### Madurese

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ILLUSTRATION OF THE IPA

Madurese

Misnadin
Universitas Trunojoyo Madura
misnadin@trunojoyo.ac.id

James Kirby
University of Edinburgh
j.kirby@ed.ac.uk

Madurese (bhāsa Madhurā) is a Malayo-Polynesian language spoken primarily on the island of Madura and a number of regions in East Java, Indonesia. Its further subgrouping has remained a matter of some dispute. Early work placed Madurese in a Malayo-Javanic subgroup containing Javanese, Sundanese, and Malay (Dyen 1963). Glottolog and Ethnologue use the more recent ‘Malayo-Sumbawan’ classification (Adelaar 2005a), which puts Malayic, Chamic, and the Balinese-Sasak-Sumbawa group into one branch with Madurese and Sundanese in two other branches, to the exclusion of Javanese. Blust (2009), rejecting the Malayo-Sumbawan hypothesis, tentatively places Madurese in a Malayo-Chamic subgroup, but also (2010) suggests that, as Madurese is lexically similar to Malay but phonologically and morphologically quite different, it may once have subgrouped with Javanese and later underwent heavy relexicalization due to language contact (see also discussion in Kluge 2017: 3).

The number of Madurese speakers who speak the language for daily communication at home is approximately 7.8 million (Ananta et al. 2015: 278). This number includes both speakers living on the island of Madura itself as well as those living on other islands across the Indonesian archipelago. Outside Madura, speakers of Madurese are mostly concentrated in a number of regencies across the north coast of East Java. On the island, Madurese is formally taught in schools from grade 1 to grade 11 as part of muatan lokal (local content), but most speakers are also fluent in Indonesian.
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Figure 1: Map of the island of Madura and location in the Indonesian archipelago (inset). The boundaries of the Bangkalan, Sampang, Pamekasan and Sumenep regencies are indicated by grey lines.

Madurese uses the Roman script for its writing system. The orthography has been revised on a number of occasions (see Davies 2010: 51–60 for a review); in this Illustration, we use the 2008 Balai Bahasa Surabaya system adopted in some recent dictionaries (e.g. Pawitra 2009). In the pre-colonial period, Madurese was written using a syllabary originating from the Javanese script called *aksara Jhâbûn*, which literally means ‘the Javanese letters’. This system originally derives from the Grantha- or Palava-script of South India, which also has an indirect relation to the Devanagari script of North India (Adelaar 2005b: 3–4). Although the *aksara Jhâbûn* is no longer in use, it remains formally taught in schools along with the language.

Like Sundanese, Javanese, and some other languages of the region, Madurese maintains an elaborate system of lexical variants based on the social relationship between speaker and addressee, commonly known as ‘speech levels’. The *alus* ‘refined’ vocabulary is primarily borrowed from Javanese, while the *kasar* ‘rough’ substrate shows greater similarities with Malay (Stevens 1968). For overviews, references, and comparisons to related systems see Stevens (1965) and Davies (2010).

Madurese distinguishes three main dialects: Western Madurese, spoken in Bangkalan Regency; Central Madurese, spoken in Pamekasan and Sampang Regencies; and Eastern Madurese, spoken in Sumenep Regency. However, the isoglosses defining
the dialect areas do not line up perfectly with the administrative regions, or with each other. In Sampang Regency for example, there are areas which are characterized by more Western/Bangkalan features, and others by more Central/Pamekasan features, and in one and the same village there is often a mix of both (Soegianto et al. 1986; Soetoko et al. 1998). Soegianto et al. (1986: 32) also note that increased mobility had resulted in extensive dialect mixing, making it difficult to unambiguously identify a speaker’s dialect.

The most visible differences between dialects are in the domains of morphology, lexicon, and to some extent syntax (Kiliaan 1897a, 1897b; Soegianto et al. 1986; Soetoko et al. 1998; Davies 2010). In terms of phonetic and phonological variation, we note a tendency for word-final vowels to be lengthened in Eastern Madurese, and for phrase-final open syllables to be realized with final [h] in the Central and Western dialects, a point we return to below. Soegianto et al. (1986) mention possible dialect differences in intonation, as well as in patterns of vowel reduction and elision, but do not indicate them in their survey; these are clearly areas that invite further study. In addition, the varieties of Madurese spoken on East Java, as well as the closely related language of the Kangean islands, have not to our knowledge been carefully described.

Eastern Madurese, as spoken in and around Sumenep Regency, is regarded as the prestige dialect, and this is what is taught in schools. The dialect described in this illustration more closely reflects the features of Central Madurese, as spoken by the first author, who was born in 1975 in Pademawu district, Pamekasan and now lives in Bangkalan. The associated audio files were produced by the first author and they became the main data set on which the current analysis is based. The data used for Figure 5 was taken from the first author’s dissertation (Misnadin 2016).

## Consonants

<table>
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<tr>
<th></th>
<th>Bilabial</th>
<th>Dental</th>
<th>Alveolar</th>
<th>Retroflex</th>
<th>Palatal</th>
<th>Velar</th>
<th>Glottal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plosive unaspirated</td>
<td>p</td>
<td>t</td>
<td>t̚</td>
<td>c</td>
<td>k</td>
<td>?</td>
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Compared to its neighbouring languages such as Javanese, Sundanese, or Indonesian, Madurese has a relatively large consonant inventory, due primarily to the large number of distinctions between plosives. The native phonemes are illustrated in the following words:

(1) p paraŋ *parang* ‘machete’ ʈʰ *ṭhraṭ* ‘land’

pʰ *pʰraŋ* *bhârâng* ‘thing’ ɖ *ḍhra* ‘blood’

b *bəɾəŋ* *bârâng* ‘sick’ c *cala* *calâ* ‘defective’

m məɾə *marè* ‘finished’ cʰ *cʰla* *jhâlə* ‘fish net’

t talam *talam* ‘plate’ ɻ *ɻara* ‘guard’

ʈʰ *ʈʰɪlm* *dhaməl* ‘house’ ɲ *ɲəɾə* *nyəor* ‘coconut’

d ɖɪlm *dala* ‘deep’ j *kerpʰu* *kerbhuy* ‘water buffalo’

n na*ʔ* *nasë* ‘rice’ k *kakaʔ* *kaka’* ‘elder brother’

s səpɛ *sapę* ‘cow’ kʰ *kʰkʰ* *ghâghâ* ‘touch’

l lorəs *loros* ‘straight’ ɡ *ɡagj’* *gâgâ’* ‘bold’
Word-medially, almost all consonants can also occur as geminates, due either to an underlying contrast or allophonic or morphophonemic conditioning. Examples are given in (4) and (16) below.

In native vocabulary, /ʔ h j w/ do not occur word-initially, and in word-medial position /ʔ/ can only function as a syllable coda. Only /p t k m n ɾ s jʔ/ occur word-finally. For more on /ʔ/, see the section on *Marginal and non-native segments* below.

**Place of articulation**

Madurese distinguishes five places of articulation in the plosive series and four places of articulation in the nasal series. While previous researchers agree that there are five places of articulation in Madurese, there is some variation in the way they are labelled. Stevens (1968, 1994) names them as labial, dental, alveolar, palatal and velar, noting that while the alveolar series might be treated as retroflex for the purposes of a distinctive feature analysis, ‘this is neither phonetically accurate, nor could this feature be used elsewhere in the language’ (1968: 66). Cohn & Ham (1999) add retroflex but they do not distinguish retroflex from alveolar, labelling them labial, dental, retroflex/alveolar, palatal and velar. In contrast, Davies (2010: 12) does not make a distinction between dental and alveolar, but instead distinguishes dental/alveolar from retroflex, as does Kiliaan (1897a). Clynes (1995) suggests that the ‘retroflex’ consonants are better described as apico-alveolar, and that the coronal place contrast in both Madurese and Javenese is actually apico-dental vs. apico-alveolar.

In the speech of the first author, the coronal plosives /tʰ d/ are canonically laminal denti-alveolar [tʰ d̪], while /n s l r/ are apico-alveolar [n̺ s̺ l̺ r̺]. In citation forms, the retroflex plosives are apical or subapical post-alveolar, with a moderately concave tongue body. However, these can and do surface as apico-alveolar as well,
especially /ɖ/. While retroflex plosives sometimes surface as alveolars, the converse does not occur (i.e., /tʰ d n l s r/ do not have retroflex variants). Whether different speakers primarily opt for one or the other, or whether there are variants that occur systematically in different lexemes or different connected speech contexts, is at present unclear. The fact that virtually all Madurese also speak Indonesian may play a role. In any case, it seems likely that this variability has led to the range of variation in published descriptions.

Although dental and retroflex are contrastive in the speech of the first author, the functional load of this contrast is not very high. This is evidenced by there being very few minimal pairs contingent on this distinction, for example [patɛ] ‘death’ vs. [paʈɛ] ‘coconut milk’, [tʰɛntʰɛn] ‘dress up’ vs. [ʈʰɛntɛn] ‘snatch’.

**Laryngeal contrast**

Acoustically, Madurese distinguishes voiced, voiceless unaspirated, and voiceless aspirated plosives (except word-finally, where all oral plosives are voiceless unaspirated and canonically unreleased). This is unusual when compared to geographically and genetically neighbouring languages, which uniformly have a two-way contrast between either unaspirated and prevoiced plosives, as in Indonesian (Adisasmito-Smith 2004) and Sundanese (Kulikov 2010), or ‘stiff voice’ vs. ‘slack voice’, as in Javanese (Ladefoged & Maddieson 1996; Thurgood 2004). As shown in Figures 2 and 3, voiced plosives in Madurese are robustly prevoiced in both absolute initial and medial position. Although statistically significant, the difference in VOT values between voiceless aspirated and unaspirated plosives is on the order of 2:1 (Cohn & Lockwood 1994; Misnadin, Kirby & Remijsen 2015; Misnadin 2016) in contrast to the 3:1 or 4:1 difference often observed between these plosive series in other languages (Lisker & Abramson 1964). Orthography, historical evidence (Stevens 1966), and early descriptions (Kiliaan 1897a) all suggest that the aspirated series was previously voiced. However, acoustic analyses of the modern language have found no evidence that aspirated plosives ever involve vocal fold vibration during the closure phase (Cohn & Ham 1999; Misnadin 2016).
Despite the phonetic evidence to support a three-way contrast, minimal triplets distinguishing aspirated, unaspirated, and voiced plosives do not exist. We can only find binary minimal sets distinguishing voiceless aspirated and voiced plosives, for example [bɤɾɤ] ‘swollen’ vs. [pʰɤɾɤ] ‘lung’, [bɤɾɤ] ‘tell’ vs. [pʰɤɾɤ] ‘family’ or [rɤɾɤ] ‘big’ vs. [raɹɤ] ‘steal by magic power’. This is because the vowels following voiceless aspirated and voiced plosives are in complementary distribution with those following voiceless unaspirated plosives: voiceless aspirated and voiced plosives are followed by high vowels, while voiceless unaspirated plosives are followed by non-high vowels. Some examples are given in (8) below.

Although the VOT difference is marginal and the contrast is probably borne primarily by the vowel height differences, it is worth noting that the VOT distributions themselves appear to be quite stable (Misnadin 2016).

**Figure 2:** Spectrographs of (a) voiceless unaspirated [p] in [paɾaŋ] ‘machete’, (b) aspirated [pʰ] in [pʰɤɾɤŋ] ‘thing’, and (c) prevoiced [b] in [bɤɾɤŋ] ‘sick’. VOT is about 10 ms for [p] and 55 ms for [pʰ].
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**Figure 3:** Spectrographs of (a) voiceless unaspirated [k] in [kakaʔ] ‘elder brother’, (b) aspirated [kʰ] in [kʰykʰɤ] ‘touch’, and (c) prevoiced [ɡ] in [ɡɤɡɤʔ] ‘bold’ in both initial and medial positions. VOT is about 25 ms for [k] and 55 ms for [kʰ].

**Approximants**

In native vocabulary, the approximant /j/ only occurs in word-final position, e.g. [karpʰu] ‘water buffalo’, [apə] ‘fire’, [sɔɾə] ‘comb’. One argument for claiming that it is phonemic in this position is that it becomes a syllable onset when certain affixes are added. When words ending with /j/ are followed by the definite suffix -na, for example, the suffix appears in its –a allomorph, e.g. [karpʰu] ‘his/her water buffalo’, [apə] ‘his/her fire’, [sɔɾə] ‘his/her comb’, cf. [sɔɾə] ‘order’, [sɔɾəna] ‘his/her order’, [pɔɾə] ‘ulcer’, [pɔɾəna] ‘his/her ulcer’. In contrast, /w/ never occurs in word-final position.

Intervocally, /w/ and /j/ appear due to an insertion process triggered when two vowels differing in backness occur next to one another. The first vowel determines which approximant to be inserted: [j] is inserted after a front vowel whereas [w] is
inserted after a back vowel. However, insertion does not take place if the vowel sequence rises in height (see Vowel hiatus, below). Word-internally, the occurrence of approximants is thus completely predictable. Examples of word-internal approximants are shown in (2), with examples involving affixation given in (3).

(2)  
pɔwa  powa  ‘soft’
  buwɤʔ  buwâ’  ‘fit’
  kejaɛ  kèyaè  ‘Muslim cleric’
  kʰuwɤ  ghuwâ  ‘cave’
  lejaʔ  lèya’  ‘hard’
  mɔwaʔ  mowa’  ‘load’
  satijaʔ  satèya  ‘now’
  buwi  buwi  ‘mute’

(3)  
tɔkʰu  +  akʰi  →  [tɔkʰuwɤkʰi]  toghuwâghi  ‘watch-IMP.BEN’
  tɔpɔ  +  akʰi  →  [tɔpɔwakʰi]  topowaghi  ‘cover-IMP.BEN’
  məlɛ  +  akʰi  →  [məlɛjakʰi]  mellèyaghi  ‘buy-IMP.BEN’
  sarɛ  +  akʰi  →  [sarəjakʰi]  sarəyaghi  ‘find-IMP.BEN’

Word-initially, /j w/ occur only in loanwords, although many of these items are now well-integrated into the lexicon. For further details see Marginal and non-native segments, below.

Rhotics

Word-medially, /r/ is often a tap, for example [ɳɔɾəŋ] ‘sick’, [lɔɾəs] ‘straight’, [məɾɛh] ‘finished’. This is because its geminate counterpart (which can only occur word-medially) is realised as a trill [ɾ], for example [kʰirx] ‘hard’, [marəs] ‘squeeze’, [parən] ‘metallic base’; see Cohn and Ham (1999) and the examples in (4) below. Note that singleton /t/ may also be realized as a trill word-medially, as in [kɛpʰuʃ] ‘water buffalo’. Cohn and Ham (1999) describe the geminate trill as longer than the singleton, but we do not observe a difference in our data, with the trill in both cases exhibiting from two to four taps.

Geminates

All of the consonants in (1) can also appear as word-medial geminates. Geminates occur both as the result of an underlying contrast, as illustrated in (4), or due to allophonic and morphological conditioning, as in the examples in (16).

(4) /p~p/:  
  papa  papa  ‘humble’
  papa:  pappa  ‘stem of palm leaf’

/t~t/:  
  mata  mata  ‘eye’
  mata:a  matta  ‘raw’

/n~n/:  
  kanaʔ  kana’  ‘child’
  kana:aʔ  kanna’  ‘come here’

/l~l/:  
  kala  kala  ‘lose’
  kala:a  kalla  ‘go ahead’
Acoustic analysis of the items in (4) shows that closure durations for geminates are on average 50% longer than those of corresponding singletons (range: 30-90%), while vowels preceding geminates were on average 55% shorter than those preceding singletons (range: 51-60%). No difference in the duration of the following vowel is observed, nor does VOT differ between singleton and geminate plosives. These observations correspond to those of Cohn and Ham (1999).

‘Marginal’ and non-native segments

The segments /f w j h/ require special mention. Word-initially, they are found only in loanwords. Those beginning with /f/ and /h/ may have been borrowed from Arabic, Indonesian or Malay while those beginning with /w j/ may have been borrowed from Arabic or Malay (Stevens 1968). Some examples are given in (5). Note that in general,
Indonesian and Javanese cognate forms with initial /w/ will have /b/ in Madurese (Kiliaan 1897a; Stevens 1966).

(5) /f/ fas  → Arabic fasih ‘fluent’
    fardu → Arabic farad ‘obligation’

/h/ haram → Arabic haram ‘forbidden’
    hasel → Malay hasil ‘result’

/w/ wejib → Arabic wajaba ‘obligatory’
    wakel → Malay wakil ‘deputy’

/j/ jaken → Arabic jaqin ‘believe without any doubt’
    jasin → Arabic jasin ‘a chapter’s name in the Koran’

As noted above, /j/ differs from /w/ in that /j/ occurs word-finally in native vocabulary, and is treated phonologically as a consonant in this environment. However, both /j/ and /w/ are clearly visible to the phonology, as they are both copied in reduplication (see Cohn 1993b: 356–360). Thus, they are ‘marginal’ only in the sense that they do not occur word-initially in native vocabulary, but are otherwise treated like other native segments.

It has previously been noted that an optional final [h] may be pronounced in phrase-final words ending with vowels, at least in western varieties of Madurese (Kiliaan 1897a: 5; Pawitra 2009; Davies 2010: 26–7). However, there do exist a number of minimal pairs nominally distinguished by presence vs. absence of final [h]. Some examples are given in (6).

(6) bykʰi bāghi ‘give’  bykʰiħ bāghi(h) ‘a day’s name’
    kala kala ‘lose’  kalah kala(h) ‘scorpion’
    cʰucʰu jhujjhu ‘stab’  cʰucʰuħ jhujjhu(h) ‘need to’
    tata tata ‘arrange’  tatah tata(h) ‘help toddlers to walk’
The difference is subtle but audible, and clearly visible in the acoustic signal (Figure 4).

Figure 4: Spectrographs of (a) /kala/ ‘lose’ and (b) /kalah/ ‘scorpion’.

While the durations of both items are extremely similar, in careful pronunciations of items like /kalah/ ‘scorpion’, the second vowel is considerably shorter and followed by a period of glottal frication. The frication of this ‘lexical’ /h/ is much stronger than of the ‘optional’ [h]. However, in Eastern Madurese the pairs in (6) are homophones, and a distinction is often not made in the Western and Central varieties either. Moreover, lexical /h/ is inconsistently indicated in the orthography, with items like /kalah/ variably spelled as kala or kalah (Pawitra 2009). In the absence of clear acoustic evidence such as that seen in Figure 4, we have left possible instances of final [h] in this Illustration untranscribed.
Vowels

Monophthongs

Madurese has eight phonetic vowel qualities: four high vowels [i ɨ u] and four non-high vowels [ɛ ə a ɔ]:

(7) i ʰikʰir ʰighir ‘scold’ ɛ ʰɛbə ʰɛbā ‘bring’
    i ʰindo ʰindir ‘correct’ ə ʰpɛlka? ʰpelka’ ‘thirsty’
    ɤ ʰyɛkʰɤ ʰghâhâ ‘elephant’ ə ʰpate? ʰpate’ ‘dog’
    u ʰucʰur ʰjhur ‘honest’ ɔ ʰpəsəŋ ʰposang ‘lost’

The high vowels have a restricted distribution, occurring only after voiced and voiceless aspirated plosives, while non-high vowels occur elsewhere. The eight phonetic vowel qualities can thus be described in terms of four high-low pairs. This consonant-vowel co-occurrence restriction was first described by Kiliaan (1897a) and discussed by a number of authors including Stevens (1968, 1980, 1994), Trigo (1991), Anderson (1991), Cohn (1993a, 1993c), Cohn & Lockwood (1994) and Cohn & Ham (1999).

Some examples illustrating the CV co-occurrence restriction involving the alternations of non-high and high vowels are given in (8).

(8) ɛ ~ i ʰpɛrak ʰpərak ‘happy’
     ʰpʰiṭak ʰbhiṭak ‘bird’
     ʰbisa ʰbisa ‘able’
     a ~ ɤ ʰpadɤ ʰpadâ ‘same’
     ʰpʰyɛ ʰbhâṭɛ ‘profit’
     ʰbyca ʰbâca ‘read’
     ɔ ~ u ʰpəṭe ʰpotɛ ‘white’
\[ \text{p}^{\text{h}}\text{uta} \quad \text{bhuta} \quad \text{‘giant’} \]
\[ \text{buta} \quad \text{buta} \quad \text{‘blind’} \]
\[ \varepsilon \sim \text{i} \quad \text{pessè} \quad \text{pessè} \quad \text{‘money’} \]
\[ \text{p}^{\text{h}}\text{isèt} \quad \text{bhessèt} \quad \text{‘scratched’} \]
\[ \text{bisè} \quad \text{bessè} \quad \text{‘iron’} \]

Figure 5 shows an F1/F2 vowel plot for the surface vowels with z-normalisation. The plot is based on V₁ in recordings of 188 C₁V₁C₂V₂(C₃) words, read three times in random order by 15 native speakers of Madurese (data from Misnadin 2016). The plot also shows that vowels [\varepsilon] and [\text{x}] in particular, which do not form a pair, overlap considerably. However, since they phonologically always occur after different consonant types, the systemic stability of 8 vowel qualities is maintained.
Figure 5: F1~F2 plot of Madurese vowels with z-normalisation. The ellipses indicate one standard deviation from the mean. Data from Misnadin (2016).

Vowel hiatus

Madurese also has what Tabain & Jukes (2016) term ‘intra-morphemic’ vowel sequences, i.e. sequences of two vowels, each of which heads its own syllable. The vowel hiatus can also occur without an onset consonant. Like Davies (2010: 28), we identify four surface ‘vowel clusters’ [aɛ], [aɔ], [ɤɪ] and [ɤu]; note that in all four
sequences the second vowel is higher than the first. Impressionistically, the first vowel in each cluster bears stress and is longer. Some examples are given in (9).

(9) \textipa{ae} \textipa{sae} \textipa{sa\textipa{e}} ‘fine’
\textipa{ka\textipa{e}?} \textipa{kae'} ‘hook’
\textipa{a\textipa{c}} \textipa{pa\textipa{c}} \textipa{pao} ‘mango’
\textipa{a\textipa{p}} \textipa{aop} ‘shady’
\textipa{\textipa{\textipa{y}}i} \textipa{b\textipa{y}\textipa{i}?} \textipa{b\textipa{\textipa{y}}i} ‘seed’
\textipa{\textipa{c}\textipa{h}\textipa{y}i} \textipa{jh\textipa{\textipa{y}}i} ‘ginger’
\textipa{\textipa{\textipa{y}}u} \textipa{p\textipa{h}\textipa{y}u} \textipa{bh\textipa{\textipa{u}}} ‘shoulder’
\textipa{\textipa{\textipa{y}}u} \textipa{b\textipa{\textipa{u}}} ‘smell’

That the vowel clusters are really a sequence of two monophthongs, rather than a diphthong, is supported by spectrographic evidence. As seen in Figure 6, these sequences are characterized by two clear periods of steady-state formants, with a rapid transition period between them.

\textbf{Figure 6:} Example of vowel hiatus in [ka\textipa{e}?] ‘hook’.
**Phonotactics and syllable structure**

Most roots in Madurese consist of two syllables, with CV and CVC being the most common structures (Stevens 1968: 51–2; Davies 2010: 25). In terms of word categories, the majority of content words are disyllabic. Monosyllabic words are mostly limited to function words and are associated with borrowings. Some possible syllable structures for monosyllabic, disyllabic and trisyllabic words are given in (10).

<table>
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<td>CV</td>
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<td>‘chicken’</td>
</tr>
<tr>
<td>VC.CVC</td>
<td>aŋkaʔ</td>
<td>angka’</td>
<td>‘lift’</td>
</tr>
<tr>
<td>CV.CVC.CV</td>
<td>kʰyŋcʰi</td>
<td>ghârâjhi</td>
<td>‘saw’</td>
</tr>
<tr>
<td>CV.CVC.CVC</td>
<td>kamekʰil</td>
<td>kamèghil</td>
<td>‘shivering’</td>
</tr>
<tr>
<td>CV.CVC.CV</td>
<td>bɔrympa</td>
<td>bărâmpa</td>
<td>‘how many/how much’</td>
</tr>
</tbody>
</table>
CCV(C) syllables, while rare, are also possible. /Cr/ and /Cl/ onset clusters occur infrequently in some loanwords, e.g. /tarompet/ → [trom.pet] ‘trumpet’. These onset clusters may also arise, primarily in Western and Central Madurese, through reduction and elision of the initial vowel (usually [a]) in trisyllabic words, e.g. /pa.ra.o/ → [prao] ‘boat’, /ta.re.tan/ → [tre.tan] ‘sibling’, /sa.la.kʰɤ/ → [slakʰɤ] ‘rake’, /ka.le.bun/ → [klebun] ‘village head’ (Kiliaan 1897a: 6; Sutoko et al. 1998; Davies 2010: 42, 44–45).

Vowel height alternations

As discussed above, Madurese vowels can be divided into two sets of high and non-high vowels with a predictable distribution. Vowel height alternations can also occur as a result of morphophonological processes as such affixation. An example comes from the process of nasal substitution, involving an underspecified nasal prefix indicating the ‘actor voice’ form of verbs (Cohn 1993c: 110; Stevens 1994: 363; Davies 2010: 32). When an underlying voiced or voiceless aspirated plosive is replaced with its homorganic nasal equivalent, the following vowel is realized as a corresponding low vowel. In this case, the N-prefix behaves like a nasal, as shown in (11).

\[(11)\] N+[bʰca] → maca [maca] ‘AV. read’
N+[pʰte] → matè [mate] ‘AV. die’
N+[pʰykta] → makta [makta] ‘AV. bring’
N+[dʰpaʔ] → napa’ [napaʔ] ‘AV. arrive’
N+[tːkɔl] → nokol [nɔkɔl] ‘AV. beat’
N+[sɔɾɔ] → nyoro [nɔɾɔ] ‘AV. order’
N+[cakar] → nyakar [nɑkɑr] ‘AV. scratch (done by an animal)’
Vowel harmony

Unless determined by the preceding consonant, vowels in Madurese words are subject to progressive height harmony. Word-medially, the consonants /r/, /l/ and /ʔ/ are always transparent in the sense that the height of the vowels following these consonants is dependent on the quality of the preceding vowel (Stevens 1968; Trigo 1991). That is, if the vowels preceding them are high, the vowels following them are also high, as exemplified in (12).

\begin{align*}
\text{bɤɾɤ} & \quad \text{bârâ} \quad \text{‘swell’} \\
\text{bɤʔɤ} & \quad \text{bâ’â} \quad \text{‘flood’} \\
\text{bulu} & \quad \text{bulu} \quad \text{‘feather’} \\
\text{kʰɤɾu} & \quad \text{ghâru} \quad \text{‘scratch (by hand)’} \\
\text{kʰulɤ} & \quad \text{ghulâ} \quad \text{‘sugar’} \\
\text{ʈʰɤʔr} & \quad \text{ḍhâ’âr} \quad \text{‘eat’ (alos tenggi)} \\
\end{align*}

On the other hand, if the vowels before /r l ʔ/ are non-high, the vowels following them will be non-high.\(^4\) Some examples are given in (13).

\begin{align*}
\text{lɛʔɛr} & \quad \text{lɛ’êr} \quad \text{‘neck’} \\
\text{paʔaʔ} & \quad \text{pa’a’} \quad \text{‘chisel’} \\
\text{pɛlak} & \quad \text{pɛlak} \quad \text{‘kind’} \\
\text{pola} & \quad \text{pola} \quad \text{‘probably’} \\
\end{align*}
One aspect which deserves mention here is the behaviour of /s/. In word-initial position, /s/ behaves in the same manner as voiceless plosives, nasal consonants, and liquids. When /s/ appears in intervocalic position, the height of the following vowel depends on whether /s/ occurs morpheme-internally or at a morpheme boundary (Stevens 1968; Cohn 1993a). If it occurs morpheme-internally, the following vowel will be non-high regardless of the preceding vowel height, as exemplified in (14).

(14) kasar  kasar ‘rude’
    kɔsɔt  kosot ‘delete’
    nɛsɔr  nèser ‘feeling pity’
    kʰuse  ghusè ‘gum’
    sɔsɔt  sosot ‘diminished’
    tʰisa  dhisa ‘village’

However, if /s/ occurs at a morpheme boundary, the vowel following this consonant is determined by the vowel height preceding it, as shown in (15) (note: the suffix –an changes a verb into a noun while the suffix –ɛ changes a verb into an imperative).

(15) **High**
/sylis/ + /an/  →  [sylisən] bâlesan ‘reply-NOM’
/sylis/ + /ɛ/  →  [sylisɛ] bâlessè ‘reply-IMP’

**Non-high**
/solɛs/ + /an/  →  [solɛsan] tolèsan ‘writing-NOM’
/solɛs/ + /ɛ/  →  [solɛsɛ] tolèsè ‘write-IMP’
Gemination

Another type of consonant-vowel interaction in Madurese is one in which particular vowels trigger the appearance of certain consonants, rather than the other way around. This type of consonant-vowel interaction involves two vowels, namely [ə] and [i]. Unlike the other vowels, [ə] and [i] trigger gemination of the following consonant when they occur word-medially as V1 in a CV1CV2(C) context. Some examples are shown in (16).

(16) pəːɔ  pello  ‘sweat’
    təːka  tekka  ‘satisfied’
    kəːma  kemma  ‘where’
    bikəs  bekkas  ‘former’
    pʰɪrəs  bhârrâs  ‘rice’
    kʰɪtə  ghetta  ‘sap’

It is important to note that while consonants following [ə] and [i] are always geminated, gemination does not entail a preceding [ə] or [i]; see examples in (4) above. This process may be due to a syllable weight requirement. Figure 7 compares CVCV [kala] ‘lose’, CVC:V [kalːa] ‘go ahead’, and CəC:V [pəːɔ] ‘sweat’. In [kala], the VC sequence is approximately 200 ms, with the vowel having a duration of about 140 ms; in [pəːɔ], the əC: sequence is approximately 170 ms, with the schwa lasting only 35 ms. In contrast, the VC: sequence in [kalːa] lasts 275 ms. Additional examples may be found in Ham (1998) and Cohn & Ham (1999).
Word stress

Word stress is an area that has not been systematically studied in Madurese. Impressionistically, word stress in both disyllabic and trisyllabic words occurs on the first syllable, while stress on words with four syllables appears to fall on the antepenultimate syllable. However, there is at present no phonetic evidence of word stress in Madurese, lexical or otherwise. We note that in its close neighbour Indonesian, the existence of word stress has been much debated (van Zanten & van Heuven 1998, 2004).

Transcription of the recorded passage

\textit{Angèn Dâjâ bân Mataarè} \hspace{1cm} (Madurese orthography, 2008 revision)

\textit{aŋen ðr̥ŋ bɾn mataɾe} \hspace{1cm} (broad phonetic transcription)

\textit{wind north and sun} \hspace{1cm} (interlinear gloss)
‘The North Wind and the Sun’ (translation)

Notes

1. The Madurese word for ‘day, sun’ is arè but its Indonesian cognate matahari (mata ‘eye’, hari ‘day’) is also commonly used. The Madurese pronunciation contains a medial glottal stop, which is predictably epenthesized between identical vowels (see Davies 2010: 40—41).

2. For clarity, we have marked morpheme boundaries with hyphens in the orthographic forms, but these would not normally be so indicated.

Angèn Dâjâ bân Mataarè a-tokar parkara sapa sè palèng kobâsa

wind north and sun AV-fight over who REL most powerful

èantara kaduâ’-na.

‘The North Wind and the Sun were fighting over who were the strongest between themselves.’

È bâkto jâriyâ ka-bhender-ân lèbât pa-ngambhârâ ngangghuy

at time that NOM-correct-NOM pass NOM-wander AV.use

jhubâ pang-anga’.

‘It was a coincidence that at the time a traveler came along wearing a warm cloak.’
Saterros-sa Angèn Dâjâ bân Mataarè a-ghâbây ka-sapakadh-ân,
satərɔsːa əŋɛn dʊyɾ bʏn mataʔaɾe akʰɾyɾiʔ jʊŋkasapakatʰɣn
one.continue-DEF wind north and sun AV-make NOM-agree-NOM

ya arèya sapa sala sɛtːoŋ dɪɾi kαduˈːna bɪsa nyɛbbaˈːbɤɣi
jo arɪja sapa sala setːoŋ dɪɾi kαduˈːna bɪsa ɲopʰːɾpʰːɾkʰi
yes this who between one from both-DEF can AV.cause-AGI

pa-ngambhârâ sɛ kɑ-maksod mokkaʔ jhubaˈːna, maka jâreya
paŋɑmpʰɣɣ se kɑmaksot mokːaʔ cʰuˈbɤna maka ɣrɪjɪɣ
NOM-wander REL OV-mention AV.open cloak-POSS then that
sɛ ɛ-angɡ-hep ɬalɛŋ kɔbâsa.

se ɛjɑŋkʰɪp ɬalɛŋ kɔbɤsə
REL OV-consider most powerful
‘After that they made an agreement; that is, whoever could make the traveller take off
his cloak would be considered as the most powerful.’

Angèn Dâjâ terros a-tèop kålabaŋ tαndɛsːˈa.
əŋɛn dʊyɾ tɔrɔs atiʃp kαlɑbɤn tɑndisːɾ
wind north continue AV-blow with heavy-DEF
‘Then the North Wind blew as hard as he could.’

Namong samakèn tandes tɛop-an-a, samakèn sekken kɛya
namɔŋ sɑmɑkɛn tɑndis tijøpːɑna sɑmɑkɛn sɑkːən kɪja
however more heavy blow-NOM-DEF more tight also

pa-ngambhârə jâriɟa neɡɡuˈːi jhubaˈːna.
paŋɑmpʰɣɣ ɣrɪjɪɣ nɔkʰːuʔi cʰuˈbɤna
NOM-wander that AV.hold-LOC cloak-his
'However, the more he blew the more closely did the traveler hold his cloak around him.'

\textit{Aher-ra, Angèn Dâjâ nyerra bân satèya ghilir-ân-a Mataarè.}

\textit{ahera anen dyyr nèra byn satija kʰiliryn:a mata?are}

final-DEF wind north AV.surrender and now turn-NOM-DEF sun

‘At last the North Wind gave up the attempt and now it is the Sun’s turn.’

\textit{Mataarè makaloar sonar-a sè talèbât anga‘-en.}

\textit{mata?are makalôwar sonara se talevt nga?on}

sun AV.exert light-POSS REL excessive warm-DEF

‘The Sun shined out warmly.’

\textit{È bâkto jâriyâ kèya pa-ngambhârâ arowa terros mokka’ jhubâ-na.}

\textit{e bâkto jyrij’ kija pañampʰry arowa təros mokaʔ cʰubynə}

at time that also NOM-wander that continue AV.open cloak-POSS

‘Soon after that the traveler took off his cloak.’

\textit{Angèn Dâjâ ta-paksa ngakoè jhâ’ Mataarè jâriyâ sè lebbi}

\textit{anen dyyr tapaksa nəkowe cʰry? mata?are jyrij’ se ləbi:i}

wind north OV-force AV.admit that sun that REL more

\textit{kobâsa katəmbhâng abâ’-na dhibi‘.}

\textit{kobəsə katempʰry abyʔəna tʰibiʔ}

powerful than body-POSS REFL

‘And so the North Wind was forced to confess that the Sun was stronger than himself.’

\textbf{Abbreviations}

\textit{AV} : actor voice
Acknowledgments

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References


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1 Note that Indonesian cognates will often have an alveolar plosive where the corresponding Madurese phone is retroflex (Stevens 1966; Davies 2010: 23).

2 Here, the predictably inserted approximant appears to trigger coarticulatory fronting of the preceding vowel. See also footnote 4.

3 The phonologically expected and orthographically indicated vowel here is [ɛ], but it is raised in the recording, probably on account of the preceding nasal. We thank Abby Cohn for this observation.

4 Both reviewers point out several apparent violations of the height harmony/CV co-occurrence restriction in the Illustration, including *satèya* /satɛja/ → [satiŋa] ‘now’ in (2) and *ja* ‘yes’ /ja/ → [jɐ], *arèya* ‘this’ /areja/ → [ariŋa], *atèop* ‘AV.blow’ /a-tɛɔp/ → [atijɔp], *kèya* ‘also’ /keja/ → [kija] in the Narrative. We suspect these cases are due to the coarticulatory influence of the neighbouring palatal approximant. This effect appears to be primarily regressive rather than progressive, and is seen more often in connected speech than in citation forms. There are also a number of lexical items, mainly loanwords, in which the expected vowels do not occur; see e.g. Davies (2010: 36).