ

'There was the East Wind and the Sun, they disputed each other who was the strongest.'

(4) [pəˈno ˈtɛpi səˈⁿtɔru ˈnæᵐpər juˈwæi juwæi iˈrɛpɛ, nəˈgu ˈkuᵐpərwa akaˈkaiwa ˈjirau]

pno	*tepi*	*sntoru*	*naempr*	*yuayyuay*
that.time	just	3SG.REM.PFV.arrive	one	wander_around

irepe	*ngu*	*kumpr-wa*	*akakai-wa*	*irau*
person	clothes	bundle-ADJ	tie.INF-ADJ	3SG.REM.COP

'One time a traveller came; he was wrapped in a cloak.'

(5) [ˈjɛᵐpɔka mɛl mɔˈrɔ taˈtunæⁿtai ˈpənət ˈᵐpana ˈwɔwər kʷɛ ˈmɔrɔ səˈtəⁿɔⁿtu iⁿtaˈkənæjət ˈnɔrwa ᵐpjæt juˈwæi juˈwæi iˈrɛpɛ pi nəˈgu ɛˈsipraʲt]

yempoka	*mel*	*moro*	*tatunaentai*	*pnt*
two	head	how	RECP.NSG.REM.agree	like.that

mpana	*wowr*	*kue*	*moro*	*stnontu*
old.man.HON	monsoon	wind	how	3SG>3.REM.PFV.craft

intaknaei-t	*nor-wa*	*mpyae-t*	*yuayyuay*
convince.INF-PURP	what-CAUS	thing-PURP	wander_around

irepe	*pi*	*ngu*	*esiprai-t*
person	that	clothes	unclothe.INF-PURP

'They agreed for the East Wind to try and convince the man to open his cloak.'

(6) [ˈpə̆nə̆t pi səˈkroʷlɛ iˈrɛpɛ ˈtɛpɛ ˈpɛwa]

pnt	*pi*	*s=krole*	*irepe*	*tepepe-wa*
like.that	3.ABS	IRR=SG.IRR.become	man	very.strong-ADJ

'So that he would be the strongest one.'

(7) [səˈᵐpɔ ˈᵐpana ˈwɔwər kʷɛ pi kʷɛ ˈmərə seˈlusijaᵑᵍk pjɛn ˈtɛpɛnəmtɔ]

smpo	*mpana*	*wowr*	*kue*	*pi*
again	old.man.HON	monsoon	wind	3.ABS

kue	*moro*	*selusiangk*	*pien*	*tepe-nm-to*
wind	how	SG>3.REM.PFV.blow	3.DAT	strong-INST-ADV

'Then, the East Wind blew with all his strength.'

(8) [kʷɛ ˈmərɔ suˈlisiɛn pi təˈmæ ˈmərɔ aˈwaⁿtɔkɔ ˈtɛpɛ ˈtɛpɛ ˈpɛtɔ]

kue	*moro*	*sulisien*	*pi*	*tmae*
wind	how	SG>3.REM.IPFV.blow	he	SG.PFV.hold

moro	*awantoko*	*tepe~tepe*	*peto*
how	SG.enter	strong~INTS	very

'He began to blow wind, he pulls in the wind for the most power.'

(9) [juˈwæi juˈwæi iˈrɛpɛu ˈpʲɛᵑᵍku ˈmərɔ səˈlapinəᵑᵍk nəˈgu ˈpɛnɛ pi kaˈtɛi]

yuay~yuay	*irepe-u*	*piengku*	*moro*	*slapinngk*
wander_around	person-SG.ERG	he.ERG	how	SG>3.REM.PFV.embrace

negu	*pene*	*pi*	*katai*
clothes	3SG.POSS	that	pity

'The traveller pulls his cloak to him, what a shame.'

(10) [ˈᵐpana ˈwɔwər kʷɛ pi ˈᵑkɔlᵑᵍkolwa ˈtowlɛᵑᵍk]

mpana	*wowr*	*kue*	*pi*	*ngkolngkol-wa*
old.man.HON	monsoon	wind	3.ABS	peak-ADJ

towlengk
SG.REM.PFV.become

'The East Wind had tried his hardest.'

(11) [pɔˈᵐpa ˈsəᵐpɔ ˈᵐpana ˈkɔᵑᵍkɔ bəl pʲɛn tɔˈⁿsɔbru ˈᵐpʲæt ˈpræwa ˈwɛrɛnəm sərˈmarkərəⁿt ˈpənəm]

pompa	*smpo,*	*mpana*	*kongko*	*bl*	*pien*
from.there	again	old.man.HON	sun	round.object	3.SG.DAT

tonsobru	*mpyae-t*	*prae-wa*	*were-nm*
SG.REM.PFV.shine	thing-PURP	heat-ADJ	light-INS

srmarkrnt	*pnm*
SG>3.IRR.DUR.burn	3.INS

'Then, the Sun shone to burn the man with the hot light.'

(12) [ˈsəᵐpɔ pəˈnɔ ˈtɛpi juˈwæi juˈwæi iˈrɛpɛ pi nəˈgu ˈmərɔ ɛˈsipəru]

smpo	*pno*	*tepi,*	*yuay~yuay*	*irepe*	*pi*
again	that.time	just	wander_around	person	3.ABS

negu	*moro*	*esipru*
clothes	how	SG.REM.DUR.undress

'Then, the traveller opened his cloak.'

(13) [pɔˈᵐpa ˈᵐpana ˈwɔwər kʷe ˈmərɔ tərˈsuᵑᵍk ˈɔⁿtɔ al ˈkɔᵑᵍkɔ bəl jəˈrau ˈtɛpɛpɛwa ˈɔⁿtɔ ˈᵐpana ˈwɔwər kʷɛ ˈtɛpɛ ˈmɛnwa ˈjərau]

pompa	*mpana*	*wowr*	*kue*	*moro*
from.there	old.man.HON	monsoon	wind	how

torsungk,	*onto*	*al*	*kongko*	*bl*
SG.REM.PFV.admit	can	father	sun	round.object

irau	*tepepe-wa,*	*onto*	*mpana*	*wowr*
3SG.REM.COP	very.strong-ADJ	can	old.man.HON	monsoon

kue	*tepemen-wa*	*irau*
wine	weak-ADJ	3SG.REM.COP

'Then, the East Wind confessed that the Sun was the strongest.'

(14) [ˈpəᵑkɛ ˈtɛpi jiˈrɛi ˈᵑkənɛ ˈɛibəⁿtai ˈkiki al ˈkɔᵑko bəl raːt al ˈwɔwər kʷɛt]

pngke	*tepi*	*irei*	*ngkne*	*eibentai*	*kiki,*	*al*
to.there	just	3SG.HOD.COP	this.FOC	story	word	father

kongko	*bl*	*ra-t,*	*al*	*wowr*
sun	round.object	who-COM	father	monsoon

kue-t
wind-COM
'The story of the Sun and the East Wind goes until here.'

(15) [tɛˈbaip]
tebaip
enough
'The story is finished.'

References

Blevins, Juliette. 1995. The syllable in phonological theory. In Goldsmith, John A. & Riggle, Jason & Yu, Alan C. L. (eds.), *The handbook of phonological theory*. Cambridge, MA: Blackwell Publishing.

Blevins, Juliette & Pawley, Andrew. 2010. Typological implications of Kalam predictable vowels. *Phonology* 27: 1–44.

Carroll, Matthew J. 2016. *The Ngkolmpu language with special reference to distributed exponence.* Canberra: The Australian National University. (Doctoral dissertation.)

Carroll, Matthew J. 2019. Prenasalised voiceless stops in Ngkolmpu. In Calhoun, Sasha & Escudero, Paola & Tabain, Marija & Warren, Paul (eds.), *Proceedings of the 19th International Congress of Phonetic Sciences, Melbourne, Australia 2019*, 2036–2040. Canberra: Australasian Speech Science and Technology Association Inc.

Donohue, Mark. 2008. Complexities with restricted numeral systems. *Language Typology* 12: 423–429.

Donohue, Mark. 2011. Case and configurationality: Scrambling or mapping? *Morphology* 21: 499–513.

Donohue, Mark. 2015. Morphological opacity: Rules of referral in Kanum verbs. In Baerman, Matthew & Brown, Dunstan & Corbett, Greville G. (eds.), *Understanding and measuring morphological complexity*, 53–68. Oxford: Oxford University Press.

Clements, George Nickerson. 1990. The role of the sonority cycle in core syllabification. In Kingston, John & Beckman, Mary E. (eds.), *Papers in laboratory phonology: Volume 1, between the grammar and physics of speech*, 283–333. Cambridge: Cambridge University Press.

Döhler, Christian. 2018. *A grammar of Komnzo*. Berlin: Language Science Press.

Evans, Nicholas & Arka, Wayan & Carroll, Matthew J. & Choi, Yun Jung & Döhler, Christian & Gast, Volker & Kashima, Eri & Mittag, Emil & Olsson, Bruno & Quinn, Kyla & Schokkin, Dineke & Tama, Philip & Van Tongeren, Charlotte & Siegel, Jeff. 2018. The languages of Southern New Guinea. In Bill Palmer (ed.), *The languages and linguistics of New Guinea: A comprehensive guide*, 641–774. Berlin: Walter de Gruyter.

Evans, Nicholas & Miller, Julia C. 2016. Nen. *Journal of the International Phonetic Association.* 46(3): 331–349.

Hall, Nancy. 2006. Cross-linguistic patterns of vowel intrusion. *Phonology* 23: 387–429.

Ladefoged, Peter & Maddieson, Ian. 1996. *The sounds of the world's languages*. Hoboken, NY: Wiley.

Lindsey, Kate L. 2021. Ende. *Journal of the International Phonetic Association*, 1-21. doi: 10.1017/S0025100320000389.

Maddieson, Ian. 1997. Phonetic universals. In Hardcastle, William J. & Laver, John & Gibbon, Fiona E. (eds.), *The handbook of phonetic sciences*, 619–639. Oxford: Blackwell Publishing.

Pawley, Andrew K. 1966. *The structure of Kalam: A grammar of a New Guinea Highlands language*. Auckland: University of Auckland. (Doctoral dissertation.)

Selkirk, Elisabeth O. 1984. On the major class features and syllable theory. In Aronoff, Mark & Oehrle, Richard T. (eds.), *Language sound structure*, 107–113. Cambridge, MA: MIT Press.

Zec, Draga. 2007. The syllable. In De Lacy, Paul (ed.), *The Cambridge handbook of phonology*, 161–194. Cambridge: Cambridge University Press.

4

Language Documentation & Conservation Special Publication No. 24 (2021)
Phonetic fieldwork in Southern New Guinea
ed. by Kate L. Lindsey & Dineke Schokkin, pp. 53–75
http://nflrc.hawaii.edu/ldc/ http://hdl.handle.net/24994

The phonetics of Nmbo (Nɐmbo) with some comments on its phonology (Yam family; Morehead district)

Eri Kashima
University of Helsinki

This paper presents aspects of the phonetics and phonology of the Nmbo language as spoken by the Kerake tribe peoples of southern Western Province, Papua New Guinea. The paper is primarily concerned with the phonetics of consonants and vowels, but also presents description and audio examples of stress and clausal intonation patterns.

1. Introduction[1]

Nmbo (pronounced /nɐm.bo/, also known as Nambo), is a Papuan language of the Yam family (also known as the Morehead Upper-Maro family (Wurm & Hattori 1981, Ross 2005)) (glottocode NAMB1293, ISO-639-3 code ncm). It is spoken by 700-1000 people, primarily across three villages in the Morehead district of the South-fly in Western Province of Papua New Guinea. Nmbo is a vital language, in the sense that children learn it as one of their many first languages. Due to the small speaker population, however, Nmbo is theoretically always endangered. The moniker of 'Nmbo speaker' overlaps in local ideology with the Kerake tribe, and the Nmbo language is spoken of in terms of being the language of the Kerake people (Kashima 2020b: 50-52; Williams 1936). The Kerake tribe reside primarily in the villages of Govav, Bevdvn, and Arovwe. There is a closely related variety, Namna (also confusingly known as Nambo, pronounced /nam.bo/), which is spoken by the Yarne tribe in the villages of Drdr and Fongarke. This paper is concerned with the Kerake variety of the language.

Nmbo is an under-described language, with one prior acoustic phonetic study conducted on the vowel space (Kashima et al. 2016). A sketch grammar has been produced as part of a doctoral dissertation by the author (Kashima 2020b), and this paper is a partial adaptation of the phonology section. A phonetic description of the closely related Nen has been published by Evans and Miller (2016). While Nmbo and Nen share many similarities, there are enough differences in their phonetics and phonology to warrant separate descriptions.

The majority of the recorded examples in this paper were provided by Ruscien Aniba who originates from Arovwe village. She is a long-term resident of the Nen speaking village of Bimadbn, and was about 58 years old at the time of recording in 2018. The recordings of Ruscien were made by Nicholas Evans, except for the recording of the *North Wind and the Sun* text in the final section of this paper which was made by Julia C. Miller in 2013. Additional recordings are used in this paper that are not from Ruscien, and more details about the audio examples are provided in footnotes throughout the

[1] I thank the Australian Research Council (project: The Wellsprings of Linguistic Diversity, grant No. FL130100111) for funding the research, and the ARC Center of Excellence for the Dynamics of Language. Thank you to Nicholas Evans and Dineke Schokkin, who recorded Ruscien's data in 2018, and Julia Colleen Miller who recorded the North Wind and the Sun passage in 2013. Finally I would like to thank Ruscien Aniba in particular, and the Nmbo speech community broadly, for their patience and generosity.

paper. The other examples are selected from continuous speech data which were collected by the author between the years of 2014 and 2017. I have attempted to present recorded samples to support the in-text examples, but this has not always been possible.

IPA symbols and conventional bracketing symbols are used in this paper. Any representation of words in the practical orthography will be italicised, with the phonemic level representation in slanted brackets e.g., *ag* /ɑg/ 'coconut'. Note that the practical orthography omits the overt representation of one of the central vowels, /ɐ/, when in intervocalic position (e.g., *qv* /k͡pɐβ/ 'spleen'). When /ɐ/ occurs word-initially, however, it will be orthographically represented as <á>. The other central vowel, /ə/, is orthographically represented by <é> (e.g., *qév* /k͡pəβ/ 'time').

2. Consonants

Nmbo has a consonant inventory of 28 (Table 1). This is larger compared to the neighbouring Nambu branch language Nen, which has an inventory of 23 phonemes (Evans & Miller 2016). The larger consonant inventory in Nmbo is due to its partial retention of an ancestral rounded labial series and of the bilabial fricatives (*^{m}bw, *^{m}w, *f^{w}, Evans et al. 2017). Both series are absent in Nen.

Table 1. Nmbo consonant inventory

	Bilabial	**Labialised Bilabial**	**Alveolar**	**Palatal**	**Velar**	**Labialised Velar**	**Glottal**
Plosive	p b	b^{w}	t d		k g	k͡p g͡b	
Prenasalised Plosive	^{m}b		^{n}d		^{ŋ}g	^{ŋ}g͡b	
Nasal	m	m^{w}	n	ɲ			
Trill			r				
Fricative	ɸ β	ɸ^{w} β^{w}	s [z~ʒ~ɖʒ]				h
Approximant				j		w	
Lateral Approximant			l				

Plosives

Nmbo has three manners of stop consonants: voiced, voiceless, and prenasalised. In addition, there is a voiced rounded bilabial stop /b^{w}/ which will be discussed later with the other rounded bilabial consonants. All the voiced non-rounded bilabial stops have prenasalised counterparts: /^{m}b, ^{n}d, ^{ŋ}g, ^{ŋ}g͡b/.

The regular voiced and voiceless plosives occur word-initially, but the prenasalised stops do not. Languages of the Nambu subgroup within the Yam family have lost prenasalisation word-initially. Today only the Tonda subgroup languages within the Yam family have retained this feature (Evans et al. 2017).

The alveolar and velar stops show a voicing contrast across all positions, and occur word-initially, word-finally, and intervocalically.

1. /t/ vs. /d/
   a. *tén* /tən/ 'oven heat'(001) vs. *dén* /dən/ 'coconut shoot'(002)
   b. *tér-tér* /tər.tər/ 'tippy toes'(003) vs. *Dérdér* /dər.dər/ 'The locale of Drdr/Derideri'(004)

2. /k/ vs. /g/
   a. *kor* /kor/ 'again'(005) vs. *gor* /gor/ 'footprint'
   b. *ak-ak* /ɑ.kɑk/ 'A furry caterpiller with spikes' (006) vs. *ag-ag* /ɑg.ɑg/ 'tree of classification *Canthium cf. longiflorum*' (007)

The bilabial stop contrasts are restricted, with an asymmetry between the distributions of the voiced and voiceless incarnations. The voiceless bilabial stop /p/ occurs most noticeably in word-initial position of loan words such as *plen (*/plen/, 'plane')(008)[2], or personal names such as *Patra* (/pɑt.rɑ/) (009). It occurs as an initial onset, and word-finally, in reduplicated words such as *pitpit* (/pit.pit/, 'plant species') or *laplap* (/lɑp-lɑp/, 'sarong', which may also be a loan word from Tok Pisin). Impressionistically speaking, it seems that some Nmbo speakers pronounce these words in a form that approximates the voiceless bilabial fricative /ɸ/, e.g., /ɸlen/, /ɸɑ.trɑ/.

The voiced stop /b/ occurs much more frequently than its voiceless counterpart, but also has quite a restricted pattern of occurrence. It occurs word-initially, and syllable-initially in reduplicated forms, e.g., *banban* /bɑn.bɑn/ ('under', 'shadow') (010), *bérbér* /bər.bər/ ('fear') (011). It does not occur word-finally, or intervocalically. Note that the phone [β] occurs in complementary distribution with [b], but the status of [β] will be discussed in the fricatives section further on.

Finally, Nmbo has labial-velar coarticulated stops /k͡p/ and /g͡b/. There is individual variation in the degree of coarticulation, either a full closure for [k͡p] or a partial closure so that the phone is closer to [kʷ] or [gʷ]. Ruscien's pronunciations in the recordings are very coarticulated realisations of /k͡p/ and /g͡b/.

3. /k/ vs. /k͡p/
   a. *ka* /kɑ/ 'where' (012) vs. *qa* /k͡pɑ/ 'Torresian crow' (013)
   b. *kaki* /kɑ.ki/ 'grandparent', 'grandchild' (014) vs. *qéki* /k͡pə.ki/ 'vessel' (015)

4. /g/ vs. /g͡b/
   a. *ggn* /gɐ.gɐ.n/ 'rock' (016) vs. *ḡéḡén* /g͡bə.g͡bən/ 'bow', 'bamboo' (017)

The difference between the plain velar stops and the coarticulated labial-velar stops is also acoustically visible. The regular velar stop shows a stop release burst leading into the following vowel, as is indicated by the arrow in Figure 1. The coarticulated stop on the other hand shows an increase in intensity before leading into the vowel, and the stop release shows a lot less frication. The arrows in Figure 2 indicate the increase in intensity before the transition into the vowel. Also note that the release of the velar stop shows significantly less frication in contrast to the [g] release shown in Figure 1.

[2] Speaker GM, a man about 62 years old at time of recording. Segment taken from the recording WSEK1-G20151014-01BoggedPlaneGM

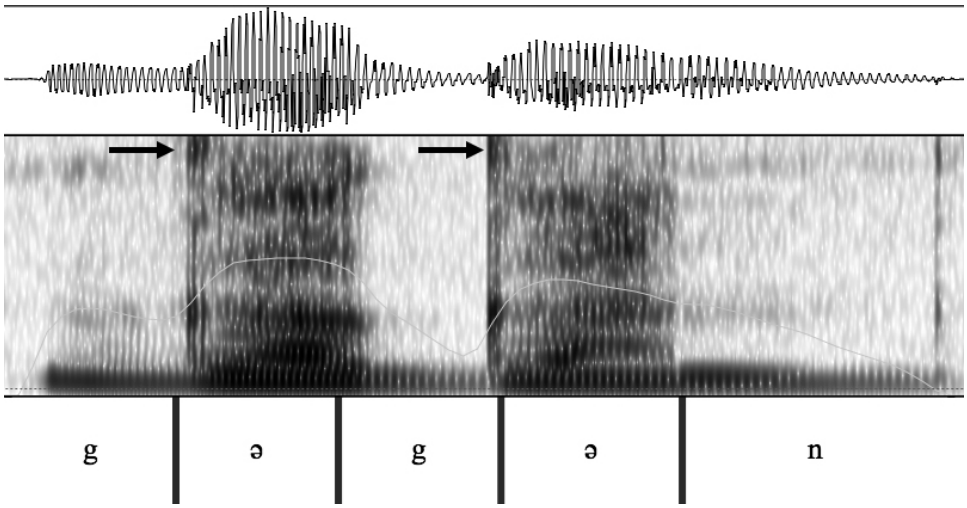


Figure 1. Acoustics of [gɐ.gɐn] ‘rock’. Contrast with Figure 2 below.

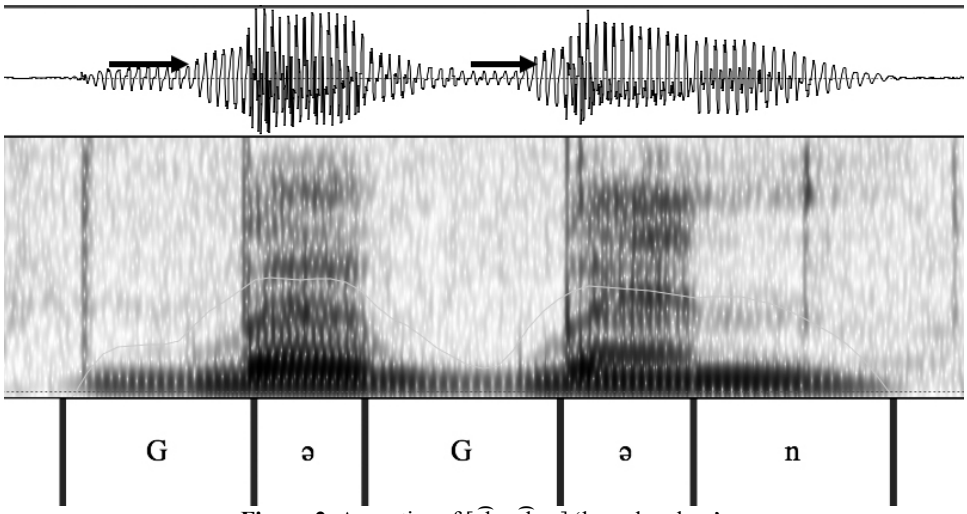


Figure 2. Acoustics of [g͡bə.g͡bən] ‘bow, bamboo’.

Labial-velar stop consonants are cross-linguistically uncommon, but when they occur tend to be concentrated around certain parts of the world such as West-Africa (Cahill 2000: 71), and Vanuatu (Billington et al. 2018). Nmbo shows a rare phonemic contrast between voiced and voiceless labial-velar stops. The contrast is cross-linguistically so rare that Cahill has suggested a phonemic /kp/ “may be non-existent” (Cahill 1999: 157). This makes Nmbo, and the closely related Nen for which this distinction is also present (Evans and Miller 2016: 3), two of the few languages known to make this voicing contrast between labial-velar coarticulated plosives.

The near-minimal pairs presented below for /k͡p/ vs. /g͡b/ show a distinction in the following vowels. The voiceless stops are followed by the short back vowel [ɐ], while the voiced stops are followed by the short central vowel [ə]. Cahill (1999) notes that labial-velars are known to have restrictions on following vowels (p. 163), so it is possible that the Nmbo examples here are showing a systematic phenomenon where the voicing of labial-velar coarticulation results in the co-occurrence with specific central vowels.

5. /k͡p/ vs. /g͡b/
   a. *qrqr* /k͡pɐr.k͡pɐr/ (‘bushfire’) (018) vs. *ḡérḡér* /g͡bər.g͡bər/ ‘plant of species *Acronychia’* (019)
   b. *dqn* /dɐ.k͡pɐn / ‘black anthill’ (020) vs. *déḡén* /də.g͡bən / ‘joint’ (021)

All voiced stops except /bʷ/ have prenasalised counterparts: / ᵐb, ⁿd, ᵑg, ᵑg͡b /. Prenasalised stops occur in all positions except in word-initial position. At non-word-initial syllable boundaries, the nasal portion of the stop syllabifies as the coda of the preceding syllable, and the stop will form the onset of the following syllable, e.g., *band=an* (land=LOC) > /bɑn.dɑn/. The minimal pairs below contrast the prenasalised stops with their non-prenasalised counterparts in this position.

6. /b/ vs. / ᵐb /
   a. *bérbér* /bər.bər/ ‘fear’ (022) vs. *bérmbér* /bərm.bər/ ‘mouth’ (023)

7. /d/ vs. / ⁿd /
   a. *kudu* /ku.du/ ‘Southern Crowned Pigeon’ (024) vs. *kundu* /kun.du/ ‘drum type’[3] (025)

8. /g/ vs. / ᵑg /
   a. *Igara* /i.gɑ.rɑ / Male personal name (026) vs. /iŋ.gɑ.rɑ.iŋ.gɑ.rɑ/ ‘plant type’ (027)

Rounded bilabials

Nmbo has four rounded bilabials: /bʷ/, /mʷ/, /ɸʷ/, and /βʷ/. They occur word-initially and intervocalically, but not word-finally. The bilabial and labiovelar parts are analysed as a single segment rather than two sequential segments since there are no other onset clusters where the second segment is labiovelar [w]. The coarticulated labiovelars /k͡p, g͡b/ are the only segments that could arguably be analysed as a velar + labial-velar sequential segment, but I have argued above that these segments be analysed as single segment based on their distribution, and acoustic properties of their realisation.

Rounded bilabial consonants rarely occur, and exhibit variable realisations when they do. The variation is likely due to coarticulatory effects. A common phonological context of variation is preceding the vowels [i] or [e]. For example [mʷ] is variably realised with less rounding, e.g., [mɑ.mʷi ~ mɑ.mi] ‘pig’ (028, this example from Ruscien exhibits a clear case of rounding). The reverse also happens, where the nasal consonant in words that are typically unrounded is labialised, e.g., [mi jɐm ~ mʷi jɐm] ‘It is still so’, [ᵃᵐbæᵐbe ~ æᵐbæᵐbʷe] ‘sometimes’. Some words, such as the village of Arovwe [ɑ.ro.βe ~ ɑ.ro.βʷe] vary so much by speaker, a more systematic study is necessary to determine what patterns the variation.

Minimal pairs contrasting rounded vs. unrounded bilabials are rare. So far there is only one minimal pair for /bʷ/ contrasting with /b/, and /βʷ/ with /β/. Minimal pairs contrasting /mʷ/ and /m/, / bʷ / and /ɸ/ have not been found. I have found one minimal pair showing a contrast between /βʷ/ and /ɸʷ/.

9. /bʷ/ vs. /b/
   bwe /bʷe/ ‘seed’, ‘round thing’ (029) vs. *be* /be/ 2.DAT (030)

10. /βʷ/ vs /β/
   kavwe /kɑ.βʷe / ‘tree branch’ (031) vs. *kave* /kɑ.βe/ ‘cockatoo’ (032)

[3] This is technically a loan word from Tok Pisin.

bavwa /bɑ.βʷɑ / ‘Singaporean Taro’ (033) vs. *bava* /bɑ.βɑ/ ‘sister’s children; mother’s brothers’ (034)

11. /bʷ/ vs /ɸʷ /
bwe /bʷe/ ‘seed, round thing’ (035) vs. /ɸʷe/ ‘tape worm’ (036)

The current evidence for postulating /mʷ/ as a phoneme comes from comparison with Nama and Nen (Table 2). Nama is one of the more phonologically conservative Nambu languages with a retention of prenasalised stops, including the prenasalised rounded bilabial /ᵐbʷ/ (Evans et al. 2017). Nmbo, like Nama, retains word-initial /mʷ/ from proto-Nambu, while this has been lost in Nen. Interestingly there are very few shared cognate words with /mʷ/ between Nama, Nmbo, and Nen. For example, Nmbo /mɑmʷi/ ‘pig’ in both Nama and Nen is an entirely different word, *kiemb*. While the linguistic justification I have presented here is based on a diachronic comparison of Nama, Nmbo, and Nen, synchronically speakers of these languages are also sensitive to the difference between rounded and unrounded bilabial nasals, i.e. Nmbo speakers have a strong awareness that Nen speakers will say *miti* for ‘exchange cousin’, while in their own language they will say *mwite*.

Table 2. Cognates of /mʷ/ words in Nama, Nmbo, and Nen. Proto-Nambu reconstructions from Evans and colleagues (2017)

	Proto-Nambu	**Nama**	**Nmbo**	**Nen**
exchange uncle		/mʷitareɸ/	/mʷitɑreβ/	/mitarbe/
exchange aunt		/mʷitartəm/	/mʷidædem/ (037)	/mitadma/
exchange cousin’	*mʷiti	/mʷite/	/mʷite/ (038)	/miti/
jaw	*ɸətkamʷe	/ɸət/	/ɸətkɑmʷe/ (039)	/bətkam/

Nasals

There are three nasals: /m/, /n/, and /ɲ/. There is no velar nasal, except as the prenasalised part of the voiced velar stop /g/, e.g., /ᵑg/. All nasals can occur in all positions. As mentioned in the section on labialized stops, /m/ is realised by some speakers as [mʷ] when followed by the vowels [i] or [e].

12. /n/ vs /ɲ/
a) *men* /men/ ‘bird’ (040) vs. *meñ* /meɲ/ ‘nose’ (041)
b) *wén* /wən/ ‘tree’ (042) vs. *wñ* /wɐɲ/ ‘cheeky, scoundrel’

Fricatives

Fricatives have three places of articulation: bilabial, alveolar, and glottal. The bilabial and alveolar fricatives show a voicing contrast.

The bilabial fricatives, much like bilabial stops, show an asymmetry in distribution. The voiceless bilabial fricative [ɸ] occurs word-initially (e.g., *fan* /ɸɑn/ ‘savannah’(043), *fíro* /ɸi.ro/ ‘naked’(044)), and occasionally intervocalically (e.g., *drfn* /dɐr.ɸɐn/ ‘bat’(045), *ynfiak* /jɐ.nɐ.ɸi.jɑk/ ‘Whistling Kite’(046)). The voiced [β] never occurs word-initially, but occurs intervocalically and word-finally. The current analysis is that [β] is an allophone of /ɸ/ word-finally, though how to distinguish this from [β] as an allophone of /b/ in word-final position is yet to be determined.

13. /β/ vs /ɸ/
a) *gova* /gɔ.βɑ/ exclamation, ‘oh gosh!’(047) vs. *gofa* /gɔ.ɸɑ/ ‘name of a malevolent

spirit'(048)
b) *däfi* /dæɸi/ 'immigrant' vs. *sävi* /sæβi/ 'law'(049)[4]

Unlike the bilabial fricatives, the alveolar fricatives /s/ and /z/ show regular behaviour. There is a voicing contrast, and they can all occur word-initially, -finally, and intervocalically.

14. /s/ vs. /z/
a) *site* /si.te/ 'white, light'(050) vs. *zite* /zi.te/ 'afternoon'(051)
b) *su* /su/ 'stomach'(052) vs. *zu-zu* /zu.zu/ 'rubbish'(053)

The fricative /z/ shows variation in its realisation, with pronunciations varying between [z ~ ʒ ~ dʒ]. Some words, such as *zv* /zɐβ/ 'hair, fur'(054) are varyingly pronounced as [zɐβ] or [dʒɐβ]. Word-list data I collected in 2017 from two Nmbo villages shows 23 (76.7%) speakers pronouncing *zav* /zɑβ/ ('cloud') with [z]. The remaining 9 (23.3%) speakers produced [dʒ]. I do not have quantitative results to support it, but my impression is that other words such as *zi* /zi/ 'word, story'(055) are almost always realised as [zi]. One possibility is that /z/ is more likely to be realised as [z] when followed by a high front vowel, while words with /z/ preceding other vowels are slightly more likely to show the variation of [z ~ ʒ ~ dʒ].

The glottal fricative /h/ occurs in all positions, and is variably realised as [h], [ʔ], or is dropped entirely. For example the word *hamba* /hɑm.bɑ/ 'village'(056) may be realised varyingly as [ʔɑm.bɑ] or [ɑm.bɑ](057).[5] A corpus study of word-initial [h] in natural speech data shows that speaker age predicts propensity of [h]-drop: speakers born after 1975 are much more likely to drop [h] compared to speakers born before this year (Kashima 2020a). [h] was dropped almost all the time by the majority of speakers who were born after 1980. The prediction is that [h] will soon cease to be realised in word-initial position by Nmbo speakers.

Trills and approximants

Nmbo has one trill phoneme /r/, and three approximants: /j, w, l/. /r/ and /l/ are phonemically contrastive, as are /j/ and /w/. All four phonemes can occur word-initially and -finally, and intervocalically. /j/ and /w/ can also occur after the vowels /æ, ɑ, o/ to form phonetic diphthongs.

15. /ɾ/ vs. /l/
a) *áreh* /ɐ.reh/ 'to look for'(058) vs. *äleh* /æ.leh/ 'to hunt'(059)
b) *férh* /ɸə.rɐh/ 'to become'(060) vs. *félh* /ɸə.lɐh/ 'to put something in something'(061)

16. /j/ vs. /w/[6]
a) *yao* /jɑw/ 'no'(062) vs. *wao* /wɑw/ 'ripe'(063)
b) *ym* /jɐm/ 's/he/it is'(064) vs. *wm* /wɐm/ 'I am'(065)

[4] Speaker MY, a man about 65 years old at time of recording in 2017. Segment taken from the recording WSEK1-G20170707-03MY02MQhm
[5] Speaker JY, a 31 year old woman at time of recording in 2017. Segment taken from the Nmbo Wordlist Corpus.
[6] Note that both the audio examples for (b) comprise two words. For (064) it is *bä ym* /bæ.jɐm/ 'It is'; the second monosyllabic unit is the relevant word for this example. For (065) it is *ynd wm* /jɐⁿd.wɐm/ 'I am', again the second monosyllabic unit is the relevant word for this example.

Table 3. Occurrence of Nmbo consonants + orthographic symbol

IPA	Grapheme	Word/Syllable Initial	Word/Syllable Final
p	p	*plen* /plen/ 'plane'(066)	-
b	b	*bä* /bæ/ '3.ABS'(067)	-
t	t	*tnd* /tɐⁿd/ 'hand'(068)	*tot* /tot/ 'nail'(069)
d	d	*deve* /de.βe/ 'father'(070)	*qd* /k͡pɐd/ 'spleen'(071)[7]
k	k	*kkv* /kɐ.kɐβ/ 'there'(072)	*ynfiak* /jɐ.nɐ.ɸi.jɑk/ 'Whistling Kite'(073)
g	g	*got* /got/ 'back', 'bone'(074)	*ag* /ɑg/ 'coconut'(075)
k͡p	q	*qa* /k͡pɑ/ 'Torresian crow'(076)	*séq* /sək͡p(ə)/ 'canoe'(077)
g͡b	g̃	*g̃ég̃én* /g͡bə.gɓən/ 'bow'(078)	
mʷ	mw	*mwil* /mʷil/ 'nipa fruit'(079)	-
bʷ	bw	*bwe* /bʷe/ 'seed'(080)	-
ɸʷ	fw	*fwe* /ɸʷe/ 'tapeworm'(081)	-
βʷ	vw	*kavwe* /kɑ.βʷe/ 'tree branch'(082)	-
ᵐb	mb	-	*gumb* /guᵐb / 'pool'(083)
ⁿd	nd	-	*tnd* /tɐⁿd/ 'hand'(084)
ᵑg	ng	-	*bwerang* /bʷe.rɑᵑg/ 'fly'(085)
ᵑg͡b	nɡ̃	-	*ynɡ̃* /jɐᵑg͡b/ 'bag'(086)
m	m	*men* /men/ 'bird'(087)	*yam* /jɑm/ 'custom'(088)
n	n	*non* /non/ 'why'(089)	*wén* /wən/ 'tree'(090)
ɲ	ñ	*ñareh* /ɲɑ.reh/ 'to share'(091)	*meñ* /meɲ/ 'nose'(092)
r	r	*raiya* /rɑy.jɑ/ 'incoming tide'(093)	*mer* /mer/ 'good'(094)
ɸ	f	*fan* /ɸɑn/ 'savannah'(095)	-
β	v	-	*zv* /zɐβ/ 'hair, fur'(096)
s	s	*sn* /sɐn/ 'tooth'(097)	*fras* /ɸrɑs/ 'plant species used as poison root'(098)
z	z	*zi* /zi/ 'word', 'story'(099)	*moz* /moz/ 'leech'(100)
h	h	*hamba* /hɑᵐ.bɑ/ 'village'(101)	*wingoh* /wiŋ.goh/ 'to see'(102)
j	y	*ynd* /jɐⁿd/ '1.ABS'(103)	*wai* /wɑj/ 'again'(104)
w	w	*wiwi* /wi.wi/ 'mango'(105)	*wao* /wɑw/ 'ripe'(106)
l	l	*lmänh* /lə.mæ.nɐh/ 'to pull'(107)	*mwil* /mʷil/ 'nipa fruit'(108)

3 Vowels

Nmbo has eight phonemic monophthongal vowels: /i, e, æ, ɑ, o, u/, and two central vowels: /ə, ɐ/ (Figure 3). Nmbo also has marginal nasal vowels [ẽ] and [æ̃]. The nasal vowels are often used as "non-lexical conversational sounds" (Ward 2006) such as [ẽː] for affirmation, or "repair initiators" (Dingemanse et al. 2013) such as [æ̃]. The exception is the expression *gihẽ* [gɪhẽ](109)[8] meaning 'right here' or 'look at this thing close to me', usually accompanied with a pointing gesture.

The full vowels can occur word-initially and -finally, and function as the nucleus of a syllable. The realisation of these vowels shows some variation, such as /e/ being realised akin to [ɛ], /o/ to [ɔ]. The central vowels have a more limited distribution with specific behaviour, and will be discussed in the central vowel section further on.

[7] Govav dialect.

[8] Speaker ZG, a man 58 years old at time of recording. Segment taken from the recording WSEK1-G20170706-03ZG04Retell. Note that the short [ɪ] is used here not to indicate a phoneme, but to approximate the phonetics of that central vowel following the velar consonant.

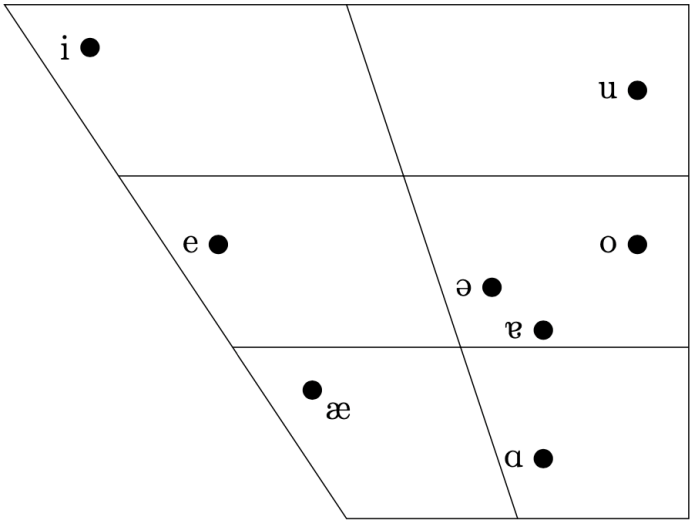


Figure 3. Community mean values of F1 and F2 per vowel, Lobanov transformed. The means are from 61 speakers of the Nmbo Wordlist Corpus from the years 2014 and 2015 (i = 981 (n), e = 1818, æ = 1089, ɑ = 1524, o = 1221, u = 606, ə = 615, ɐ = 2622).

Nmbo does not have phonemic diphthongs. Sequences of phonetic diphthongs end in a high vowel off-glide, and are analysed as a VC sequence (e.g., *yao* [jɑʊ]~[jɑʉ]~[jɑw] /jɑw/ 'no, NEG'(110), *kai* [kɑɪ]~[kɑj] /kɑj/ 'tomorrow, yesterday'(111)[9]). In the practical orthography, vowel + high vowel sequences are represented as two vowels, e.g., <ai, ao>.

Phonetic diphthongs in a single syllable are rarely followed by an additional consonant. The words that may have consonants following phonetic diphthongs in the same syllable are either proper nouns (e.g., *Kaog* [kɑwg](112)[10]), or loan words (e.g., *faol* [ɸɑwl] 'chicken' (from English *fowl*)(113)[11]. The one common noun that looks like it may be an exception is *gāiñ* 'mosquito' and other words that contain it (e.g., *engāiñ* 'a type of fresh water creek fish'). These words are analysed as a case of palatal assimilation of the palatal nasal <ñ> [ɲ], giving the monophthong [ɑ] a palatal off-glide. Orthographically, *gaiñ* looks to be a closed syllable with a diphthong nucleus, but it is phonemically /g͡bɑɲ/ and phonetically [g͡bɑʲɲ].

Central vowels as phonemic and epenthetic

Nmbo has two central vowels [ə] and [ɐ], which have a shorter duration compared to the other vowels in the inventory (Figure 4). These short, centralised vowels have been attested for many, if not all, Yam languages, but their phonemic status differs between branches. Nen's [ɪ] and [ə] have been identified as being phonemic in some instances (Evans and Miller 2016: 10). In the Tonda languages these central vowels have been analysed as mostly epenthetic for Ngkolmpu (Carroll 2016: 45─46), but emergently phonemic in Komnzo (Döhler 2018: 58). Similar kinds of vowels have been variously

[9] Speaker KSae, a man 40 years old at time of recording. Segment taken from the recording WSEK1-B20150817-02DimbanKSaehm.

[10] Speaker WZ, a woman 60 years old at time of recording. Segment taken from the recording WSEK1-B20150924-HuntingWZhm.

[11] Speaker MZ, a man 32 years old at time of recording. Segment taken from the recording WSEK1-B20150909-MissingMoneyMShm.

described in the Papuanist literature as "transitional vowels" (Foley 1986), "predictable vowels" (Blevins & Pawley 2010), or merely as "epenthetic."

Below are some of the characteristics of Nmbo [ə] and [ɐ]:

- They are phonemically contrastive, both with other peripheral vowels, and with each other.
- They function as syllable nuclei, and such syllables can take stress.
- Their realisation is not dependent on the quality of the surrounding consonants.
- They can occur word-initially in verb roots. They can also occur word-finally, but it is unclear whether this is phonemic or merely a tendency for some individuals when releasing final consonants.
- Nmbo speakers are comfortable with the orthographic non-representation of central vowels.

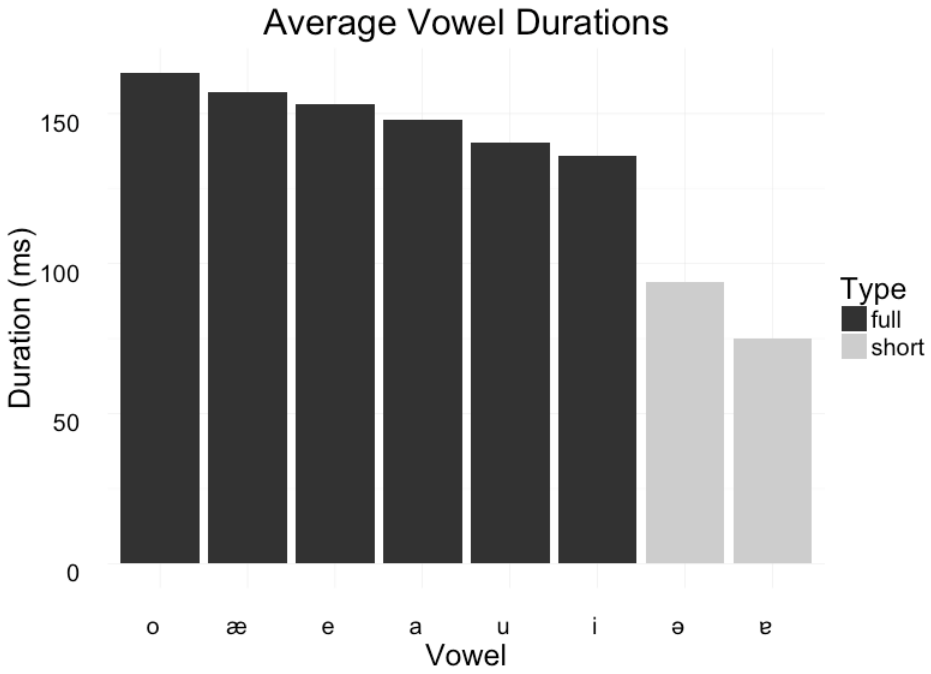


Figure 4. Nmbo vowel space. Average vowel duration of speakers from the 2015 subset of the Nmbo Wordlist Corpus (NWC) consisting of 36 speakers aged 19 ~ 60+ from Bevdvn and Govav villages (i = 252 (n), e = 432, æ = 252, ɑ = 396, o =324, u = 144, ə = 180, ɐ = 684.

There are a number of minimal pairs between central and peripheral vowels in Nmbo. Minimal pairs between the two central vowels [ə] and [ɐ] have also been attested, warranting two distinct central vowel phonemes.

17. Full vowels vs central vowels minimal pairs
    a) *sin* /sin/ 'pot'$_{(114)}$ vs. *sén* /sən/ 'tooth' $_{(115)}$
    b) *wem* /wem/ Kerake: Yam type; Yarne: 'food, yam' $_{(116)}$[12] vs. *wm* /wɐm/ 'I am'

[12] Speaker SZ, a man 69 years old at time of recording. Segment taken from the recording WSEK1-B20170614-04DrumSZhm.

(117)[13]

c) *mär* /mær/ ‘spectator’ vs. *mr* /mɐr/ ‘brain’
d) *muta* /mutɑ/ ‘yam type’ vs. *mtar* /mɐtɑr/ ‘quickly’
e) *rusa* /rusɑ/ Indonesian loan of ‘deer’ vs. rsah /rɐsɑh/ ‘to carry’
f) *fok* /ɸok/ ‘bad omen’ vs. *fék* /ɸək/ ‘loose’
g) *hakr* /hɑ.kɐr/ ‘boy’(118) vs. *hkr* /hɐ.kɐr/ ‘yam cake’(119)
h) *kanam* /kɑ.nɑm/ ‘snake’(120) vs. *knm* /kɐ.nɐm/ imperative ‘come’(121)

18. /ə/ vs. /ɐ/
a) *yém* /j͡əm/ ‘gumtree’(122) vs. *ym* /jɐm/ ’s/he/it is’(123)
b) *qév* /k͡pəβ/ ‘time’(124) vs. *qv* /k͡pɐβ/ ‘hole’(125)

19. Full vowel vs. /ə/ vs /ɐ/
a) *yam* /jɑm/ ‘to look for; the way’ (126) vs. *yém* /jəm/ ‘gumtree’ (127) vs. *ym* /jɐm/ ’s/he/it is’ (128)
b) *sov* /soβ/ ‘wave’ (129)[14] vs. *sév* /sɐβ/ ‘hoop’ (130)[15] vs. *sv* /sɐβ/ ‘bundle’ (131)[16]

Central vowels can form the nucleus of a syllable. The central vowels are visible in spectrograms, and their realisations do not appear dependent on the quality of the surrounding consonants. Figure 5 shows a slice of natural speech *mna kt* ‘because there’(132),[17] and the voicing is visible between the two voiceless stops [kʰ] and [tʰ]. Note also the presence of a central vowel between the nasals [m] and [n] in the word *mna*.

The word-final phonemic status of the central vowels is less clear. Some speakers will produce a residual echo after a monosyllabic word (contrast speaker LS(133)[18] with RA(134)). A similar phenomenon has been observed in Nen, and is described as “a voiceless echo” whose quality may differ (Evans and Miller 2016: 10), e.g., not necessarily [ɐ]. So far no minimal pairs of word-final central vowels have been found.

Syllables with a central vowel nucleus appear to take stress. Nmbo stress is obligatory, and tends to fall on the penultimate syllable. Many multisyllabic Nmbo words that take stress do not contain full vowels, e.g., *ytqn* [jɐtk͡pɐn] ‘name’(135)[19], *kkv* [kɐkɐβ] ‘garden’(136).

[13] Speaker FY, a woman 62 years old at time of recording. Segment taken from the recording WSEK1-G20170724-01FY11Fhm.
[14] Speaker JY, a woman 30 years old at time of recording. Segment taken from the recording WSEK1-B20170627-02DingyJYhm.
[15] Speaker YZ, a man 64 years old at time of recording. Segment taken from the recording WSEK1-B20150731-02SagoCakeYZ1
[16] Speaker MZ, a woman 65 years old at time of recording. Segment taken the recording WSEK1-B20150813-05PlaneMZhm. Note that this is the reduplicated form, sv-sv, where the reduplication is functioning as a pluraliser.
[17] Speaker AT, a woman 26 years old at time of recording. Segment taken the recording WSEK1-B20150721_01marriageAThm.
[18] Speaker LS, a man 50 years old at time of recording. Segment taken from the NWC, file sfbaWZ-30-sq (2016)
[19] Speaker AN, a woman 47 years old at time of recording. Segment taken from the recording WSEK1-G20170617-01Alqi02MQhm.

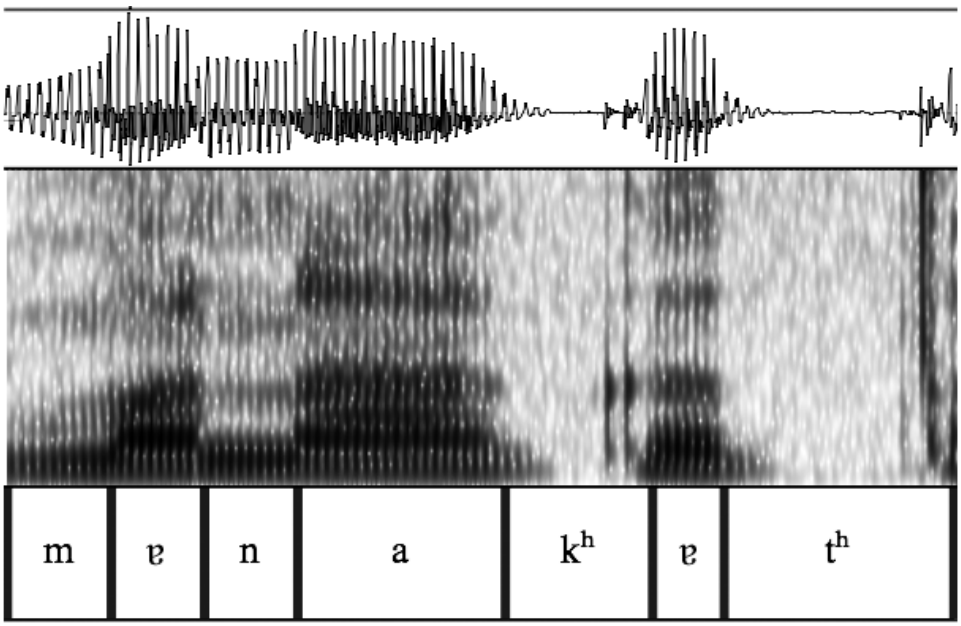


Figure 5. Spectrogram of *kt* 'there'. Speaker AT, a woman 26 y.o at time of recording. Segment taken the recording WSEK1-B20150721_01marriageAThm.

It has been argued for Komnzo that the main function of central vowels is to provide a syllable nucleus where there is none underlyingly (Döhler 2018: 57─58). Döhler argues that syllabicity alternations are affected by affixation in Komnzo, and provides the example of the syllabification of the verb *ttü-si* [tə̆.tʏ.si] 's/print/paint-NOM'. The central vowel [ə̆] occurs between the two voiceless stop consonants [t] and [t], but when the verb is inflected with the undergoer prefix *y-*, the central vowel is inserted in a different place: *yttünzr* [jə̆t.tʏ.ⁿdzə̆ɾ] 's/he paints him'. In the Nmbo sketch grammar I made a similar argument for Nmbo (Kashima 2020b: 109), using an example of *gmeh* /gɐ.meh/ 'to hit'$_{(137)}$[20] syllabifying as *ygmetam* [jɐg.me.tam] 'we hit it' when inflected. Closer inspection of audio recordings, however, shows this is not the case. The central vowel between [g] and [m] in the root form is retained when inflected: [yɐ.gɐ.me.tam]$_{(138)}$[21] $_{(139)}$[22]. This evidence makes it harder to argue that the [ɐ] is not underlyingly present in Nmbo.

Central vowels can occur word-initially in verb roots. When inflected, these verb roots syllabify the vowel with the consonant of the prefix (/ɐ.wih/$_{(140)}$ → /nɐ.wi.jej/$_{(141)}$[23]). When verb roots with word-initial full vowels are prefixed, the full vowels are completely audible (e.g., *ovarh* /o.βɑ.rɐh/ 'to arrive'$_{(142)}$[24] → *novaryn* /no.βɑr.jɐn/ 'I arrived'$_{(143)}$[25]). When the initial vowel is short, however, it sounds shorter compared to

[20] Speaker TS, a man 62 years old at time of recording. Segment taken from the recording WSEK1-B20150805-01NinyiTS

[21] Same as above. Speaker TS, a man 62 years old at time of recording. Segment taken from the recording WSEK1-B20150805-01NinyiTS

[22] Speaker WZ, a woman 60 years old at time of recording. Segment taken from the recording WSEK1-B20150924-HuntingWZhm.

[23] Speaker KSae, a man 40 years old at time of recording. Segment taken from the recording WSEK1-B20150817-02DimbanKSaehm.

[24] Speaker DS, a woman 65 years old at time of recording. Segment taken from the recording WSEK1-G20170707-04DS02MQhm.

[25] Same as above. speaker DS, a woman 65 years old at time of recording. Segment taken from the recording WSEK1-G20170707-04DS02MQhm.

peripheral vowel verbs when prefixed (again, /ɐ.wih/ 'to fall'(144) → /nɐ.wi.jej/ 's/he fell'(145)[26]). All verb roots that begin with vowels are intransitive verbs in Nmbo, including the verb roots that begin with central vowels. Since central vowels occur word-initially only in verb roots, it may be that they are performing some kind of phonotactic repair function to maintain the rule that intransitive verb roots begin with vowels.

A piece of evidence which somewhat supports the analysis of central vowels as mainly epenthetic, comes from the use of the Nmbo orthography. Nmbo has two practical orthographies. One convention is to represent the full vs. central vowel contrast by double vs. single vowels, e.g., [a] as <aa>, and [ɐ] as <a>, *kaanaam* /kanam/ 'snake' vs. *kanam* /kɐnɐm/ 'you come'. The other convention is the one used in this paper, where the central vowel [ɐ] is not overtly represented, *kanam* /kanam/ vs. *knm* /kɐnɐm/. The second convention was adopted for the duration of my fieldwork, and Nmbo speakers were happy to use it in transcription work. One could argue that the seeming ease with which Nmbo speakers are able to omit the central vowels suggests they are underlyingly absent in most cases, i.e. epenthetic. A similar case has been made by Blevins & Pawley (2010: 15–16) for Kalam (Trans-New Guinea; PNG).

In summary, the phonological status of [ə] and [ɐ] thus appears to be two-fold: to function as a fully-fledged phonemic vowel in some instances, and to function as a phonetically visible epenthetic vowel in others. Further work must be done on the syllabification process of Nmbo to paint a clearer picture of the phonological role played by these central vowels.

Table 4. Occurrence of Nmbo vowels

IPA	Grapheme	Word/syllable initial	Nucleus of closed syllable	Word/syllable final
i	i	*ingaraingara* /iŋ.gɑ.rɑ.iŋ.gɑ.rɑ/ 'plant type'(146)	*wim* /wim/ 'scent'(147)	*zi* /zi/ 'word, story'(148)
e	e	*eg* /eg/ 'fog'(149)	*men* /men/ 'bird'(150)	*de* /de/ 'honeyeater'(151)
æ	ä	*är* /ær/ 'man'(152)	*däv* /dæβ/ when'(153)	*bä* /bæ/ '3.ABS'(154)
ɑ	a	*ag* /ɑg/ 'coconut'(155)	*kal* /kɑl/ 'wound'(156)	*ka* /kɑ/ 'where'(157)
u	u	*ur* /ur/ 'bushfowl'(158)	g*umb* /gu^{m}b/ 'pool'(159)	*gu* /gu/ 'great billed heron'(160)
o	o	*onda* /o^{n}da/ 'dream'(161)	*non* /non/ 'why'(162)	*daro* /dɑro/ 'butterfly'(163)
ə	é	*évermeh* /əβermeh/ 'to cross over'	*yém* /jəm/ 'gumtree'(164)	[unclear]
ɐ	á[27]	*áwih* /ɐwih/ 'to fall'(165)	*sn* /sɐn/ 'tooth'(166)	[unclear]

4 Prosody

The first part of this phonetic-phonological description of Nmbo has resulted in an analysis of its segmental characteristics. A proper analysis of Nmbo's suprasegmental characteristics would require a dedicated research design with appropriate methodology (e.g., as outlined by Jun & Fletcher 2014, Himmelmann & Ladd 2008). Nonetheless, I have included this impressionistic section on stress and intonation as part of the documentation endeavour, with the conviction that some preliminary sketches with audio are preferable to the complete absence of any description.

[26] Speaker KSae, a man 40 years old at time of recording. Segment taken from the recording WSEK1-B20150817-02DimbanKSaehm.

[27] Word-initial; otherwise, omitted.

Stress

Stress is typically defined as detectable through a combination of pitch, intensity, and duration (Gussenhoven 2004: 14─15), although there is cross-linguistic variability as to how these correlates combine. As mentioned earlier, given that Nmbo central vowels with their short duration can also take stress, it seems that duration is not a major characteristic of Nmbo stress.

While I describe Nmbo as having stress, it should be acknowledged that this is based on my own perception. Instrumental studies have not been conducted. Stress ghosting is a well-known phenomenon among speakers of predictable stress languages (e.g., Tabain et al. 2014; see Cutler 2012 for projection of L1 prosody on L2 perception), and what I auditorily detect may be an artefact of my dominant language, English. Having said so, it seems that stress falls on the first syllable for two- and three-syllable words. Four-syllable root words are unusual in Nmbo; words greater than four syllables are morphologically complex.

Stress seems to be attracted by the first syllable with an open vowel, and appears to be assigned at the syllable level. Both characteristics suggest that intensity is a relevant factor in the definition of Nmbo stress. Komnzo is described as having stress where higher pitch may be a relevant phonetic factor, while vowel duration is not (Döhler 2018: 83). This seems true for Nmbo also. The central vowels in Nmbo can also take both primary and secondary stress, suggesting that vowel duration is not a relevant phonetic feature of stress.

At this stage of description, it is unclear how central stress is in the morphophonemics of Nmbo. Stress shift occurs when words are inflected, though the systematicity of this process has not been tested.[28] For example, when the trisyllabic word *Bevdvn* /beβ.dɐ.βɐn/ 'village name'$_{(167)}$ is inflected with the closed syllable originative clitic /-mɐn/, the stress shifts from the first syllable to the third: /ˈbev.dɐ.βɐn/ → /beβ.dɐ.ˈβɐn.mɐn/$_{(168)}$.

Intonation

The intonation contour of a declarative utterance follows a typical decline of fundamental frequency. The pitch is relatively consistent through most of the utterance, until it clearly drops towards the end. The utterance shown in Figure 6$_{(169)}$ shows a clear case of a pitch drop to mark an utterance-final boundary.

Nmbo also seems to have a variety of non-falling final intonation boundaries. There is what I call a "flat final boundary" (Figure 7$_{(170)}$). The pitch shows a shallow decline at the end of the utterance which can dubiously be characterised as a fall. In the example shown in Figure 7$_{(170)}$, the discourse topic of the following clause is different to that of this particular utterance. This suggests that the boundary is marking a transition in discourse topic, in which case the boundary is functioning in more-or-less the same way as a final fall boundary marker. Figure 8 is a pitch contour of a continuing boundary marked utterance$_{(171)}$. This utterance cannot be taken as the end of a conversational topic, as the speaker continues to talk about hot water.

There is also a "raised final boundary." In terms of discourse and content, however, this boundary marks the end of a clause and IU. We may expect to find a final falling boundary marker in such cases, yet sometimes there is a raised end that resembles a continuing boundary marker. Figure 9 $_{(172)}$ shows the pitch of a raised final boundary, where the speaker raises the pitch at the end of the clause. In the original narrative, there

[28] An anonymous reviewer has suggested that the stress shift could be due to foot structure, where binary feet that are left-headed have stress shift on the right-most foot. Given my lack of expertise in the area, I have included this comment here as a footnote for reference.

is a pause of approximately four seconds before the speaker continues on with the narrative. Notice the relative lack of pitch movement across the entire IU.

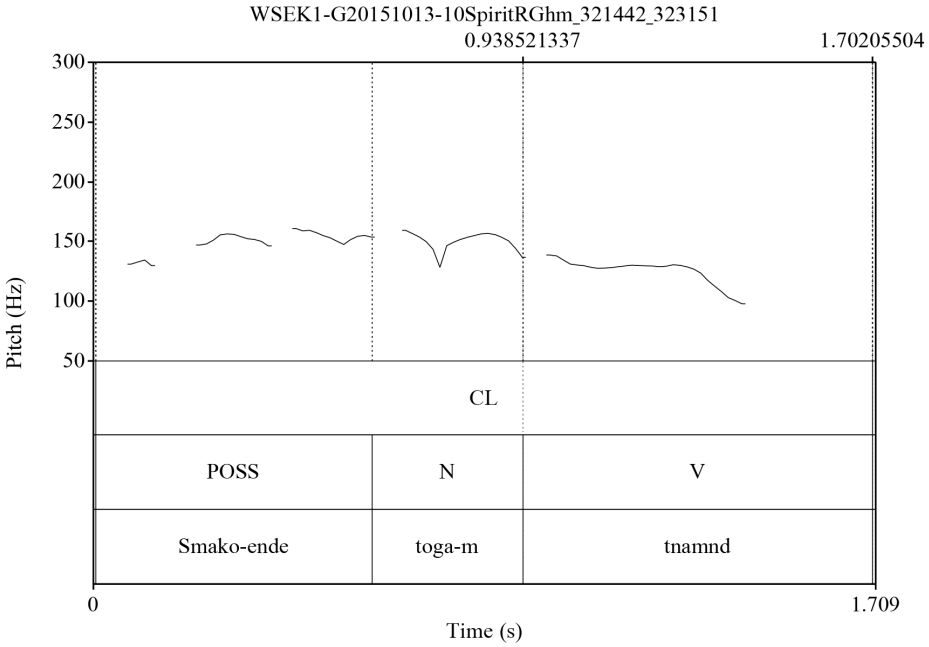


Figure 6. Pitch contour of intonation unit, marked by a final fall boundary marker at the end. The utterance can be translated as "Smako's child shot [the animal]." (Speaker GM 33 y.o male, G20151013-10SpiritRGhm 321442 - 323151)(169)

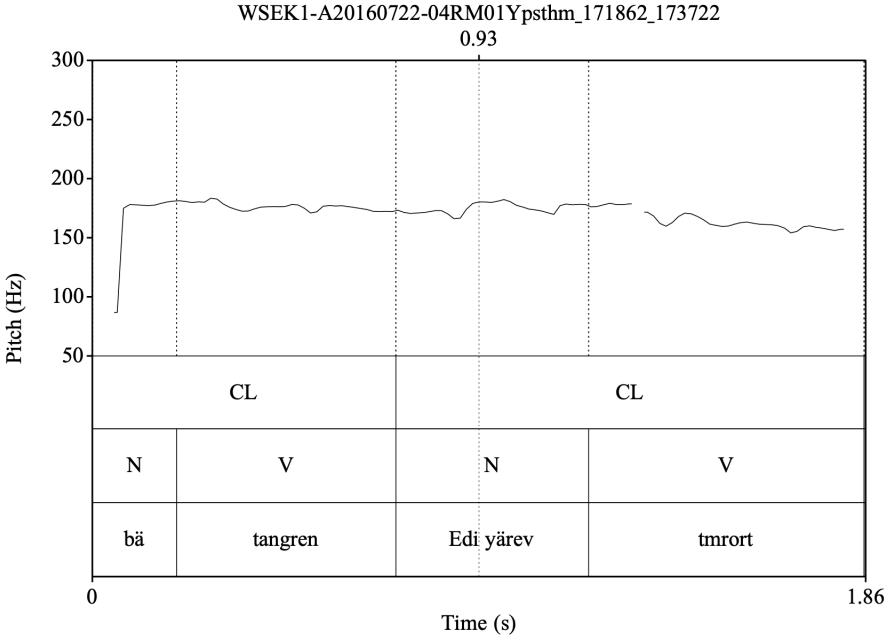


Figure 7. Pitch contour of intonation unit, marked by a "flat final" marker at the end. Notice the relative lack of pitch range across the entire IU. The utterance can be translated as 'Those two argued with Eddy's father.' (30 year old female, A20160722- 04RM01Ypsthm , 00:02:51.136 - 00:02:53.673)(170)

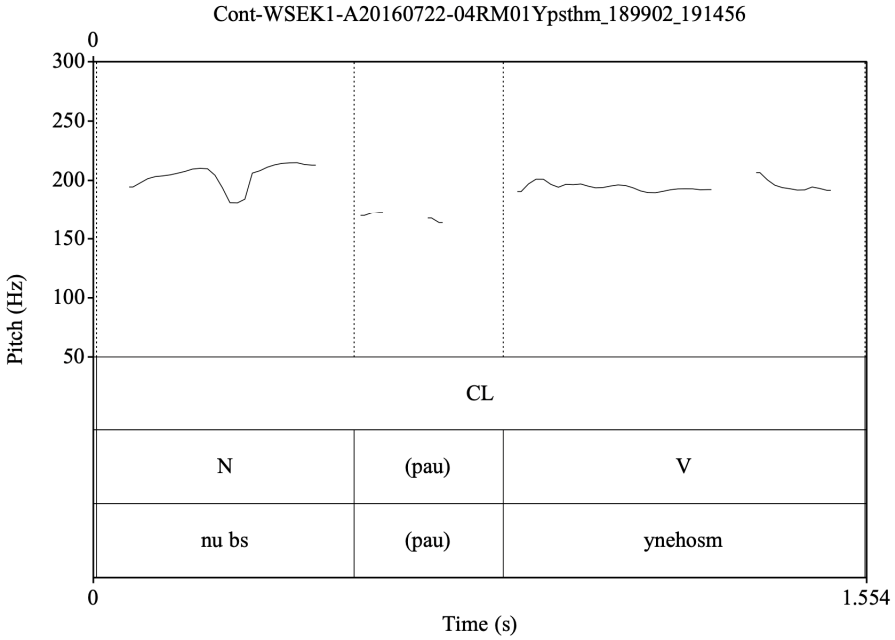


Figure 8. Pitch contour of intonation unit, marked by a continuing boundary marker at the end. The utterance can be translated as 'The hot water, we boiled it.' (30 year old female, A20160722-04RM01Ypsthm, 00:03:09.902 - 00:03:14.131)(171)

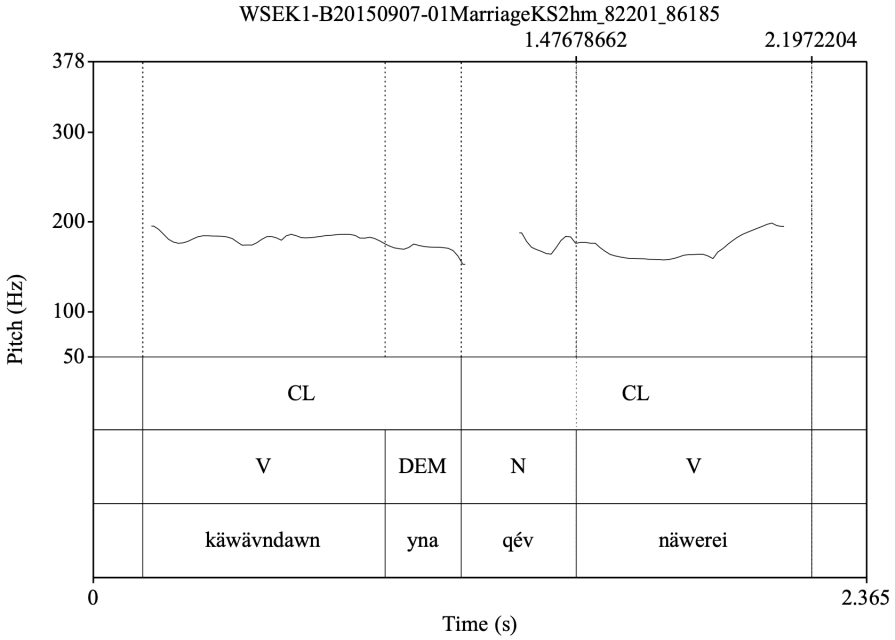


Figure 9. Pitch contour of intonation unit, marked by a "raising final" marker at the end. The utterance can be translated as 'I was waiting, in darkness she came' (37 year old male, B20150907-01MarriageKS2hm_82201_86185, 00:01:23.690 - 00:01:25.751) (172)

An observation made by other linguists in the Southern New Guinea area is that question intonation often does not have a rising final boundary (Gregor, this volume; Lindsey 2021). Both polar and content questions often have a downward trajectory of F0 across the clause with a final falling boundary marker at the end of the utterance. Nmbo also exhibits this tendency on occasion (see Figure 10 for a polar question(173), Figure 11 for a

content question(174)) but there is much work to be done in order to understand the phenomenon in greater detail.

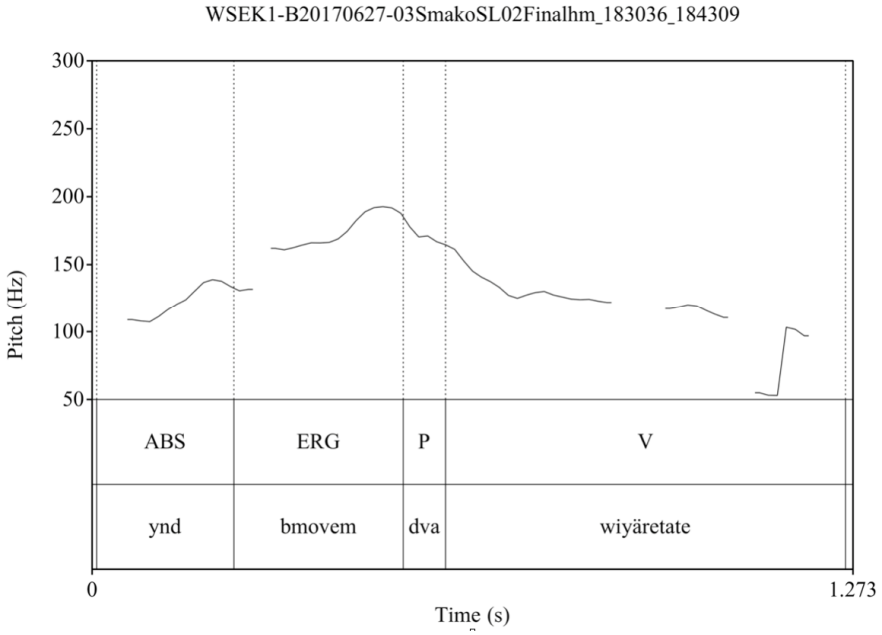


Figure 10. Pitch contour of a polar question, 'Did you all just hear me?'. ABS = absolutive pronoun, ERG = ergative pronoun, P = particle, V = verb. (Speaker SL, 25 year old male, WSEK1-B20170627-03SmakoSL02Finalhm)(173)

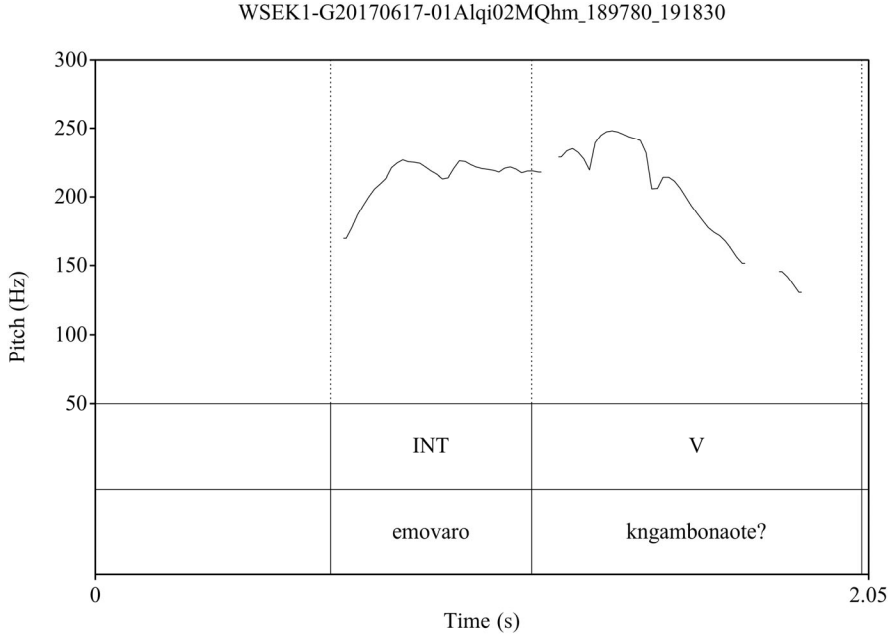


Figure 11. Pitch contour of an interrogative clause, 'Who did you play with [when you were a child]?'. INT = interrogative pronoun (30 year old female, WSEK1-G20170617-01Alqi02MQhm)(174)

5 Transcription of recorded passage

The following is a transcription of a localised *North Wind and the Sun* passage. The essence of the story is the same as the European version, but the character of the north wind has been changed to a locally relevant wind known as *bolmbol,* the powerful westerly wind that blows in December to herald the wet season. The speaker is Ruscien Aniba, and the linguist eliciting the passage is Julia C. Miller. The recording session was conducted with a Nen speaker, Mary Dibod. Mary's utterances are omitted from the recording submitted here, but is audible in the original recording (Miller 2013). Miller read out an English passage, Mary translated the passage into Nen, then Ruscien translated into Nmbo. Ruscien is a highly competent English speaker, as well as a Nen speaker, so it is not entirely clear whether her Nmbo passage was influenced more by the original English, or the Nen speaker's translation of the original English. Note that some of Ruscien's pronunciations in the passage contain elements that strike me as Nen-like (such as pronouncing *fsah* /ɸɐsah/ 'to increase' → [pʰɐsah]), which may be due to her long-term residence in a Nen speaking village. The broad transcription below does not mark this level of detail.

The transcription and translation below are, unfortunately, done by the author alone. These were done after my fieldwork had concluded in 2017, without consultation with any Nmbo speakers. I have tried to do the transcription and translation to the best of my ability and knowledge of Nmbo, supported by a draft dictionary produced in conjunction with Nmbo speakers. I also consulted the Nen word utterances by Mary Dibod, with additional consultation of the Nen dictionary (Evans 2019). Uncertainties in translation and transcription are marked in the following texts.

There are four lines of glossing. The first line is a broad phonetic transcription of the passage. The second line, transcribed in the practical orthography, shows the morphology on non-verbal elements. Verbs are given a unified gloss for readability. The third line is the interlinear gloss done in line with a Yamist adaptation of the Leipzig Glossing Rules (Comrie et al. 2015).[29] The fourth line is the English translation.

(1) [æᵐb eβhon bolɐᵐbol ah eβɐh]
ämb *evh=on* <...> *bolmbol* *a* <…> *evh* <...>
some day=LOC west.wind.ABS CONJ sun.ABS
'One day… Bolmbol [the west wind] and… the sun…'

(2) [bæ kowaβʷɐt eβe mujɑβɑ jɐm]
bä *kowavt* *eve* *muya=va*
3ABS 3DU.IPFV.NPHD.speak who.ABS strength=COM
ym.
3SG.IPFV.NPHD.COP
'The two spoke about who is stronger [lit. who is with strength]'

(3) [ær nɐnɐwɑnoj wumɑnhere]
är *nnowanoi* *wumanhere*
man.ABS 3SG.PFV.PRET.arrive ?[30]
'A man arrived,'

[29] Non-standard glosses include: DEM.FW = forward manner demonstrative, DEM.PROX = proximal demonstrative, DEM.V = preverbal demonstrative, NPHD = non-prehodiernal TAM, POSSC = close possessive, PRIM = primordial TAM,

[30] Translation unknown, but this is an agent nominalised verb root *wumanh.*

(4) [sælæme tærβær nɐnomɑnetɑm]
säläme *tärvär-e* *nnomanetam.*
clothes.ABS many-DAT 3SG.IPFV.PRIM.be.dressed
'He was adorned with many clothes.'

(5) [bolɐᵐbol ɑ eβɐh bæ nowɑ nowɑβtɑⁿgeɑjɐn]
bolmbol *a* *evh,* *bä* *nowa-*
west.wind.ABS CONJ sun.ABS ?FUT [false start]
nowavtangeaen.
1SG.PFV.PHAB.say
'Bolmbol and the sun would have said,'

(6) [mɑto æ nuβuwɐm]
mato *ä* *nuvuwm.*
perhaps FUT 1DU.IPFV.NPHD.intend.to.do
"Perhaps we two will do something

(7) [eβe mujɑβɑ jɐm mɐnɑt]
eve *muya=va* *ym* *mna=t,*
who strength=COM 3SG.IPFV.NPHD.COP DEM.FW=ALL
'to see who is stronger,'

(8) [jɐnɑ æruende sælæme ge jəⁿgɐβtɐrnɑ]
yna, *är-uende* *säläme* *ge*
DEM.PROX man-POSS cloth.ABS DEM.V
yngvtrna.
3SG>3SG.IPFV.IMP.take.off
'you take away his clothes from him."'

(9) [bolᵐbol æ nowanoy ɸroⁿde]
bolmbol *ä* *nowanoi* *fronde....*
west.wind.ABS ?3ABS 3SG.PFV.PRET.depart first
'Bolmbol departed first…'

(10) [ær ɸɐsɑh jɑβⁿgoj]
är. *fsa-h*[31] *yavngoi.*
man.ABS increase.intensity-NMLZ 3SG>3SG.PFV.PRET.begin
'He began increasing [in intensity].'

(11) [tɐβsɑw tɐβsɑw tɐβsɑw]
tvsao, tvsao, tvsao,
3SG>3SG.IPFV.REM.increase
'He increased it, he increased it, he increased it,'

(12) [jɑw æᵐb jɐβtrærjɐⁿg]
yao *ämb* *yvträryng.*
NEG some 3SG>3SG.PFV.PRET.strip.off
'he could not strip any of it off.'

[31] I have inferred the meaning of the root *fsah* as "to increase". This inference is made on the Nen word *wpnas* meaning "to multiply, increase in number", which appears to be the word Mary Dibod is using in the Nen portion of the same recording (inflected as *dpnze*).

(13) [wɐⁿdede ærum gjɐm]
wndede *är-um* *gym,*
CNTF man-ERG TOP
'however the man's clothes, ok…'

(14) [wɐⁿdede ærueⁿde sælæme gjɐmɐn]
wndede *är-uende* *säläme* *gymn…*
CNTF man-POSS cloth.ABS TOP
'however the man's clothes you see…'

(15) [sælæme tærβær mɐ tɐtimgotɑw]
säläme *tärvär* *mé* *ttimgotao*[32],
cloth.ABS plenty CONT 3SG>3SG.IPFV.REM
'he continued to have the clothes,'

(16) [jɐnɑ sælæme tokɐn]
yna *säläme* *tok=n.*
DEM.PROX cloth.ABS up=LOC
'have on these clothes.'

(17) [bolᵐbol ædi nɑβrɑᵑgoj]
bolmbol *ädi* *navrangoi…*
west.wind.ABS INTS 3SG.PRF.PRET.give.up
'Bolmbol truly gave up.'

(18) [jɐna ɸoɑ wej eβhende]
yna *foa* *wei* *evh-ende…*
DEM.PROX after again sun-POSS
'Then next the sun's…'

(19) [eβɐh ɑβlɐh novᵑgoj kɑβlaw kɑβlaw]
evh *avl-h* *novngoi, kavlao, kavlao,*
sun.ABS move.in-NMLZ 3SG.PFV.PRET.move.in [repeat]
'the sun began moving in, he moved in, he moved in,'

(20) [wɑβta kitoᵑgova nɑmdoj]
wavta *kitong=ova* *namdoi.*
heat big=COM 3SG.PFV.PRET.become
'he became very hot,'

(21) [ærum jænzu sælæme dæβ ɸɐtrærɐh jɑβɐⁿgoj]
är-um *yänzu* *säläme* *däv* *fträr-h* *yavngoi.*
man-ERG POSSC cloth.ABS when strip.off-NMLZ 3SG>3SG.PFV.PRET.begin
'the man then began to strip off his own clothes.'

[32] The root form and its meaning are not known. A possible root is *ttimgoh*. Another possibility is that this is in fact *te timgotao* , a variant of *de timgotao* where *de* is a temporal/iamitive particle meaning 'already.' In the translation I have put "have on" following Mary Dibod's Nen expression *dngawasngron*, meaning for something 'to be in a state of having on.'

(22) [bolᵐbol dæβ æ nɑmi nowɑβtɑj,]
bolmbol *däv* *ä* *nami* *nowavtai,*
west.wind.ASB when ?3ABS ? 3SG.PFV.PRET.say
'Bolmbol then said,'

(23) [mɑto bɐm eβɐh mujɑβɑ ɸiβi ædi nɐm]
mato *bm,* *evh* *muya=va* *fivi* *ädi*
perhaps 2ABS sun.ABS strength=COM INTS INTS
nm.
2SG.IPFV.NPHD.COP
'"Perhaps you, the sun, you are the strongest."' [lit. perhaps you, the sun with strength, truly you are]

6 Conclusion

This phonetic-phonological description has focussed on the segmental aspects of Nmbo. In the spirit of language documentation, I have made some preliminary comments about some suprasegmental characteristics, but this is an area where future work would be highly beneficial. In particular, the related elements of the central vowels and stress need much attention, as they are deeply related to understanding lexical, morpho-phonemic, and morphosyntactic aspects of Nmbo.

References

Blevins, Juliette & Pawley, Andrew. 2010. Typological implications of Kalam predictable vowels. *Phonology* 27(1): 1–44.

Cahill, Michael. 1999. Aspects of the phonology of labial-velar stops. *Studies in African Linguistics* 28(2): 155–184.

Carroll, Matthew J. 2016. *The Ngkolmpu language with special reference to distributed exponence.* Canberra: The Australian National University. (Doctoral dissertation.)

Comrie, Bernard, & Haspelmath, Martin & Bickel, Balthasar. 2015. Leipzig Glossing Rules: Conventions for interlinear morpheme-by-morpheme glosses. https://www.eva.mpg.de/lingua/resources/glossing-rules.php.

Cutler, Anne. 2012. *Native listening: Language experience and the recognition of spoken words*. Cambridge, USA: MIT Press.

Dingemanse, Mark & Torreira, Francisco & Enfield, Nicholas J. 2013. Is "Huh?" a universal word? Conversational infrastructure and the convergent evolution of linguistic items. *PLoS ONE* 8(11): 1–10.

Döhler, Christian. 2018. *A grammar of Komnzo*. Berlin: Language Science Press.

Evans, Nicholas. 2019. *Nen dictionary*. (https://dictionaria.clld.org/contributions/nen) (Accessed 2020-05-01.)

Evans, Nicholas & Carroll, Matthew J. & Döhler, Christian. 2017. Proto-Yam phonology. (Paper presented at the Languages of Melanesia Workshop, Manokwari, Indonesia, 24th Jan. 2017.)

Evans, Nicholas & Miller, Julia C. 2016. Nen. *Journal of the International Phonetic Association* 46(3): 331–349.

Foley, William. 1986. *The Papuan languages of New Guinea*. Cambridge, UK: Cambridge University Press.

Gregor, Tina. A phonetic description of Yelmek. This volume.

Gussenhoven, Carlos. 2004. *The phonology of tone and intonation*. Cambridge, UK: Cambridge University Press.

Himmelmann, Nikolaus P. & Ladd, D. Robert. 2008. Prosodic description: An introduction for fieldworkers. *Language Documentation & Conservation* 2(3): 244–274.

Jun, Sun-Ah & Fletcher, Janet. 2014. Methodology of studying intonation. In Jun, Sun-Ah (ed.), *Prosodic typology II: The phonology of intonation and phrasing*, 493–519. Oxford: Oxford University Press.

Kashima, Eri. 2020a. Word initial [h]-drop variation in Nmbo: Change-in-progress within an egalitarian multilingual speech community of Papua New Guinea. In Kashima, Eri & Meyerhoff, Miriam (eds.), *Variation in the Pacific. Special issue of Asia Pacific Language Variation*: 250–277.

Kashima, Eri. 2020b. *Language in my mouth: Linguistic variation in the Nmbo speech community of Southern New Guinea*. Canberra: Australian National University. (Doctoral dissertation.)

Kashima, Eri & Williams, Daniel & Ellison, T. Mark & Schokkin, Dineke & Escudero, Paola. 2016. Uncovering the acoustic vowel space of a previously undescribed language: The vowels of Nambo. *Journal of the Acoustical Society of America Express Letters* 139(6). doi: https://doi.org/10.1121/1.4954395.

Lass, Robert. 1984. *Phonology: An introduction to basic concepts*. Cambridge, UK: Cambridge University Press.

Lindsey, Kate L. 2021. Ende. *Journal of the International Phonetic Association*, 1-21. doi: 10.1017/S0025100320000389.

Miller, Julia C. (collector). 2013. *Wind and Sun Story*, Digital collection managed by The Language Archive [Open Access]. Persistent Identifier: https://hdl.handle.net/1839/00-0000-0000-0022-44A7-D

Ross, Malcolm. 2005. Pronouns as a preliminary diagnostic for grouping Papuan languages. In Pawley, Andrew & Attenborough, Robert & Golson, Jack & Hide, Robin (eds.), *Papuan Pasts: Cultural, linguistic and biological histories of Papuan-speaking people*, 15–66. Canberra, Australia: Pacific Linguistics.

Tabain, Marija & Fletcher, Janet, & Butcher, Andrew. 2014. Lexical stress in Pitjantjatjara. *Journal of Phonetics* 42(1): 52–66.

Ward, Nigel. 2006. Non-lexical conversational sounds in American English. *Pragmatics & Cognition* 14(1): 129–182.

Wurm, Stephen A. & Hattori, Shiro. 1981. *Language atlas of the Pacific area, part 2*. (Series C, 67.) Canberra: Pacific Linguistics.

5

Language Documentation & Conservation Special Publication No. 24 (2021)
Phonetic fieldwork in Southern New Guinea
ed. by Kate L. Lindsey & Dineke Schokkin, pp. 76–107
http://nflrc.hawaii.edu/ldc/ http://hdl.handle.net/24995

Phonetics and phonology of Idi

Dineke Schokkin
University of Canterbury/The Australian National University

Volker Gast
Friedrich Schiller-University Jena

Nicholas Evans
The Australian National University

Christian Döhler
Leibniz-Centre General Linguistics (ZAS)

1 Introduction[1]

This paper provides a description of the phonetics and phonology of Idi (ISO 639-3: idi, glottocode: idii1243) as spoken by about 1,000 people in the villages of Dimsisi (with its two satellites Birem and Iblamnd) and Sibidiri, located in the Morehead District of Western Province, Papua New Guinea (cf. Figure 1). Idi, also spoken in Dimiri, belongs to the Pahoturi River family (Evans et al. 2018), which further includes Agob, Taeme, Ende, Kawam and Em. Dimsisi Idi is in close and stable contact, mainly through intermarriage, with the unrelated Nen language (Yam family) spoken in Bimadbn village, and thus a sizable proportion of Idi speakers live there, and conversely a substantial number of Nen speakers in Dimsisi village (see Evans [2014, 2015a,b, 2017, 2019a,b] for general information on Nen). This longstanding bilingualism is probably leaving traces in the phonology of Dimsisi Idi, but despite this, there are significant differences in the phoneme inventories of both languages. Most importantly this involves the presence of what we call a retroflex series of plosives, a velar nasal and a palatal lateral in Idi, and in the difference between coarticulated labial-velars in Nen and labio-velars in Idi. Language contact in Sibidiri is more limited, and the use of languages other than Idi in daily communication is less common than it is in Dimsisi.

[1] All authors wish to thank the Idi speech communities in Bimadbn, Dimsisi and Sibidiri for their hospitality and support in making this research possible. For financial support of our fieldwork, NE and VG thank the Volkswagen Foundation's DoBeS program, the Alexander von Humboldt Stiftung (Anneliese-Maier Forschungspreis to NE) and the Australian Research Council (Discovery Project 'Languages of Southern New Guinea', Grant No. DP110100307), and CD, NE and DS thank the Australian Research Council (Laureate Project 'The Wellsprings of Linguistic Diversity', Grant No. FL130100111 and the ARC Centre of Excellence for the Dynamics of Language, Grant No. E140100095).

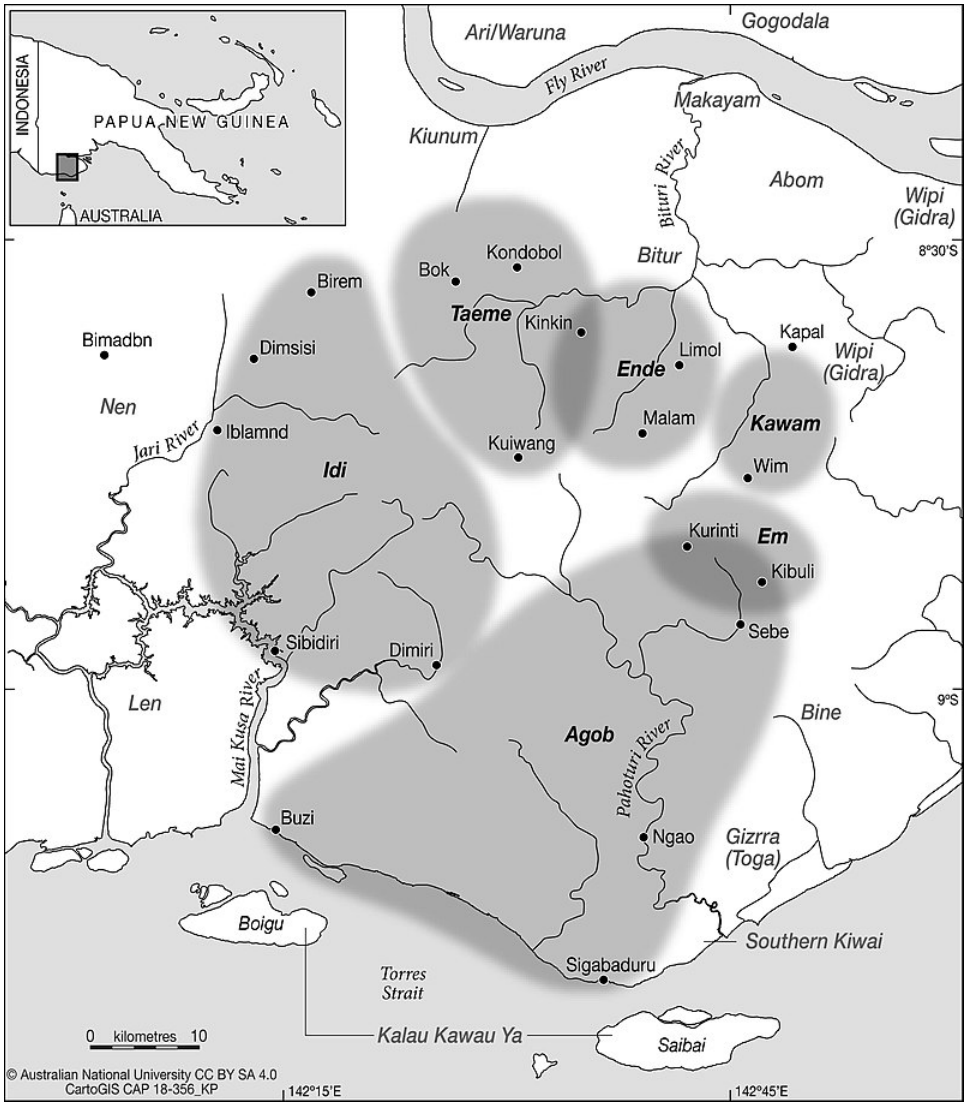


Figure 1. Approximate locations of Pahoturi River languages

The level of description for the languages in this region, though improving, is scarce; see Evans and colleagues (2018) for a recent overview, as well as the other contributions to this Special Issue of LDC. Nen and Ende have been the subject of recent JIPA Illustrations (Evans & Miller 2016; Lindsey 2021). The data on which the current description of Idi is based was gathered during various field trips between 2009 and 2018.[2] Unless indicated otherwise, recordings of the Dimsisi variety are provided by a female speaker from Dimsisi who is now a long-term resident of Bimadbn village, Titi Masa (born 1974). Recordings of the Sibidiri variety are provided by Gwama Dublä.

[2] Data on the Sibidiri variety was gathered by VG in September/October 2013, and in September/October 2014. Data on the Dimsisi variety was gathered by NE in Bimadbn in 2009 and during a Field Methods course in Boulder, Colorado in 2011, by DS in August/September 2014, July-September 2015 and August 2018, and by CD and NE in 2016/2017.

2 Preliminaries

The paper discusses segmental phonology in the sections to follow, by firstly looking at consonants (§3) and then vowels (§4). After that, discussion will turn to phonotactics. In order to interpret the examples in the sections on consonants (and indeed throughout the paper), a brief preliminary note about the status of Idi vowels is in order, before discussing the issue more fully in the corresponding section. The Idi vowel inventory includes six so-called "full" vowels occupying the peripheries of the vowel space, /i e æ a o u/, and two further vowels that are more centralised (a feature many languages of the region have in common). The exact phonetic quality of these central vowels is quite variable, and what predominantly sets them apart from the full vowels, from an auditory perspective, is their significantly shorter length.

Quite apart from the phonetics, the phonological status of the two central vowels is not straightforward. While on the one hand they appear to function as epenthetic vowels, inserted to satisfy phonotactic restrictions, the occurrence of the one central vowel over the other is not predictable based on the immediate phonetic environment, but the most reliable "predictor" appears to be phonological.[3] Idi exhibits a vowel harmony system, where {/æ/, /i/, /u/} comprise a "light" set and {/a/, /e/, /o/} a "dark" set. Basically, "light" versus "dark" is a morphophonological feature of a given root and is lexically determined (some verbal affixes also carry this feature, which complicates matters for inflected verbs). The occurrence of either central vowel strongly correlates with the harmony sets: the fronter, higher vowel combines with light vowels (i.e. occurs in the same domain), while the lower, more back central vowel combines with full vowels from the dark set.

For the sake of consistency and transparency, throughout the paper the two central vowels are phonemically represented as /ɪ/ and /ə/: /ɪ/ for the high front central vowel and /ə/ for the low back central vowel. However, the reader should bear in mind that (1) vowel quality can vary significantly, which is indicated by the close phonetic transcription supplied with each example, and (2) their phonological status is not quite the same as that of the full vowels, even though this is not indicated in the phoneme-level representation. In line with speech community preferences, in the practical orthography, /ə/ is not written. Whether a central vowel occurs is largely predictable from the phonotactic context. However, /ɪ/ is represented with <é>, in order to distinguish its occurrences from those of /ə/.

3 Consonant system

The consonant system of Idi can be represented as shown in Table 1. There is considerable inter-speaker variation both within and across communities in the realization of the voiced sibilant and the postalveolar segments. This will be discussed in more detail in the relevant sections. The sections below are organized according to manner of articulation, subsuming the consonants under the two major categories obstruents and sonorants.

[3] The central vowels' hybrid nature inspired Lindsey (2019) to analyse them as "ghost elements" in related Ende.

Table 1. The consonants of Idi, with orthographic representations deviating from IPA symbols shown in angled brackets

	Bilabial	Alveolar	Postalveolar	Palatal	Velar	Labio-velar
Plosive	p b	t d	ʈ ɖ		k g	k^w g^w
			<th> <dh>			<q> <ḡ>
Nasal	m	n		ɲ	ŋ	
				<ny>	<ng>	
Trill		r				
Sibilants		s z				
		<s> <dz>				
Glide	w			j		
				<y>		
Lateral approximant		l		ʎ		
				<ly>		

3.1 Obstruents

After providing a general overview of plosives, we will discuss several issues related to plosives separately: nasal-obstruent sequences and whether to analyse them as segments or not (§3.1.2), the analysis of plosives in a coronal place of articulation (§3.1.3), and labio-velar plosives (§3.1.4). Finally, we discuss affricates and fricatives in §3.1.5.

3.1.1 Plosives: overview

There are two series of plosives (voiced and voiceless) in five places of articulation: bilabial, alveolar, postalveolar (analysed and represented as retroflex here, justification is given in §3.1.3), velar, and labio-velar. Whether a prenasalised series can also be distinguished is discussed in §3.1.2. Plosives occur in both onset and coda position, with the exception of the labio-velar plosives, which are only found in the syllable onset. Examples of the plosives of Idi occurring in the syllable onset are given in (1). For examples illustrating consonants throughout the paper, forms with low vowels were chosen to the fullest extent possible. Labio-velar plosives show some variation with respect to their realization as co-articulated plosives/glides ([k͡w], [g͡w), or co-articulated plosives ([k͡p], [g͡b]; see §3.1.4 for more detailed discussion.

(1) Onset word-initial

/p/	/pa/	[pa]	‘bird’(001)
/b/	/ba/	[ba]	‘our’(002)
/t/	/tan/	[tan]	‘broom’(003)
/d/	/dabe/	[dæbe̯]	‘enough’(004)
/ʈ/	/ʈæʈ/	[t͡θɛt͡θ]	‘jaw’(005)
/ɖ/	/ɖapal/	[ɖ͡ʐapal]	‘sky, heaven’(006)
/k/	/kak/	[kak]	‘grandparent’(007)
/g/	/gæd/	[gɛd]	‘child’(008)
/k^w/	/k^wak/	[k͡pak] ~ [k͡wak]	‘moon’(009)
/g^w/	/g^wæd͡ʒi/	[g͡wæd͡zi]	‘prawn’(010)

In intervocalic position, the realization of plosives is basically invariant, as shown in the examples in (2).

(2) Onset intervocalic

/p/	/ɖapal/	[d͡ʐapal]	‘sky, heaven’ (006)
/b/	/dibæn/	[dibæn]	‘snake’ (011)
/t/	/pitæ/	[pitæ]	‘grass skirt’ (012)
/d/	/pudær/	[podær]	‘shoulder’ (013)
/ʈ/	/piʈæ/	[pi͡ʈʂæ]	‘palm cockatoo’ (014)
/ɖ/	/mapaɖag/	[mapaɖag]	‘roof’ (015)
/k/	/məkat/	[mə̆kat]	‘rat’ (016)
/g/	/age/	[age]	‘banana’ (017)
/gʷ/	/drgʷag/	[də̆rə̆g͡bag]	‘chase’ (018)
/kʷ/	/mikʷɪʈ/	[mik͡pĭ͡ʈʂ]	‘angry’ (019)

In syllable-final position, all plosives except the labio-velar ones are found, as shown in (3). Word-finally, both voiced and voiceless plosives are optionally released into a vowel-like sound. This vowel does not have the exact same quality as the vowel occupying the previous syllable nucleus. It usually has very short duration, even shorter than the weak vowels discussed fully in §4.3, and no fully-fledged formant structure. It could be considered an anaptyctic vowel. Retroflex plosives, particularly word-finally, show a considerable degree of affrication.

(3) Coda

/p/	/gap/	[gɐp]	‘water cassava’ (020)
/b/	/karab/	[karab]	‘paddle’ (021)
/t/	/məkat/	[mə̆kat]	‘rat ’(016)
/d/	/gæd/	[gɛd]	‘child’ (008)
/ʈ/	/pæʈ/	[pæ͡ʈʂ]	‘log’ (022)
/ɖ/	/kəɖ/	[kə̆ɖə]	‘small ’(023)
/k/	/kak/	[kak]	‘grandparent’ (007)
/g/	/æg/	[æg]	‘morning’ (024)

In intervocalic position, the voiced plosives /b/ and /g/ are optionally lenited, thus being realized as [β] and [ɣ], respectively: see (4) and Figure 2, based on a recording by a male Sibidiri speaker.[4] No such lenition has been observed for the alveolar or retroflex plosives.

(4) /jagalaben/
[jaɣalaβen]
‘(S)he opened it. (remote past)’ (025)

The voiceless bilabial plosive is optionally realized as a voiceless fricative when preceding the voiceless retroflex plosive. In other words, the sequence /pʈ/ is realized as [ɸʈ]; see (5) and Figure 3, based on a recording by a male speaker from Sibidiri.

(5) /bopʈənən/
[boɸʈə̆nə̆n]
‘I will arrive.’ (026)

[4] All spectrograms were generated using the Praat software (Boersma & Weenink 2021, Elvira García 2018).

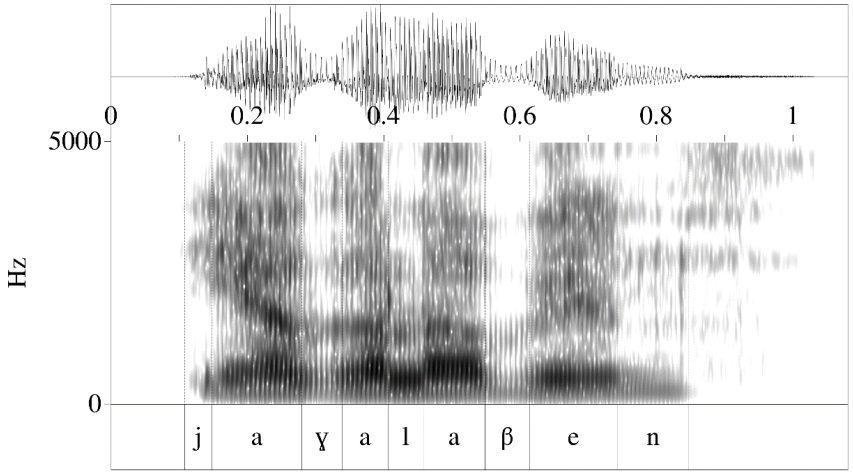


Figure 2. Lenition of /b/ and /g/ in /jagalaben/ '(s)he opened it'

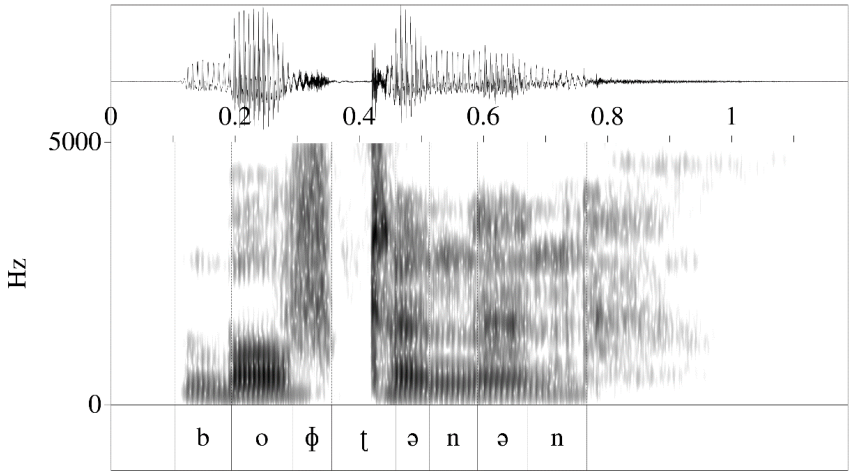


Figure 3. Lenition of /p/ in /bopʈənən/ 'I will arrive'

3.1.2 Nasal-obstruent sequences

Homorganic nasal-obstruent sequences are interesting due to the fact that, while very frequent, they are never subject to vowel epenthesis, which is otherwise a pervasive phenomenon in Idi. As will be shown in §5, most consonant clusters are illicit and will be broken up by an epenthetic vowel. This raises the question of whether we should treat homorganic nasal-obstruent sequences as unit phonemes. Phonologically, however, this analysis as single segments seems unlikely to us. In what follows, the surface realizations of these sequences will be discussed first, followed by a discussion as to why they are unlikely to be single segments.

Combinations of a voiced plosive or affricate preceded by a homorganic nasal are commonly found in intervocalic and word-final position, as illustrated in (6) and (7). Word-final sequences of /n/ and the voiced alveolar fricative /z/, however, do not occur. Titi Masa produced the first and last example, while the others are from different speakers. Note that in Idi, corresponding homorganic sequences of a nasal plus a voiceless obstruent are not found, which contrasts with some other languages of the region such as Ende (Lindsey 2019; 2020) and Ngkolmpu (Carroll this issue).

(6) Intervocalic position:

/mb/	/ɖamba/	[d͡ʐ̃amba]	‘wing’(027)
/nd/	/mənda/	[mə̆nda]	‘five’(028)
/nɖ/	/lanɖag/	[lan͡ʐaᵑ͡g]	‘lizard sp.’(029)
/ŋg/	/rəŋgæ/	[rə̆ŋgæ]	‘medium-sized pig’(030)
/nz/	/kʷənze/	[k͡pə̆nd͡ʒe]	‘proper name’(031)

(7) Word-final position:

/mb/	/kʷɪmb/	[k͡pɪ̆mbə̆]	‘buttocks’(032)
/nd/	/mænd/	[mænd]	‘rope’(033)
/nɖ/	/lanɖ/	[lan͡ʐ]	‘ear’(034)
/ŋg/	/ɲəŋg/	[ɲə̆ŋg]	‘leg’(035)

For completeness’ sake, we note that Idi allows heterorganic nasal-obstruent sequences when these occur across syllable boundaries (but not within the same syllable), as shown by the forms in (8):

(8)	/ankom/	[ankom]	‘ant’(036)
	/amtət/		‘breathe’ (no recording)
	/jɪnbu/		‘in-law’ (no recording)
	/bəmdər/		‘tree sp.’ (no recording)

Nasal-obstruent sequences do not occur word-initially. That is, in word-initial surface realizations we only find either a plain nasal, or a plain voiced obstruent. However, there are indications that the nasal is not functioning completely independently from the obstruent in homorganic clusters. The first bit of evidence comes from inflected verb roots. Verbs in their infinitive forms do not take any prefixes. Some roots that, as infinitives, start with a plain voiced stop have a homorganic nasal surfacing when the verb root is inflected, and a prefix is added. This is exemplified below in (9) with the verb /baland/ ‘to sell’.

(9)	Infinitive:	/**b**aland/	[baland]	‘to sell’ (037)
	Inflected verb form:	/ba**mb**alande/	[bambalande]	‘I will sell it.’ (038)

Prefixing /ba/ to the verb root previously realized as [baland] in infinitive form leads to a homorganic /m/ surfacing before the /b/.

Note that word-initial voiced plosives are very often produced with a brief period of weak prenasalization, at least in the careful speech of, e.g., a word list recording. This feature is optional and may disappear in connected speech. Importantly, this phonetic prenasalization is qualitatively different from nasal-obstruent sequences occurring word-medially and -finally. It does not show fully developed formant structures and is considerably lower in intensity. It may also be regarded as strong pre-voicing. Figure 4 shows a spectrogram of /bombeag/ ‘I will chase’. While the voice onset time seems to be comparatively long, the relevant segment does not have the same spectral structure as the [m]-segment constituting the coda of the first syllable.

A second piece of evidence regarding the special status of nasals preceding voiced obstruents comes from infinitival reduplication. A number of monosyllabic, monomorphemic verb roots show a reduplicated infinitive form.[5] In these cases, the root

[5] In related Ende, it appears that infinitival reduplication is a purely morphophonological process (see Lindsey [2019] for full discussion). In Idi, the picture is somewhat murkier, as verb conjugation class also seems to enter into it: verb roots from particular classes do not have

exhibits a nasal-obstruent sequence, while the preceding word-initial reduplicant does not. This is illustrated in (10) and (11).

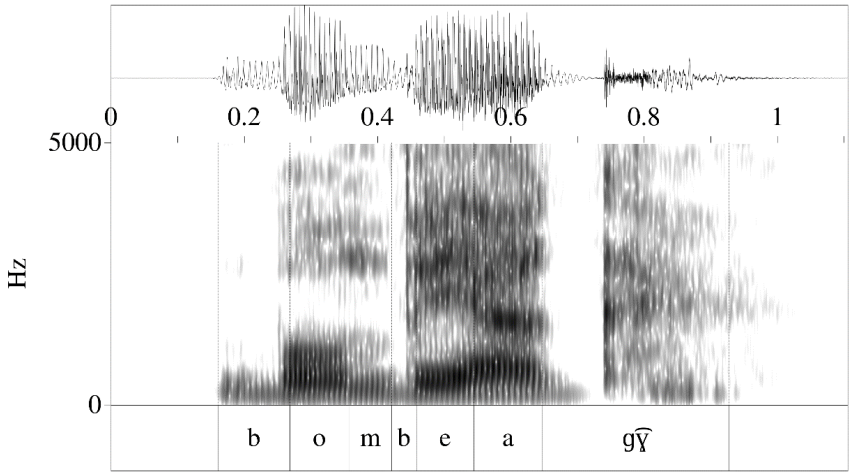


Figure 4. Contrast of phonetic prenasalization and a nasal-obstruent sequence in /bombeag/ 'I will chase' (039)

(10) Infinitive: /**ɖ**ə~**nɖ**əg/ [ɖ͡ʐɛ̆nɖ͡ʐɛ̆g] 'to bite' (040)
Inflected verb form: /be-**nɖ**əg-n/ [bɛnɖ͡ʐɛ̆gɛ̆n] 'I/(s)he bit it.' (041)

(11) Infinitive: /**d**ə~**nd**ər/ [dɜ̆ndɜ̆rɜ̆] 'to hear' (042)
Inflected verb form: /g-w-a-**nd**r-a/ [g͡bɜ̆ndrɜ̆] 'We listened.' (043)

With infinitival reduplication, in the case of a nasal-obstruent sequence involving /b/, /d/, /ɖ/ or /z/, it is the obstruent that surfaces in the word-initial position, while the nasal does not. With a sequence involving /g/, by contrast, it is the nasal that surfaces when the verb root is reduplicated. This is exemplified in (12) for the verb /ŋaŋgas/ 'to make'.

(12) Infinitive: /**ŋ**a~**ŋg**as/ [ŋɜ̆ŋgas] 'to make' (044)
Inflected verb form: /be-a-**ŋg**as-n/ [bæŋgasɜ̆n] 'I/(s)he made it.' (045)

Finally, a phenomenon is observed in which a nasal can "float" leftward (cf. Lindsey 2019) from a voiced obstruent to another voiced obstruent that is not word-initial. It is exemplified here by means of the verb /zoŋg/ 'to burn'. Note the difference between the infinitive and the inflected verb form in (13):

(13) Infinitive: /zo**ŋg**/ [d͡ʒoŋg͡] 'to burn' (046)
Inflected verb form: /w-a-**nz**o**g**-en/ [wand͡ʒogen] 'It burned.' (047)

---

infinitives or use other means besides reduplication to form them (cf. Schokkin & Lindsey [in revision]). The relation between infinitive morphophonology and verb class membership requires further investigation.

While the nasal precedes /g/ in the coda of the infinitive form, in the inflected verb it is no longer in this position and now precedes /z/, assimilating in place of articulation. It can do this because /z/ is a voiced obstruent (that does not have a nasal feature itself), and is no longer word-initial due to the addition of prefixes. These observations support the assumption that in Idi, a homorganic nasal-obstruent sequence is neither made up of two full segments, nor does it form a unitary segment, i.e. a prenasalised obstruent. Rather, the nasal may best be analysed as an underspecified feature of a particular segment that only surfaces when the segment it is associated with is a non-word-initial voiced obstruent, and that can float leftward in a phonological word when there is a suitable host (i.e. another non-word-initial voiced obstruent without a nasal feature).[6]

Summarizing the discussion above, there is good evidence for the conclusion that nasal-obstruent sequences are unlikely to be single segments. Firstly, they are limited in their distribution, not occurring word-initially. In this, Idi differs from other languages of Southern New Guinea for which nasal-obstruent sequences have been analysed as single segments, such as Ngkolmpu (Carrol this issue), Komnzo (Döhler 2018) or Coastal Marind (Olsson 2017). Secondly, nasal-obstruent sequences are not phonologically contrastive with either plain nasals or plain obstruents, and minimal pairs have not been found. Thirdly, the morphophonological alternations we find with respect to verbal reduplication and nasal float in inflected verbs are difficult to explain if we assume that the nasal-obstruent sequences consist of single segments.[7]

3.1.3 Coronal plosives: place of articulation

We now turn to the four coronal plosives /t/, /d/, /ʈ/ and /ɖ/. /t/ and /d/ are invariably produced as alveolar plosives, and do not show affrication. As with other plosives, word-finally they are frequently released into an anaptyctic vowel. The realization of /ʈ/ and /ɖ/, however, varies significantly across varieties of Idi as well as within varieties, i.e. across speakers. Generally speaking, the sounds we classify as "retroflex" are produced further back compared to the alveolar ones, in a postalveolar place of articulation, but they are not necessarily retroflex in a narrow (articulatory) sense. They are often also affricated, to the point where affrication is probably the most prominent acoustic correlate of the opposition. Still, affricated retroflex plosives are audibly different in realization from [d͡ʒ], the voiced postalveolar affricate allophone of /z/. Distributional patterns seem to support their analysis as retroflex sounds, as retroflexes typically tend to occur after back vowels and not front vowels (Flemming 2003). Based on counts from the Dimsisi Idi dictionary (Schokkin et al. 2019), the retroflex consonants are only very rarely flanked by mid or high front vowels, and also high back vowels. This is particularly true for the voiced /ɖ/, which occurs less frequently across the board compared to voiceless /ʈ/.

While there is considerable variation in realization, as shown below, on a phonological level we analyse the retroflex consonants as plosives rather than affricates. An apparent-time study from related Ende indicated that the plosive variant of the retroflex consonants is considered the conservative variant in that language (Strong,

[6] This explains the difference between forms such as /zoŋg/ and those like /baland/. In the latter, the nasal preceding /d/ never floats leftward, because /b/ already has a nasal feature associated with it (which can surface or not, depending on whether /b/ is word-initial).

[7] An anonymous reviewer enquired whether the nasal float phenomena could alternatively be explained by posing a phonotactic restriction on nasal-obstruent sequences which prohibits them from occurring adjacently (i.e. separated by a single syllable nucleus). While this solution is appealing for its elegance, it doesn't adequately explain the Idi data, as these sequences are quite often adjacent in complex forms: compare, e.g., /wɪnd-ændæ/ 'meat-INS', /b-a-mblo-nd-eo/ 'they will multiply', or /bla~mblamb/ 'to raid (INF)'.

Lindsey & Drager 2020). Figure 5 and Figure 6 show a comparison of the realization of /ʈoj/ ‘skin’ and /toj/ ‘plant species’ by a male speaker from Sibidiri. The duration of the release is approximately 63ms in the case of /ʈoj/, and approximately 34ms in the case of /toj/.

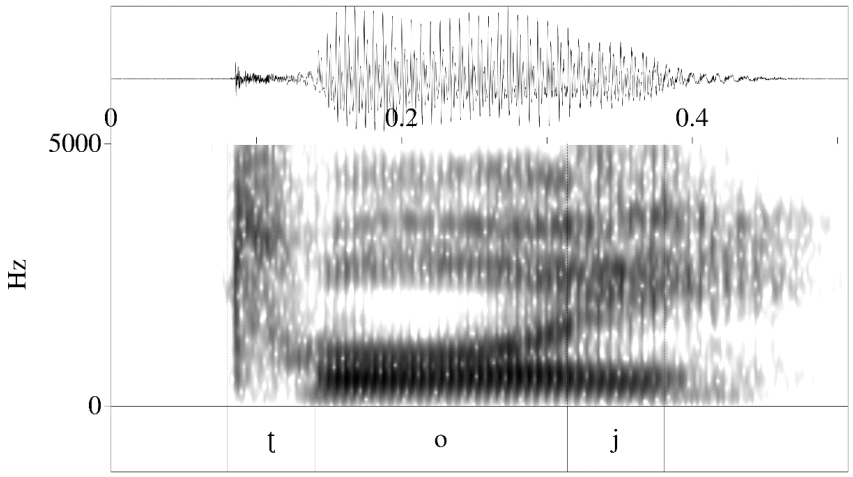


Figure 5. Release of the voiceless retroflex stop in /ʈoj/ ‘skin’ (048)

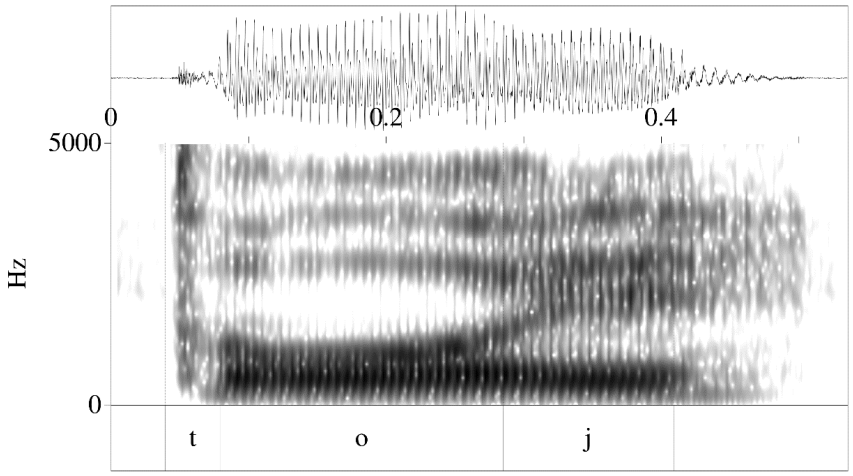


Figure 6. Release of the voiceless alveolar stop in /toj/ ‘plant species’ (049)

The difference between the opposition in the coda is shown in Figure 7 (/kʷɪʈ/ ‘bone’) and Figure 8 (/kʷɪt/ ‘night’). Figure 7 shows the characteristic fricated release of the retroflex, whereas in Figure 8 the release is short, followed by an echo schwa.

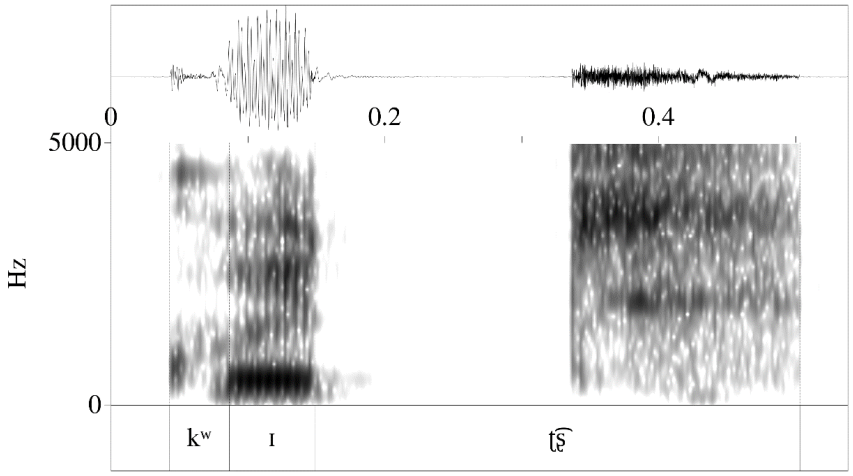


Figure 7. Word-final release of the voiceless retroflex stop in /kʷɪʈ/ ‘bone’ (050)

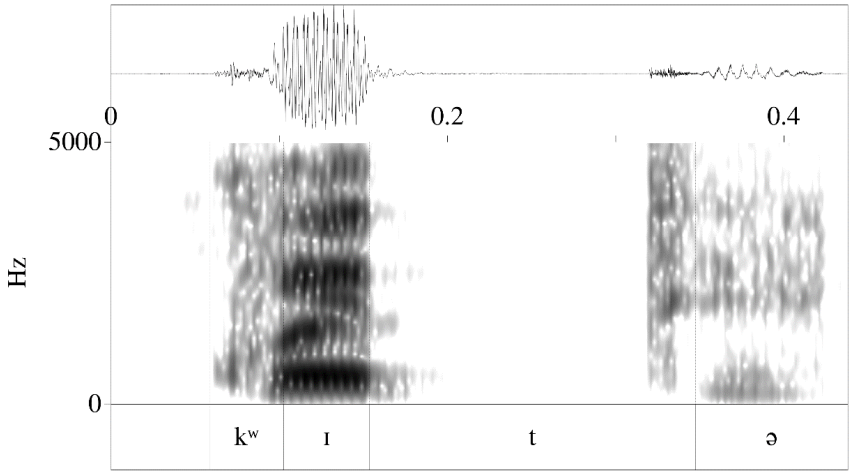


Figure 8. Word-final release of the voiceless alveolar stop in /kʷɪt/ ‘night’ (051)

The same situation can be observed with the voiced coronal plosives. Figure 9 shows the realization of /kəɖ/ ‘small’, and Figure 10 shows /kʷədkʷəd/ ‘hard’, said by the same speaker.

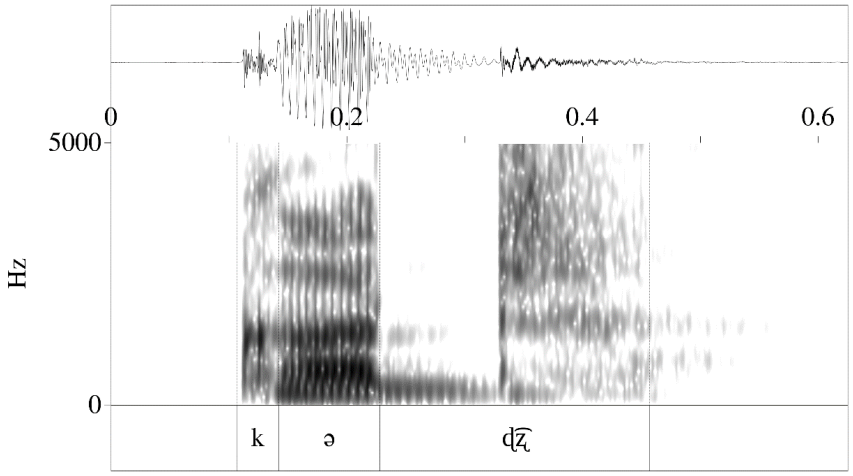


Figure 9. Word-final release of the voiced retroflex stop in /kəɖ/ ‘small’ (052)

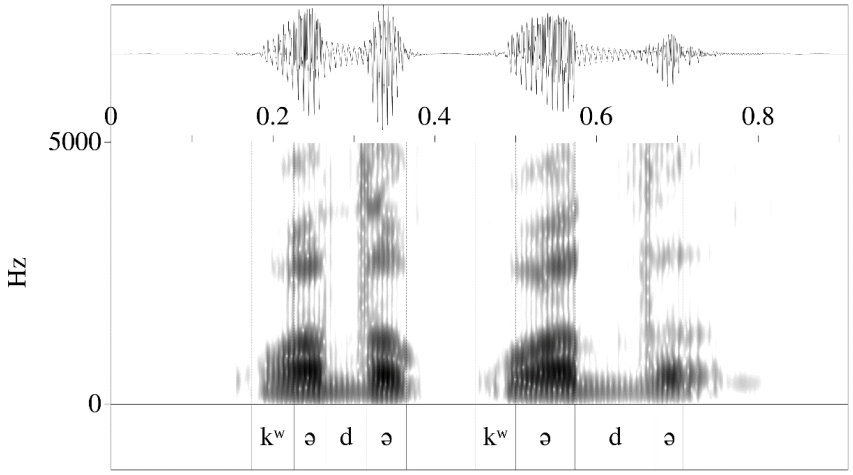


Figure 10. Word-final release of the voiced alveolar stop in / kʷədkʷəd/ ‘hard’ (053)

As an illustration of inter-speaker variation with regard to the retroflex segments, consider the spectrograms in Figures 11 and 12, showing the realization of /kaoʈe/ ‘clothes’ by two male speakers from Sibidiri. Note that while the realization in Figure 11 shows the characteristic long affrication with the retroflex /ʈ/, Figure 12 hardly shows it. The realization of the retroflex by that speaker is therefore much closer to that of /t/. Speech rate may be a factor in this and of course differs between individuals. This remains an area for further research.

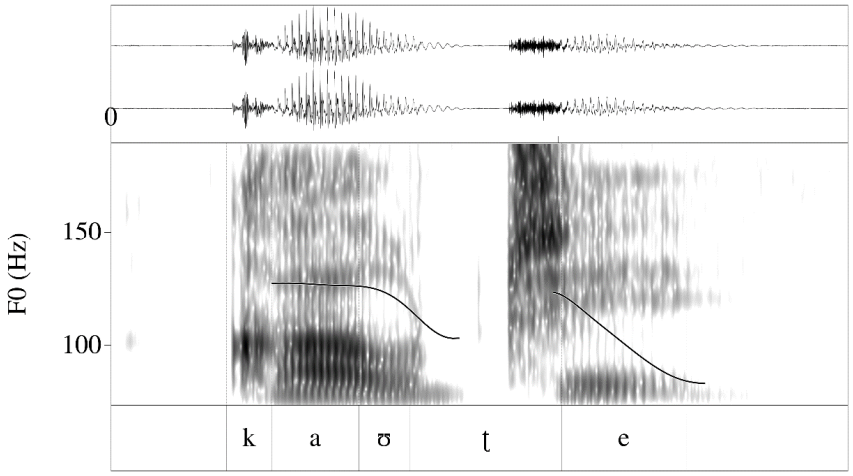


Figure 11. Realization of /kaoʈe/ ‘clothes’ with more affrication (054)

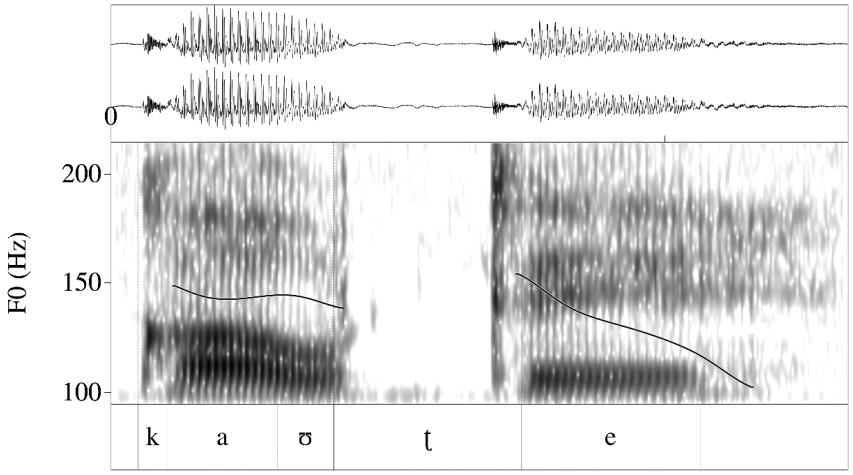


Figure 12. Realization of /kaoʈe/ ‘clothes’ with less affrication (055)

3.1.4 Labio-velar plosives

Idi has a series of labio-velar plosives for which the velar plosive and bilabial components are inseparable; whether the bilabial component is a glide or involves more complete closure varies with the village and the individual, as does the relative timing of the two gestures (from coarticulated to sequential). In Sibidiri Idi, the bilabial articulatory gesture corresponds to a glide, and no complete bilabial closure is produced. This realization can be considered a labialised velar plosive: a velar plosive with an approximant-like secondary articulation. In Dimsisi we also find this realization, but there is more inter- and intra-speaker variation, in particular for the voiced plosive. Here,

speakers sometimes produce a complete bilabial closure in addition to the velar closure, so that in those cases the sounds are realized as coarticulated labial-velar plosives. This variable realization is schematised below in (14):

(14) /k^{w}/ [k͡w] ~ [k͡p]
/g^{w}/ [g͡w] ~ [g͡b]

In Figures 13 and 14, spectrograms are shown for the contrasting forms /gap/ ‘water cassava’ and /dərg^{w}ag/ ‘to chase’, as realized by a female speaker from Dimsisi, Puli Ämädu. The [g] in /gap/ just has a velar release, while the co-articulated segment [g͡b] in /dərg^{w}ag/ superimposes a labial release (cf. Ladefoged & Maddieson 1996: 334ff.), characterised by a lowering of F2 as evident from the spectrogram.

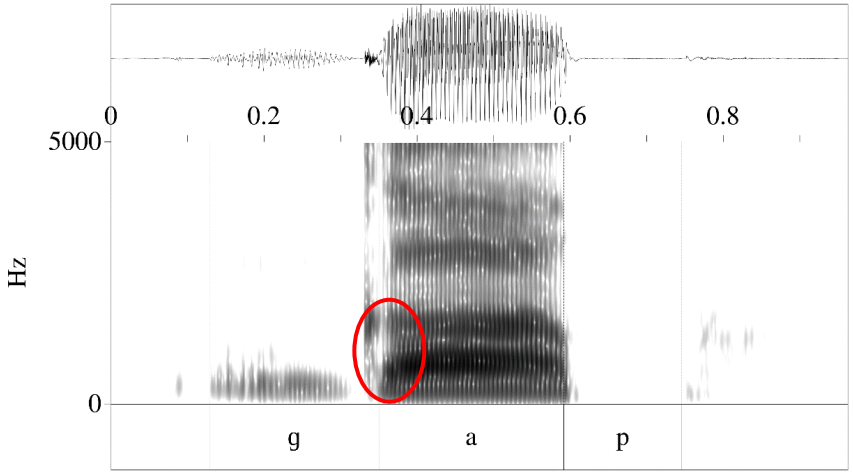


Figure 13. Release of the voiced velar stop in /gap/ ‘water cassava’ (056)

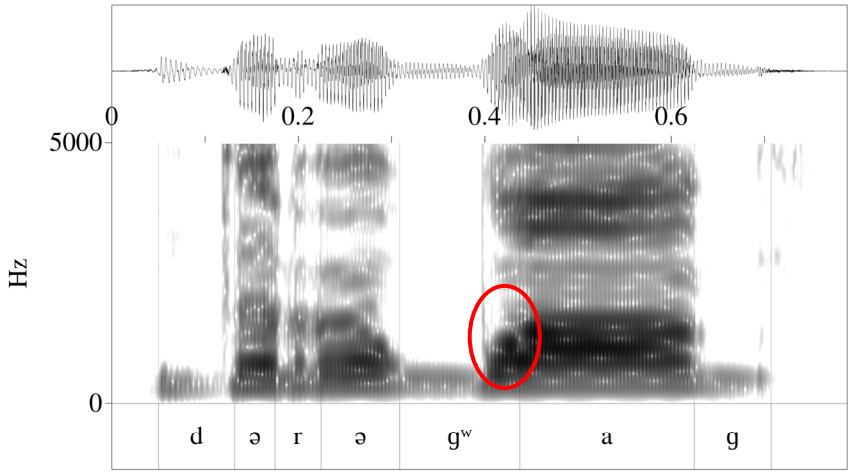


Figure 14. Release of the coarticulated voiced labio-velar stop in /dərg^{w}ag/ ‘to chase’ (057)

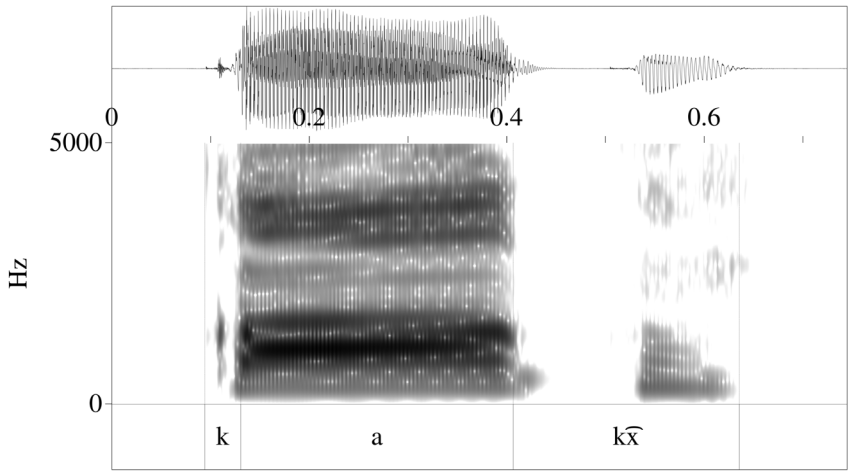


Figure 15. Word-initial voiceless plain velar stop in /kak/ ‘grandparent’ (058)

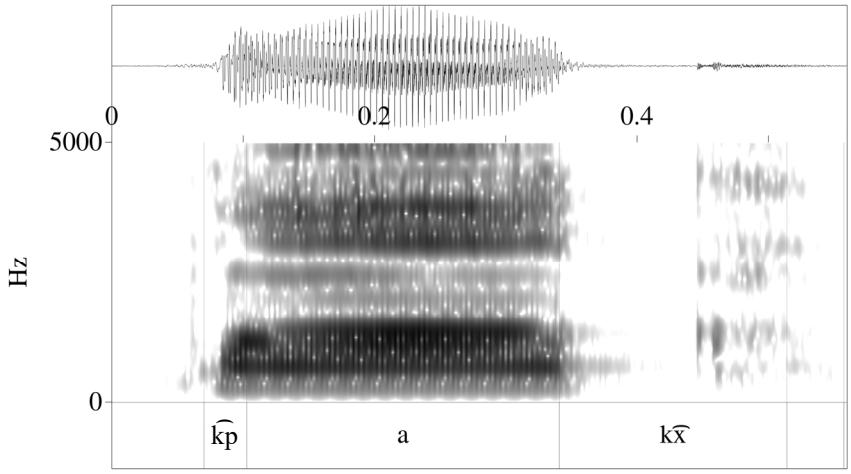


Figure 16. Word-initial /kʷ/ realized with a double closure in /kʷak/ ‘moon’ (059)

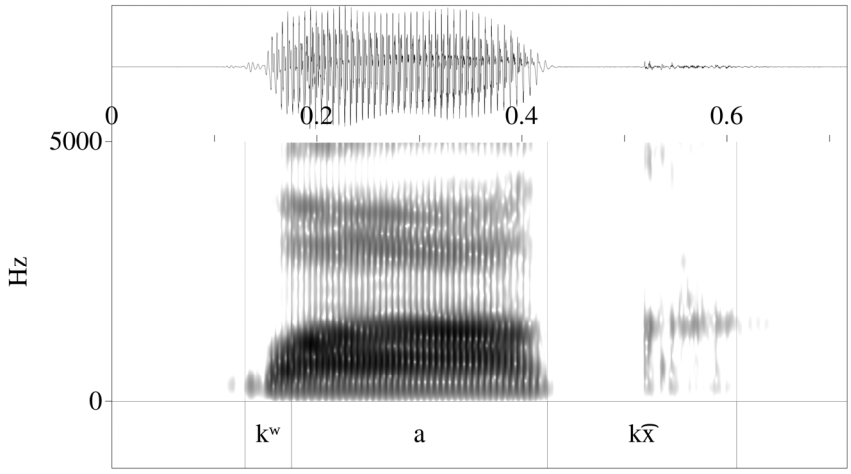


Figure 17. Word-initial /kʷ/ realized with a velar offglide in /kʷak/ ‘moon’ (060)

In Figures 15, 16, and 17, spectrograms are shown for the minimal pair /kak/ ‘grandparent’, with a plain velar voiceless plosive, and two realizations of /kʷak/ ‘moon’, one where there is a double closure, and one where there is a clear offglide after the velar closure. In both cases, the release is labial rather than velar. The examples in Figure 15 and Figure 16, are provided by Puli Ämädu, while the one in Figure 17 is provided by Titi Masa.

In (15), (near-)minimal pairs for the labio-velar plosives are given.

(15) /kʷam/ [k͡pɐm] ‘hair’ (061)
/kam/ [kam] ‘fish sp.’ (062)
/kʷak/ [k͡wak] ‘moon’ (009)
/kak/ [kak] ‘grandparent’ (007)
/gʷlin/ [g͡blin] ‘mudcrab’ (063)
/glen/ [glen] ‘run’ (064)

The voiced labio-velar plosive occurs in only a limited number of lexical items (82 in the latest dictionary of Dimsisi Idi [Schokkin et al. 2019]) and is not generally contrastive; /gʷlin/ ~ /glen/ is the only near-minimal pair that could be found. This phoneme is found predominantly in plant and animal names that are likely borrowings, and in some cases, particularly with bird names, onomatopoeic. Presumably, the co-articulated labial-velar realizations in Idi have been borrowed with these forms from Nen, where the relevant phoneme is clearly a coarticulated labial-velar rather than a velar plosive with a secondary bilabial articulation (Evans & Miller 2016). Velar plosives with bilabial coarticulation or secondary articulation are not a native feature of other Pahoturi River languages. Dimsisi Idi is the variety that is in most extensive contact with Nen, and there would be ample opportunity for borrowing.

Despite the fact that the co-articulated variant appears to be a realization introduced through language contact, there is some evidence that it is now being extended to original Idi words. Consider, e.g., the form /ɡwaɡn/, which is the first or third person singular intransitive auxiliary for the remote past. It consists of a root /ɡ/, with the prefixes /ɡ/ for the remote past and /w/ in the slot for object agreement, indicating that the inflection is intransitive (it further bears an /a/ ‘augment’ prefix and a /n/ first or third person subject agreement suffix). Crucially, the elements /ɡ/ and /w/, while co-occurring in this form and other similarly inflected intransitive verbs, do occur separate from each other in other inflected verbs: /ɡ/ occurs with transitive verbs, which do not show /w/, and /w/ occurs with intransitive verbs of a different subclass, which do not take tense prefixes. They are thus obviously different segments. Still, in /ɡwaɡn/ and similar forms, the two are sometimes co-articulated as if they represented one segment,[8] and consequently we find [g͡bagə̆n] as a realization, as is evident from (16).

(16) /ɡwaɡn/ [g͡bagə̆n]1|3sg.INTR.AUX (065)

3.1.5 Affricates and fricatives

The Idi consonant inventory contains two alveolar sibilants: voiceless /s/ and voiced /z/. Voiced /z/ occurs in all positions, as shown in (17).

[8] In Nen and Nmbo (Evans et al. 2018: 757), at least some occurrences of the labial-velar unit phonemes derive historically from a sequence *k-w-* via *kʷ-*, most importantly the 1sg 'beta-series' object prefix *k͡p-*, which derives historically from *k-w-* where *k-* is a past tense prefix and *w-* a 1sg undergoer prefix. This gives a clear precedent for the diachronic pathway from two segments to one.

(17) /zəŋe/ [d͡ʒə̆ŋe] ‘sweet coconut’ (066)
/kəze/ [kə̆d͡ʒe] ‘crocodile’ (067)
/taz/ [taz] ‘poison root’ (068)

The phoneme /z/ has a broad range of realizations. It is variably realized as a fricative or an affricate, ranging between the alveolar and postalveolar places of articulation: [z], [d͡z], [ʒ] and [d͡ʒ]. The different variants are illustrated in (18) below with the frequent word /kədʒe/ ‘crocodile’. Example (a) and (b) are produced by the same speaker, Titi Masa, while (c) is produced by a different female speaker of comparable age, and (d) is produced by an elderly female speaker.

(18) /kəze/ ‘crocodile’
a. [kə̆d͡ʒe] (069)
b. [kə̆d͡ze] (070)
c. [kə̆ʒe] (071)
d. [kə̆ze] (072)

Comparable inter- and intra-speaker variation for /z/ is common throughout Southern New Guinea languages, cutting across families (see Evans & Miller [2016] for discussion of the Nen equivalent). It is our impression that there is some sociolinguistic conditioning, as there are several female speakers who seem to produce almost exclusively [z], especially in Dimsisi and Bimadbn. A more systematic study of cross-community language variation, controlling for factors such as age, gender and clan membership, would be informative.

While [d͡ʒ] seems to be the most common realization in Dimsisi, we regard /z/ as the voiced counterpart of the fricative /s/. The fact that some speakers seem to prefer the realization [z] could be taken as evidence pointing in the direction of ongoing language change integrating the two segments into a single oppositional category. The /s/ phoneme is relatively widely distributed and occurs in all positions as well (see (19)), without the variations in place of articulation and degree of affrication that is found with /z/.

(19) /sasa/ [sasa] ‘swim’ (073)
/kʷas/ [k͡was] ‘Chinese taro’ (074)

3.2 Sonorants

There are four nasals in Idi: bilabial /m/, alveolar /n/, palatal /ɲ/ and velar /ŋ/. All nasals can occur in both onset and coda position. Examples are given in (20)–(22). The alveolar nasal is often elided word-finally in inflected verbs. This variation is sociolinguistically conditioned, and is discussed in more detail in Schokkin (forthcoming).

(20) Onset word-initial
/maj/ [ma͡ɪ] ‘house’ (075)
/nag/ [nag] ‘friend’ (076)
/ɲuɲu/ [ɲɯ̹ɲu] ‘to growl’ (077)
/ŋi/ [ŋi] ‘coconut’ (078)

(21) Onset intervocalic
/kæmæ/ [kæmæ] ‘ignorance’ (079)
/wana/ [wana] ‘eagle’ (080)
/aɲo/ [aɲo] ‘where’ (081)
/zəŋe/ [d͡ʒə̆ŋe] ‘sweet coconut’ (066)

(22) Coda

/kʷam/	[k͡pam]	‘hair’ (061)
/tan/	[tan]	‘broom’ (003)
/pæɲ/	[pɛ̯ɲ]	‘azure kingfisher’ (082)
/meaŋ/	[meaŋ]	‘younger brother of father’ (083)

Idi has a palatal approximant /j/ and a labio-velar approximant /w/, occurring in both onset and coda position. As we do not assume any diphthongs (justification is given in §4 on vowels), we treat phonetic sequences like [aj̯] as combinations of a vowel and a glide. Some examples are given in (23)–(25). Epenthetic glides are regularly inserted between vowels: see e.g., /joa/, realized as [joʷa], in (23).

(23) Onset word-initial

/joa/	[joʷa]	‘vulva’ (084)
/wap/	[wap]	‘stick’ (085)

(24) Onset intervocalic

/kajakaja/	[kajakaja]	‘plant sp.’ (086)
/awea/	[aweʲa]	‘cassowary’ (087)

(25) Coda

/naj/	[na͡ɪ]	‘sweet potato’ (088)
/aw/	[a͡ʊ]	‘yes’ (089)

The two lateral approximants of Idi, alveolar /l/ and palatal /ʎ/, can occur in both onset and coda position, as can the rhotic /r/, which is realized variably as a trill [r] or a tap [ɾ]. In (26)–(28), near-minimal pairs for the laterals and the rhotic in all positions are given.

(26) Onset word-initial

/lɪl/	[lĭĭlə̆]	‘pig’s burrow’ (090)
/ʎɪʎ/	[ʎĭʎə̆]	‘rub’ (091)
/rɪsi/	[rĭsi]	‘big’ (092)

(27) Onset intervocalic

/kalag/	[kalag]	‘saratoga (fish sp.)’ (093)
/kæʎi /	[kæʎi]	‘work’ (094)
/karab/	[kaɾab]	‘paddle’ (021)

(28) Coda

/təbəl/	[tə̆bə̆l]	‘arrow’ (095)
/təbəʎ/	[tə̆bə̆ʎ]	‘strangler fig’ (096)
/bærbær/	[bærbær]	‘shallow’ (097)

4 Vowel system

As in many other languages of the region, the main difficulty of analysing the vowel system of Idi consists in determining the status of vowels that can be described as “short”, “weak”, or “fleeting”; i.e. vowels whose (non-)occurrence and quality appear to be heavily context-dependent. We call such vowels *weak* vowels. Even though they exhibit these characteristics, coinciding with those of epenthetic vowels, from a phonological point of view they cannot be considered purely epenthetic. They will be dealt with in detail in §4.3. The analysis of the *full* vowels is more straightforward, and they will be discussed first.

4.1 Full vowels

There are six full vowels: /i/ /e/ /æ/ /a/ /o/ /u/. These vowels can occur in monosyllabic monomorphemic words with open syllables, as illustrated in (29).

(29)	/i/	/bi/	[bi]	'we' (098)
	/e/	/we/	[we]	'penis' (100)
	/æ/	/bæ/	[bæ]	'you' (101)
	/a/	/ba/	[ba]	'our' (102)
	/o/	/bo/	[bo]	'(s)he, they' (103)
	/u/	/lu/	[lu]	'tree' (104)

Figure 18 below shows the Idi vowel space schematically represented in a trapezoid.

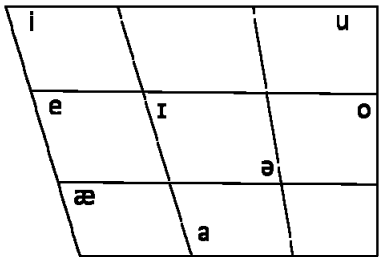


Figure 18. Idi vowel chart

Unlike the weak vowels, full vowels can occur in syllables with an empty onset. While this is relatively rare, all full vowels are found at the beginning of word forms, as shown in (30). Mid and high vowels are optionally realized with a slight on-glide [j] for the front vowels, as in the first word below, or a [w] for the back vowels.

(30)	/i/	/ibiek/	[ʲibiʲɛk]	'digging stick' (106)
	/e/	/era/	[era]	1|3sg present transitive auxiliary (107)
	/æ/	/æl/	[æl]	'river' (108)
	/a/	/aba/	[aba]	'swamp lake' (109)
	/o/	/obænæ/	[o̰bænæ]	'his, hers' (110)
	/u/	/umlæŋ/	[umlæŋ]	'knowledge' (111)

There do not seem to be any compelling reasons for assuming indivisible gliding vowels, i.e. diphthongs or triphthongs, in Idi. There are no obvious morphophonological alternations which can be used as diagnostics, e.g., suffixes showing different allomorphs depending on whether they attach to a base ending in either a vowel or a consonant. Vowel sequences like those illustrated in (31) can be analysed as combinations of a vowel and a glide, and the fact that the second element is always high favours its analysis as a glide. However, further study of Idi phonotactics will be needed to reach a definitive conclusion about the presence of diphthongs in Idi.

(31)	/aw/	/aw/	[a͡ʊ]	'yes' (112)
	/aj/	/maj/	[ma͡ɪ]	'house' (113)
	/æj/	/mæjk/	[me͡ɪk]	'yam house' (114)
	/æw/	/æwli/	[ɛ͡ʊli]	'how many' (115)

In Figure 19 all Idi vowels are plotted, based on the example recordings used for this article which amounted to 431 vowel tokens in total. Mean F1 and F2 measurements (represented by the IPA symbols), normalized with the Bark-difference method according

to Syrdal and Gopal (1986), are shown for the six full vowels and two weak vowels. The ellipses represent the area covered by standard deviation of the normal density contour estimated from the data. The plot indicates that there is clear phonetic evidence to distinguish six full vowels. Within one standard deviation, covering approximately 68% of the data (in a Gaussian distribution), they occur in largely non-overlapping areas of the vowel space. The plot also suggests that there is a fair bit of variable realization for some vowels, particularly /æ/ and /u/ and the two central vowels.

If we consider vowel realizations in individual words, it appears that the lexical items containing /æ/ form two major clusters, one positioned higher up and fairly close to /e/, the other in a typical place for /æ/. /æ/ is raised significantly, sometimes virtually to [ɛ], when there is a vowel /i/ present in the same word, or when it is flanked by a palatal nasal /ɲ/ or lateral /ʎ/. Examples of lexical items that on average have raised /æ/ include /pæɲ/ 'kingfisher' (116), /zuwæʎ/ 'milkwood tree' (117) and /dibæn/ 'snake' (118).

Similarly, for /u/ the presence of a palatal appears to make a difference, with, e.g., /ɲuɲu/ showing a much "fronter" /u/. The variable quality for /u/ cannot be explained satisfactorily by the phonetic environment alone, however, and it is possible that for some lexical items there may be a change-in-progress in which the full /u/ vowel gets increasingly more centralised and reduced in length. Evidence from sets of cognate Pahoturi River words suggests that reduction processes may have progressed to a greater degree in Idi than in some other languages in the family, and that there are many cases where a full vowel */u/ in the protolanguage corresponds to the weak vowel /ɪ/ in Idi (likewise, there are many cases where Proto-PR */o/ corresponds to the Idi weak vowel /ə/). For some present-day lexical items, this reduction may still be ongoing and we find inter-speaker variation. However, based on the presently available data, no significant effects were found for the social categories age and gender.

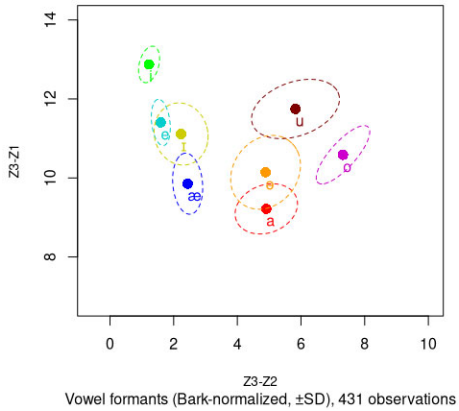


Figure 19. Idi vowel plot: Bark-normalized values for height (Z3–Z1) and advancement (Z3–Z2). (Generated with the package 'vowels' for R, Kendall & Thomas 2018.)

4.2 Weak vowels

As can be seen in Figure 19, two central vowels can be distinguished. At the phonemic level (even though they may not fully classify as such) we have labelled these /ɪ/ and /ə/. The two weak vowels rarely contrast, but we have found a couple of minimal pairs, given in (32).

(32) /dɪdɪr/ [də̆də̆r] 'dry' (119)
/dədər/ [də̆də̆r] 'rock' (120)
/tɪn/ [tɪ̆n] 'smoke' (121)
/tən/ [tə̆n] 'clan' (122)

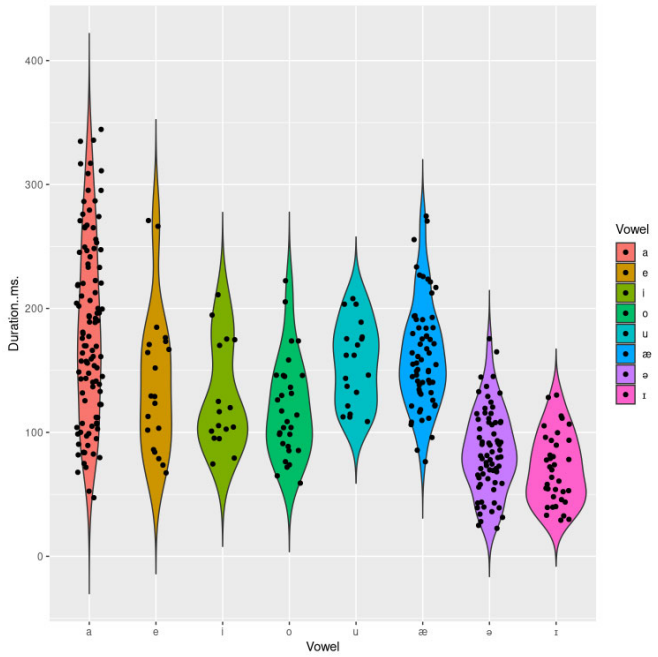


Figure 20. Length of non-final vowels in the sample used for this study. (Generated with the package 'ggplot2' for R, Wickham 2016.)

As is evident from Figure 19, weak vowels show much greater variation in quality than most full vowels (except /æ/ and /u/, discussed above). Realizations of /ɪ/ overlap with /e/ to an extent, as does /ə/ with /a/. The fleeting nature of the weak vowels and their short duration makes them more susceptible to influences from the immediate phonetic environment. /ɪ/ is realized as [ɜ̆] in some cases, and /ə/ shows considerable variation for both height and backness: realizations as [ɜ̆] and [ɐ̆] are attested, in addition to a more back and perhaps rounded variant, here represented as [ɞ̆]. Nevertheless, their mean F1 and F2 values are quite far apart. Phonological evidence, discussed below, suggests that considering them two separate phonemes is also justified on a more abstract level.

The weak vowels occur only between consonants or as (non-phonemic) "echo vowels". As mentioned above they are not attested in syllables without an onset, and they do not occur in open syllables word-finally. Weak vowels are significantly shorter than full vowels. Figure 20 shows the distribution of vowel length for all vowels in non-final position. A regression model shows that both short vowels differ significantly from all full vowels in terms of length. We fit two linear models with the function lm() of R, using 'vowel' as a predictor variable and 'length' as a response variable. In one model we used /ɪ/ as the reference level, in the other model /ə/. Significance levels for pairs of short and full vowels were estimated using a t-test. All pairs of short and full vowels differ significantly at $p < 0.001$, with the exception of the two pairs </ə/, /i/> and </ə/, /o/>, with $p < 0.01$. Pairwise comparisons (see Figure 21) also indicate that no long vowels differ significantly from any other. See the Appendix for the model statistics.

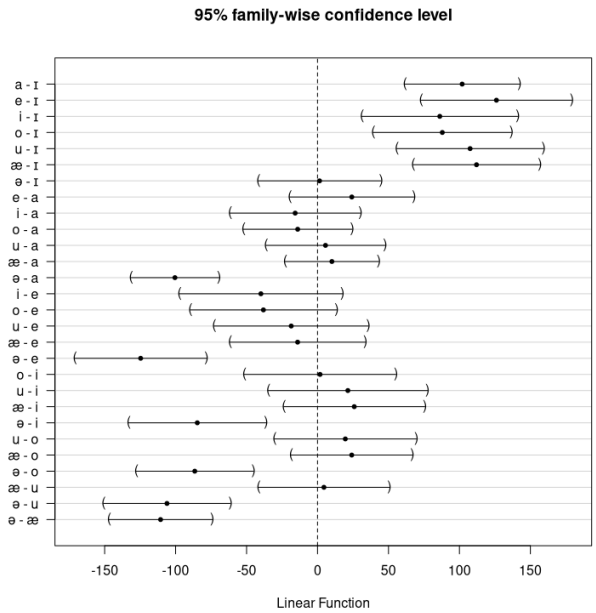


Figure 21. Pairwise comparison of vowel lengths according to linear model.
(Generated with the package 'multcomp' for R, Hothorn et al. 2008.)

Some examples of weak vowels are given below: for /ə/ in (33) and for /ɪ/ in (34).

(33)	/ɖəg/	[d͡ʐə̆g]	‘back’ (123)
	/kəɖ/	[kə̆d]	‘small’ (124)
	/k^{w}əd/	[kwə̆d]	‘hard’ (125)
	/nən/	[nə̆n]	‘ant sp.’ (126)
	/lətən/	[lə̆tə̆n]	‘to arrive’ (127)
(34)	/bɪn/	[bɪ̆n]	‘head’ (140)
	/k^{w}ɪt/	[k͡pɪ̆t]	‘black’ (128)
	/mɪɖ/	[mɪ̆d͡ʐ]	‘bark’ (129)
	/tɪn/	[tɪ̆n]	‘smoke’ (121)
	/bɪbɪd/	[bɪ̆bɪ̆d]	‘to call’ (130)

As the examples in (33) and (34) show, /ə/ tends to occur in the context of retroflex plosives, but is not confined to these contexts (cf. /nən/, /kwəd/), and /ɪ/ seems to be more frequent in the neighbourhood of coronal consonants.

Weak vowels seem to function epenthetically in many cases, occurring for instance in inflected verbs, where an affix consisting of just a consonant is attached to a root starting or ending in another consonant, resulting in a cluster. Conversely, they are absent when they are not “needed” to break up illicit consonant clusters. A few instances of the central vowels where they seem to more obviously serve epenthetic functions are given below. (35) shows an inflected form of the verb /ŋaŋgas/ ‘to make’, consisting of the prefixes /be/ and /a/ (indicating transitive remote past with a 3sg object), the root /ŋgas/, and a first/third-person subject agreement suffix /n/. /sn/ is not a legitimate coda cluster in Idi. Instead, the final /s/ of the root syllabifies with the /n/ of the suffix, and a vowel is needed to form the syllable nucleus. When the same suffix attaches to a root ending in a

(full) vowel, we don't find a central vowel.[9] This is shown in (36) with the vowel-final root /mɪltæ/ 'to get, to hold'.

(35) /be-a-ŋgas-n/ [bæŋgasə̆n] '(s)he made it' (remote past) (131)
(36) /be-mɪltæ-n/ [bemĭltæn] '(s)he held it' (remote past) (no recording)

A similar case is shown with the verb in (37), which is an inflected form of the root /dru/, 'wash', and bears the prefix /n/, indicating recent past with transitive roots, and the suffix /n/ for a first or third-person singular subject. A central vowel (here, /ɪ/) is found between the initial /n/ and the following plosive, as /ndr/ is not a legitimate onset cluster.

(37) /n-dru-n/ [nə̆drun] 'I/(s)he washed it' (recent past) (132)

Minimal pairs contrasting the two weak vowels have already been given, but there are also minimal pairs contrasting weak vowels contrasting with full vowels, see (38).

(38) /kak/ [kak] 'grandparent' (133)
/kək/ [kə̆k] 'spit' (134)
/k^{w}ap/ [k͡pap] 'womb' (135)
/k^{w}ɪp/ [k͡pĭpə̆] 'well' (136)
/sir=æ/ [siræ] 'grass (CORE)'[10] (137)
/sɪræ/ [sə̆ræ] 'tail' (138)
/ben/ [ben] 'name' (139)
/bɪn/ [bĭn] 'head' (140)
/gap/ [gap] 'water cassava' (141)
/gəp/ [gə̆pə̆] 'small hole' (142)

The fact that there are minimal pairs both between the two weak vowels, and between weak and full vowels, is an indication that they have phonemic status in at least some of their occurrences, despite the restrictions on their distribution. Another piece of evidence that they are something more than epenthetic comes from the fact that they participate in a phonological process of vowel harmony, a topic we turn to in the next section. An overview of near-minimal pairs for all Idi vowels is shown in Table 2.

[9] Another possible analysis for these and similar cases, is that the suffix would have an allomorph [ə̆n] ~ [ĭn], occurring after a consonant, in addition to a plain consonantal allomorph, occurring after a vowel.
[10] Core case is discussed below in §4.2.

Table 2. Near-minimal pairs for Idi vowels

	t_n/ŋ	**b_n/ŋ**	**b_#**	**d_]σ**	**d_r**	**p_]σ**
/i/			/bi/ [bi] 'we' (098)	/didu/ [didu] 'run' (163)	/dirımdirım/ [dirĭmdirŏm] 'dragonfly' (171)	/lu pi/ [lu pi] 'small branch' (178)
/ɪ/	/tın/ [tĭn] 'smoke' (121)	/bın/ [bĭn] 'head' (140)		/dıdu/ [dĭdɯ] 'pain' (164)	/dıdır/ [dĭdŏr] 'dry' (119)	
/e/		/ben/ [ben] 'name' (139)	/abe/ [abe] 'come' (imp.) (155)	/ade/ [ade] 'also' (162)	/zəbo der/ [dʒə̆bo der] 'rainbow lorikeet' (170)	/tope/ [tope] 'index finger' (177)
/ə/	/tən/ [tə̆n] 'clan' (122)	/bəndɛ/ [bə̆ndɛ] 'plant sp.' (148)		/dədara/ [də̆daɾa] 'grass' (158)	/dədər/ [də̆də̆r] 'rock' (120)	/pəpək/ [pə̆pʌ̆k] 'throat' (174)
/æ/	/tænæn/ [tænæn] 'to perch' (145)	/bænæ/ [bænæ] 'mine' (151)	/bæ/ [bæ] 'you' (101)	/dædærb/ [dædærb] '(get) permission' (161)	/dær/ [dær] 'ashes' (168)	/topæ/ [topɛ] 'crest' (176)
/a/	/tan/ [tan] 'broom' (144)	/banzro/ [bandʒɾo] 'to stop' (150)	/ba/ [ba] 'our' (102)	/ada/ [ada] 'thus' (160)	/badar/ [badar] 'tree sp.' (167)	/pa/ [pa] 'bird' (175)
/o/	/tondræl/ [tondrɛl] 'humbug' (147)	/boŋgo/ [bɔŋgo] 2SG.EMP (153)	/bo/ [bo] '(s)he, they' (103)	/dodo/ [dodo] 'to mash' (166)	/awea doro/ [aweə̯a doro] 'cassowary type' (173)	/po/ [po] 'rubbish heap' (179)
/u/	/tuŋgi/ [tuŋgi] 'giant' (146)	/bunibuni/ [bunibuni] 'tree sp.' (152)	/tubu/ [tɯbu] 'knee' (157)	/du/ [du] 'wild' (165)	/lu dur/ [lu duɾ] 'hollow tree' (172)	/pu/ [pu] 'reeds' (180)

4.3 Vowel harmony

The full vowels can be divided into the two harmony sets {/a/, /e/, /o/} and {/æ/, /i/, /u/}. Generally speaking, only vowels from either of these harmony sets can co-occur within a given phonological domain. Gast (2015) analyses this system as an instance of cross-height harmony. While the exact nature of the domain within which vowel harmony holds is a non-trivial question, in general harmony seems to hold within phonological words: verb roots including inflectional prefixes and suffixes, and nouns including case suffixes or enclitics. We call members of the first set "dark" (with the feature [-light]) and members of the second set "light" (with the feature [+light]). Primarily, whether a given form entails a dark or light domain is based on whether the root has the feature [+light];

this is lexically determined. Some examples of dark and light words, both nouns and infinitive verbs, are given in (39) and (40), respectively.

(39) Dark words:

/age/	[age]	'banana' (181)
/awea/	[awe̤a]	'cassowary' (182)
/ankom/	[ankom]	'ant' (183)
/tope/	[topɛ]	'index finger' (177)
/sepotar/	[sepotar]	'regent whistler' (184)
/zoŋg/	[d͡ʒoŋg]	'to burn' (185)
/beaŋg/	[beaŋg]	'to chase' (186)

(40) Light words:

/piplu/	[piplu]	'lizard' (188)
/tikɪp/	[tikɞ̆p]	'heart' (189)
/tætu/	[tætɯ]	'wash' (190)
/buʈæl/	[buʈæl]	'axe' (192)
/pɪduj/	[pɞ̆du͡ɪ]	'to blow' (193)
/ɲuɲu/	[ɲɯ̹ɲu]	'to growl' (194)

Vowel harmony leads to systematic morphophonological alternations. For example, there is a nominal enclitic, glossed 'CORE', attached to NPs in core syntactic function (i.e. S of an intransitive, A or O of a transitive clause). Depending on whether the stem it is attached to has the feature [+light], it will be realized as either /a/ [-light] or /æ/ [+light]. Thus the [-light] root /jəbəd/ 'sun' (195) will take the enclitic /a/ to form [jə̆bə̆da] 'sun-CORE' (196), while the [+light] root /lu/ 'tree' (104) will take the other variant, /æ/, resulting in [luæ] 'tree-CORE' (197). The same happens with other case suffixes and enclitics; most of these are harmonizing without exception in terms of the words they attach to. Exceptions are found within monomorphemic lexical words, however, as is the case in most vowel harmony systems. A few examples of disharmony within lexical words are given in (41) and (42).

(41) /topæ/	[topɛ]	'crest' (176)
(42) /lu do/	[lu do]	'fishing rod' (potentially a compound) (198)

A precise analysis of vowel harmony in Idi is a complex undertaking, which we cannot tackle here. Specifically, the domain within which harmony holds is sometimes hard to define. Some affixes that are transparent when it comes to vowel harmony, like the case suffixes on NPs mentioned above, will have variable realization based on the harmony feature of the root. Other affixes, such as the durative suffix /nd/ on verbs, appear to block the spread of harmony. Yet others, such as the ventive directional prefix /i/ on verbs, are themselves [+light], and this will overwrite any lexically determined feature of a root, leading to systematic vowel changes spreading through certain inflected verbs. An example is of this is discussed below.

Extending the analysis just sketched for full vowels, the weak vowels /ɪ/ and /ə/ can also be regarded as participating in the vowel harmony system: /ɪ/ harmonizes with the vowels in the light set, /ə/ with the ones from the dark set. This is reflected in the choice of affixes for nouns, and in more global patterns for verbs. Remember the core case clitic discussed above, that is either realized as /æ/ or as /a/. The same alternation can be found when this clitic attaches to nouns containing weak vowels only: compare [bɪ̆næ], the core case form of /bɪn/ 'head', and [kə̆pa], the corresponding form of /kəp/ 'fruit'.

Weak vowels harmonise, just as full vowels do, when harmony spreads throughout inflected verbs. Many verbal roots of Idi are primarily defined by consonantal "skeletons" that have weak vowels occurring between them. Consider for example the

verb /ŋələbən/ ‘take (nonplural O)’. This is found in forms like those in (43)–(45), produced by a male speaker from Sibidiri. Note that the present tense in Idi can only be formed analytically, so (43) consists of an infinitive form plus an inflected transitive auxiliary, whereas the past tense forms in (44) and (45) are inflected verbs with inflectional affixes directly attached to the root.

(43)	/ŋələbən era/	[ŋ̆lə̆β̆nera]	‘I am/(s)he is taking it.’ (202)
(44)	/nəŋgələbənan/	[nə̆ŋğlə̆b̆nan]	‘I took it.’ (recent past) (203)
(45)	/jɪŋgɪlɪbɪnæn/	[jĭŋğlə̆bĭnæn]	‘(S)he took it.’ (recent past) (204)

From the quality of the weak vowels observed in the infinitive in (43), we can conclude that this verb root has a feature [-light] (remember that this feature is lexically determined, for both nouns and verb roots). This particular verb belongs to a conjugation class for which the recent past tense form indexing a third person singular agent and patient is formed by prefixing a form [i], which carries a feature [+light]. As you can see, when comparing (44) to (45), this feature spreads rightward throughout the entire verb form, and both the weak vowels and the full vowel in this form now have the feature [+light]. The fact that weak vowels behave identically to full vowels with respect to this phonological assimilation process suggests that they cannot be considered purely epenthetic, inserted into the output of assimilation processes that happen on an underlying level.

Based on the phenomena described above, i.e. the fact that their occurrence is unpredictable in monosyllabic and some multisyllabic lexical roots, and that they participate in a vowel harmony system, it does not seem accurate to analyse the weak vowels in Idi as purely, or always, epenthetic. Note that there have been similar issues for other Papuan languages: see, e.g., Pawley and Blevins (2010) on the need to postulate more than one status for epenthetic vowels in Kalam. The observed phenomena for Idi suggest that the phones represented throughout with /ɪ/ and /ə/ are sometimes phonemic, and sometimes epenthetic.

5 Phonotactics

The Idi syllable consists of a nucleus, an onset, and a coda. Onsets and codas are optional and consist of consonants at the edges of the syllable, while the nucleus is obligatory and occupied by a vowel, either full or weak. In words with more than one nucleus, onsets are preferred over codas. Onsets and codas may consist of multiple segments as long as the cluster is phonotactically permitted. Licit onset clusters generally rise in sonority, while licit coda clusters fall in sonority. There are some generalisations that can be made with respect to combinations of natural classes of consonants that can co-occur in a cluster, but not many, and consonant clusters in general are a quite marginal phenomenon in the language. Examples of permissible clusters in both onset and coda position are given in Table 3.

Generalising over the data presented in Table 3, complex onsets can consist either of a bilabial or velar plosive (/p/, /b/, /k/, /g/) followed by a liquid (/r/, /l/, /ʎ/), or of an alveolar plosive /t/ or /d/ followed by /r/. Other, rarer complex onsets involve a bilabial nasal /m/ followed by a lateral approximant /l/ or /ʎ/, or the alveolar fricative /s/ followed by alveolar nasal /n/. An exception to the rising sonority generalisation is the complex onset /sp/. Retroflex obstruents and the voiced sibilant /z/ are not found in any clusters.

Complex codas are rarer, and even more limited in terms of the range of combinatorial possibilities. They can only consist of a liquid (/l/, /ʎ/, /r/) followed by a bilabial or velar plosive (/p/, /b/, /g/) or the glide /j/ followed by a velar plosive /k/ or /g/. While there are many intervocalic and coda sequences consisting of a homorganic nasal and obstruent, as discussed in §3.1.2, we do not consider these sequences to be

Table 3. Overview of permissible consonant clusters

	Complex			
	Onset 1 **._CV**	**Onset 2** **.O_V**	**Coda 1** **V_O.**	**Coda 2** **VC_.**
p	/næplæ/ [næplæ] ‘soft’ (205)	/speliŋg/ [speliŋg] ‘basket’ (206)	-	-
b	/brægu/ [bɾægu] ‘payment’ (207)	-	-	/dædærb/ [dædærb] ‘(get) permission’ (209)
t	/ætræ/ [ætɾæ] ‘yam’ (211)	-	-	-
d	/tondræl/ [tondræl] ‘humbug’ (212)	-	-	
k	-	-	-	/mejk/ [me͡ɪk] ‘yam house’ (213)
kʷ	-	-	-	-
g	/glabaj/ [glaba͡ɪ] ‘later’ (214)	-	-	
gʷ	/gʷlin/ [g͡blin] ‘mudcrab’ (063)	-	-	-
ʈ	-	-	-	-
ɖ	-	-	-	-
m	/mʎæmʎæ/ [mʎæmʎe] ‘to dress sores’ (216)	-	-	-
n	-	/snæɖəkæl/ [snæɖə̆kæl] ‘ring finger’ (215)	-	-
ɲ	-	-	-	-
ŋ	-	-	-	-
s	/speliŋg/ [speliŋg] ‘basket’ (206)	-	-	-
z	-	-	-	-
r	-	/ætræ/ [ætɾæ] ‘yam’ (211)	/dædærb/ [dædærb] ‘(get) permission’ (209)	-
l	-	/gæmblæ/ [gæmblæ] ‘weeds’ (210)	-	-
ʎ	-	/mʎæmʎæ/ [mʎæmʎe] ‘to dress sores’ (216)	/bmætæʎg/ [bə̆mæ͡ʈʂæʎg] ‘I will roast it’ (217)	-
j	-	-	/mejk/ [me͡ɪk] ‘yam house’ (213)	-
w	-	-	-	-

clusters of multiple segments, but rather analyse the nasal as a feature related to the obstruent segment in question, that only surfaces when following a vowel.

If a consonant sequence violates the legal onset or coda specifications, this will be resolved by inserting a weak vowel. In these cases, the weak vowels serve a more clearly epenthetic function, but still adhere to the vowel harmony domains as discussed above. There is quite a bit of variability in the realization of consonant clusters, and weak vowels

are found in legal clusters as well: for instance, /speliŋg/ ‘basket’ can be realized both as [speliŋg] and [sĭpeliŋg].

6 Lack of stress and tone

Like other languages spoken in Southern New Guinea, Idi does not have tonal contrasts. Stress seems to be a marginal phenomenon in the language, if at all present, and there are no minimal pairs distinguished by just word-level stress.

7 Illustrative transcription

The Idi version of the North Wind & Sun tale was recorded in 2016 and told by Bill Diwara, a middle-aged speaker originally from Sibidiri (218). The text was composed by Bill listening to the Nen version previously recorded by Jimmy Nébni (which appears in Evans & Miller 2016), then back-translating into English and writing this down, then giving a running translation into Idi. It was then transcribed and translated with the assistance of Jimmy Nébni of Bimadbn village, whose mother was an Idi speaker. Some minor adjustments to the original text were made in the interests of local comprehensibility, such as the substitution of ‘cold wind’ for ‘north wind’. Below, an Idi orthographic representation, with glossing and free translation, of the text is given, followed by a phonetic transcription. All phonemes except /ɖ/ and /ɲ/ are covered, which means 27 out of 29 phonemes or 93%.

7.1 Orthographic representation, gloss and free translation

1. *kalkal-ang* *buey=ä* *a* *ybd=a*
   cold-ATTR wind=CORE and sun=CORE
   The cold wind and the sun…

2. *kalkal-ang* *buwey=ä* *a* *ybd=a* *yka*
   cold-ATTR wind=CORE and sun=CORE talk

   g-w-a-plye-nd-o
   REM-INTR-AUG-tie-DUR-3NSGS
   The cold wind and the sun were arguing…

3. *ni* *yaka* *mnggal-ag* *b-r-en*
   SUB who strength-ATTR FUT-go.NPL-3SGS
   who would be the stronger (one).

{repetition of lines 1 and 2}

4. *nma* *yaka=nd* *mnggal-ag=a,* *obänä*
   maybe who=SG.PRS.COP strength-ATTR=CORE 3SG.POSS

   kauthe=a *gl* *b-kn-n*
   clothes=CORE will FUT-take.off-3SGA
   Whoever may be the stronger (one), he would [make the traveller] take off his coat.

5. *bo* *komblabe* *yka* *be-maly-o*
   3.NOM two talk 3SGO.REM-touch-3NSGA
   The two of them made an agreement…

6. *ämänä* *kauthe=a* *ni* *b-kn-n,* *bo* *gä*
whose clothes=CORE SUB FUT-take.off-3SGS 3.NOM EMP

mnggal-ag *mg* *da*
strength-ATTR INTS SG.PRS.COP
who will [make him] take his coat off, he is the strongest one.

7. *kalkal-ang* *buwey=ä* *mnggal-ändä* *mg*
cold-ATTR wind=CORE strong-INS INTS

bi-pdu-nd-n *oblä-pätä*
3SGO.REM.VEN-blow-DUR-3SGA 3sg.BEN-DAT
The cold wind blew strongly towards him.

8. *bo* *kauthe=a* *obänä* *qd~qd*
3.NOM clothes=CORE 3SG.POSS REDUP~hard

g-w-mla-n
REM-INTR-tie-3SGS
He tied his cloak very tightly.

kalkal-ang *buey=ä* *mnggal-ändä* *mg*
cold-ATTR wind=CORE strength-INS INTS

bi-pdu-n
3SGO.REM-blow-3SGA
The cold wind blew strongly towards him…

9. *gta* *mnggalmnd* *g-w-a-g-n*
but strength-PRIV REM-INTR-AUG-NPL.PFV.AUX-3SGS
but became exhausted.

10. *ybd=a* *ththm-ang* *mg* *w-a-ndzog-en*
sun=CORE heat-ATTR INTS INTR-AUG-burn-3SGS
But the sun shone very hot…

11. *kmänd-äg* *la* *bänä* *kauthe=a*
walk.around-ATTR man 3SG.POSS clothes=CORE

y-kn-en
3SGO-take.off-3SGS.REM
and the traveller took off his coat.

12. *kalkal-ang* *buey=ä* *obom* *ada*
cold-ATTR wind=CORE 3SG.ACC thus

be-gä-n
3SGO.REM-3SG.PFV.AUX-3SGS
The cold wind told him [the traveller],

13. *“bä* *gl* *kadramang* *yka* *w-a-g-o*
2.NOM will sorry talk INTR-AUG-NPL-PFV.AUX-2SGS.FUT
“You will say sorry [to the sun].

14. *ybd=a* *gä* *mnggal* *mg,* *mnggalag* *mg*
sun=CORE EMP strength INTS strength-ATTR INTS

da”
SG.PRS.COP
The sun is the strongest.”

15. *eso* *résі*
thank.you big
Thank you very much.

7.2 Phonetic transcription

Below, a narrow phonetic transcription is shown. The square brackets divide intonation units.

[kalkalaŋ buʷeˈæ a jəbə̆da] [kalkalaŋ buʷeˈæ a jəbə̆da jɛka gwapʌ̆ndo] [neˌ jaka mə̆ŋgalag bɾɛn] [kalkalaŋ buʷeˈæ a jəbə̆da] [kalkalaŋ buʷeˈæ a jəbə̆da jɛka gwapʌ̆ndo] [nə̆ma jakand mə̆ŋgalaga] [obænæ ka͡ʊ͡tʂˌea gəl bə̆kə̆nən] [bo komblabe jɜka bemaʌo] [æmænæ ka͡ʊ͡tʂˌea neˌ bə̆kə̆nən] [bo gæ mə̆ŋgalə̆g mə̆g da] [kalkalaŋ buʷeˈæ mə̆ŋgalændæ mə̆g bipɔ̆dunden oblæbætæ] [bo ka͡ʊ͡tʂˌea obænæ] [kwə̆dəkwə̆də gɓə̆məlan] [kalkalaŋ buʷeˈæ mə̆ŋgalændæ mə̆g bipɔ̆dun] [gəta mə̆ŋgalmə̆nd gwagə̆n] [jəbə̆da] [t͡ʂˌə̆t͡ʂˌə̆ŋaŋ mə̆g wandʒogen] [kə̆mændæg la bænæ ka͡ʊ͡tʂˌea jəkə̆nən] [kalkalaŋ buʷeˈæ obom ada begæn] [bæ gə̆l kadɾamaŋ jɛka wago] [jəbə̆da gæ mə̆ŋgal mə̆g] [mə̆ŋgalag mə̆g da] [eso rĭsi]

Appendix

Model with /ɪ/ as reference level

	Estimate	Std. Error	t value	Pr(>|t|)	
(Intercept)	70.609	8.531	8.277	2.62e-15	***
Vowela	110.747	9.885	11.203	<2e-16	***
Vowele	70.171	14.402	4.872	1.67e-06	***
Voweli	57.197	15.527	3.684	0.000266	***
Vowelo	48.754	12.749	3.824	0.000155	***
Vowelu	84.942	14.646	5.799	1.48e-08	***
Vowelæ	91.756	10.780	8.511	4.95e-16	***
Vowelə	13.997	10.548	1.327	0.185358	

Model with /ə/ as reference level

	Estimate	Std. Error	t value	Pr(>|t|)	
(Intercept)	84.606	6.203	13.641	<2e-16	***
Vowelɪ	-13.997	10.548	-1.327	0.18536	
Vowela	96.750	7.963	12.150	<2e-16	***
Vowele	56.174	13.157	4.269	2.52e-05	***
Voweli	43.200	14.380	3.004	0.00285	**
Vowelo	34.757	11.324	3.069	0.00231	**
Vowelu	70.945	13.424	5.285	2.20e-07	***
Vowelæ	77.759	9.050	8.592	2.77e-16	***

References

Boersma, Paul & Weenink, David. 2021. Praat: doing phonetics by computer [Computer program]. Version 6.1.41, retrieved 25 March 2021 from http://www.praat.org/

Elvira García, Wendy. 2018. Create pictures with tiers v.4.5. Praat script. (Retrieved from http://stel.ub.edu/labfon/en/praat-scripts).

Evans, Nicholas. 2014. Positional verbs in Nen. *Oceanic Linguistics* 53(2): 225–255.

Evans, Nicholas. 2015a. Inflection in Nen. In Baerman, Matthew (ed.), *The Oxford handbook of inflection*, 543–575. Oxford: Oxford University Press.

Evans, Nicholas. 2015b. Valency in Nen. In Malchukov, Andrej & Comrie, Bernard (eds.), *Valency classes in the world's languages*, 1069–1116. Berlin: Mouton de Gruyter.

Evans, Nicholas. 2017. Quantification in Nen. In Keenan, Edward L. & Paperno, Denis (eds.), *Handbook of quantifiers in natural language*. Dordrecht: Springer.

Evans, Nicholas. 2019a. Waiting for the word: Distributed deponency and the semantic interpretation of number in the Nen verb. In Baerman, Matthew & Hippisley, Andrew & Bond, Oliver (eds.), *Morphological perspectives: Papers in honour of Greville G. Corbett*, 100–123. Edinburgh: Edinburgh University Press.

Evans, Nicholas. 2019. *Nen dictionary*. (https://dictionaria.clld.org/contributions/nen)

Evans, Nicholas & Arka, Wayan & Carroll, Matthew J. & Choi, Yun Jung & Döhler, Christian & Gast, Volker & Kashima, Eri & Mittag, Emil & Olsson, Bruno & Quinn, Kyla & Schokkin, Dineke & Tama, Philip & Van Tongeren, Charlotte & Siegel, Jeff. 2018. The languages of Southern New Guinea. In Palmer, Bill (ed.), *The languages and linguistics of New Guinea: A comprehensive guide*, 641–774. Berlin: Walter de Gruyter.

Evans, Nicholas & Miller, Julia C. 2016. Nen. *Journal of the International Phonetic Association.* 46(3): 331–349.

Flemming, Edward. 2003. The relationship between coronal place and vowel backness. *Phonology* 20(03): 335–373.

Gast, Volker. 2015. *Advanced tongue root harmony in Sibidiri Idi, a language of Southern New Guinea?* (Paper presented at the 11th Association for Linguistic Typology Conference, Albuquerque, New Mexico.)

Hothorn, Torsten & Bretz, Frank & Westfall, Peter. 2008. Simultaneous Inference in General Parametric Models. *Biometrical Journal* 50(3): 346–363.

Kendall, Tyler and Erik R. Thomas. 2018. vowels: Vowel Manipulation, Normalization, and Plotting. R package version 1.2-2. https://CRAN.R-project.org/package=vowels.

Ladefoged, Peter & Maddieson, Ian. 1996. *The sounds of the world's languages*. Malden, MA: Blackwell Publishing.

Lindsey, Kate L. 2019. *Ghost elements in Ende phonology*. Stanford, CA: Stanford University. (Doctoral dissertation.) http://purl.stanford.edu/ys194fp6634.

Lindsey, Kate L. 2021. Ende. *Journal of the International Phonetic Association*, 1-21. doi: 10.1017/S0025100320000389.

Pawley, Andrew & Blevins, Juliette. 2010. Typological implications of Kalam predictable vowels. *Phonology* 27(1): 1–44.

R Core Team. 2019. R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. (https://www.R-project.org/.)

Schokkin, Dineke. Forthcoming. Variable realization of verb-final /n/ in Idi. In Kashima, Eri & Meyerhoff, Miriam (eds.), *Variation in the Pacific. Special Issue of Asia-Pacific Language Variation*, part II.

Schokkin, Dineke & Lindsey, Kate L. In revision. The Pahoturi River language family, with special reference to its verbal puzzles. Submitted to *Linguistic Typology.*

Schokkin, Dineke & The Dimsisi Idi Language Committee. 2019. A preliminary dictionary of Idi as spoken in Dimsisi, Western Province, Papua New Guinea. Draft version 5. (Unpublished ms.)

Strong, Katherine A. & Lindsey, Kate L. & Drager, Katie. 2020. Gender, oration, and variable affrication in Ende. *University of Pennsylvania Working Papers in Linguistics* 26(2): 129–138.

Syrdal, Ann K. & Gopal, H. S. 1986. A perceptual model of vowel recognition based on the auditory representation of American English vowels. *Journal of the Acoustic Society of America* 79: 1086–1100.

Wickham, Hadley. 2016. ggplot2: Elegant Graphics for Data Analysis. New York: Springer.

6

Language Documentation & Conservation Special Publication No. 24 (2021)
Phonetic fieldwork in Southern New Guinea
ed. by Kate L. Lindsey & Dineke Schokkin, pp. 108–119
http://nflrc.hawaii.edu/ldc/ http://hdl.handle.net/24996

The phonetics of Bitur

Phillip G. Rogers
University of California, Santa Barbara

Abstract

This paper offers a description of the phonetics of Bitur, a language spoken by less than a thousand people in Western Province, Papua New Guinea. With just thirteen consonants and five vowels, the phoneme inventory of Bitur is fairly typical of a Papuan language and yet relatively small in its more immediate geographic and genealogical contexts. The consonants of Bitur represent five manners of articulation and span four places of articulation. Prenasalized stops are noticeably absent, despite their prevalence in the region and among related languages. The low central vowel /a/ assimilates in height to nearby mid and high vowels, and it provides a means to distinguish high vowels from approximants. The Bitur syllable consists minimally of a vowel nucleus with simple onsets and codas allowed. Vowel length is not contrastive, but it seems to be the most salient prosodic feature of the Bitur word. As the first substantial phonetic description of a Lower Fly language—the least-known language group in Southern New Guinea—this paper represents an important contribution to our understanding of Papuan languages.

1. Introduction[1]

The Bitur [bi.tur]$_{(01)}$ language (ISO 639-3: mcc; Glottocode: bitu1242) is spoken by less than a thousand people in five villages inland of the south bank of the lower Fly River in Western Province, Papua New Guinea (see Figure 1). It is a member of the Lower Fly (also known as Tirio) group within the Anim language family (Usher & Suter 2015), and the Anim languages likely belong to the large Trans-New Guinea family.[2] Previous research on the Lower Fly languages is limited to wordlists (most recently, Jore & Alemán 2002) and a one-page typological description (Wurm 1971). For this reason, Evans and colleagues (2018: 731–732) write that the Lower Fly languages are the least-known of all Southern New Guinea groups and give highest priority to descriptive work on them.

Ethnologue classifies Bitur as "vigorous" (Eberhard et al. 2020). It is used in all domains and children learn it from an early age. English is the primary lingua franca of the region. It is taught in the local schools and used regularly to communicate with residents of surrounding villages. Tok Pisin and Hiri Motu are also used by some portions of the population, and bi- and multilingualism are common among the Bituri people.

[1] This work was generously supported by a grant from the Endangered Languages Documentation Programme (SG0446), grants from the Department of Linguistics at the University of California, Santa Barbara, and a fellowship from the Graduate Division at the University of California, Santa Barbara. I am especially grateful to the Bituri people for their invitation, generosity, support, and knowledge.

[2] Ethnologue (Eberhard et al. 2020) places the Anim languages within Trans-New Guinea, while Glottolog (Hammarström et al. 2020) does not.

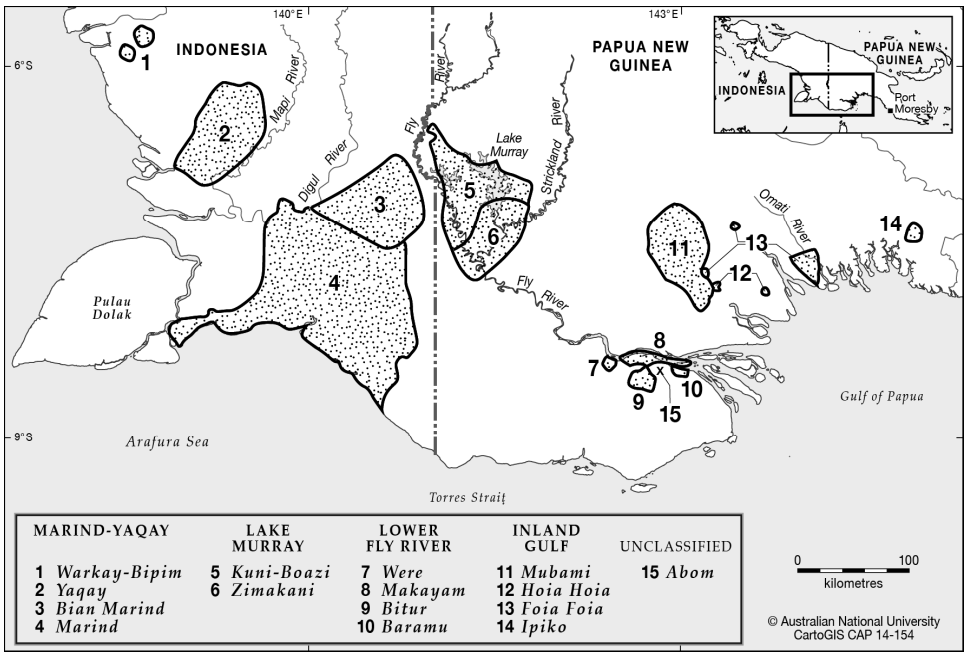


Figure 1. Map of the Anim languages.

The description presented in this paper is based on a database of around 2,000 words and morphemes, the result of eight weeks of fieldwork in the village of Upiara carried out in the summers of 2015 and 2016. The illustrative sound files are derived from wordlist and grammatical elicitation recordings of four male speakers: Darima Maiki (age ≈40), Gabriel Domaka (≈30), Timothy Numa (≈30), and Max Maresa (≈28). Some of these recordings can be found in Rogers (2018). An ideal corpus would feature more balanced gender representation as well as speakers from a wide age range, and this remains a goal for future research. However, there is no evidence to suggest that this description is not generalizable to the speech community as a whole.

2. Consonants

There are thirteen native consonant phonemes in the Bitur language, and these are illustrated in Table 1. The practical orthography differs from the International Phonetic Alphabet for only one phoneme, /j/, and this orthographic convention is indicated in angle brackets.

Table 1. The consonant phonemes of Bitur

	Bilabial	**Alveolar**	**Palatal**	**Velar**	**Labial-velar**
Plosive	p b	t d		k g	
Nasal	m	n			
Trill		r			
Fricative		s z			
Approximant			j <y>		w

The consonant inventory of Bitur is fairly typical of a Papuan language (Foley 2000), but it can be considered relatively small in more immediate genealogical and geographic contexts. There are no phonological descriptions available for Bitur's closest relatives in the Lower Fly group, but more broadly among the Anim languages Kuni Boazi has 21 consonants (Edwards-Fumey 2006), Coastal Marind has 19 (Olsson 2017), and Ipiko is

comparable to Bitur with 13 (Petterson 2007). The nearby yet unrelated Ende language has 19 consonant phonemes (Lindsey 2021).

Contrastive sets for Bitur consonant phonemes are presented in Table 2. Wherever possible, examples are given for each consonant in word-initial position before /a/, intervocalically between two /a/ vowels, and word-finally following /a/. Some consonant phonemes are infrequent or even unattested in coda positions. This is true of the approximants and several alveolar obstruents. As a result, a few cells remain empty in the table or the consonant follows a vowel other than /a/ word-finally.

Table 2. Contrastive sets for Bitur phoneme consonants[3]

		Initial	**Medial**	**Final**
Plosive	/p/	/pasip/ ‘boy’(02)	/puapa/ ‘flying fox’(03)	/tikap/ ‘heart’(04)
	/b/	/bari/ ‘eye’(05)	/agiaba/ ‘meat’(06)	/siguab/ ‘bark’(07)
	/t/	/tame/ ‘goanna’(08)	/tata/ ‘that.N1’(09)	
	/d/	/dawo/ ‘bird’(10)	/padapada/ ‘white.N1’(11)	
	/k/	/kapur/ ‘head’(12)	/amaka/ ‘bushfowl’(13)	/asak/ ‘arrow’(14)
	/g/	/gag/ ‘name’(15)	/awaga/ ‘wallaby’(16)	/orag/ ‘one.N1’(17)
Nasal	/m/	/magor/ ‘foot’(18)	/esama/ ‘bird of paradise’(19)	/abam/ ‘lower leg’(20)
	/n/	/naraka/ ‘bone’(21)	/nana/ ‘older sister’(22)	/apsin/ ‘morning’(23)
Trill	/r/	/rawarga/ ‘to stand’(24)	/mandara/ ‘shoulder’(25)	/gawar/ ‘feather’(26)
Fricative	/s/	/sapa/ ‘cockatoo’(27)	/asak/ ‘arrow’(14)	/bius/ ‘tree sp.’ (28)
	/z/	/zabeada/ ‘centipede’(29)	/zazap/ ‘big.PL’(30)	
Approximant	/j/	/jagaja/ ‘father’(31)	/pasaja/ ‘leaf’(32)	
	/w/	/wagi/ ‘neck’(33)	/tawar/ ‘mouth’(34)	

2.1 Plosives

There are six plosives in Bitur which follow from a voicing distinction at three places of articulation: bilabial, alveolar, and velar. Notably absent in the consonant inventory of Bitur are prenasalized plosives (as well as phonetic prenasalization of plosives), which are common in Papuan languages (Foley 2000: 368). Some related languages such as Marind (Olsson 2017) and Kuni Boazi (Edwards-Fumey 2006) feature a phonemic distinction between voiceless, voiced, and prenasalized plosives, making their absence in Bitur conspicuous.

Bitur voiced plosives exhibit substantial negative voice onset time, exceeding 100 milliseconds in some cases. Voiceless consonants are unaspirated to mildly aspirated, with word-initial voice onset time around 25 milliseconds. This voicing distinction is illustrated for bilabial plosives in the first pair of words in (1) and Figure 2. Both voiced and voiceless plosives can be either released or unreleased word-finally. There are word-final phonemic contrasts between voiced and voiceless plosive pairs in Bitur, but optional word-final devoicing can neutralize these contrasts. This neutralization is illustrated in the third word in (1) and Figure 2, in which the word-final /b/ is devoiced.

(1)		Phonemic	Phonetic	Gloss
	a.	/pasip/	[pasip]	‘boy’(02)
	b.	/baub/	[boub][4]	‘star’(35)

[3] CIS = cislocative; N1 = neuter 1; N2 = neuter 2; NN1 = non-neuter 1; PLUR = pluractional; PREH = prehodiernal; U = undergoer; all other abbreviations follow the Leipzig Glossing Rules (Comrie et al. 2015).

[4] The realization of /au/ as [ou] in these examples is addressed in §3.1.

c. /baub/ [bouḇ] ‘star’(36)

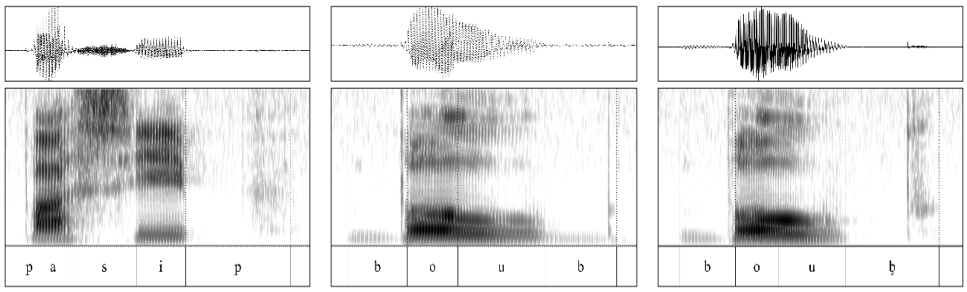


Figure 2. Voicing distinction in Bitur plosives and optional neutralization of the contrast word-finally

2.2 Nasals

There are two nasal phonemes in Bitur, /m/ and /n/. The velar nasal [ŋ] appears not to be a native Bitur phoneme. It occurs infrequently in two contexts: in words known to be borrowed, and preceding a velar consonant as in (2). I analyze the latter as alveolar nasal phonemes which have assimilated in place to the following plosive.

(2)	Phonemic	Phonetic	Gloss
	/gongor/	[goŋgor]	‘bandicoot’(37)

2.3 Trill

There is just one trill phoneme /r/ in Bitur. It can be realized phonetically as a tap, especially intervocalically. (3) gives an example of the same speaker alternating between a tap and trill pronunciation of /r/ in the same word.

(3)		Phonemic	Phonetic	Gloss
	a.	/bari/	[bɐri]	‘eye’(05)
	b.	/bari/	[bɐri]	‘eye’(38)

2.4 Fricatives

There are two fricative phonemes in Bitur, /s/ and /z/. There is considerable inter- and intra-speaker variation in the pronunciation of /z/, and this appears to be characteristic of many languages of Southern New Guinea (Kashima, this volume; Lindsey, 2021; Schokkin et al., this volume). In Bitur, this phoneme can be realized as a voiced alveolar fricative [z], voiced alveolar affricate [dz], voiced post-alveolar fricative [ʒ], or voiced post-alveolar affricate [dʒ]. Examples of this variation can be found in (4). The voiced alveolar fricative /z/ is selected to represent this phoneme because it is the most common realization and because there are some Bitur words which are almost exclusively pronounced with this variant. Whether or not there are sociolinguistic factors conditioning this variation is a question for future research.

(4)		Phonemic	Phonetic	Gloss
	a.	/zu/	[zu]	3SG.F(39)
	b.	/zu/	[dzu]	3SG.F(40)
	c.	/zu/	[dʒu]	3SG.F(41)

2.5 Approximants

There are two approximant phonemes in Bitur, /w/ and /j/, and neither is found in coda position.

3. Vowels

There are five vowel phonemes in Bitur as illustrated by Figure 3. They occupy the vowel space in a typologically familiar fashion, with two high vowels (front and back), two mid vowels (front and back), and one low central vowel. Many languages in the area have larger vowel inventories (see other articles in this issue).

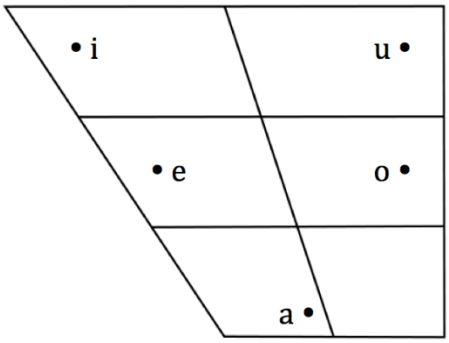


Figure 3. Diagram of Bitur vowel phonemes

Figure 4 is a plot of 1,572 vowel tokens from the four speakers introduced above. The measurements were taken from wordlist recordings of basic vocabulary. Vowels bordered on each side by a plosive, nasal, fricative, or word boundary were inspected, delineated, and annotated with textgrids in Praat (Boersma & Weenink 2021). A Praat script was used to collect formant values at the midpoint of each vowel. The data were normalized according to the Lobanov formula in NORM: Vowel Normalization Suite (Thomas & Kendall 2007) and plotted using the phonR package (McCloy 2016).

Perhaps the most interesting characteristic which can be observed in the formant plot is the extensive distribution of /a/, particularly with regard to vowel height. A considerable amount of this variation is predictable from context, although some free variation exists for speakers. The primary factor motivating the height of /a/ seems to be assimilation to nearby non-low vowels. This analysis also lends support to the decision to represent the central vowel as phonemically low despite its frequent mid and mid-low realizations. The examples in (5) illustrate the range of /a/ as it is pronounced in different contexts.

(5)		Phonemic	Phonetic	Gloss
	a.	/nana/	[nana]	‘older sister’$_{(22)}$
	b.	/wagi/	[wɐgi]	‘neck’$_{(33)}$
	c.	/sua/	[suə]	‘eye’$_{(42)}$

The assimilation of /a/ also serves to distinguish high vowels from their approximant counterparts. The first two examples in (6) show that adjacent approximants have little to no effect on the realization of /a/, while the third example illustrates the effect of both /u/ and /i/ on nearby /a/ vowels.

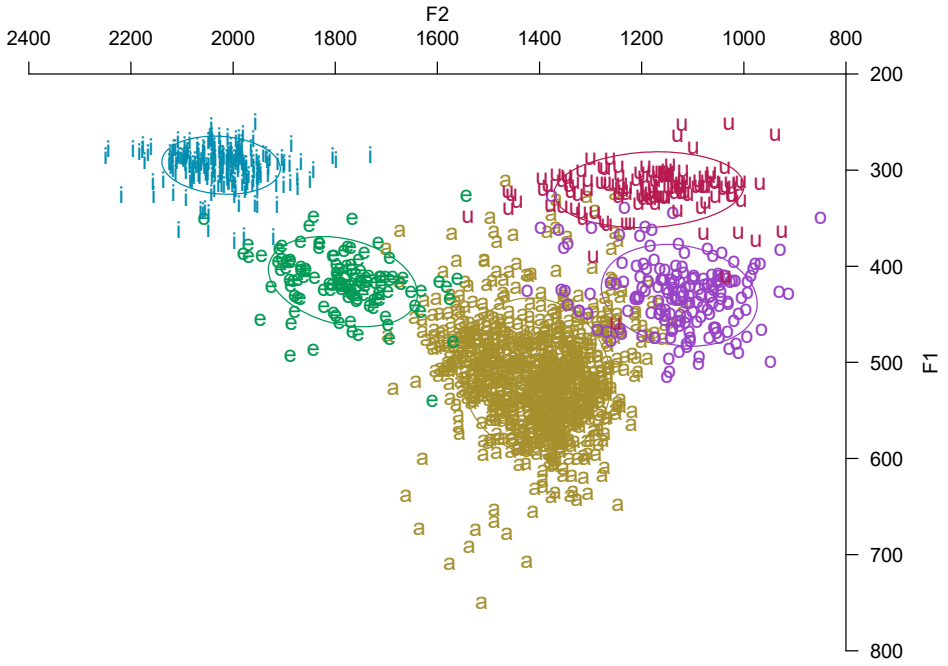


Figure 4. Formant plot of Bitur vowel phonemes

(6)		Phonemic	Phonetic	Gloss
	a.	/jagaja/	[jagaja]	'father'$_{(31)}$
	b.	/awaga/	[awaga]	'wallaby'$_{(16)}$
	c.	/auwagia/	[ɐuwɐgiɐ]	'new.N1'$_{(43)}$

Near-minimal pairs for Bitur vowel phonemes are presented in Table 3. There are four genders in Bitur whose exponence in various grammatical paradigms is characterized by vowel ablaut (Rogers, in revision). These gender paradigms offer convenient minimal and near-minimal sets for illustrating the vowels of Bitur.

Table 3. Near-minimal pairs for Bitur vowel phonemes

/i/	/titi/ 'that.N2'$_{(44)}$	/anima/ 'people'$_{(48)}$
/e/	/tete/ 'that.M'$_{(45)}$	/anema/ 'man'$_{(49)}$
/a/	/tata/ 'that.N1'$_{(09)}$	/weinam/ 'kill.3SG.ABS.PST'$_{(50)}$
/o/	/totarga/ 'hot.N1'$_{(46)}$	/manom/ 'moon'$_{(51)}$
/u/	/tutu/ 'that.F'$_{(47)}$	/anuma/ 'woman'$_{(52)}$

3.1 Vowel sequences

Vowel sequences are widespread in Bitur and their analysis presents a challenge to the linguist. The phonetic realization of vowel sequences varies across speakers and speech contexts, and speakers do not have consistent intuitions as to the number of syllables in many words. I have not found convincing evidence that certain vowel sequences should be analyzed as diphthongs. Rather, I analyze all vowels in sequences as independent vowel nuclei which can undergo optional phonetic diphthongization. Many of the theoretically possible sequences of two vowels are attested, and they are exemplified in (7). Each of the seven unattested vowel sequences involves a mid vowel; these include any combination of /u/ and a mid vowel (/ou/, /uo/, /eu/, /ue/), the two mid vowels in either order (/oe/, /eo/), and /io/.

(7)		Phonemic	Gloss
	a.	/puapa/	‘flying fox’(03)
	b.	/gaopa/	‘buttocks’(53)
	c.	/nauka/	‘tree’(54)
	d.	/maika/	‘fighter’(55)
	e.	/seima/	‘banana’(56)
	f.	/mameata/	‘papaya’(57)
	g.	/agiaba/	‘meat’(58)
	h.	/noana/	‘steal’(59)
	i.	/oboin/	‘secret’(60)
	j.	/mui/	‘ant sp.’ (61)
	k.	/bius/	‘tree sp.’ (28)
	l.	/titierta/	‘run’(62)

Variation in the pronunciation of the sequence /au/ is noteworthy. For some speakers and speech contexts, the /a/ is raised, backed, and even rounded in assimilation to the /u/ to the extent that it approximates the mid back vowel /o/. This is the case for the first example in (8), while the second example illustrates a more careful pronunciation of the same word by a different speaker.

(8)		Phonemic	Phonetic	Gloss
	a.	/nauka/	[nouka]	‘tree’(54)
	b.	/nauka/	[nɐuka]	‘tree’(63)

3.2 Phonotactics

The nucleus is the only obligatory component in the Bitur syllable. Simple onsets and codas are allowed, with few restrictions on the consonants which can fill these roles. All consonant phonemes can be found in onsets, and as discussed above, only approximants are disallowed in the coda. It follows from these generalizations that coda-onset consonant clusters are allowed word-medially. Although not every possible consonant cluster is attested, there seem to be few restrictions on which combinations are allowed. Several syllable types and coda-onset clusters are illustrated in (9).

(9)		Phonemic	Gloss
	a.	/o/	2SG(64)
	b.	/zo/	2PL(65)
	c.	/mip/	‘nose’(66)
	d.	/a.pa/	‘yesterday’(67)
	e.	/ap.sin/	‘morning’(23)
	f.	/bo.ar.ta/	‘ash’(68)
	g.	/pas.ni.wa/	‘boys’(69)
	h.	/ma.sim.sir/	‘good.PL’(70)
	i.	/bu.dub.dur/	‘thumb’(71)

4. Prosody

There is no lexical tone or contrastive stress in Bitur. Vowel length is not contrastive, but it seems to be the most salient prosodic feature of the Bitur word. Not all words have a long vowel, and generally words do not have more than one long vowel, the exception being cases of reduplication. The long vowels of some words are pronounced more consistently, while for others it is difficult to determine whether or not a particular vowel

is long. As such, it is not surprising that vowel length is represented inconsistently in the orthography developed by the community.

Monosyllabic words are often (but not always) pronounced with a long vowel, and this may be related to a constraint on the minimal word in Bitur. Long vowels are found in both syllables of disyllabic words, but more often in the first syllable. Examples of vowel length in disyllabic words can be found in (10) and Figure 5. For longer words, long vowels are found among interior syllables—that is, they are not found in initial or final syllables. All this considered, it is possible to analyze Bitur as having lexical (non-contrastive) stress of which the primary acoustic correlate is length.

(10)		Phonemic	Phonetic	Gloss
	a.	/dina/	[diːna]	‘back’(72)
	b.	/asak/	[asaːk]	‘arrow’(14)
	c.	/wagi/	[wɐgi]	‘neck’(33)

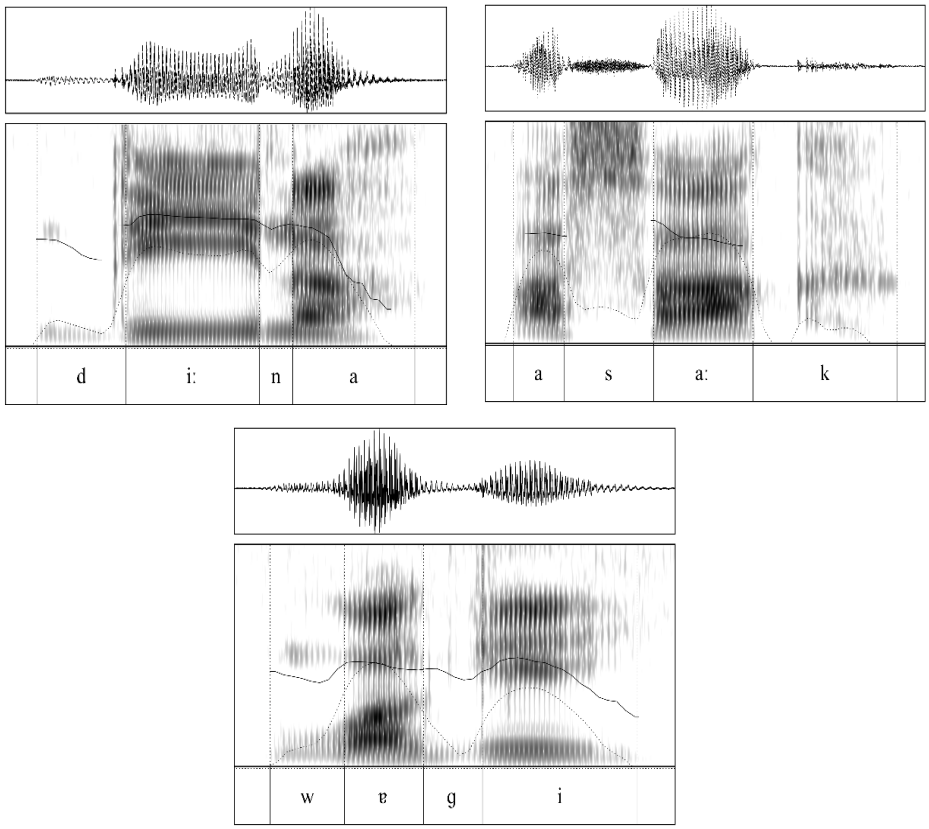


Figure 5. Disyllabic Bitur words exemplifying initial vowel length, final vowel length, and no vowel length

Acoustic analysis of pitch and intensity reveals that they often do not correlate with length. In general, both pitch and intensity tend to remain fairly level or decline gradually throughout Bitur words, the latter giving an impression of initial stress to English ears. There are plenty of exceptions, but they are not consistent enough to suggest a pitch- or intensity-based stress feature which operates independently of vowel length.

It is interesting to note the diversity of prosodic features that have been described for other Anim languages. Coastal Marind exhibits a system of non-contrastive lexical stress realized primarily as a higher pitch (Olsson 2017: 60). Meanwhile, Petterson (2007: 4) describes the “tones” of Ipiko words and offers a contrasting minimal pair. Differently

still, Edwards-Fumey (2006) describes several complex patterns of pitch realization in Kuni verbs. While these languages are only distantly related to Bitur, this diversity suggests a complex evolution of prosodic systems within the Anim group and invites a more in-depth investigation when descriptions are made available for more members of the family.

5. Illustrative transcription

A narrative passage is provided here to illustrate the sounds of Bitur. It is an excerpt from a personal story told by Darima Maiki about his young son, Nomen (Rogers 2018). In the full story, Nomen runs away from home in fear of punishment for his actions. When his parents realize that he is missing, they recruit the help of many village residents and they search for him all night. In the morning, they find him sleeping comfortably under a mosquito net in a neighbor's house. A phonetic transcription, orthographic representation (which equates to a phonemic transcription), morpheme gloss, and free translation are provided. (The glosses are somewhat simplified, particularly for the person-marking auxiliaries which precede verbs.) All 13 consonant phonemes and five vowel phonemes of Bitur are found in the narrative.

(1) [jawa nɔ̀ɪ̀n taːmi za natiɛ̀ɪ̀gim]
yawa *noin* *tami* *za* *n-atieigi-m*
so 1PL evening 1PL.SBJ 1.U-arrive-PREH
'When we arrived (home) in the evening,'

(2) [igiə tata ero wa͡in suːgɐ tiɐr wenaːmem]
igia *tata* *ero* *wain* *suga* *ti-a-r*
3SG.M that.N1 day already bad 3SG.SBJ-3SG.OBJ-PURP
w-ena-mem
3SG.U-do-PLUR.PREH
'he (Nomen) had been misbehaving during the day.'

(3) [tata rojaroja tiɐr wenaːmem]
tata *royaroya* *ti-a-r* *w-ena-mem*
that.N1 scared 3SG.SBJ-3SG.OBJ-PURP 3SG.U-do-PLUR.PREH
'He was afraid of what he had done,'

(4) [jawa nɔ̀ɪ̀n kusin epapa agaɾtam taːmi]
yawa *noin* *kusuin* *epapa* *agarta-m* *tami*
so 1PL with 3.SBJ.NEG sit-PREH evening
'so he did not sit with us all evening.'

(5) [te egiɐbanam ne͡in teɾaːnam]
te *egiaba-nam* *nein* *tera-nam*
3SG.M go.inside-PREH 3SG.while sleep-PREH
'He went inside and was sleeping,'

(6) [no bom aɾe epotab egiɐbanam winiəmɐba]
no *bom* *are* *epotab* *egiaba-nam* *winiama-ba*
1SG but quick 1SG.SBJ.NEG go.inside-PREH sleep-to
'but I did not go inside right away to sleep.'

(7) [wuːmɐb tap agaɾtam]
wuma-b *ta-p* *agarta-m*
door-at 1SG.SBJ-at sit-PREH
'I sat at the door.'

(8) [tata tɐi̯b noːmen d͡zʊ̯in winiəmɐbɐwi]
tata *taib* *nomen* *zoin* *winiama-bawi*
that.N1 there Nomen sleep sleep-NN1.POSS
'In Nomen's sleep there,'

(9) [zei̯ tea wenam]
zei *te-a* *w-ena-m*
urination 3SG.SBJ.3SG.OBJ 3SG.U-do-PREH
'he needed to urinate.'

(10) [ta toneg tunum watie͡igim]
ta *toneg–* *tu-num* *w-atieigi-m*
1SG [unknown] 3SG.SBJ-out 3SG.U-arrive-PREH
'So he came out.'

(11) [ɐi̯b zei̯ tiɐr ejatam sikiɾibɐ]
aib *zei* *ti-a-r* *eyata-m*
here urination 3SG.SBJ-3SG.OBJ-PURP go-PREH
sikiri-ba
outside-to
'He went outside to urinate.'

(12) [ta tɐi̯ zei̯ pudieɾtɐb nenen awoɾmem]
tata *taib* *zei* *pudierta-b* *neinein*
that.N1 there urination look.for-at 3SG.while
awor-mem
walk-PLUR.PREH
'He was looking for a place to urinate,'

(13) [tata noː wom wuːmɐb wei̯n tap agaɾtam]
tata *no* *bom* *wuma-b* *wain* *ta-p*
that.N1 1SG but door-at already 1SG.SBJ-at
agarta-m
sit-PREH
'but I was sitting at the door,'

(14) [siɐː zɐweɐgɐ tunum pɐtiɐi̯rim]
siaya *zaweaga* *tu-num* *patiari-m*
dog big.M 3SG.SBJ-out climb-PREH
'(and) a big dog climbed out (of the shadows).'

(15) [tete siɐjɐ bububɐ taɾwap nenam]
tete *siaya* *bububa* *ta-r-wa-p* *n-ena-m*
that.M dog stomp 1SG.SBJ-PURP-3SG.OBJ-at 1.U-do-PREH
'I rushed at that dog.'

(16) [siɐjɐ tiɐw oɾiɐɾem]
siaya *te-a-wu* *oriare-m*
dog 3SG.SBJ-3SG.OBJ-down jump-PREH
'The dog jumped down (the ladder).'

(17) [noːmen igiɐ teɐ egieɾmam]
nomen *igia* *te-a* *egierma-m*
Nomen 3SG.M 3SG.SBJ-3SG.OBJ think-PREH
'Nomen thought,'

(18) [noː aba enanab pabuji]
no *aba* *te-nar-na-b* *pabuyin*
1SG maybe 3SG.SBJ-PURP-1SG.OBJ-behind threaten
'maybe he's coming after me.'

(19) [tata roja iwisɐ roja to͡in meneatam,
tata *roya* *iwisa* *roya* *t-oin* *meneatam*
that.N1 fright 2/3SG.REFL fright 3SG.SBJ-CIS come.PREH
'In his fright he came,'

(20) [tiset nə͡ukɐb te we͡ibum]
tiset *nauka-b* *te* *weibu-m*
shirt tree-at 3SG.SBJ hang-PREH
'hung his shirt on the tree,'

(21) [kəs te eɾeɾmem]
kasin *te* *erer-mem*
then 3SG.SBJ go-PLUR.PREH
'then went away,'

(22) [gu͡ijep eweana]
guiyep *eweana*
point place
'to the point,'

(23) [tɐ͡ib kəsin mitiɾi siə ɐ͡iwɐbɐ]
taib *kasin* *mitiri* *sia* *aiwa-ba*
there then Mitiri GEN house-to
'and then to Mitiri's house.'

(24) [nʊ͡oin imi tɐ͡ipɐ netiɐɾɐɾem ɐ͡iwɐb]
noin *imi* *tai-pa* *n-etiara-rea-m* *aiwa-b*
1PL NEG 1PL.SBJ-at 1.U-wait-3SG.OBJ-PREH house-at
'We didn't wait long for him at the house,'

(25) [kəsi wuːjɐm tiɾwɐ kudiːnam]
kasin *wuyam* *ti-r-wa* *kudina-m*
then call 1PL.SBJ-PURP-3SG.OBJ begin-PREH
'then we began calling for him.'

References

Boersma, Paul & Weenink, David. 2021. Praat: doing phonetics by computer [Computer program]. Version 6.1.41, retrieved 25 March 2021 from http://www.praat.org/.

Comrie, Bernard, & Haspelmath, Martin & Bickel, Balthasar. 2015. Leipzig Glossing Rules: Conventions for interlinear morpheme-by-morpheme glosses. https://www.eva.mpg.de/lingua/resources/glossing-rules.php.

Edwards-Fumey, Deborah. 2006. *The verb subject prefix in Kuni*. Bern: Universität Bern. (MA Thesis.)

Eberhard, David M. & Simons, Gary F. & Fennig, Charles D. (eds.). 2020. *Ethnologue: Languages of the world*. (Twenty-third edition.) Dallas, TX: SIL International. (http://www.ethnologue.com)

Evans, Nicholas & Arka, Wayan & Carroll, Matthew J. & Choi, Yun Jung & Döhler, Christian & Gast, Volker & Kashima, Eri & Mittag, Emil & Olsson, Bruno & Quinn, Kyla & Schokkin, Dineke & Tama, Philip & Van Tongeren, Charlotte & Siegel, Jeff. 2018. The languages of Southern New Guinea. In Palmer, Bill (ed.), *The languages and linguistics of New Guinea: A comprehensive guide*, 641–774. Berlin: Walter de Gruyter.

Foley, William A. 2000. The languages of New Guinea. *Annual Review of Anthropology* 29(1): 357–404.

Hammarström, Harald & Forkel, Robert & Haspelmath, Martin & Bank, Sebastian. 2020. Glottolog 4.2.1. Jena: Max Planck Institute for the Science of Human History. (http://glottolog.org)

Jore, Tim & Alemán, Laura. 2002. Sociolinguistic survey of the Tirio language family. Ukarumpa: SIL PNG.

Kashima, Eri. The phonetics of Nmbo (Nɐmbo) with some comments on its phonology (Yam family; Morehead district). This volume.

Lindsey, Kate L. 2021. Ende. *Journal of the International Phonetic Association*, 1-21. doi: 10.1017/S0025100320000389.

McCloy, Daniel R. 2016. phonR: Tools for phoneticians and phonologists. R package version 1.0-7.

Olsson, Bruno. 2017. *The Coastal Marind language*. Singapore: Nanyang Technological University. (Doctoral dissertation.)

Petterson, R. G. 2007. Eva Tavo Buka: A picture dictionary in the Ipiko language. Papua New Guinea: Gulf Christian Services.

Rogers, Phillip G. 2018. Documentation and description of Bitur, a Lower Fly language of Papua New Guinea, and preliminary investigation of the moribund Abom language. London: SOAS, Endangered Languages Archive.

Rogers, Phillip G. Under revision. Gender actualization in Bitur, a language of Southern New Guinea.

Schokkin, Dineke & Gast, Volker & Evans, Nicholas & Döhler, Christian. Phonetics and phonology of Idi. This volume.

Thomas, Erik R. & Kendall, Tyler. 2007. NORM: The vowel normalization and plotting suite.

Usher, Timothy & Suter, Edgar. 2015. The Anim languages of Southern New Guinea. *Oceanic Linguistics* 54(1): 110–142.

Wurm, Stephen A. 1971. Notes on the linguistic situation in the Trans-Fly area. *Papers in New Guinea linguistics,* No. 4, 115–172. (Pacific Linguistics A-28.) Canberra: Pacific Linguistics.

7

Language Documentation & Conservation Special Publication No. 24 (2021)
Phonetic fieldwork in Southern New Guinea
ed. by Kate L. Lindsey & Dineke Schokkin, pp. 120–129
http://nflrc.hawaii.edu/ldc/ http://hdl.handle.net/24997

A phonetic sketch of Urama

Jason Brown
University of Auckland

Alex Muir
University of Auckland

Robbie Petterson
SIL

Urama (Glottocode: uram1241) is one of the varieties of the Northeast Kiwai group (iso code: kiw).[1] It is spoken in the middle of the delta area of the Gulf Province of Papua New Guinea, in the following villages on Urama Island on the coastal edge of the delta: Kivaumai, Larimia, Aibigahe, Kinomere, and Mirimailau; it is also spoken in Morovamu and Mairivepea on the island immediately to the east, in Gauri, Tovei and Omaumere further inland to the northwest, and Era Goiravi and Naharo further inland to the northeast. Urama Island is indicated by the triangle marker on the inset map of the Gulf of Papua in Figure 1 (map created using the free and open source application QGIS).

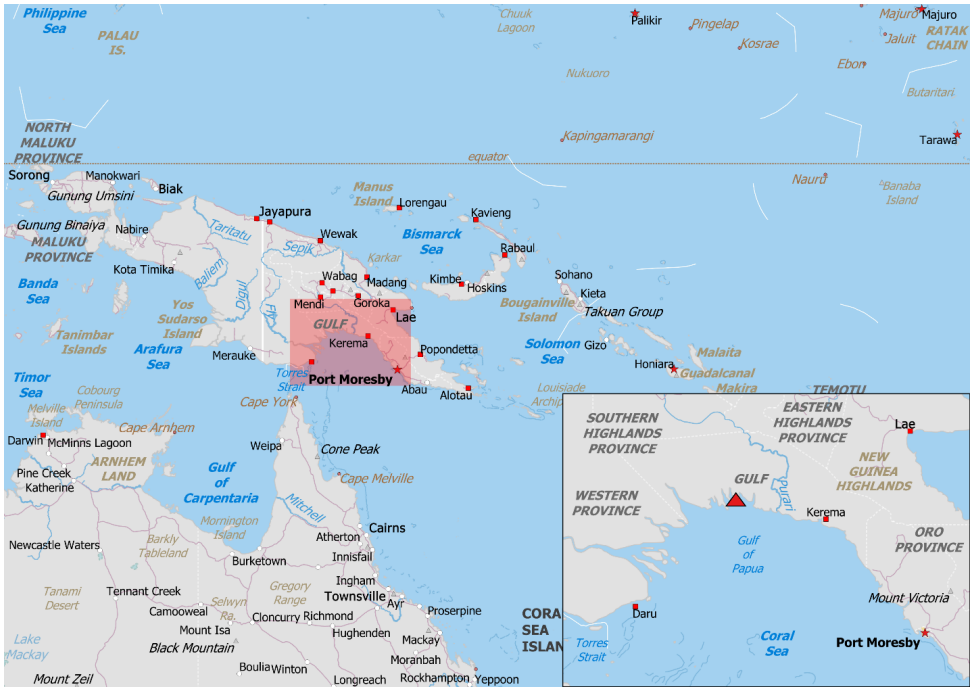


Figure 1. Map of the Gulf of Papua region, southern Papua New Guinea

There are roughly 6,000 speakers of Northeast Kiwai (Simons & Fennig 2017, based on W. Foley's 2011 estimates); the population of Urama Island is much more difficult to

[1] We wish to thank and acknowledge the Urama community. Author names appear in alphabetical order. All errors remain with the authors.

estimate (see Brown et al. 2016: 1). Other dialects in the Northeast Kiwai group include Kope, Gibaio, Anigibi, and Fomomoto. The people living to the west of the Urama speak another Kiwaian language, Kerewo, but the people to the east speak an unrelated language, Purari. The Kiwaian family includes: Bamu, Northeast Kiwai, Southern Kiwai, Kerewo, Wabuda, and Morigi.

As the region constitutes a historical trade route, there has existed opportunity for language contact, most notably reflected in the lexicon. According to Wurm (1951), words in the various languages of the family have been diffused across different lexical strata, which reflect different historical periods. On this view, different strata are found in different languages, including non-Kiwaian languages located upriver.

A previous description of the phonetics and phonology of Urama is provided by Brown and colleagues (2016). This work aims to expand on those observations, including more complete generalisations regarding consonantal distributions, vowel qualities, vowel length, and tone.

Data presented in this paper were collected between 2014 and 2017. Locations for data collection by the third author include Kivaumai and Kapuna Hospital, and the first and second authors collected data in Auckland, New Zealand. Urama speakers who were consulted include: Roy Harai and his mother Gai'a of Kivaumai; Torogo Hinimo of Mirimailau; Nick of Kinomere; Nou of Kivaumai, and Karika Anea of Kivaumai. Data was collected by targeted elicitation of words, phrases, and sentences, and also through the collection of unscripted narratives. Elicitation during some sessions was largely exploratory, or dedicated to the compilation of a lexical/syntactic database, so the corpus of recordings available is not systematically organized for phonetic analysis, but instead stands as a sampling from which to draw preliminary generalisations.

Consonants

Urama has a consonant inventory that is characteristic of other Papuan languages of the region (Foley 1986: 55). The consonant phones are presented below, with marginal phones indicated in parentheses:

Table 1. Urama Consonants

	Bilabial	**Labiodental**	**Alveolar**	**Velar**	**Glottal**
Plosive	p b		t d	k g	ʔ
Nasal	m		n		
Fricative	β		(s)		h
Flap			ɾ		

There are relatively few consonant phonemes in the inventory, including a series of voiceless and voiced stops, a set of nasals, the fricatives /β/ and /h/, and the flap /ɾ/, the latter of which occurs in word-initial position in a few pronouns, clitics, and particles, and in words borrowed from Motu and English. Examples of native lexical words (or at least lexical words with an uncertain source) with an initial flap include /ɾàβàràβá/~/ɾàβùràβú/ 'gills'$_{(01)}$ and /ɾúbíɾúbí/ 'noise'$_{(02)}$. In initial position in some word-forms, the flap is often produced as an alveolar lateral [l]. The status of /s/ is marginal, occurring largely in loans, though there are a few native words that begin with /s/. Some speakers produce /β/ as a labiodental fricative [v]; before low and rounded vowels the frication lessens and a rounded approximant [w] can be heard instead.[2] Thus, [v] and [w]

[2] While the underlying status of [w] is unclear, for some speakers, it appears to be in free variation with [β] and [v] in word-initial position. The wordlist by Brown and colleagues (2016) lists only 15 words beginning with <w>, and some of these have variants with [v]: *wadu~vadu* 'bamboo';

are surface variants of /β/. The syllable /βu/ seems to be quite rare; the only examples involve the prefix /oβ/ + a verb root beginning with /u/. The glottal stop /ʔ/, while occurring frequently in words, exhibits the highest frequency between identical vowels (e.g., /útáʔà/ 'to sleep'$_{(03)}$). It occurs word-internally, though if it is also assumed to occur word-initially in otherwise vowel-initial words, then this would make the distribution of this sound comparable to all other consonants (and would force all words to have onsets).

In addition, there is a surface glide [j], although this is not an underlying phoneme, and is the product of transitioning between vowels (as is [w] in some cases). These transitional glides will be discussed below in the section on vowels.

The voiceless stops are characterized by a small positive (i.e. short lag) voice onset time. This is illustrated in Figure 2, where it can be observed that there is a release burst, particularly in word-medial position. In slower speech, the voiceless stops can be produced with a larger positive (i.e. long lag) voice onset time.

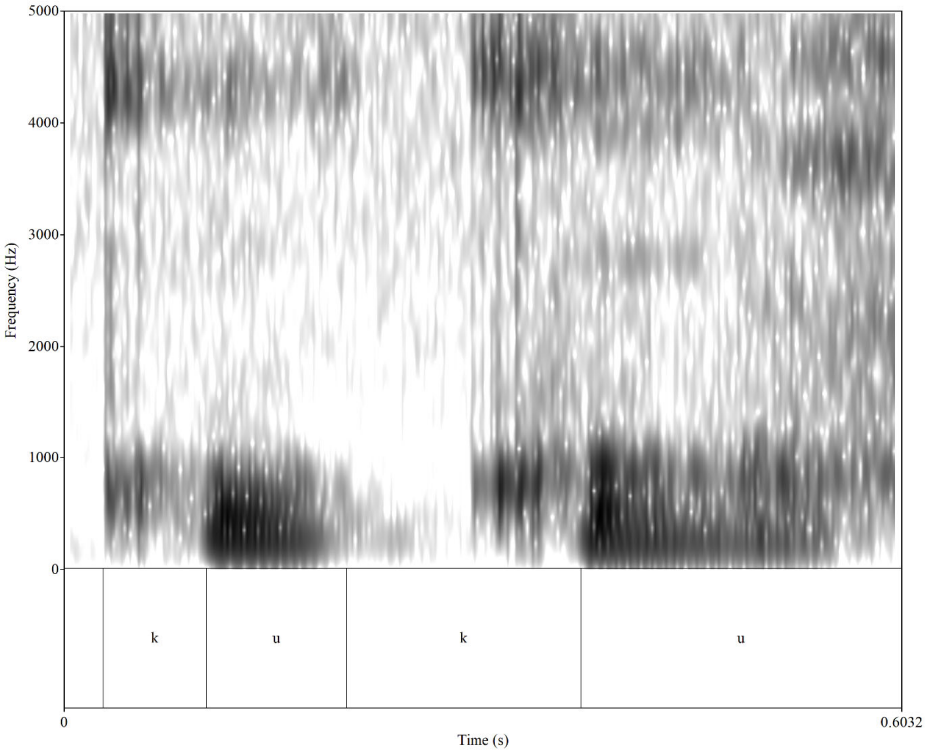


Figure 2. Spectrogram of /kúkù/ 'stick'$_{(04)}$

wapai~vapai 'bridge'; *wapea~vapea* 'ship'; *wotu~votu* 'who'. Some pairs are listed under entries for <v>: *vade~wade* 'word'; *vato~wato* 'dry, etc. These were tested for free variation, and in some instances the language consultant found only one variant of word initial [v] or [w] acceptable, indicating that this may be an emerging contrast.

The voiced stops exhibit a negative voice onset time, and are voiced through the duration of oral closure, as indicated by the word-initial and word-medial stops in Figure 3.

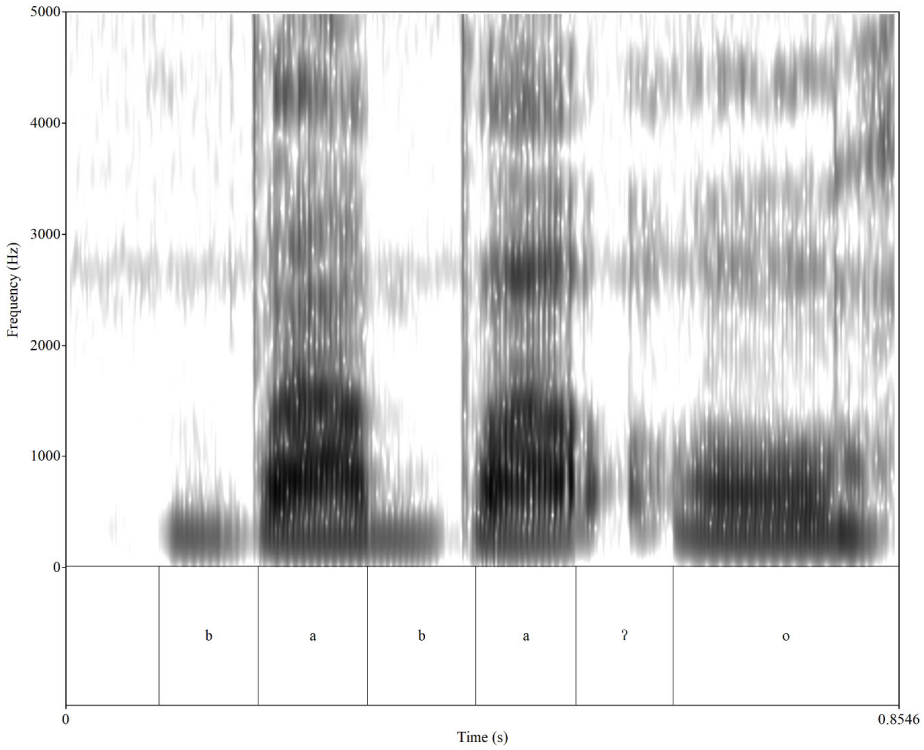


Figure 3. Spectrogram of /bàbàʔó/ 'tree fungus'(05)

There is no indication of frication (in terms of high energy noise), indicating there is no lenition of the stops in intervocalic position.

The following forms illustrate these consonantal contrasts in word-initial and word-medial positions:

(1)	Word-initial			Word-medial	
	[b]	/bátá/	'scale (n.)'(06)	/bàbàʔó/	'tree fungus'(07)
	[d]	/dádò/	'jellyfish'(08)	/édéʔà/	'put down, place'(09)
	[g]	/gàbó/	'path, road'(10)	/gágì/	'fat (N)' (11)
	[h]	/hátò/	'only'(12)	/áháʔò/	'come out'(13)
	[k]	/kákáá/	'bailer'(14)	/hákà/	NEG(15)
	[m]	/mábó/	'armband'(16)	/èmé/	'skirt'(17)
	[n]	/nátò/	'footprint, trace, track'(18)	/bánà/	'mangrove'(19)
	[p]	/pátà/	'swamp'(20)	/dápé/	'adze'(21)
	[ɾ]	/ɾáútù/	'with'(22)	/bárà/	'riverbank, side'(23)
	[s]	/sákù/	'bald'(24)	/résà/	'razor'(25)
	[t]	/tótó/	'platform'(26)	/bátá/	'scale (n.)'(27)
	[β]	/βàtíí/	'place'(28)	/tàβá/	'mudskipper'(29)

Vowels

Also characteristic of the Papuan languages generally (see Foley 2000: 367) is Urama's vowel inventory, which includes five vowels, as indicated in Table 2.

Table 2. Urama vowels

	Unrounded		**Rounded**
	Front	Central	Back
High	i		u
Mid	e		o
Low		a	

A plot of the means of F1 and F2 for each of the vowels from a small corpus of words (74 vowel tokens from a list of disyllabic and trisyllabic words uttered by a single speaker, Roy Harai) is presented in Figure 4.[3]

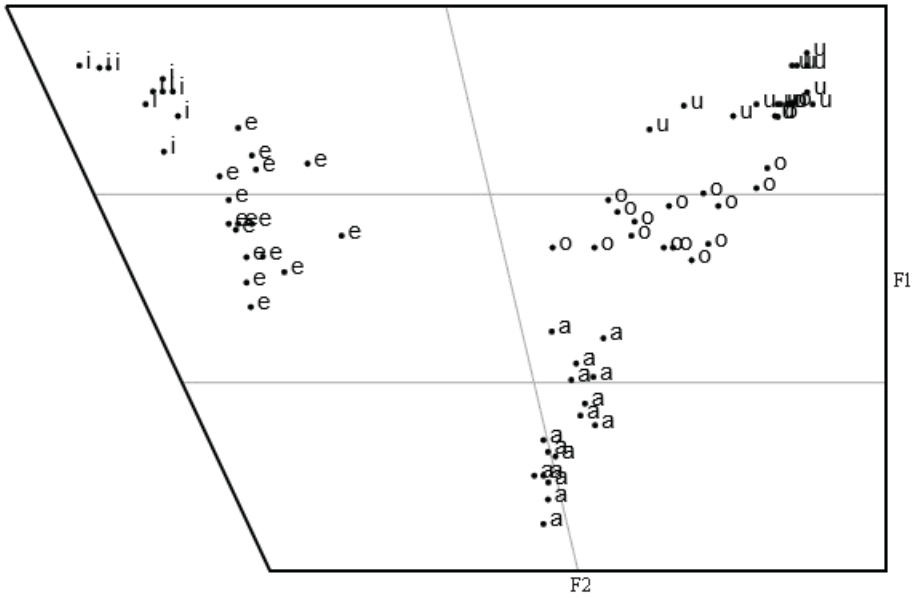


Figure 4. Vowel formant plot

The mid front vowel exhibits a broader range in height, and the mid back vowel tends to exhibit a broader range in backness, which derives a slight asymmetry in the inventory of mid vowels. In fast speech, there is a tendency (illustrated in the narrative) for /a/ in sequences of vowels to raise to [e], particularly when between high front vowels: [káβáíèì]~[káβáíàì] 'the wind'.

These vowels are illustrated in the following forms:

(2) /ímóʔà/ 'spit (v.)'(30)
/émò/ 'calf (of leg)'(31)
/ámò/ 'breast'(32)
/òmò/ 'river'(33)
/ùmú/ 'dog'(34)

As mentioned above, there appear to be no underlying consonantal glides in the language, though glides are sometimes derived from underlying vowels in some sequences. In these

[3] Generated using Formant Plot online: https://www.adambaker.org/formant-chart/formant-chart.html

contexts, glides and vowels are in free variation. For instance, it is not uncommon for /…oa…/ and /…ua…/ sequences to surface as […owa…] and […uwa…], respectively. As an example, the form /táúò/ 'old'(35) can surface as [táú.wò] or [táú.ò]. By extension, there do not seem to be contrasts between forms like [wárá] and [úárá] 'fence'(36), which would be expected if the glides were underlying in the language.[4]

Vowel length appears to be contrastive, evidenced by the following words: [ó:bó] 'woman'(37) and [óbó] 'water'(38). There are only a handful of forms which exhibit such contrasts. One possible source of this vowel length contrast is accidental, whereby two identical and adjacent underlying vowels surface as a single long vowel. A likely contributing factor is the historical loss of some intervocalic consonants, resulting in vowel clusters, including clusters of identical vowels (Wurm 1973). This is Martin's (2016) analysis of Kope, and thus it is extendable to Urama. Some Urama speakers have neutralized the vowel length difference in, for example, /ná:mú/ 'older brother'(39) as [námú] and /má:mú/ 'mother'(40) as [mámú]. This suggests that the vowel length contrast, important in other NE Kiwai dialects, may be being lost in Urama.

Syllable structure

Syllables in Urama are simple: (C)V. This means there is no consonant clustering, but strings of adjacent vowels are common. The following forms illustrate the range of possible syllables (with the proviso that V-initial words may be preceded by a glottal stop):

(3) Canonical syllables

V:	/ábèà/ 'father'(41)	/dóhòìi/	'afternoon, evening'(42)	/káβáíà/	'wind'(43)
CV:	/hóhò/ 'face'(44)	/híbà/	'crocodile'(45)	/bòmó/	'pig'(46)

Forms such as those below illustrate that sequences of vowels are common: /túíáí/ 'the middle'(47), /híβíòííòròì/ 'sunrise'(48), /húhúíá/ 'rainbow'(49), /áíáú/ 'cockatoo'(50).

What appear to be diphthongs in fast speech are syllabified as separate syllables in careful speech: what would be syllabified as [ó.dàù] 'go'(51), with a diphthong in fast speech, is syllabified as [ó.dà.ù], with the vowels in separate syllables, in careful speech. That is, a V_1V_2 diphthong in fast speech can be syllabified as $V_1.V_2$ in careful speech. Another syllable type occasionally seen in contracted words is CVn, e.g., in [hin.ta.bo] ~ [hi.ni.ta.bo] 'then' [no recording; tone unknown]; it is also sometimes seen in words borrowed from English, for example, /ei.den.ti/ 'agent' [no recording].

Tone

Urama exhibits a pitch accent system, but only a few words can be found where tone alone distinguishes their meanings:

(4) Minimal tone pairs

/nímò/	'louse'(52)	/nìmò/	'us'(53)
/múbà/	'sharp point'	/múbá/	'bend of a river'
/éʔà/	'see'	/èʔá/	'knife'(54)

[4] There are, however, some cases of the appearance (or absence) of glides in intervocalic position: maua *[mawa] 'older cross-sibling' vs [awaßo] *[auaßo] 'stupid'. These cases warrant further investigation.

It has been claimed for the nearby related language of Anigibi that the default tonal melody for words is a low (L) tone, but any syllable in a word may have a high (H) tone (see Donohue 1997). It seems clear, though, that in Urama words may consist of only L tones; cf. [òmò] 'river'(55). Careful analysis of the tone system has yet to be undertaken, so the tone data given here is tentative.[5] Some tonal melodies for words are given below, with H tones as a point of reference:

(5) First syllable H (HL, HLL)
/túà/ 'lizard'(56)
/térè/ 'floor'(57)
/ímè/ 'crab'(58)

(6) First 2 syllables H (HH, HHL)
/tóé/ 'fear'(59)
/gáhó/ 'fish trap'(60)
/éhúmè/ 'vein'(61)
/ímítò/ 'breadfruit'(62)

(7) First 3 syllables H (HHH):
/úɾíó/ 'picture'(63)
/húhíá/ 'rainbow'(64)
/dóútú/ 'tomorrow'(65)
/dúɾúpú/ 'owl'(66)
/épéné/ 'black ant'(67)
/hépátó/ 'ear'(68)

(8) Second syllable H (LH, LHL):
/dùú/ 'sago'(69)
/àbó/ 'post'(70)
/èʔá/ 'knife'(71)
/mùkó/ 'fire'(72)

(9) Second and third syllable H (LHH):
/βàtíí/ 'place'(73)

(10) Third syllable H (LLHL):
/gùàgúà/ 'frog'(74)

Martin (2016) provides an analysis of tone in Kope, where it is claimed that tone and vowel length interact. This is an area that remains to be explored in Urama. It is also unclear whether tone is implemented consistently with any dynamic F0 trajectories (i.e. rises or falls), or whether there is a 'neutral' or mid tone; this is an area for future research.

[5] There appears to be a great deal of variation in the realization of tone in the language. While many of the forms here are consistently produced with a particular melody by one speaker, slightly different melodies are found in the community Urama dictionary that is in preparation. What is noteworthy is that where there are disagreements, it is usually in the interpretation of an initial H (followed somewhere in the word by a L), where the dictionary entries have instead a L tone. Further research will hopefully shed light on the nature of this variation.

Transcription

The following is a broad transcription of a sample of a narrative performed by a female speaker, Karika Anea from Urama Island, Papua New Guinea. As intonation and its effect on word-tone is not at present properly understood, tonal representations have been omitted from the broad transcription.

Broad phonemic transcription

potoi kaβaia ɾa hiβio ɾai ɾo aipeɾemahibaido hotu ɾo

pupuohiai ita meɾei ata mamui oɾoβiei tapo ohuʔo

niti ɾo βade bida buaido ita paoido hotu ɾo oβaida meɾei

mamui aʔo eidai ɾi nu pupuohia pupuo meɾei ka

potoi kaβaia ɾo pupuhia ha pohududio, inai nu pupuhia

imuhu dudi ta meɾei nu mamui pupuo, pupuo ha pohidio

pupuohia apohidio ita potoi kaβaiei ɾo haʔimai ɾo ohiai

ka ita nu, nu ɾi emaʔai emehai ka

ita hiβioi ohui ka pupuohia ha pamai, ita meɾe

tutuhia tatoi meɾei mamui aʔoi itai ka

ita potoi kaβaiei ɾo aʔoi ka hiβioi nu pupuo ka

Orthographic Transcription and Morpheme Glosses[6]

Potoi	*kavaia*	*ra*	*hivio*	*ra-i*	*ro*	*ai-p-eremahibai=do*
inland	wind	and	sun	and=DET	AG	ASRT-REM-dispute=DU

hotu	*ro*	*pupuo-hia=i*	*ita*	*mere=i*	*ata*
who	AG	strong-really=DET	then	person=DET	some

mamui	*orovie=i*	*ta*	*p-ohu'o.*
cloak	wear=NMLZ	in	REM-come.out

'The North Wind and the Sun were disputing which was the stronger, when a traveller came along wrapped in a warm cloak.'

Niti	*ro*	*vade*	*p-idabuai=do*	*ita*	*p-ao=ido*	*hotu*	*ro*
3DU	AG	word	PST-combine=DU	then	REM-say=DU	who	AG

[6] Morpheme glosses not found in the Leipzig Glossing Rules (Comrie et al. 2015) are as follows: DPST, distant past. Orthographic conventions are largely phonetic, though with <v> representing [β], <'> representing [ʔ], and <r> representing [ɾ].

ovai-da	*mere=i*	*mamui*	*a'o*	*eidai*	*ri*	*nu*	*pupuo-hia*
force-by	person=DET	cloak	remove	get	for	3SG	strong-really

pupuo	*mere=i*	*ka.*
strong	person=DET	DECL

'They agreed that the one who first succeeded in making the traveller take his cloak off should be considered stronger than the other.'

Potoi	*kavaia*	*ro*	*pupuo-hia*	*ha*	*p-ohududio,*	*inai*	*nu*
north	wind	AG	strong-really	really	REM-blow	but	3SG

pupuo-hia	*i-muhuduti*	*ta*	*mere=i*	*nu*	*mamui*	*pupuo,*
strong-really	PL-blow	with	person=DET	3SG	cloak	strong

pupuo	*ha*	*p-ohidio*	*pupuo-hia*	*ap-ohidio*	*ita*	*potoi*
strong	really	REM-hold	strong-really	MOD-hold	then	north

kavaiai	*ro*	*ha'ima-i*	*ro*	*ohiai*	*ka*	*ita*	*nu,*
wind	AG	tired-DET	AG	catch	DECL	then	3SG

nuri	*ema'ai*	*emehai*	*ka.*
therefore	give	leave	DECL

'Then the North Wind blew as hard as he could, but the more he blew the more closely did the traveller fold his cloak around him; and at last the North Wind gave up the attempt.'

Ita	*hivio=i*	*ohu=i*	*ka*	*pupuo-hia*	*ha*	*p-amai,*	*ita*
then	sun=DET	high=DET	DECL	strong-really	really	REM-dry	then

mere	*tutu-hia*	*tato=i*	*mere=i*	*mamui*	*a'o=i*
person	long-really	without=DET	person=DET	cloak	remove=NMLZ

ita-i	*ka.*	*Ita*	*potoi*	*kavaiai*	*ro*	*a'o=i*	*ka*
must-NMLZ	DECL	then	north	wind	AG	say=NMLZ	DECL

hivio=i	*nu*	*pupuo*	*ka.*
sun=DET	3SG	strong	DECL

'Then the Sun shone out warmly, and immediately the traveller took off his cloak. And so the North Wind was obliged to confess that the Sun was the stronger of the two.'

References

Brown, Jason & Muir, Alex & Craig, Kimberley & Anea, Karika. 2016. *A short grammar of Urama*. Canberra: Asia-Pacific Linguistics.

Comrie, Bernard, & Haspelmath, Martin & Bickel, Balthasar. 2015. Leipzig Glossing Rules: Conventions for interlinear morpheme-by-morpheme glosses. https://www.eva.mpg.de/lingua/resources/glossing-rules.php.

Donohue, Mark. 1997. Tone systems in New Guinea. *Linguistic Typology* 1: 347–386.

Foley, William A. 1986. *The Papuan languages of New Guinea*. Cambridge: Cambridge University Press.

Foley, William A. 2000. The languages of New Guinea. *Annual Review of Anthropology* 29: 357–404.

Martin, Julia. 2016. *An acoustic study of Kope, Northeast Kiwai, Papua New Guinea, with preliminary tonal analysis*. Grand Forks, ND: University of North Dakota. (MA thesis.)

Simons, Gary F. & Fennig, Charles D. (eds.). 2017. *Ethnologue: Languages of the world*. Twentieth edition. Dallas, TX: SIL International. (http://www.ethnologue.com)

Wurm, Stephen A. 1951. *Studies in the Kiwai languages, Fly delta, Papua New Guinea*. Vienna: Verlag Herold.

Wurm, Stephen A. 1973. The Kiwaian language family. In Franklin, Karl J. (ed.), *The linguistic situation in the Gulf district and adjacent areas, Papua New Guinea*, 217–260. Canberra: Research School of Pacific and Asian Studies, Australian National University.