Final proposal to encode Nandinagari in Unicode

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1 Introduction

This is a proposal to encode the Nandinagari script in Unicode. It supersedes the following documents:

- L2/13-002 "Preliminary Proposal to Encode Nandinagari in ISO/IEC 10646"
- L2/16-002 "Proposal to encode the Nandinagari script in Unicode"
- L2/16-310 "Proposal to encode the Nandinagari script in Unicode"
- L2/17-119 "Towards an encoding model for Nandinagari conjuncts"

It incorporates comments regarding previous proposals made in:

- L2/16-037 "Recommendations to UTC #146 January 2016 on Script Proposals"
- L2/16-057 "Comments on L2/16-002 Proposal to encode Nandinagari"
- L2/16-216 "Recommendations to UTC #148 August 2016 on Script Proposals"
- L2/17-153 "Recommendations to UTC #151 May 2017 on Script Proposals"
- L2/17-117 "Proposal to encode a nasal character in Vedic Extensions"

Major changes since L2/16-310 include:

- Expanded description of the headstroke and its behavior (see section 3.2).
- Clarification of encoding model for consonant conjuncts (see section 5.4).
- Removal of digits and proposed unification with Kannada digits (see section 4.9).
- Re-analysis of 'touching' conjuncts as variant forms that may be controlled using fonts.
- Removal of *ardhavisarga* and other characters that require additional research (see section 4.10).
- Identification of a *pr̥ṣṭhamātrā*, which is not included in the proposed repertoire (see section 4.10).
- Proposed reallocation of a Vedic nasal letter to the 'Vedic Extensions' block (see L2/17-117).
- Revision of Indic position category for vowel signs.

The encoding model and character repertoire proposed in the present document are suitable for the general representation of Nandinagari in plain text. Characters such as *pr̥ṣṭhamātrā* and Vedic intonation marks are being analyzed and proposals for encoding them are forthcoming.

2 Description

Nandinagari is a Brahmi-based script that was used in southern India between the 11th and 19th centuries CE for producing manuscripts and inscriptions in Sanskrit in south Maharashtra, Karnataka and Andhra Pradesh. It was the official script of the Vijayanagara kingdom of southern India (1336–1646). There are numerous manuscripts and inscriptions bearing Nandinagari. Several of these manuscripts are biscriptal with text in the Kannada and Tigalari (Tulu) scripts. Nandinagari was also used for writing Kannada in Karnataka.

Nandinagari derives from the central group of 'Nagari' scripts and is related to Devanagari. There are several similarities between Nandinagari and Devanagari in terms of character repertoire, glyphic representation, and structure (see comparisons in tables 1–4). However, Nandinagari differs from Devanagari in terms of letterforms, the lack of a connecting headline, and in the rendering of consonant-vowel combinations and consonant conjuncts. There are several styles of Nandinagari, which are properly defined as variants of this particular type of 'Nagari' and do not resemble styles of other members of this class. As such, Nandinagari cannot be considered a stylistic variant of Devanagari. The independent status of Nandinagari is articulated by Saraju Rath (2009), who writes:

> From statements in various early and recent secondary literature [...] one could infer that Nandināgarī, Nāgarī and Devanāgarī are very close and show only minor distinctions. From a study of the available evidence in manuscripts, however, it is clear that the scripts are indeed related as sister scripts, but that there are significant and systematic differences which justify us in considering them as different scripts. In the case of Nandināgarī the separate status is very clear but because of neglect and misleading statements in secondary literature it is frequently noted that scholars who try to read the script without proper preparation fail and have to give up.

Following the above, despite its similarities to Devanagari, Nandinagari cannot be unified with the 'Devanagari' encoding in Unicode. The proper representation of Nandinagari in plain text requires the preservation of the glyphic distinctions of its letterforms, consonant conjuncts, and consonant-vowel ligatures. The script also has its own historical styles and variant forms of letters, which diverge from Devanagari styles. Support for Nandinagari at the character level will provide for representation of the script in plain text. The block will, in turn, offer a means for unifying various styles of the script.

There is an active community of scholars conducting research on Nandinagari in the areas of epigraphy, preservation of manuscripts, and optical-character recognition. The Sri Vadiraja Research Foundation, sponsored jointly by the National Mission for Manuscripts of the Government of India and the Puttige Math in Udupi, Karnataka has been working to preserve Nandinagari palm leaf manuscripts from 2007 to the present (Prabhu 2012). The French Institute of Pondicherry has also digitized its collection of Nandinagari manuscripts and made them available online (see `http://apps.ifpindia.org/manuscripts/`). Study of Nandinagari is also advanced through the work of independent specialists, who have analyzed manuscripts and produced character inventories (see figures 19–28). Moreover, there have been recent attempts to develop technologies for optical-character recognition of Nandinagari (Guruprasad *et al* 2011, 2013). An encoding for Nandinagari in the Unicode will help to advance research, study, and preservation of the script.
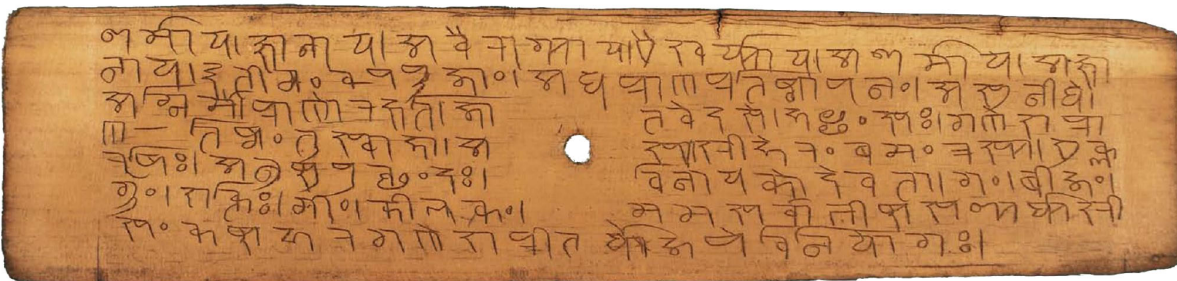
3 Script Details

3.1 Structure

The general structure of Nandinagari is similar to that of Devanagari.

3.2   Headstroke

Headstrokes are an inherent feature of Nandinagari letters, but their behavior differs from headstrokes in modern Devanagari.

Lines 1 and 2 of the above folio read as follows:

dha·rmā·ya . jñā·nā·ya . a·vai·rā·gyā·ya . ai·śva·ryyā·ya . a·dha·rmā·ya . a·jñā·[-]
nā·ya . ? nī· ? pa·pū·jāṃ . a·tha·prā·ṇa·pra·ti·ṣṭhā·pa·nam . a·su·nī·the .

As a general convention, headstroke connections in Nandinagari are restricted to an *akṣara* (orthographic syllable) and do not extend to neighboring syllables. The headstroke connects vowel / consonant letters and spacing dependent vowels of an *akṣara*, while individual *akṣara*-s are separated by spaces.

3.3   Character repertoire

The proposed repertoire is based upon character inventories in manuscripts (see figures 1 and 2) and those published in secondary sources, such as Grünendahl (2001) and Visalakshy (2003). The representative glyphs are normalizations of forms attested in these sources. Several characters have variant forms, which are to be treated as glyphic variants. The glyphs used here have been designed by the proposal author.

4   Proposed Repertoire

4.1   Vowel letters

There are 12 vowel letters:

शा   NANDINAGARI VOWEL LETTER A

शा   NANDINAGARI VOWEL LETTER AA

३   NANDINAGARI VOWEL LETTER I

३ी   NANDINAGARI VOWEL LETTER II

    ಽ   NANDINAGARI VOWEL LETTER U

    ಽ   NANDINAGARI VOWEL LETTER UU

     H   NANDINAGARI VOWEL LETTER VOCALIC R

    H   NANDINAGARI VOWEL LETTER VOCALIC RR

    ▽   NANDINAGARI VOWEL LETTER E

    ▽̇   NANDINAGARI VOWEL LETTER AI

    ಽ   NANDINAGARI VOWEL LETTER O

    औ   NANDINAGARI VOWEL LETTER AU

Distinctive letters for *vowel letter vocalic l* and *vowel letter vocalic ll* are not attested, but space for them has been reserved in the event that attestations are discovered. See section 5.1 for details.

4.2 Vowel signs

There are 11 dependent vowel signs:

    ◌ा   NANDINAGARI VOWEL SIGN AA

    ੰ◌   NANDINAGARI VOWEL SIGN I

    ◌ी   NANDINAGARI VOWEL SIGN II

    ◌ु   NANDINAGARI VOWEL SIGN U

    ◌ू   NANDINAGARI VOWEL SIGN UU

    ◌ृ   NANDINAGARI VOWEL SIGN VOCALIC R

    ◌ॄ   NANDINAGARI VOWEL SIGN VOCALIC RR

    ◌̀   NANDINAGARI VOWEL SIGN E

    ◌̏   NANDINAGARI VOWEL SIGN AI

    ◌ो   NANDINAGARI VOWEL SIGN O

    ◌ौ   NANDINAGARI VOWEL SIGN AU

The ◌ VOWEL SIGN I is positioned at the top-left edge of letters that have headstrokes. For other letters it hangs above the top-left portion of the body. The style of writing the sign varies considerably, and in rapid writing the stroke may be positioned to the left of the base and may appear as an elongated curve.

Distinctive forms for *vowel sign vocalic l* and *vowel sign vocalic ll* are not attested. Space has been reserved for them.

4.3 Consonant letters

There are 35 consonant letters:

क	NANDINAGARI LETTER KA	॰	NANDINAGARI LETTER DHA
ख	NANDINAGARI LETTER KHA	न	NANDINAGARI LETTER NA
ग	NANDINAGARI LETTER GA	प	NANDINAGARI LETTER PA
घ	NANDINAGARI LETTER GHA	फ	NANDINAGARI LETTER PHA
ङ	NANDINAGARI LETTER NGA	ब	NANDINAGARI LETTER BA
च	NANDINAGARI LETTER CA	भ	NANDINAGARI LETTER BHA
छ	NANDINAGARI LETTER CHA	म	NANDINAGARI LETTER MA
ज	NANDINAGARI LETTER JA	य	NANDINAGARI LETTER YA
झ	NANDINAGARI LETTER JHA	र	NANDINAGARI LETTER RA
ञ	NANDINAGARI LETTER NYA	ल	NANDINAGARI LETTER LA
ट	NANDINAGARI LETTER TTA	व	NANDINAGARI LETTER VA
ठ	NANDINAGARI LETTER TTHA	श	NANDINAGARI LETTER SHA
ड	NANDINAGARI LETTER DDA	ष	NANDINAGARI LETTER SSA
ढ	NANDINAGARI LETTER DDHA	स	NANDINAGARI LETTER SA
ण	NANDINAGARI LETTER NNA	ह	NANDINAGARI LETTER HA
त	NANDINAGARI LETTER TA	ळ	NANDINAGARI LETTER LLA
थ	NANDINAGARI LETTER THA	ऱ	NANDINAGARI LETTER RRA
द	NANDINAGARI LETTER DA		

The ऱ NANDINAGARI LETTER RRA is not part of the traditional repertoire. It appears to have been introduced in the 11th century for transcribing the Kannada letter ಱ U+0CB1 KANNADA LETTER RRA (see figure 3).

4.4 Virama

ᮻ NANDINAGARI SIGN VIRAMA

The ᮻ VIRAMA has two functions, similar to the corresponding character of Devanagari. It is used as a *halanta* for marking the absence of the inherent vowel of a consonant letter. It is also a control character that is used for producing conjuncts.

4.5 Vowel modifiers

◌ं NANDINAGARI SIGN ANUSVARA

◌ः NANDINAGARI SIGN VISARGA

The ◌ं ANUSVARA is used for indicating nasalization. It is placed to the right of a base letter or right-side vowel sign. The ◌ः VISARGA is used for representing post-vocalic aspiration in words of Sanskrit origin.

4.6 Avagraha

ऽ NANDINAGARI SIGN AVAGRAHA

This sign is used for marking the elision of word-initial *a* in Sanskrit as a result of sandhi (see figure 5).

4.7 Auspicious sign

꣸ NANDINAGARI SIGN SIDDHAM

The sign ꣸ SIDDHAM is used as an invocation at the beginning of documents (see figure 3).

4.8 Punctuation

¯ NANDINAGARI HEADSTROKE

The ¯ HEADSTROKE is used as a sign of spacing or joining a word. It may be used for connecting a word that is broken on account of imperfections on a writing surface. It is also used as gap filler (see figure 6).

Nandinagari uses । *daṇḍā* and ॥ double *daṇḍā* for punctuation. These should be unified with the corresponding Devanagari characters. Script extensions have been specified in section 6.5.

4.9 Digits

A full set of digits is used in Nandinagari: ೦ 0, ೧ 1, ೨ 2, ೩ 3, ೪ 4, ೫ 5, ೬ 6, ೭ 7, ೮ 8, ೯ 9. These are derived from digits of the Kannada script (see table 4). Slight differences in shape between digits in Nandinagari sources and Kannada forms should be considered glyphic variants. Kannada digits should be extended for usage in Nandinagari. Script extensions have been specified in section 6.5.

4.10 Characters not proposed at present

The following characters are attested in Nandingari sources, but are not included in the proposed repertoire because additional information is needed.

Gap filler   The sign �lı is used for marking gaps and spaces in manuscripts (see figure 14). It may be interpreted as a ligated ‖ double *daṇḍā*, but its shape and contexts of use suggest that it is a separate character.

Vedic intonation signs   The following signs are used in Vedic manuscripts: ○̖ *udatta* (?), ○̖ *anudatta* (?), ○́ *svarita* (?). Usage of these signs is shown in figures 12 and 13. They are not proposed for encoding at present because the identities of the signs remain to be established.

Vedic nasalization signs   The signs ꙮ and ꙮ are used for representing nasalization in Vedic texts. They are letter-like characters and behave similar to ꙮ U+1135E GRANTHA LETTER VEDIC ANUSVARA, and ꙮ U+1135F GRANTHA LETTER VEDIC DOUBLE ANUSVARA. Another nasal sign ꙮ was included in earlier proposals, but it has been removed from the Nandinagari repertoire and has been proposed for inclusion in the 'Vedic Extensions' block as *VEDIC SIGN DOUBLE ANUSVARA ANTARGOMUKHA.

ardhavisarga   The sign ⚔ *ardhavisarga* is used in Vedic texts for indicating *jihvāmūlīya* and *upadhmānīya* (see figures 8, 9). It may be analyzed as either a letter-like character or as a combining mark. The sign may correspond to ○⚔ U+1CF2 VEDIC SIGN ARDHAVISARGA of the 'Vedic Extensions' block, and may be a candidate for unification.

pṛṣṭhamātrā   The ○̍ VOWEL SIGN AI, ○ꞁ VOWEL SIGN O, and ○ꞁ VOWEL SIGN AU may be represented alternately as the two-part forms ⌐○̍, ⌐○ꞁ, and ⌐○ꞁ, respectively (see figure 15). These forms are constructed using a sign ⌐○ called *pṛṣṭhamātrā*, which precedes the base letter, followed by ○̍ VOWEL SIGN E, ○ꞁ VOWEL SIGN AA or ○ꞁ VOWEL SIGN O, respectively. The prefix vowel sign corresponds to ⌐○ U+094E DEVANAGARI VOWEL SIGN PRISHTHAMATRA E. The sign is a strong candidate for encoding, but more evidence is needed in order to fully understand its usage in Nandinagari.

5   Encoded Representations

5.1   Vowel letters

Some independent vowel may be represented using a combination of a vowel letter and a dependent vowel sign. This is not recommended. The encoded character for the independent vowel should be used.

Recommended	Not recommended
शी LETTER AA	शा LETTER A + ○ꞁ VOWEL SIGN AA
३ी LETTER II	३ LETTER I + ○ꞁ VOWEL SIGN II
ੳ LETTER UU	ੳ LETTER U + ○ VOWEL SIGN U
∀ LETTER AI	∇ LETTER E + ○̍ VOWEL SIGN E
शो LETTER AU	शा LETTER A + ○ꞁ VOWEL SIGN AU

The ꙮ VOWEL LETTER VOCALIC R and ꙮ VOWEL LETTER VOCALIC RR are also represented as a consonant-vowel combination with the letter ꙮ RA, as:

ॠ   <ऎ RA, ॢ VOWEL SIGN VOCALIC R>

ॡ   <ऎ RA, ॣ VOWEL SIGN VOCALIC RR>

Different representations for independent *ḷ* are shown in manuscripts (figure 1) and script charts (figure 29). These are consonant-vowel combinations with the letter ऩ LA:

ऌ   <ऩ LA, ॢ VOWEL SIGN VOCALIC R>

ऴ   <ऩ LA, ु VOWEL SIGN U>

5.2   Consonant-vowel combinations

Combinations of consonant and vowel signs and modifiers are represented in encoded text as follows:

cā	वा	<व CA, ा VOWEL SIGN AA>
ci	वि	<व CA, ि VOWEL SIGN I>
cī	वी	<व CA, ी VOWEL SIGN II>
cu	वु	<व CA, ु VOWEL SIGN U>
cū	वू	<व CA, ू VOWEL SIGN UU>
cṛ	वृ	<व CA, ृ VOWEL SIGN VOCALIC R>
cṝ	वॄ	<व CA, ॄ VOWEL SIGN VOCALIC RR>
ce	वे	<व CA, े VOWEL SIGN E>
cai	वै	<व CA, ै VOWEL SIGN AI>
co	वो	<व CA, ो VOWEL SIGN O>
cau	वौ	<व CA, ौ VOWEL SIGN AU>
caṃ	वं	<व CA, ं ANUSVARA>
caḥ	वः	<व CA, ः VISARGA>

Dependent *ḷ* may be represented using the syllable *klī* (see figure 36). This practice occurs in Grantha and other southern Brahmi scripts.

klī	क्ली	<क KA, ् VIRAMA, ऩ LA, ी VOWEL SIGN II>

Some consonant-vowel combinations may be rendered as ligatures:

ku   ह्र   <क KA, ु VOWEL SIGN U>

kū   ह्र   <क KA, ू VOWEL SIGN UU>

kṛ   व्र   <क KA, ृ VOWEL SIGN VOCALIC R>

du   ३   <२ DA, ु VOWEL SIGN U>

5.3 Positioning of VIRAMA

The VIRAMA ligates with the base letter at the lower right edge. It is centered below letters with round bodies.

k   व्र   <क KA, ् VIRAMA>

c   ३्   <व CA, ् VIRAMA>

ṭ   ॅ्   <ट TTA, ् VIRAMA>

5.4 Consonant Conjuncts

Nandingari consonant clusters are represented as conjuncts, which are rendered in various ways. Atomic ligatures are standard for some clusters; fusion of letters into distinctive or vertical ligatures is also common. Some letters exhibit special behavior, as in Devanagari. The letter ह RA is rendered as *repha* when C_1 and as *ra-kāra* when C_2. The letter य YA takes a post-base form when C_2, similar to Bengali. Half-forms of C_1 are used when the letterform allows for truncation of descenders.

Another common method of representing conjuncts in Nandinagari is to join the consonants of a cluster using an extension of their headstrokes, or by causing each letter in the cluster to touch the right edge of the previous letter. In both cases, the constituent letters retain their nominal shapes. These 'touching' conjuncts are meaningful because as a general convention, headstroke connections in Nandinagari are restricted to an *akṣara* (orthographic syllable) and do not extend to neighboring syllables (see section 3.2). Following the conventions of the script, a group of letters connected by a single headstroke, or a group of letters with touching bodies is an indication of membership in an *akṣara*.
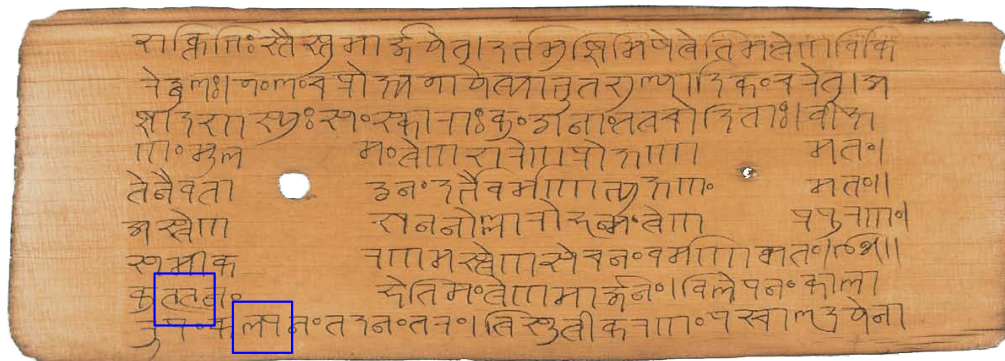
The above folio contains two touching conjuncts, shown in blue. The ट्ट *ṭṭa* occurs in ह्ट्टनं *kuṭṭanaṃ* and the ल्प *lpa* occurs in कल्पनं *kalpanaṃ*.

Most conjuncts can be rendered as either a ligature or as a 'touching' form. For instance, the cluster ३ *da* + ३ *da* may be written as both ३ and ३३ *dda*. Both forms may be used interchangably. For this reason, the 'touching' conjuncts are to be considered a stylistic variant. They may be selected through the usage of a font. There is no requirement at present to maintain a distinction between 'touching' and non-'touching' conjuncts in plain text.

The conjunct model for Nandinagari follows that of Devanagari. Conjuncts are to be produced by placing VIRAMA after each letter in a cluster:

<center>C, (◌ VIRAMA, C)*</center>

5.4.1   Examples of common conjuncts

Some ligatures are atomic or *akhaṇḍa* in which the constituent letters may not be recognizable. These are always rendered using the forms below:

     kṣa   ३   <क KA, ◌ VIRAMA, ष SSA>

     jña   ३   <ज JA, ◌ VIRAMA, ञ NYA>

Examples of other distinctive ligatures are:

     ccha   ३   <च CA, ◌ VIRAMA, छ CHA>

     dda   ३   <द DA, ◌ VIRAMA, द DA>

     dma   ३   <द DA, ◌ VIRAMA, म MA>

     ṣṭa   ३   <ष SSA, ◌ VIRAMA, ट TTA>

Ligatures are also produced by joining glyphs vertically:

     kka   ३   <क KA, ◌ VIRAMA, क KA>

     kla   ३   <क KA, ◌ VIRAMA, ल LA>

     kṣṇa   ३   <क KA, ◌ VIRAMA, ष SSA, ◌ VIRAMA, ण NNA>

     gla   ३   <ग GA, ◌ VIRAMA, ल LA>

     ṅga   ३   <ङ NGA, ◌ VIRAMA, ग GA>

     jjha   ३   <ज JA, ◌ VIRAMA, झ JHA>

     ṭva   ३   <ट TTA, ◌ VIRAMA, व VA>

     dga   ३   <द DA, ◌ VIRAMA, ग GA>

     ddha   ३   <द DA, ◌ VIRAMA, ध DHA>

<center>10</center>

     lla   ള്ള   <ल LA, ◌ VIRAMA, ल LA>

     ṣṇa   ष्ण   <ष SSA, ◌ VIRAMA, णा NNA>

     ṣṇva   ष्ण्व   <ष SSA, ◌ VIRAMA, णा NNA, ◌ VIRAMA, व VA>

     hna   ह्न   <ह HA, ◌ VIRAMA, न NA>

     hla   ह्ल   <ह HA, ◌ VIRAMA, ल LA>

The letter TA takes different shapes in conjuncts. When it is conjunct initial its left stroke is truncated: त →
त. When it is conjunct final TA is represented as a semi-circle.

     tka   त्क   <त TA, ◌ VIRAMA, क KA>

     tna   त्न   <त TA, ◌ VIRAMA, न NA>

     tta   त्त   <त TA, ◌ VIRAMA, त TA>

     nta   न्त   <न NA, ◌ VIRAMA, त TA>

     pta   प्त   <प PA, ◌ VIRAMA, त TA>

     sta   स्त   <स SA, ◌ VIRAMA, त TA>

A ligature may be formed using a half-form of C_1 if the letterform provides an opportunity for modification,
ie. a half-form can be produced by removing the right descender. This type of conjunct occurs commonly
with the following letters: ग → ग *ga*, त → त *ta*, म → म *ma*, शा → श *śa*, स → स *sa*.

     gga   ग्ग   <ग GA, ◌ VIRAMA, ग GA>

     gda   ग्द   <ग GA, ◌ VIRAMA, द DA>

     mpa   म्प   <म MA, ◌ VIRAMA, प PA>

     śca   श्च   <शा SHA, ◌ VIRAMA, च CA>

     ska   स्क   <स SA, ◌ VIRAMA, क KA>

     spa   स्प   <स TA, ◌ VIRAMA, प PA>

5.4.2   Special case: YA

When य YA is final in a cluster it it represented by default using the post-base form ◌्य:

     kya   क्य   <क KA, ◌ VIRAMA, य YA>

     kṣya   क्ष्य   <क KA, ◌ VIRAMA, ष SSA, ◌ VIRAMA, य YA>

     gya   ग्य   <ग GA, ◌ VIRAMA, य YA>

tmya   ಹಾಲಿ   ‹त TA, ् VIRAMA, म MA, ् VIRAMA, य YA›

tya   तया   ‹त TA, ् VIRAMA, य YA›

dmya   ह्या   ‹द DA, ् VIRAMA, म MA, ् VIRAMA, य YA›

yya   य्या   ‹य YA, ् VIRAMA, य YA›

ṣya   ष्या   ‹ष SSA, ् VIRAMA, य YA›

The post-base YA can connect to the preceding letter at different positions:

ṭya   ट्या   ‹ट TTA, ् VIRAMA, य YA›

5.4.3 Special case: RA

The letter र RA is rendered by default as ◌ॅ *repha* when C_1:

rka   र्क   ‹र RA, ् VIRAMA, क KA›

rra   र्र   ‹र RA, ् VIRAMA, र RA›

rṣa   र्ष   ‹र RA, ् VIRAMA, ष SSA›

Non-initial RA has the default form ◌ॢ *ra-kāra*. The *ra-kāra* attaches to the right descender. It attaches to a stem with letters that do not have a descender.

ṭra   टॢ   ‹ट TTA, ् VIRAMA, र RA›

tra   त्र   ‹त TA, ् VIRAMA, र RA›

pra   प्र   ‹प PA, ् VIRAMA, र RA›

śra   श्र   ‹श SHA, ् VIRAMA, र RA›

sra   स्र   ‹स SA, ् VIRAMA, र RA›

5.4.4 Special case: YA + RA

Given the above rules for RA and YA, the following are the normal interactions for the letters when they are adjacent in a cluster.

rya   र्य   ‹र RA, ् VIRAMA, य YA›

rṣya   र्ष्य   ‹र RA, ् VIRAMA, ष SSA, ् VIRAMA, य YA›

prya   प्र्य   ‹प PA, ् VIRAMA, र RA, ् VIRAMA, य YA›

5.4.5 'Touching' conjuncts

'Touching' conjuncts are produced by joining the headstrokes of letters or by causing the letters of a cluster to touch at adjacent edges. In both cases, letters appear without modification (see section 5.4.5). Apart from the *akhaṇḍa* conjuncts *kṣa* and *jña*, any cluster can be rendered as a 'touching' conjunct.

Examples of such conjuncts produced by connecting headstrokes:

> *tpa*   तप   <त TA, ् VIRAMA, प PA>
>
> *dda*   २२   <२ DA, ् VIRAMA, २ DA>
>
> *bda*   व२   <व BA, ् VIRAMA, २ DA>

Examples producing by joining letters at edges:

> *ḍḍa*   ३३   <३ DDA, ् VIRAMA, ३ DDA>
>
> *dda*   २२   <२ DA, ् VIRAMA, २ DA>
>
> *tpa*   तप   <त TA, ् VIRAMA, प PA>
>
> *bda*   व२   <व BA, ् VIRAMA, २ DA>
>
> *stha*   स्थ   <स SA, ् VIRAMA, थ THA>

'Touching' conjuncts may contain *akhaṇḍa* ligatures. In such cases, the atomic ligature is produced first then fused with the adjacent letter:

> *kṣma*   क्ष्म   <क KA, ् VIRAMA, ष SSA, ् VIRAMA, म MA>

The headstroke is elongated for letters without a full-width headstroke so that the connection extends fully above all letters. This pertains particularly to क KA, whose normative glyph has a half-width headstroke.

> *kśa*   कश   <क KA, ् VIRAMA, श SHA>

5.4.6 Modifying conjunct behavior

Default conjunct formation may be modified using ⟨ZWNJ⟩ U+200C ZERO WIDTH NON-JOINER:

$$C_1, \text{ ् VIRAMA, } ⟨ZWNJ⟩ \text{ ZWNJ, } C_2$$

This produces a visible VIRAMA under consonants:

> *kṣa*   क्ष   <क KA, ् VIRAMA, ष SSA>
>
> *kṣa*   क्ष   <क KA, ् VIRAMA, ⟨ZWNJ⟩ ZWNJ, ष SSA>

5.4.7 Glyph requirements for conjuncts

In the event that a font lacks ligatures for certain conjuncts, the fallback should be to display a visible ◌ VIRAMA beneath each bare consonant in the cluster.

Another fallback for missing conjuncts glyphs is to produce 'touching' conjuncts. This removes the need to use visible VIRAMA and offers a more natural alternative that aligns with the orthography for conjuncts in the script.

5.5 Invocation signs

In addition to ? NANDINGARI SIGN SIDDHAM, the syllable ꣽ◦ *oṃ* is used frequently used. The *oṃ* is not encoded as a distinctive character for Nandinagari. It is to be represented using the sequence:

     oṃ   ꣽ◦   <ꣽ O, ◌◦ ANUSVARA>

5.6 Punctuation

A sequence of multiple headstrokes are generally unconnected.

     ᆿ ̄ ̄ ᇋ   <ᆿ BHA, ̄ HEADSTROKE, ̄ HEADSTROKE, ᇋ JHA>

The HEADSTROKE may also occur between *daṇḍā*-s at the end of a section:

     ‖ ̄ ̄ ‖   <‖ U+0965 DEVANAGARI DOUBLE DANDA, ̄ HEADSTROKE, ̄ HEADSTROKE,
              ‖ U+0965 DEVANAGARI DOUBLE DANDA>

5.7 Number forms

Fraction signs occur in Nandinagari sources (see figure 7; also L2/15-243: 22). These may be represented using characters already encoded in the 'Common Indic Number Forms' block (U+A830):

¼	‖	U+A830 NORTH INDIC FRACTION ONE QUARTER
½	‖	U+A831 NORTH INDIC FRACTION ONE HALF
¾	‖‖	U+A832 NORTH INDIC FRACTION THREE QUARTERS
¹⁄₁₆	͞	U+A833 NORTH INDIC FRACTION ONE SIXTEENTH
⅛	≂	U+A834 NORTH INDIC FRACTION ONE EIGHTH
³⁄₁₆	≋	U+A835 NORTH INDIC FRACTION THREE SIXTEENTHS

These characters are specified as script extensions for Nandinagari. The 'Common Indic Number Forms' are described briefly in *The Unicode Standard* (chapter 22.3 'Numerals', pp. 770–771) and in more detail in the original encoding proposal (L2/07-354).

5.8 Collation

The sort order for Nandinagari is as follows:

श A < शा AA < इ I < ई II < उ U < ऊ UU < ऋ VOCALIC R < ॠ VOCALIC RR <

ए E < ऐ AI < ओ O < औ AU < क KA < ख KHA < ग GA < घ GHA < ङ NGA <

च CA < छ CHA < ज JA < ञ NYA < ट TTA < ठ TTHA < ड DDA < ढ DDHA <

ण NNA < त TA < थ THA < द DA < ध DHA < न NA < प PA < फ PHA < ब BA <

भ BHA < म MA < य YA < र RA < ल LA < व VA < श SHA < ष SSA < स SA <

ह HA < ळ LLA < ऱ RRA < ि VOWEL SIGN I < ी VOWEL SIGN II < ु VOWEL SIGN U <

ू VOWEL SIGN UU < ृ VOWEL SIGN VOCALIC R < ॄ VOWEL SIGN VOCALIC RR <

े VOWEL SIGN E < ै VOWEL SIGN AI < ो VOWEL SIGN O < ौ VOWEL SIGN AU <

् VIRAMA

The letter ऱ RRA does not have a position in the traditional order. It is to be sorted after ळ LLA. The following characters have secondary weights:

ं ANUSVARA, ः VISARGA

6 Character Data

6.1 Character Properties

In the format of `UnicodeData.txt`:

```
11B90;NANDINAGARI LETTER A;Lo;0;L;;;;;N;;;;;
11B91;NANDINAGARI LETTER AA;Lo;0;L;;;;;N;;;;;
11B92;NANDINAGARI LETTER I;Lo;0;L;;;;;N;;;;;
11B93;NANDINAGARI LETTER II;Lo;0;L;;;;;N;;;;;
11B94;NANDINAGARI LETTER U;Lo;0;L;;;;;N;;;;;
11B95;NANDINAGARI LETTER UU;Lo;0;L;;;;;N;;;;;
11B96;NANDINAGARI LETTER VOCALIC R;Lo;0;L;;;;;N;;;;;
11B97;NANDINAGARI LETTER VOCALIC RR;Lo;0;L;;;;;N;;;;;
11B98;<reserved>
11B99;<reserved>
11B9A;NANDINAGARI LETTER E;Lo;0;L;;;;;N;;;;;
11B9B;NANDINAGARI LETTER AI;Lo;0;L;;;;;N;;;;;
```

```
11B9C;NANDINAGARI LETTER O;Lo;0;L;;;;;N;;;;;
11B9D;NANDINAGARI LETTER AU;Lo;0;L;;;;;N;;;;;
11B9E;NANDINAGARI LETTER KA;Lo;0;L;;;;;N;;;;;
11B9F;NANDINAGARI LETTER KHA;Lo;0;L;;;;;N;;;;;
11BA0;NANDINAGARI LETTER GA;Lo;0;L;;;;;N;;;;;
11BA1;NANDINAGARI LETTER GHA;Lo;0;L;;;;;N;;;;;
11BA2;NANDINAGARI LETTER NGA;Lo;0;L;;;;;N;;;;;
11BA3;NANDINAGARI LETTER CA;Lo;0;L;;;;;N;;;;;
11BA4;NANDINAGARI LETTER CHA;Lo;0;L;;;;;N;;;;;
11BA5;NANDINAGARI LETTER JA;Lo;0;L;;;;;N;;;;;
11BA6;NANDINAGARI LETTER JHA;Lo;0;L;;;;;N;;;;;
11BA7;NANDINAGARI LETTER NYA;Lo;0;L;;;;;N;;;;;
11BA8;NANDINAGARI LETTER TTA;Lo;0;L;;;;;N;;;;;
11BA9;NANDINAGARI LETTER TTHA;Lo;0;L;;;;;N;;;;;
11BAA;NANDINAGARI LETTER DDA;Lo;0;L;;;;;N;;;;;
11BAB;NANDINAGARI LETTER DDHA;Lo;0;L;;;;;N;;;;;
11BAC;NANDINAGARI LETTER NNA;Lo;0;L;;;;;N;;;;;
11BAD;NANDINAGARI LETTER TA;Lo;0;L;;;;;N;;;;;
11BAE;NANDINAGARI LETTER THA;Lo;0;L;;;;;N;;;;;
11BAF;NANDINAGARI LETTER DA;Lo;0;L;;;;;N;;;;;
11BB0;NANDINAGARI LETTER DHA;Lo;0;L;;;;;N;;;;;
11BB1;NANDINAGARI LETTER NA;Lo;0;L;;;;;N;;;;;
11BB2;NANDINAGARI LETTER PA;Lo;0;L;;;;;N;;;;;
11BB3;NANDINAGARI LETTER PHA;Lo;0;L;;;;;N;;;;;
11BB4;NANDINAGARI LETTER BA;Lo;0;L;;;;;N;;;;;
11BB5;NANDINAGARI LETTER BHA;Lo;0;L;;;;;N;;;;;
11BB6;NANDINAGARI LETTER MA;Lo;0;L;;;;;N;;;;;
11BB7;NANDINAGARI LETTER YA;Lo;0;L;;;;;N;;;;;
11BB8;NANDINAGARI LETTER RA;Lo;0;L;;;;;N;;;;;
11BB9;NANDINAGARI LETTER LA;Lo;0;L;;;;;N;;;;;
11BBA;NANDINAGARI LETTER VA;Lo;0;L;;;;;N;;;;;
11BBB;NANDINAGARI LETTER SHA;Lo;0;L;;;;;N;;;;;
11BBC;NANDINAGARI LETTER SSA;Lo;0;L;;;;;N;;;;;
11BBD;NANDINAGARI LETTER SA;Lo;0;L;;;;;N;;;;;
11BBE;NANDINAGARI LETTER HA;Lo;0;L;;;;;N;;;;;
11BBF;NANDINAGARI LETTER LLA;Lo;0;L;;;;;N;;;;;
11BC0;NANDINAGARI LETTER RRA;Lo;0;L;;;;;N;;;;;
11BC1;NANDINAGARI VOWEL SIGN AA;Mc;0;L;;;;;N;;;;;
11BC2;NANDINAGARI VOWEL SIGN I;Mn;0;NSM;;;;;N;;;;;
11BC3;NANDINAGARI VOWEL SIGN II;Mc;0;L;;;;;N;;;;;
11BC4;NANDINAGARI VOWEL SIGN U;Mn;0;NSM;;;;;N;;;;;
11BC5;NANDINAGARI VOWEL SIGN UU;Mn;0;NSM;;;;;N;;;;;
11BC6;NANDINAGARI VOWEL SIGN VOCALIC R;Mn;0;NSM;;;;;N;;;;;
11BC7;NANDINAGARI VOWEL SIGN VOCALIC RR;Mn;0;NSM;;;;;N;;;;;
11BC8;<reserved>
11BC9;<reserved>
11BCA;NANDINAGARI VOWEL SIGN E;Mn;0;NSM;;;;;N;;;;;
11BCB;NANDINAGARI VOWEL SIGN AI;Mn;0;NSM;;;;;N;;;;;
11BCC;NANDINAGARI VOWEL SIGN O;Mc;0;L;;;;;N;;;;;
11BCD;NANDINAGARI VOWEL SIGN AU;Mc;0;L;;;;;N;;;;;
11BCE;NANDINAGARI SIGN ANUSVARA;Mc;0;L;;;;;N;;;;;
11BCF;NANDINAGARI SIGN VISARGA;Mc;0;L;;;;;N;;;;;
11BD0;NANDINAGARI SIGN VIRAMA;Mc;9;L;;;;;N;;;;;
11BD1;NANDINAGARI SIGN AVAGRAHA;Lo;0;L;;;;;N;;;;;
11BD2;NANDINAGARI SIGN SIDDHAM;Lo;0;L;;;;;N;;;;;
11BD3;NANDINAGARI HEADSTROKE;Lo;0;L;;;;;N;;;;;
```

6.2 Linebreaking

In the format of `LineBreak.txt`:

```
11B90..11B97; AL   # NANDINAGARI LETTER A .. NANDINAGARI LETTER VOCALIC RR
11B9A..11BC0; AL   # NANDINAGARI LETTER E .. NANDINAGARI LETTER RRA
11BC1..11BC7; CM   # NANDINAGARI VOWEL SIGN AA .. NANDINAGARI VOWEL SIGN VOCALIC RR
11BCA..11BD0; CM   # NANDINAGARI VOWEL SIGN E .. NANDINAGARI SIGN VIRAMA
11BD1..11BD3; AL   # NANDINAGARI SIGN AVAGRAHA .. NANDINAGARI HEADSTROKE
```

6.3 Syllabic Categories

In the format of `IndicSyllabicCategory.txt`:

```
# Indic_Syllabic_Category=Bindu
11BCE         ; Bindu              # Mc       NANDINAGARI SIGN ANUSVARA


# Indic_Syllabic_Category=Visarga
11BCF         ; Visarga            # Mc       NANDINAGARI SIGN VISARGA


# Indic_Syllabic_Category=Virama
11BD0         ; Virama             # Mn       NANDINAGARI SIGN VIRAMA


# Indic_Syllabic_Category=Vowel_Independent
11B90..11B97 ; Vowel_Independent   # Lo   [9] NANDINAGARI LETTER A ..
                                              NANDINAGARI LETTER VOCALIC RR
11B9A..11BC0 ; Vowel_Independent   # Lo   [4] NANDINAGARI LETTER E ..
                                              NANDINAGARI LETTER AU


# Indic_Syllabic_Category=Vowel_Dependent
11BC1         ; Vowel_Dependent    # Mc       NANDINAGARI VOWEL SIGN AA
11BC2         ; Vowel_Dependent    # Mn       NANDINAGARI VOWEL SIGN I
11BC3         ; Vowel_Dependent    # Mc       NANDINAGARI VOWEL SIGN II
11BC4..11BC7 ; Vowel_Dependent    # Mn   [4] NANDINAGARI VOWEL SIGN U ..
                                              NANDINAGARI VOWEL SIGN VOCALIC RR
11BCA..11BCB ; Vowel_Dependent    # Mn   [2] NANDINAGARI VOWEL SIGN E ..
                                              NANDINAGARI VOWEL SIGN AI
11BCC..11BCD ; Vowel_Dependent    # Mc   [2] NANDINAGARI VOWEL SIGN O ..
                                              NANDINAGARI VOWEL SIGN AU


# Indic_Syllabic_Category=Consonant
11B9E..11BC0 ; Consonant           # Lo  [35] NANDINAGARI LETTER KA ..
                                              NANDINAGARI LETTER RRA
```

6.4 Positional Categories

In the format of `IndicPositionalCategory.txt`:

```
# Indic_Positional_Category=Top
11BCA..11BCB  ; Top        # Mn   [2] NANDINAGARI VOWEL SIGN E ..
                                      NANDINAGARI VOWEL SIGN AI


# Indic_Positional_Category=Top_And_Left
11BC2         ; Top_And_Left # Mn       NANDINAGARI VOWEL SIGN I
```

```
# Indic_Positional_Category=Bottom
11BC4..11BC7   ; Bottom        # Mn    [4] NANDINAGARI VOWEL SIGN U ..
                                           NANDINAGARI VOWEL SIGN VOCALIC RR
11BD0          ; Bottom        # Mn        NANDINAGARI SIGN VIRAMA

# Indic_Positional_Category=Right
11BC1          ; Right         # Mc        NANDINAGARI VOWEL SIGN AA
11BC3          ; Right         # Mc        NANDINAGARI VOWEL SIGN II
11BCC..11BCD   ; Right         # Mc    [2] NANDINAGARI VOWEL SIGN O ..
                                           NANDINAGARI VOWEL SIGN AU
11BCE..11BCF   ; Right         # Mc    [2] NANDINAGARI SIGN ANUSVARA ..
                                           NANDINAGARI SIGN VISARGA
```

6.5   Script Extensions

The following characters should be extended for use with Nandinagari in `ScriptExtensions.txt`:

```
0964..0965    ;  # Po   [2] DEVANAGARI DANDA..DEVANAGARI DOUBLE DANDA

0CE6..0CEF    ;  # Nd  [10] KANNADA DIGIT ZERO..KANNDA DIGIT NINE

1CE9          ;  # Lo       VEDIC SIGN ANUSVARA ANTARGOMUKHA

A830..A835    ;  # No   [6] NORTH INDIC FRACTION ONE QUARTER..
                            NORTH INDIC FRACTION THREE SIXTEENTHS
```

7   References

Anderson, Deborah; et al. 2016a. "Recommendations to UTC #146 January 2016 on Script Proposals". L2/16-216. http://www.unicode.org/L2/L2016/16037-script-rec.pdf

———. 2016b. "Recommendations to UTC #148 August 2016 on Script Proposals". L2/16-216. http://www.unicode.org/L2/L2016/16216-script-ad-hoc.pdf

———. 2017. "Recommendations to UTC #151 May 2017 on Script Proposals". L2/17-153. http://www.unicode.org/L2/L2017/17153-script-ad-hoc-rec.pdf

Grünendahl, Reinhold. 2001. *South Indian Scripts in Sanskrit Manuscripts and Prints: Grantha Tamil, Malayalam, Telugu, Kannada, Nandinagari*. Wiesbaden: Harrassowitz.

Guruprasad, Prathima; Jharna Majumdar; Guruprasad [K. S. Rao]. 2013. "Feature Extraction and Classification Techniques for Handwritten Nandinagari Vowels". *Anusandhana: Journal of Science, Engineering and Management*, vol. 2, no. 2 (December).

Guruprasad, Prathima; Guruprasad K. S. Rao. 2011. "A Survey of Nandinagari Manuscript Recognition System". *International Journal of Science & Technology*, vol. 1, no. 1 (November).

Karnatak Inscriptions, vol. 1. 1941.

Mukhopadhyaya, Satkari. 2005. "Palaeographical Importance of Nandinagari". http://www.harekrsna.com/sun/features/06-07/features681.htm

—

Pandey, Anshuman. 2007. "Proposal to Encode North Indic Number Forms in ISO/IEC 10646". L2/07-354.
    http://www.unicode.org/L2/L2007/07354-north-indic.pdf

———. 2013. "Preliminary Proposal to Encode Nandinagari in ISO/IEC 10646". N4389 L2/13-002.
    http://www.unicode.org/L2/L2013/13002-nandinagari.pdf

———. 2016a. "Proposal to encode the Nandinagari script in Unicode". L2/16-002.
    http://www.unicode.org/L2/L2016/16002-nandinagari.pdf

———. 2016b. "Proposal to encode the Nandinagari script in Unicode". L2/16-310.
    http://www.unicode.org/L2/L2016/16310-nandinagari.pdf

———. 2017a. "Proposal to encode a nasal character in Vedic Extensions". L2/17-117.
    http://www.unicode.org/L2/L2017/17117-vedic-double-antargomukha.pdf

———. 2017b. "Towards an encoding model for Nandinagari conjuncts". L2/17-119.
    http://www.unicode.org/L2/L2017/17119-nandinagari-conjuncts.pdf

Prabhu, Ganesh. 2012. "Foundation on a mission to protect palm leaf manuscripts". *The Hindu*, Karnataka
    ed., December 25, 2012. http://www.thehindu.com/todays-paper/tp-national/tp-karnataka/
    foundation-on-a-mission-to-protect-palm-leaf-manuscripts/article4237455.ece

Rath, Saraju. 2009. "Nandināgarī manuscripts: distinctive features, geographical and chronological range".
    Abstract of a conference paper for the 14th World Sanskrit Conference, Kyoto, Japan, 1–5 September,
    2009. http://www.indology.bun.kyoto-u.ac.jp/14thWSC/programme/16/Rath.pdf

Rice, Lewis. 1879. "Two new Chalukya grants". *Indian Antiquary*, vol. 8 (April), pp. 89–98.

Sharma, Shriramana. 2016. "Comments on L2/16-002 Proposal to encode Nandinagari". L2/16-057.
    http://www.unicode.org/L2/L2016/16057-nandinagari-comments.pdf

Srinidhi A. 2015a. "Encoding of Vedic characters used in non-Devanagari scripts". L2/15-101.
    http://www.unicode.org/L2/L2015/15101-vedic.pdf

———. 2015b. "Representation of Fractional Signs in Kannada script". L2/15-243.
    http://www.unicode.org/L2/L2015/15243-kannada-frac.pdf

Visalakshy, P. 2003. *Nandināgarī Script*. Dravidian Linguistics Association no. 83. 1st ed. Thiruvanantha-
    puram: Dravidian Linguistics Association.

8   Acknowledgments

	11B9	11BA	11BB	11BC	11BD	11BE
0	স্থা 11B90	ग 11BA0	ঙ 11BB0	ন 11BC0	়ু 11BD0	
1	স্থা 11B91	घ 11BA1	ন 11BB1	়া 11BC1	S 11BD1	
2	३ 11B92	ど° 11BA2	প 11BB2	়ি 11BC2	? 11BD2	
3	ईী 11B93	द 11BA3	ফ্রে 11BB3	়ী 11BC3	— 11BD3	
4	ঙ 11B94	क 11BA4	ব 11BB4	়ু 11BC4		
5	ঙ 11B95	ক্ল 11BA5	ন 11BB5	়ু 11BC5		
6	म 11B96	न 11BA6	र 11BB6	়ু 11BC6		
7	म 11B97	ন 11BA7	য 11BB7	়ু 11BC7		
8		ঽ 11BA8	न 11BB8			
9		ঠ 11BA9	ল 11BB9			
A	∇ 11B9A	३ 11BAA	ব 11BBA	়ো 11BCA		
B	∀ 11B9B	ঠ 11BAB	रा 11BBB	়ৌ 11BCB		
C	३ 11B9C	Ⅲ 11BAC	ঘ 11BBC	়ো 11BCC		
D	স্রী 11B9D	ন 11BAD	स 11BBD	়ো 11BCD		
E	क 11B9E	ব 11BAE	স্ন 11BBE	়ঃ 11BCE		
F	র 11B9F	ৰ 11BAF	ল 11BBF	়ঃ 11BCF		

Independent vowels

11B90	शा	NANDINAGARI LETTER A
11B91	शा	NANDINAGARI LETTER AA
11B92	३	NANDINAGARI LETTER I
11B93	३ी	NANDINAGARI LETTER II
11B94	૩	NANDINAGARI LETTER U
11B95	૩	NANDINAGARI LETTER UU
11B96	Ħ	NANDINAGARI LETTER VOCALIC R
11B97	Ħ	NANDINAGARI LETTER VOCALIC RR
11B98	▨	<reserved>
11B99	▨	<reserved>
11B9A	▽	NANDINAGARI LETTER E
11B9B	ॐ	NANDINAGARI LETTER AI
11B9C	३	NANDINAGARI LETTER O
11B9D	शैो	NANDINAGARI LETTER AU

Consonants

11B9E	के	NANDINAGARI LETTER KA
11B9F	ख	NANDINAGARI LETTER KHA
11BA0	ग	NANDINAGARI LETTER GA
11BA1	घ	NANDINAGARI LETTER GHA
11BA2	₹°	NANDINAGARI LETTER NGA
11BA3	व	NANDINAGARI LETTER CA
11BA4	ऊ	NANDINAGARI LETTER CHA
11BA5	ॐ	NANDINAGARI LETTER JA
11BA6	ㅋ	NANDINAGARI LETTER JHA
11BA7	௧	NANDINAGARI LETTER NYA
11BA8	౭	NANDINAGARI LETTER TTA
11BA9	ठ	NANDINAGARI LETTER TTHA
11BAA	३	NANDINAGARI LETTER DDA
11BAB	७	NANDINAGARI LETTER DDHA
11BAC	॥	NANDINAGARI LETTER NNA
11BAD	ᄀ	NANDINAGARI LETTER TA
11BAE	ㅂ	NANDINAGARI LETTER THA
11BAF	₹	NANDINAGARI LETTER DA
11BB0	ᄁ	NANDINAGARI LETTER DHA
11BB1	ᄀ	NANDINAGARI LETTER NA
11BB2	प	NANDINAGARI LETTER PA
11BB3	फ	NANDINAGARI LETTER PHA
11BB4	व	NANDINAGARI LETTER BA
11BB5	ㅌ	NANDINAGARI LETTER BHA
11BB6	꒐	NANDINAGARI LETTER MA
11BB7	य	NANDINAGARI LETTER YA
11BB8	ㅋ	NANDINAGARI LETTER RA
11BB9	ल	NANDINAGARI LETTER LA
11BBA	व	NANDINAGARI LETTER VA
11BBB	श	NANDINAGARI LETTER SHA
11BBC	ष	NANDINAGARI LETTER SSA
11BBD	स	NANDINAGARI LETTER SA
11BBE	ह	NANDINAGARI LETTER HA
11BBF	ल	NANDINAGARI LETTER LLA
11BC0	ⱬ	NANDINAGARI LETTER RRA

Dependent vowel signs

11BC1	○ा	NANDINAGARI VOWEL SIGN AA
11BC2	○	NANDINAGARI VOWEL SIGN I
11BC3	○ी	NANDINAGARI VOWEL SIGN II
11BC4	○	NANDINAGARI VOWEL SIGN U
11BC5	○	NANDINAGARI VOWEL SIGN UU
11BC6	○	NANDINAGARI VOWEL SIGN VOCALIC R
11BC7	○	NANDINAGARI VOWEL SIGN VOCALIC RR
11BC8	▨	<reserved>
11BC9	▨	<reserved>
11BCA	○	NANDINAGARI VOWEL SIGN E
11BCB	○	NANDINAGARI VOWEL SIGN AI
11BCC	○ा	NANDINAGARI VOWEL SIGN O
11BCD	○ी	NANDINAGARI VOWEL SIGN AU

Various signs

11BCE	○॰	NANDINAGARI SIGN ANUSVARA
11BCF	○ः	NANDINAGARI SIGN VISARGA
11BD0	○	NANDINAGARI SIGN VIRAMA

Additional sign

11BD1	ऽ	NANDINAGARI SIGN AVAGRAHA

Auspicious sign

11BD2	?	NANDINAGARI SIGN SIDDHAM

Punctuation

11BD3	‾	NANDINAGARI HEADSTROKE
		• used as a spacing or filler mark

	Nandinagari	Devanagari		Nandinagari	Devanagari
KA	के	क	DHA	ꣃ	ध
KHA	ꣃ	ख	NA	ꣃ	न
GA	ग	ग	PA	प	प
GHA	ꣃ	घ	PHA	ꣃ	फ
NGA	ꣃ	ङ	BA	ब	ब
CA	ꣃ	च	BHA	ꣃ	भ
CHA	ꣃ	छ	MA	ꣃ	म
JA	ꣃ	ज	YA	य	य
JHA	ꣃ	झ	RA	ꣃ	र
NYA	ꣃ	ञ	LA	ꣃ	ल
TTA	ꣃ	ट	VA	व	व
TTHA	ꣃ	ठ	SHA	ꣃ	श
DDA	ꣃ	ड	SSA	ꣃ	ष
DDHA	ꣃ	ढ	SA	ꣃ	स
NNA	ꣃ	ण	HA	ꣃ	ह
TA	ꣃ	त	LLA	ꣃ	ळ
THA	ꣃ	थ	RRA	ꣃ	ऱ
DA	ꣃ	द			

Table 1: Comparison of basic letters and signs of Nandinagari and Devanagari.

	Nandinagari	Devanagari		Nandinagari	Devanagari
A	शा	अ		Inherent vowel	
AA	शा	आ	SIGN AA	ा	ा
I	३	इ	SIGN I	ि	ि
II	३ी	ई	SIGN II	ी	ी
U	૩	उ	SIGN U	ु	ु
UU	૩	ऊ	SIGN UU	ू	ू
VOCALIC R	म	ऋ	SIGN VOCALIC R	ृ	ृ
VOCALIC RR	म	ॠ	SIGN VOCALIC RR	ॄ	ॄ
E	▽	ए	SIGN E	े	े
AI	▽	ऐ	SIGN AI	ै	ै
O	૪	ओ	SIGN O	ो	ो
AU	औ	औ	SIGN AU	ौ	ौ

Table 2: Comparison of basic letters and signs of Nandinagari and Devanagari.

	Nandinagari	Devanagari
ANUSVARA	ं	ं
VISARGA	ः	ः
VIRAMA	्	्
AVAGRAHA	ऽ	ऽ

Table 3: Comparison of various signs of Nandinagari and Devanagari.

	Nandinagari	Kannada	Devanagari
0	೦	೦	०
1	೧	೧	१
2	೨	೨	२
3	೩	೩	३
4	೪	೪	४
5	೫	೫	५
6	೬	೬	६
7	೭	೭	७
8	೮	೮	८
9	೯	೯	९

Table 4: Comparison of digits of Nandinagari, Kannada, and Devanagari.
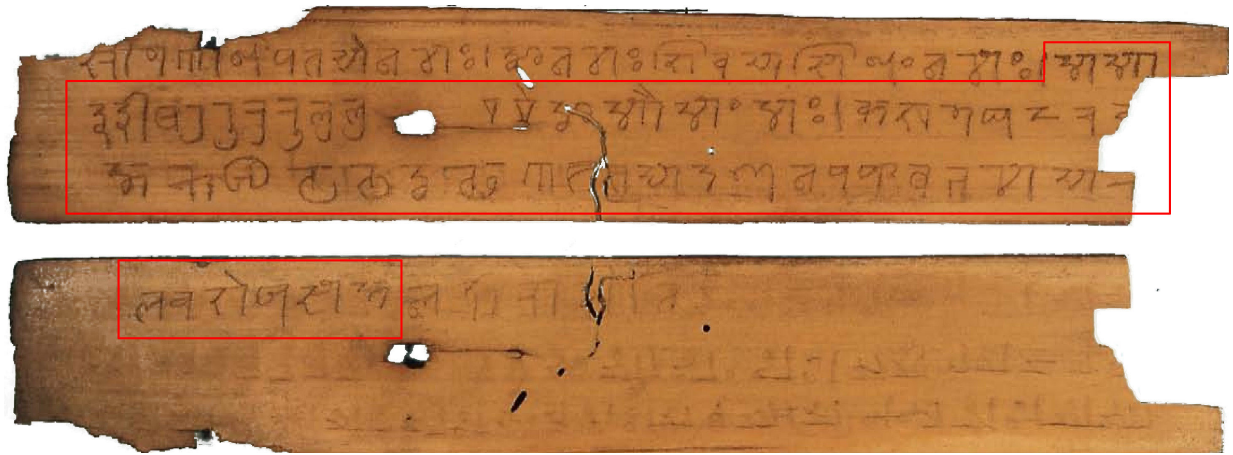
Figure 1: Nandinagari character inventory in a manuscript. Note the representation of the vocalic letters *ṛ, ṝ, ḷ, ḹ* using ㄱ RA and ㄹ LA combined with ◌ VOWEL SIGN U. The letter ꙅ◦ NGA is shown without the ◦ *bindu*. The letter Ϝ CHA and half of ㄱ RA is missing because the folio is damaged.
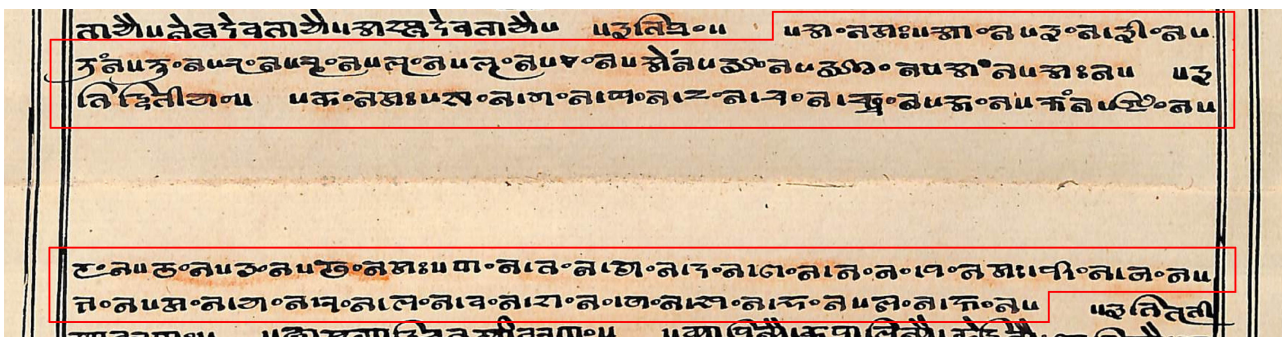
Figure 2: Nandinagari character inventory in a folio written in an ornate style.
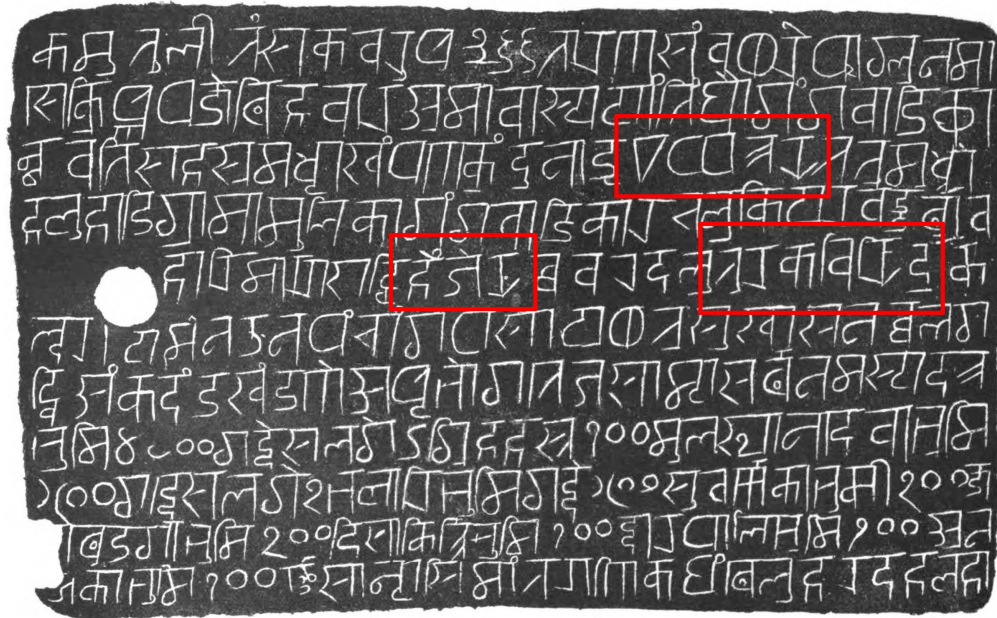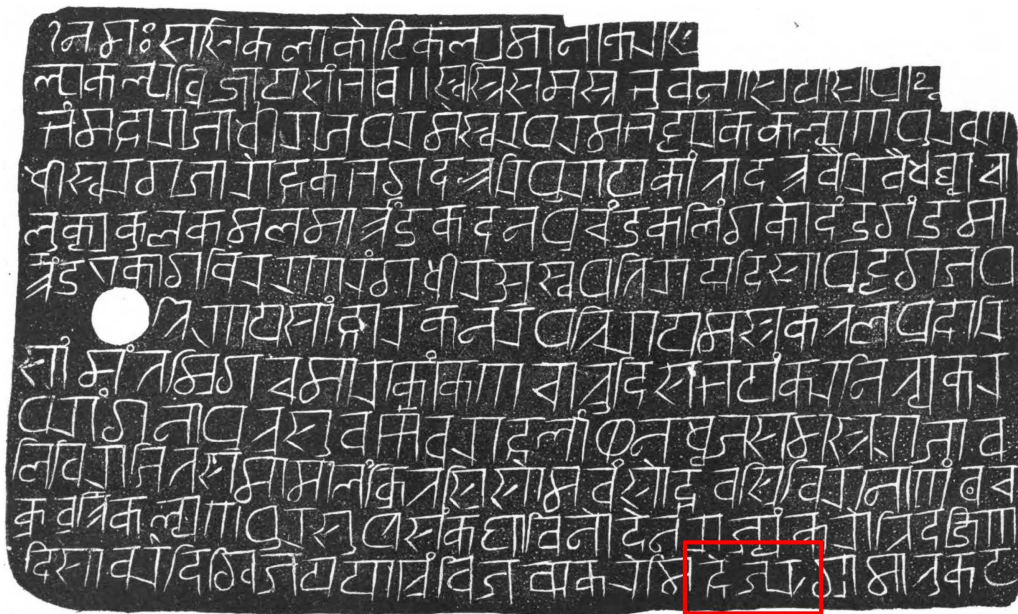
Figure 3: Copper plate of Vīranoṇamba bearing a grant inscribed in Nandinagari, Saka 366 (from Rice 1879, plates 1, 2). The letter ꢬ RA occurs in the name of the village Henjara (*heṃjaṟa-grāmā*) and in the phrases *eppattaṟa* and *turakaviṟidu*.
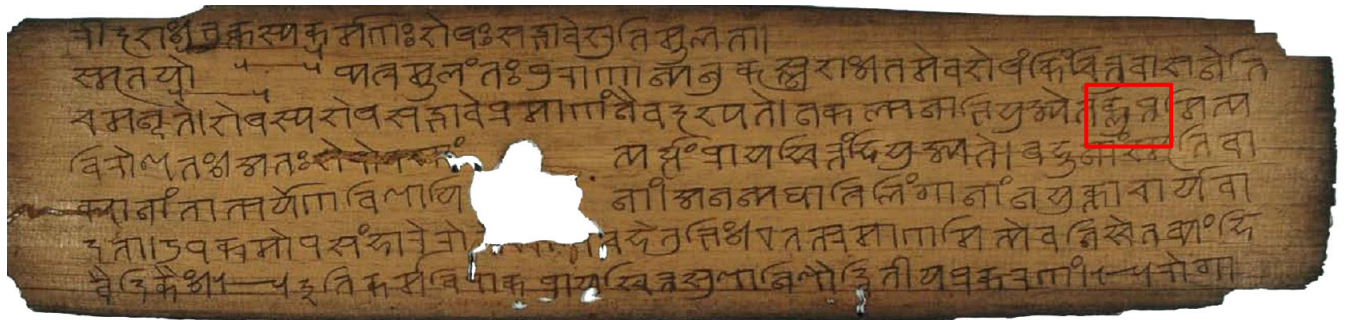
Figure 4: Representation of *ḷ* using a conjunct of क KA + ल LA in the word *kḷpta*.
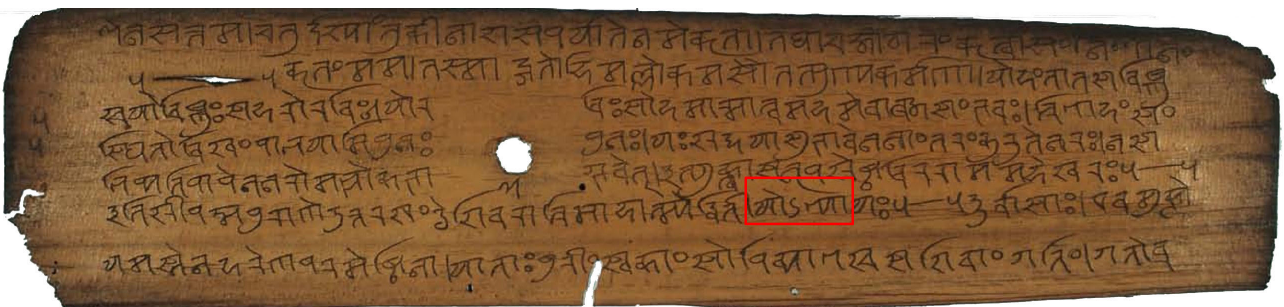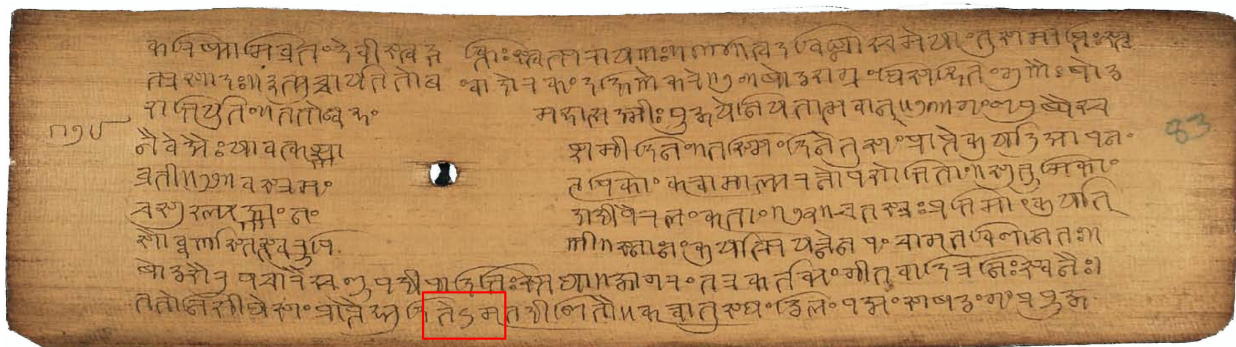
Figure 5: Nandinagari folios showing usage of ꣼ NANDINAGARI SIGN AVAGRAHA.
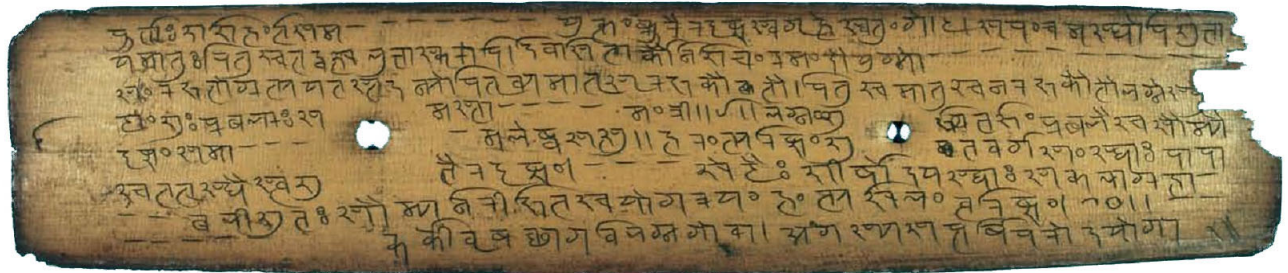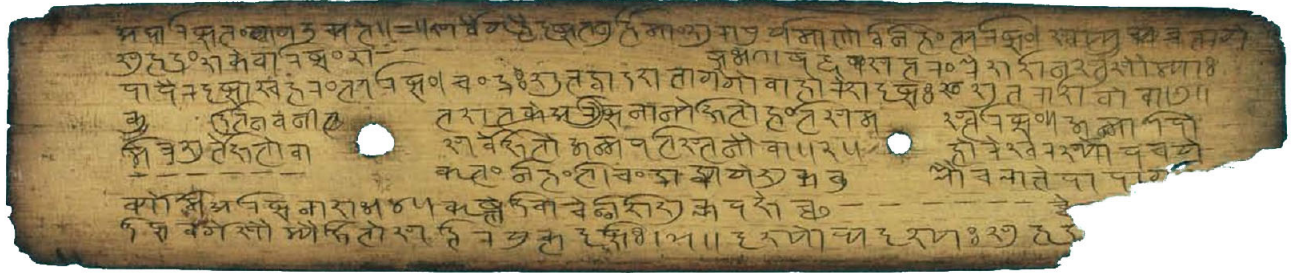
Figure 6: Usage of the ‾ ɴᴀɴᴅɪɴᴀɢᴀʀɪ ʜᴇᴀᴅsᴛʀᴏᴋᴇ for spacing (from *Jyotisham Vastulakshanam*, IFP no. RE33587).
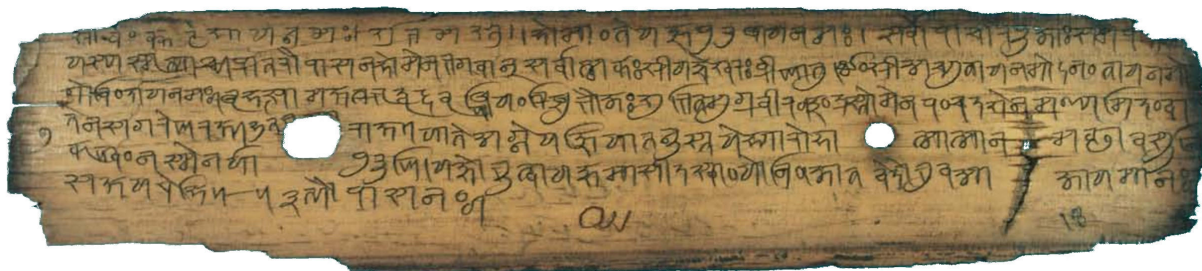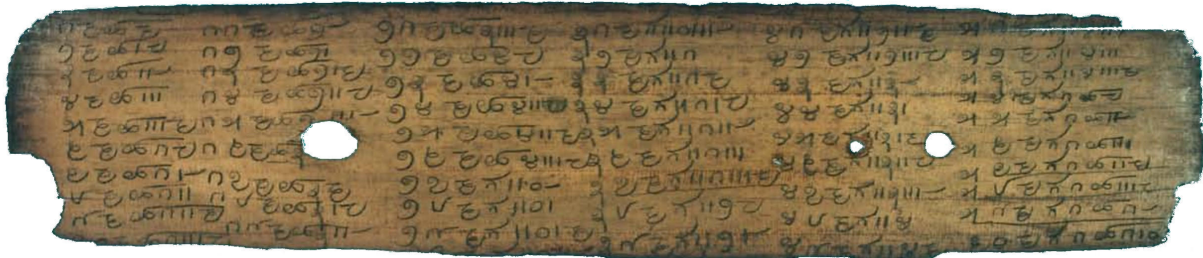
Figure 7: Usage of digits and fraction signs in Nandinagari (from *Jyotisham Vastulakshanam*, IFP no. RE33587).
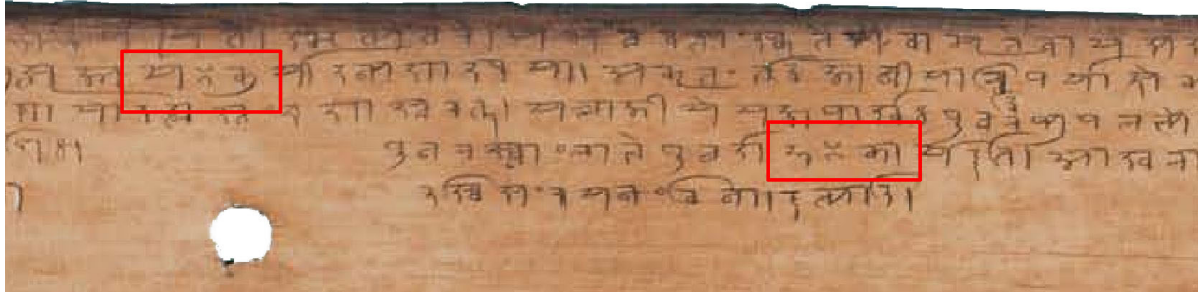
Figure 8: Usage of *jihvāmūlīya* in Nandinagari.
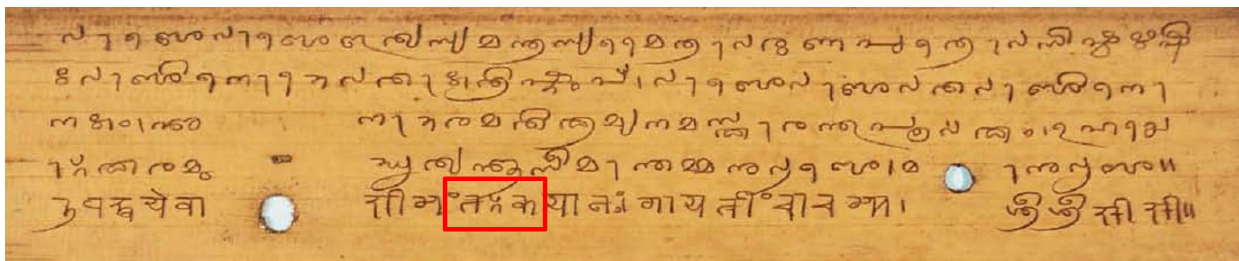
Figure 9: Usage of *jihvāmūlīya* in Nandinagari.
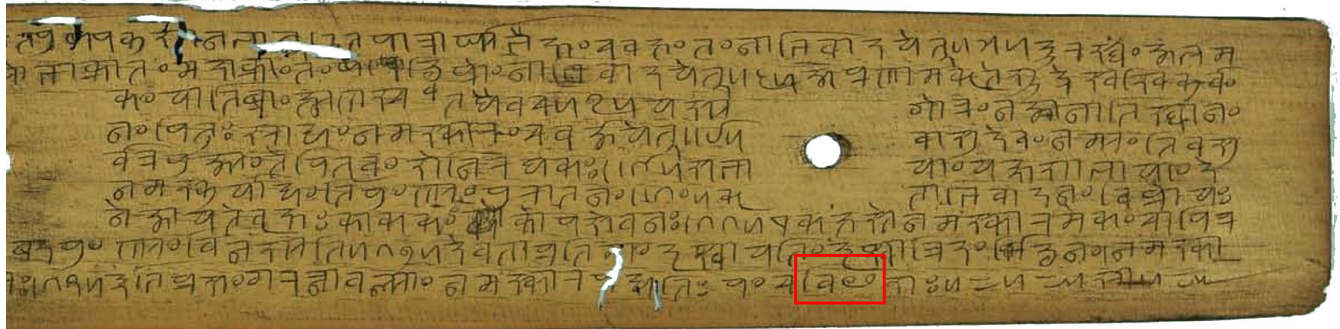
Figure 10: Usage of ꣩ U+1CE9 ᴠᴇᴅɪᴄ ꜱɪɢɴ ᴀɴᴜꜱᴠᴀʀᴀ ᴀɴᴛᴀʀɢᴏᴍᴜᴋʜᴀ in Nandinagari.
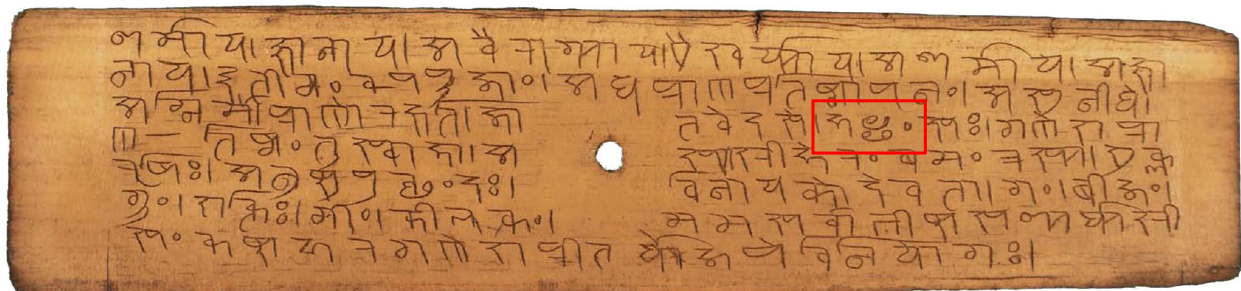
Figure 11: Usage of the sign ꣩ in ꣩°. This sign is a double stack of ꣩ U+1CE9 ᴠᴇᴅɪᴄ ꜱɪɢɴ ᴀɴᴜꜱᴠᴀʀᴀ ᴀɴᴛᴀʀɢᴏᴍᴜᴋʜᴀ, and has been proposed for inclusion in the 'Vedic Extensions' block as ᴠᴇᴅɪᴄ ꜱɪɢɴ ᴅᴏᴜʙʟᴇ ᴀɴᴜꜱᴠᴀʀᴀ ᴀɴᴛᴀʀɢᴏᴍᴜᴋʜᴀ.
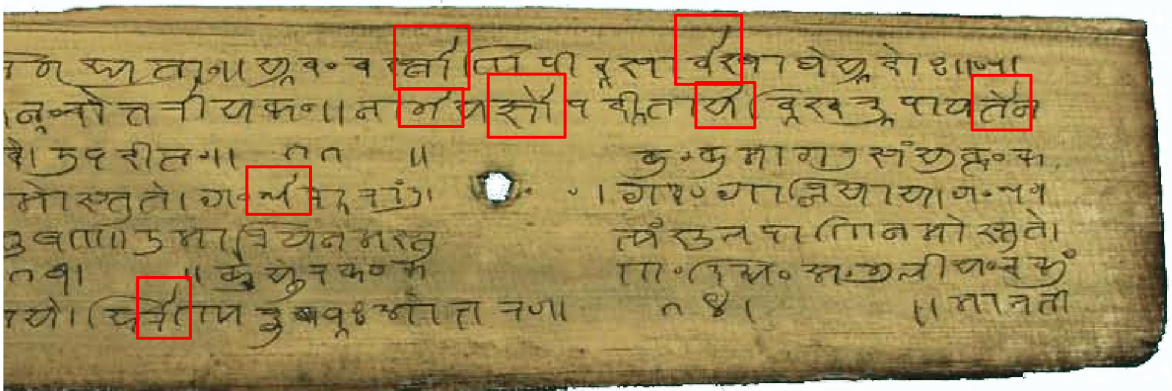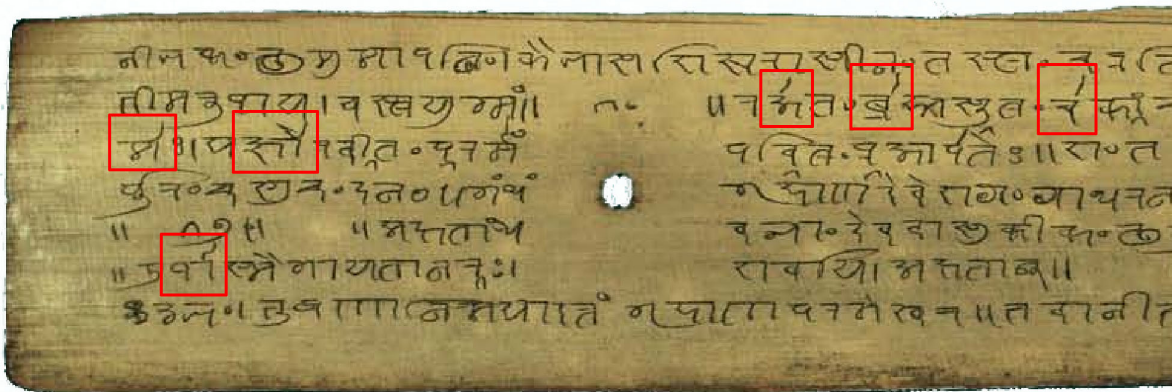
Figure 12: Usage of the Vedic intonation sign ○' *svarita* in Nandinagari.
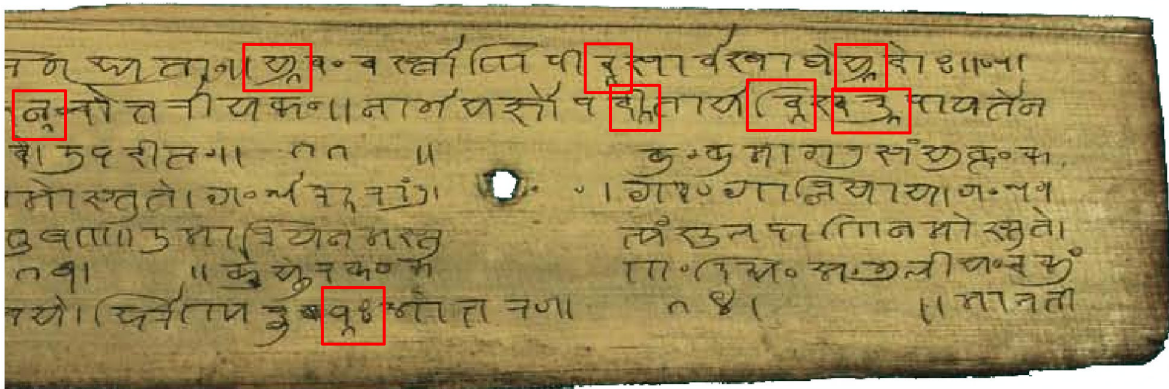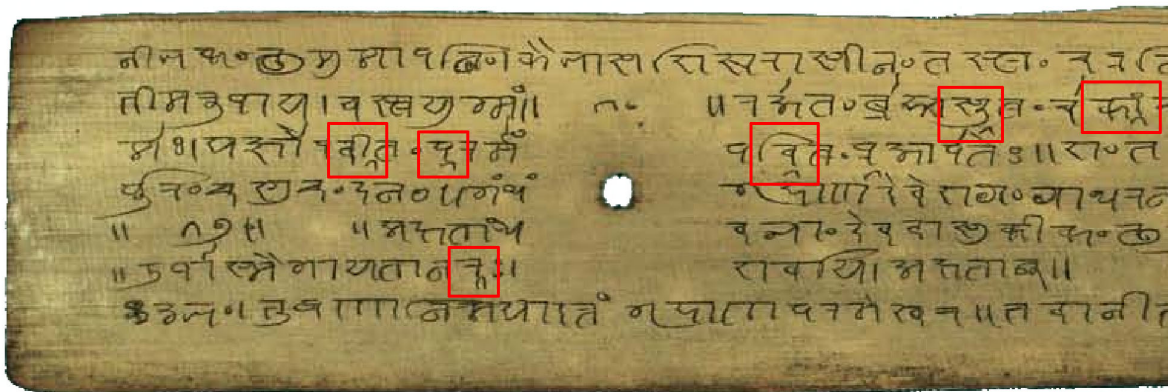
Figure 13: Usage of the Vedic intonation sign ◌॒ *anudatta* in Nandinagari.
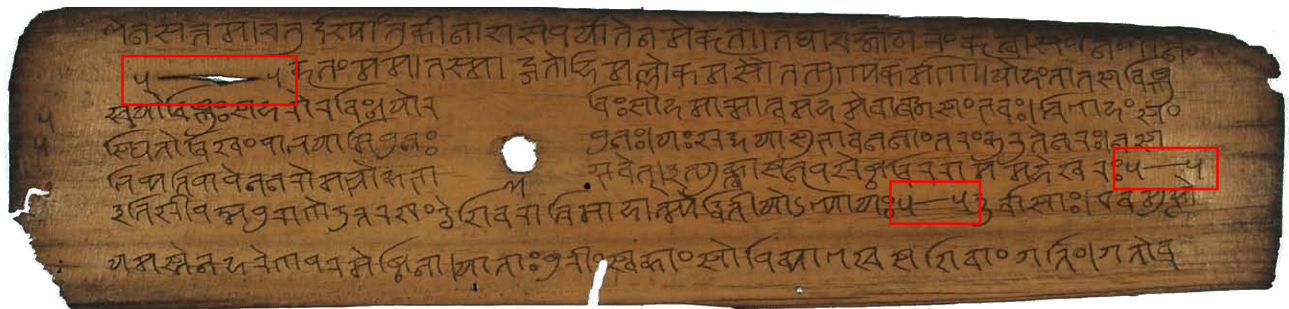
Figure 14: Folio showing usage of a ꟷ filler and ⁻ ʜᴇᴀᴅsᴛʀᴏᴋᴇ for marking gaps. The sign ꟷ is not currently proposed for encoding.

Plate IV-b.

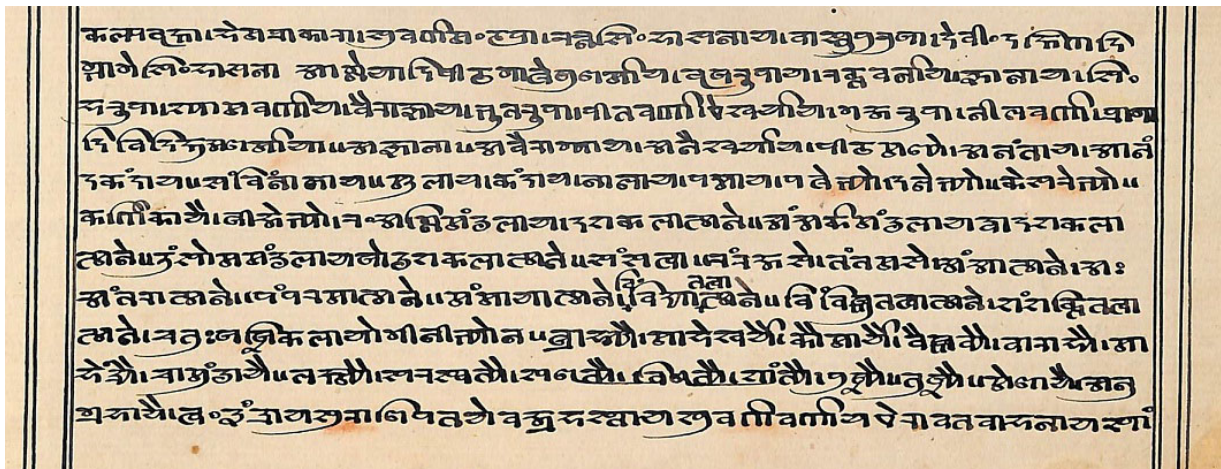*No. 28* (Cont.)

Second plate, I side

Figure 16: Example of a style of Nandinagari written in ink, which differs from the style used on palm leaves, as shown in the preceding figures.

Figure 17: A coin of Krishnadevaraya, the emperor of Vijayanagara (r. 1509–1530), with the inscription "*srīkṛṣṇarāya*" in Nandinagari on the reverse.
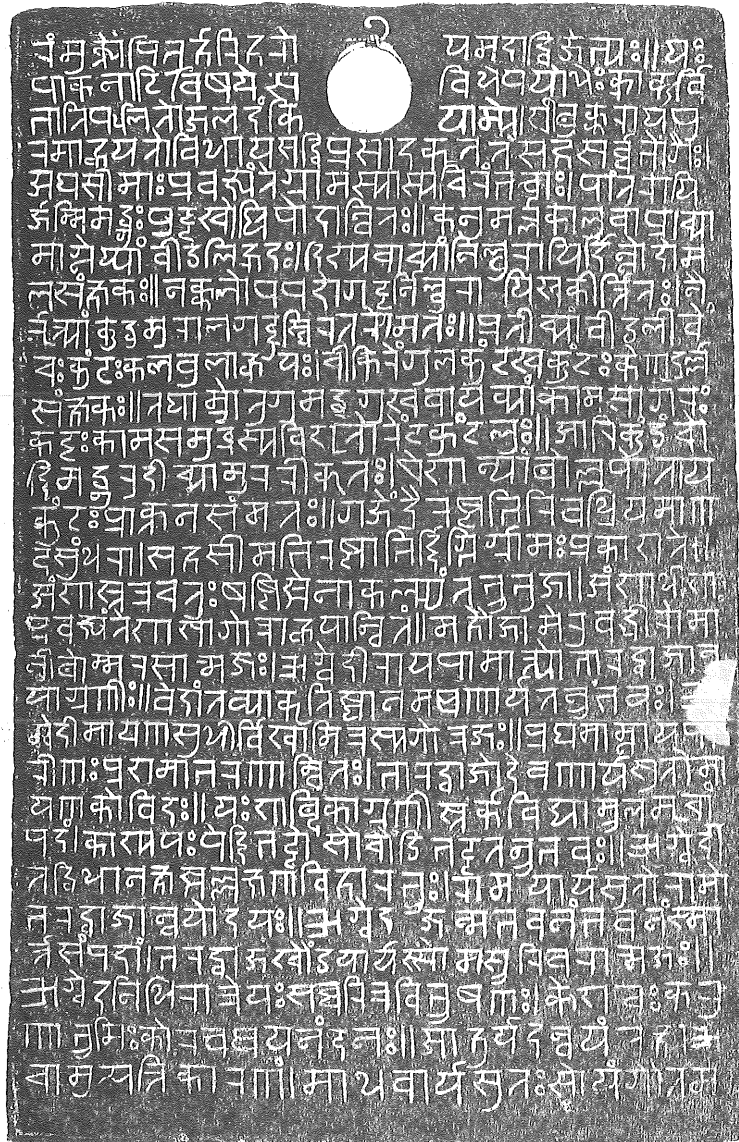
Figure 18: A plate containing a record in Nandinagari (from Visalakshy 2003: 266).

Figure 19: Handwritten chart of Nandinagari characters (courtesy of Srinidhi A., Tumkur, Karnataka).

Vowel signs

क का कि की कृ कृ कॄ कॄ के कै को कौ
ka kā ki kī ku kū kṛ kṝ ke kai ko kau

Various signs

Anusvara- ˙o   Visarga- ˙8   Ardhavisarga- Ⴏ

Avagraha- ऽ   Vedic Anusvaras- ల , ల

Virama- ꣢

क्‍-k , ग्‍-g त्‍-t न्‍-n , ट्‍-ṭ

Digits (Kannada digits)

೦ ೧ ೨ ೩ ೪ ೫ ೬ ೭ ೮ ೯

0   1   2   3   4   5   6   7   8   9

Variants

श्रा - श्रा , श्रा   व - व , व

व - व्रो   ग्र - ग्र

ज - ळ   प - प , प

ट - ट   स - स , स

त - त   ꣢ - ꣢

ठ - ꣣   ꣢ - ꣢

व - व   ꣢ - ꣢

ण - ण , ण

प्री - प , प

                            ల - ౺

Figure 20: Handwritten chart of Nandinagari characters (courtesy of Srinidhi A., Tumkur, Karnataka).

Figure 21: Handwritten table of Nandinagari conjuncts (courtesy of Srinidhi A., Tumkur, Karnataka).

Figure 22: Handwritten table of Nandinagari conjuncts (courtesy of Srinidhi A., Tumkur, Karnataka).

Figure 23: Handwritten table of Nandinagari conjuncts (courtesy of Srinidhi A., Tumkur, Karnataka).

Figure 24: Handwritten table of Nandinagari conjuncts (courtesy of Srinidhi A., Tumkur, Karnataka).

Figure 25: Handwritten table of Nandinagari conjuncts (courtesy of Srinidhi A., Tumkur, Karnataka).

Figure 26: Handwritten table of Nandinagari conjuncts (courtesy of Srinidhi A., Tumkur, Karnataka).

Figure 27: Handwritten table of Nandinagari conjuncts (courtesy of Srinidhi A., Tumkur, Karnataka).

Figure 28: Handwritten table of Nandinagari conjuncts (courtesy of Srinidhi A., Tumkur, Karnataka).

CHAPTER II

ALPHABETS AND NUMERALS

Nandināgarī has twelve vowel letters and thirty five consonant letters. The number excludes 'a' with anusvāra and 'a' with visarga. In the inventory of Nandināgarī alphabets 'kṣa' and 'jña' are treated as single letters. In the case of the letter for 'kṣa' it does not show any apparent resemblance with the letters of ka and ṣa. However, in the case of 'jña' it has some resemblance with the letter ja. The letter for 'ba' is very often used to represent 'va' and the letter for 'sa' is commonly used to represent 'śa'. Since a few instances are noticed where sa-śa and ba - va are distinguished by separate letters, all the four are included in the inventory of letters.

VOWELS

There exists only four basic vowel letters. The other letters representing vowels are only derivations. These four primary vowel letters are those which represent a, i, u and e. The long vowels ā, ī, and ū are derived by the use of subsidiary symbols. The vowels ṛ and ḷ are derived from the consonant letters 'ra' and 'la'. The letters for long vowels ṝ and ḹ are absent. The dipthong 'ai' is formed by the use of subsidiary symbol with the letter for the vowel 'e', the letters for 'o' and 'au' are formed by adding subsidiary symbols to the letter 'ā'. The vowels of Nandināgarī script are given below.

NANDINĀGARĪ	ROMAN	DEVANĀGARĪ
३१	A	अ
३११	Ā	आ
३२	I	इ

NANDINĀGARĪ	ROMAN	DEVANĀGARĪ
३गो	O	ओ
३गौ	AU	औ

CONSONANTS

The basic consonant letters of Nandināgarī, similar to that of other Indian scripts, indicate the consonant + the vowel 'a'. As in Devanāgarī, letters are found for all the varga consonants. When a pure consonant i.e. without any vowel is to be represented, a separate subsidiary symbol which is identical with the symbol in the Devanāgarī script is found to be in use. Eg. (k) , (c) , (t). The consonant letters are as follows:

NANDINĀGARĪ	ROMAN	DEVANĀGARĪ
फ	KA	क
रव	KHA	ख
ग	GA	ग

NANDINĀGARĪ	ROMAN	DEVANĀGARĪ
ई	Ī	ई
उ	U	उ
ऊ	Ū	ऊ
ऋ	Ṛ	ऋ
ऌ	Ḷ	ऌ
ए	E	ए
ऐ	AI	ऐ

NANDINĀGARĪ	ROMAN	DEVANĀGARĪ
घ	GHA	घ
ङ	ṄA	ङ
च	CA	च
छ	CHA	छ
ज	JA	ज
झ	JHA	झ
ञ	ÑA	ञ

Figure 29: Charts showing basic characters of Nandinagari (from Visalakshy 2003: 20–23).

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NANDINĀGARĪ	ROMAN	DEVANĀGARĪ
	ṬA	ट
	ṬHA	ठ
	ḌA	ड
	ḌHA	ढ
	ṆA	ण
	TA	त
	THA	थ

NANDINĀGARĪ	ROMAN	DEVANĀGARĪ
	DA	द
	DHA	ध
	NA	न
	PA	प
	PHA	फ
	BA	ब
	BHA	भ

NANDINĀGARĪ	ROMAN	DEVANĀGARĪ
	MA	म
	YA	य
	RA	र
	LA	ल
	VA	व
	ŚA	श
	ṢA	ष

NANDINĀGARĪ	ROMAN	DEVANĀGARĪ
	SA	स
	HA	ह
	KṢA	क्ष
	JÑA	ज्ञ

ANUSVĀRA AND VISARGA

Anusvāra   o

Visarga   :

Figure 30: Charts showing basic characters of Nandinagari (from Visalakshy 2003: 24–27).

ļ. For the combination of the vowel 'ļ' with consonants, instead of a separate subsidiary symbol the letter for ļ itself is used.

Subsidiary Symbols of Vowels:

SUBSIDIARY SYMBOL (NANDINĀGARĪ)	VOWEL REPRESENTED	DEVANĀGARĪ
৲	Ā	आ
∠	I	इ
৭	Ī	ई
ں	U	उ
∂	Ū	ऊ
ç	Ṛ	ऋ

SUBSIDIARY SYMBOL (NANDINĀGARĪ)	VOWEL REPRESENTED	DEVANĀGARĪ
⅃	E	ए
↲	AI	ऐ
⅂	O	ओ
⅃	AU	औ

Letters Representing Consonant Vowel Combinations

Though ṛ does not occur with all consonants, its combination with consonants is not very much restricted and also has a regular pattern. Hence all C+ṛ combinations are given. Only very few examples are found for the occurrence of consonant +vowel ļ.

NANDINĀGARĪ	ROMAN	DEVANĀGARĪ
फ	KA	क

NANDINĀGARĪ	ROMAN	DEVANĀGARĪ
फा	KĀ	का
फि	KI	कि
फी	KĪ	की
फु	KU	कु
फू	KŪ	कू
फृ	KṚ	कृ
फॢ	KḶ	क्लृ

NANDINĀGARĪ	ROMAN	DEVANĀGARĪ
फे	KE	के
फै	KAI	कै
फो	KO	को
फौ	KAU	कौ
रव	KHA	ख
रवा	KHĀ	खा
रिव	KHI	खि

Figure 31: Dependent vowel signs in Nandinagari (from Visalakshy 2003: 30–33).

NUMERALS

In order to represent numerals, Nandināgarī uses ten symbols. They are as follows:

NANDINĀGARĪ	ROMAN	NANDINĀGARĪ	ROMAN
o	0	᠈ᡭ	5
᠗	1	ℰ	6
᠖	2	᠑	7
᠖	3	᠊	8
४	4	᠍	9

The combination of these symbols derive higher numerals. The patterns of combinations are same as in Devanāgarī. The following are some examples:

NANDINĀGARĪ	ROMAN	NANDINĀGARĪ	ROMAN
᠗o	10	᠗ooo	1000
᠗᠗	11	᠖᠖᠖᠈ᡭ	2235

Figure 32: Nandinagari digits (from Visalakshy 2003: 86).

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CHAPTER VII
VARIANTS

Some variant letters/symbols noticed in Nandinagarī are given here. Some of the variants may be due to the interference of other writing systems such as Devanāgarī.

Nandinagarī		Letter Represented	
Regular Form	Variant Form	Roman	Devanāgarī
३	ॐ	u	उ
ॠ	ᄆ	r̥	ऋ
ॄ	ॄ , ॄ	e	ए
॓	॓ ॓	ai	ऐ
ॗ	ॗ	ku	कु

Nandinagarī		Letter Represented	
Regular Form	Variant Form	Roman	Devanāgarī
ॗ	ॗ ॗ	kū	कू
ॕ	ॕ	kra	क्र
ख	ख , ख	kha	ख
ॿ	ॿ	cā	चा
ॖ	वि	ci	चि
ॕ	ॕ , ॕ , ॕ	cha	छ

Nandinagarī		Letter Represented	
Regular Form	Variant Form	Roman	Devanāgarī
॓	॓	ṭha	ठ
॒	॒	tna	ल
॒	॒ ॒	tra	त्र
॒	॒	tva	त्व
॒	॒	dya	द्य
॒	॒ , ॒ , ३, ३, ॒	dha	ध

Nandinagarī		Letter Represented	
Regular Form	Variant Form	Roman	Devanāgarī
प	३	pa	प
॰	ᄖ	ppa	प्प
॰	॰ , ॰	pha	फ
॰	॰ ॰	ba	ब
॰	॰	bhū	भू
॰	४ , ४ , ॰	ma	म

Figure 33: Glyphic variants in Nandinagari (from Visalakshy 2003: 235–238).

Nandināgarī		Letter Represented	
Regular Form	Variant Form	Roman	Devanāgarī
?	?	ya	य
?	?	ra	र
?	?	rū	रू
?	?	la	ल
?	?	rla	ऴ

Nandināgarī		Letter Represented	
Regular Form	Variant Form	Roman	Devanāgarī
?	?	ṣa	ष
?	?	ṣṭa	ष्ट
?	?	srī	श्री
?	?	jña	ज्ञ
0 (Anusvāra)	?	ṃ	‍ं

Nandināgarī		Letter Represented	
Regular Form	Variant Form	Roman	Devanāgarī
?	?	2	२
?	?	6	६
?	?	7	७
?	?	9	९

Figure 34: Glyphic variants in Nandinagari (from Visalakshy 2003: 235–238).

The following letters show close resemblance and care is required to distinguish them.

	NANDINĀGARĪ	ROMAN	DEVANĀGARĪ
SET I	३॒	I	इ
	३	U	उ
	३	DA	ड
	३॒	JA	ज
SET II	ꤛ	JHA	झ
	ꤛ	RA	र

	ROMAN	DEVANĀGARĪ	NANDINĀGARĪ
SET III	त	TA	त
	त	BHA	भ
SET IV	३	ṄA	ङ
	३	DA	द
SET V	ꤛ	PA	प
	ꤛ	YA	य

CONSONANT VOWEL COMBINATIONS

As already pointed out, the basic consonant letter represents the combination of consonant and the vowel 'a'. All the other vowel combinations with the consonants are represented by using subsidiary symbols with the basic consonant letter except in the case of

Figure 35: Internal 'confusables' in Nandinagari (from Visalakshy 2003: 28–29).

Appendix: Distinctive Features of Nandinagari

Vowels	Initial	Diacritic	k-Ligatures
a	शा & श्र & अ		क्र
ā	शा & श्रा & आ	ा	का
i	र & रु	ि & ि & ि	कि & कि & कि
ī	री & री	ी	की
u	ऊ & ३	ु	कु
ū	ऊ & ३	ू	कू
ṛ	ऌ (="rṛ")	ृ	कृ
ṝ	ऌ (="rṝ")	ॄ	कॄ
ḷ	(*not documented*)	ॢ	कॢ
ḹ	(*not documented*)		
e	ᔭ & ▽	े	के
ai	ᔭ & ᔗ	ै	कै
o	ᔓ & ᔔ	ो	को
au	शौ	ौ	कौ

Figure 36: Distinctive features of Nandinagari (from Grünendahl 2001: 201).

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Consonants: Velar   *Retroflex*

ka	𑦮	ṭa	𑧄 & 𑧄 & 𑧄	
kha	𑧀 & 𑧀	ṭha	𑧅 & 𑧅 & 𑧅 (*cf.* ḍha)	
ga	𑧂 & 𑧂 & 𑧂 & 𑧂 & 𑧂	ḍa	𑧆 & 𑧆	
gha	𑧃 & 𑧃	ḍha	𑧇	
ṅa*	𑧁	ṇa	𑧈	

Palatal   *Dental*

ca	𑦯 & 𑦯	ta	𑧉	
cha	𑦰 & 𑦰 & 𑦰 (*cf.* ccha)	tha	𑧊 & 𑧊	
ja	𑦱 & 𑦱	da	𑧋 & 𑧋	
jha†	𑦲	dha	𑧌 & 𑧌 & 𑧌	
ña	(*not documented*)	na	𑧍	

* *interpolated from conjuncts*

† *to be distinguished from* 𑧒 ru

Figure 37: Distinctive features of Nandinagari (from Grünendahl 2001: 202).

Labial   *Sibilants*

pa   प & प   śa   रा & रा

pha   फ & पा   ṣa   ष & ष

ba   व   sa   सा & सा

bha   त & त

ma   म

Sonorants   *Other*

ya   म & म & प & प & ण   ha   रु & रु

ra   र   ḷa   ऌ

la   ल & ल

va   व & व

Figure 38: Distinctive features of Nandinagari (from Grünendahl 2001: 203).

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Additional Graphs

o   *-ṃ (anusvāra)*

ల9   *-n̆ (anunāsika)*

ः & Ꞓ   *-ḥ (visarga)*

ౘ   *avagraha*

◻ & ◻   *virāma, e.g. -ṭ* ರ್ *   -t* ಌ *&* ಌ

◻ & ◻ & ◻   Vedic accents (preceding accented syllables)

ॐ   *oṃ*

Numerals (cf. pp. 138, 180)

∩	೨	೨ & ₹ & ೩ & १	೮	೫ & ೪
1	2	3	4	5

Ɛ & ౬	೨ & ೭	∨ & ∪	౯ & ౯	○
6	7	8	9	0

Figure 39: Distinctive features of Nandinagari (from Grünendahl 2001: 204).

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Conjuncts

kka	𑦲		gga	𑦲	
kca	𑦲		gna	𑦲	
kta	𑦲	𑦲	gya	𑦲	
ktyā	𑦲		gra	𑦲	
ktra	𑦲	𑦲	gla	𑦲	
ktva	𑦲	𑦲			
ktha	𑦲		ghna	𑦲	
kya	𑦲	𑦲			
kra	𑦲		ṅ- *usually appears as* anusvāra		
kla	𑦲	𑦲	ṅmu	𑦲	
kṣa	𑦲	kṣū 𑦲			
kṣma	𑦲		cca	𑦲	
kṣmyā	𑦲		ccha	𑦲 (*cf.* cha)	𑦲
kṣya	𑦲		cchṛ	𑦲 (*also for* cchru)	
			cchva	𑦲	
khya	𑦲		cya	𑦲	

Figure 40: Distinctive features of Nandinagari (from Grünendahl 2001: 205).

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cyu	𑦂		ḍhva	𑦂		
cra	𑦂					
			ṅya	𑦂	𑦂	
jjha	𑦂		ṅva	𑦂		
jña	𑦂					
jñya	𑦂		tka	𑦂	tku	𑦂
jya	𑦂	𑦂	tta	𑦂		𑦂
jyo	𑦂	𑦂	tna	𑦂		
jva	𑦂		tpa	𑦂		𑦂
			tpra	𑦂		
ñ- *is usually appears as* anusvāra			tpha	𑦂		
			tma	𑦂		
ṭya	𑦂		tmya	𑦂		
ṭva	𑦂		tya	𑦂		
			tra	𑦂		
ḍya	𑦂		trya	𑦂		

Figure 41: Distinctive features of Nandinagari (from Grünendahl 2001: 206).

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tva	व,			dhva	ᳬव	ध्व
tsa	र्श	र्श				
tsya	र्श्य			nta	न्त	न्त
tsva	र्श्व			nma	न्म	
				nya	न्य	nyu	न्यु
dga	द्ग			nva	न्व	
dda	द्द	ddu	द्दु	द्दु		
ddha	द्ध	द्ध	द्ध	pta	प्त	
dba	द्ब			pna	प्न	
dbra	द्ब्र			pno	प्नो	प्नो
dma	द्म			pra	प्र	प्र
dya	द्य	dyu	द्यु			
dra	द्र	द्र		bda	ब्द	
dva	द्व			bra	ब्र	
dhya	ᳬय	ध्य		bhya	भ्य	

Figure 42: Distinctive features of Nandinagari (from Grünendahl 2001: 207).

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bhra ले   vya द्या

                                 vra द

mpa अप

mya अण   śca रख

mra अ   śna रञ

                                 śya रण

yya ण   ण   śra स

                                 śrī सी   śrū सु

rda र   śva रख

rma र्म

rya ण   ṣka ष्क   ष्क

rṣa ष   ṣkṛ ष्कृ

rṣe ∧ष   ṣṭa ष्ट

rṣya ष्र   ṣṭra ष्ट्र

                                 ṣṭva ष्व   ष्व

lkya ल्क्या   ṣṭha ष्ठ   ष्ठ

Figure 43: Distinctive features of Nandinagari (from Grünendahl 2001: 208).

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ṣṇa	𑦰		sma	𑦰	𑦰
ṣṇu	𑦰		sya	𑦰	𑦰
ṣṇva	𑦰		sra	𑦰	𑦰
ṣma	𑦰	𑦰	sva	𑦰	𑦰
ṣya	𑦰				
ṣva	𑦰		hna	𑦰	
			hma	𑦰	
ska	𑦰	𑦰	hya	𑦰	
sta	𑦰	𑦰	hla	𑦰	
stra	𑦰	𑦰	hva	𑦰	
stha	𑦰	𑦰	𑦰		

Figure 44: Distinctive features of Nandinagari (from Grünendahl 2001: 209).

Figure 45: A chart showing letters of Nandinagari (from Mukhopadhyaya 2005).

ISO/IEC JTC 1/SC 2/WG 2
PROPOSAL SUMMARY FORM TO ACCOMPANY SUBMISSIONS
FOR ADDITIONS TO THE REPERTOIRE OF ISO/IEC 10646[1]
Please fill all the sections A, B and C below.
Please read Principles and Procedures Document (P & P) from http://std.dkuug.dk/JTC1/SC2/WG2/docs/principles.html **for guidelines and details before filling this form.**
Please ensure you are using the latest Form from http://std.dkuug.dk/JTC1/SC2/WG2/docs/summaryform.html**.**
See also http://std.dkuug.dk/JTC1/SC2/WG2/docs/roadmaps.html **for latest *Roadmaps*.**

A. Administrative

1. **Title:**   *Final proposal to encode Nandinagari in Unicode*
2. Requester's name: *Anshuman Pandey <pandey @umich.edu>*
3. Requester type (Member body/Liaison/Individual contribution):   *Expert contribution*
4. Submission date: *2017-05-05*
5. Requester's reference (if applicable):
6. Choose one of the following:
    This is a complete proposal: *Yes*
    (or) More information will be provided later:

B. Technical – General

1. Choose one of the following:
    a. This proposal is for a new script (set of characters):   *Yes*
       Proposed name of script: *Nandinagari*
    b. The proposal is for addition of character(s) to an existing block:
       Name of the existing block:
2. Number of characters in proposal: *64*
3. Proposed category (select one from below - see section 2.2 of P&P document):
    A-Contemporary   B.1-Specialized (small collection)   B.2-Specialized (large collection)
    C-Major extinct   *X*   D-Attested extinct   E-Minor extinct
    F-Archaic Hieroglyphic or Ideographic   G-Obscure or questionable usage symbols
4. Is a repertoire including character names provided?   *Yes*
    a. If YES, are the names in accordance with the "character naming guidelines"
       in Annex L of P&P document?   *Yes*
    b. Are the character shapes attached in a legible form suitable for review?   *Yes*
5. Fonts related:
    a. Who will provide the appropriate computerized font to the Project Editor of 10646 for publishing the standard?
                                 Anshuman Pandey
    b. Identify the party granting a license for use of the font by the editors (include address, e-mail, ftp-site, etc.):
                                 Anshuman Pandey
6. References:
    a. Are references (to other character sets, dictionaries, descriptive texts etc.) provided?   *Yes*
    b. Are published examples of use (such as samples from newspapers, magazines, or other sources) of proposed characters attached?   *Yes*
7. Special encoding issues:
    Does the proposal address other aspects of character data processing (if applicable) such as input, presentation, sorting, searching, indexing, transliteration etc. (if yes please enclose information)?   *Yes*

8. Additional Information:

Submitters are invited to provide any additional information about Properties of the proposed Character(s) or Script that will assist in correct understanding of and correct linguistic processing of the proposed character(s) or script. Examples of such properties are: Casing information, Numeric information, Currency information, Display behaviour information such as line breaks, widths etc., Combining behaviour, Spacing behaviour, Directional behaviour, Default Collation behaviour, relevance in Mark Up contexts, Compatibility equivalence and other Unicode normalization related information. See the Unicode standard at http://www.unicode.org for such information on other scripts. Also see Unicode Character Database (http://www.unicode.org/reports/tr44/) and associated Unicode Technical Reports for information needed for consideration by the Unicode Technical Committee for inclusion in the Unicode Standard.

C. Technical - Justification

1. Has this proposal for addition of character(s) been submitted before? *Yes*
   If YES explain *L2/13-002, L2/16-002, L2/16-310*

2. Has contact been made to members of the user community (for example: National Body,
   user groups of the script or characters, other experts, etc.)? *Yes*
   If YES, with whom? *Jean-Luc Chevillard <jean-luc.chevillard@univ-paris-diderot.fr>*
   Srinidhi A. <srinidhi.pinkpetals24@gmail.com>
   If YES, available relevant documents:

3. Information on the user community for the proposed characters (for example:
   size, demographics, information technology use, or publishing use) is included? *Yes*
   Reference: *See section 2 of proposal*

4. The context of use for the proposed characters (type of use; common or rare) *Common*
   Reference: *See section 2 of proposal*

5. Are the proposed characters in current use by the user community? *Yes;*
   If YES, where? Reference: *Currently used by scholars of India; see section 2 of proposal*

6. After giving due considerations to the principles in the P&P document must the proposed characters be entirely
   in the BMP? *N/A*
   If YES, is a rationale provided?
   If YES, reference:

7. Should the proposed characters be kept together in a contiguous range (rather than being scattered)? *Yes*

8. Can any of the proposed characters be considered a presentation form of an existing
   character or character sequence? *No*
   If YES, is a rationale for its inclusion provided?
   If YES, reference:

9. Can any of the proposed characters be encoded using a composed character sequence of either
   existing characters or other proposed characters? *No*
   If YES, is a rationale for its inclusion provided?
   If YES, reference:

10. Can any of the proposed character(s) be considered to be similar (in appearance or function)
    to, or could be confused with, an existing character? *No*
    If YES, is a rationale for its inclusion provided?
    If YES, reference:

11. Does the proposal include use of combining characters and/or use of composite sequences? *Yes*
    If YES, is a rationale for such use provided? *Yes*
    If YES, reference: *Combining signs*
    Is a list of composite sequences and their corresponding glyph images (graphic symbols) provided? *N/A*
    If YES, reference:

12. Does the proposal contain characters with any special properties such as
    control function or similar semantics? *Yes*
    If YES, describe in detail (include attachment if necessary) *Virama*

13. Does the proposal contain any Ideographic compatibility characters? *No*
    If YES, are the equivalent corresponding unified ideographic characters identified?
    If YES, reference: