

AN ARTIFICIAL KEY TO THE GRASSES OF ERAVIKULAM NATIONAL PARK  
(KERALA, INDIA), BASED ON VEGETATIVE CHARACTERISTICS

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ABSTRACT

A key is presented for the grasses of Eravikulam National Park, Kerala, India. The key is designed for use by non-botanists. Only a 10X eyepiece and a scale are needed to identify the grasses.

INTRODUCTION

The purpose of this key is to provide a means by which non-botanists can identify grasses from Eravikulam National Park, Kerala, India. The advantages of this key over more traditional keys based on floral characteristics are as follows:

1. All characteristics utilized in the key can be distinguished by the naked eye or with the aid of a 10X eyepiece, making it possible to make the identifications in the field without the aid of more sophisticated optical equipment. The only other equipment required is a millimeter and centimeter scale.

2. Grass specimens can be collected at any time of the year, whether the species is flowering or not.

3. All terms used in the key are defined or illustrated, making it possible for a wildlife manager, zoologist, ecologist, or complete novice to correctly identify any grass.

This key was derived from characteristics recorded from grasses collected from Eravikulam National Park. Rice compiled the original key, which was then tested by Edblom and appropriate revisions were made. Specimens of the included grasses are on deposit at both Kew Botanic Gardens and the Kerala Forest Research Institute.

DESCRIPTION OF GRASS CHARACTERISTICS

The terms used in this key are described below. Most of the terminology follows that of Harrington 1957, 1977, and Achariyar and Mudaliyar 1921.

The Grass Plant: Fig. 1a illustrates a grass plant. The **culm** refers to the main central stem. **Joints** or **nodes** occur along the stem. **Proximal** refers to the portion of the structure closest to the stem, whereas **distal** refers to the part most distant from it. The **angle of exit** refers to the angle between the proximal section of the blade and the stem. Parts of the plant which are old, ageing, or dying are termed **senescent**.

The bases of the leaves are arranged in either of two ways. **Conduplicate** leaves are folded along their mid-lines, with the result that the base of the grass plant is compressed or flattened along the axis of the stem. **Convolute** leaves wrap around the stem, and the base of the plant is round.

Grass plants are either **annual** or **perennial**. Annual grasses grow for one year, and survive from year to year only by reseeding. Perennial grass plants grow for two or more years. Perennial grasses may be distinguished from annuals by any of the following:

- (1) Woody plants are always perennials.
- (2) Plants with tubers, bulbs, corms, or rhizomes are perennials.
- (3) Living plants with dead remains of last year's growth are perennials.

The leaf: Together, the **sheath** and **blade** comprise the grass leaf. The sheath wraps around the stem, and changes from overlapping or closed to open just below where the blade starts. The distance below the start of the blade to where the sheath becomes overlapping or closed is a characteristic used in this key. On the blade, the **top** or **upper surface** refers to the side of the blade facing upwards as the blade leaves the stem (equals adaxial surface). The **lower** or **bottom** surface of the blade is that opposite the top (equals abaxial surface). The **margin** or lateral edge of the blade may be **serrate** or **barbed**, that is with sharp teeth, or **entire**, meaning without serrations. Sometimes the blade has a **hyaline** (thin and translucent) margin. The surfaces or margins of the leaf may have **hairs**, and these hairs may arise from small bumps or pimple-like structures called **tubercles**. A **glabrous** surface is one without hairs.

At the juncture of the sheath and blade there is a light colored band of tissue known as the **collar**. The **ligule** is a projection of hairs or membranous tissue on the inside at the most distal point on the sheath. The collar and ligule are shown in Fig. 1b. A ligule which wraps around the stem is termed **clasping**.

The blades of all grasses in this key are either **lanceolate**, **lanceolate-linear**, or **linear**. These shapes are illustrated in Fig. 2. The distal "constriction" seen in many blades of

Eragrostis nigra is also shown in Fig. 2. Grass leaves have numerous longitudinal parallel **veins**. The median vein is often more conspicuous and prominent than the others, in which case it is termed a **median rib**. Sometimes the median rib forms a long ridge or **keel** along the bottom surface of the blade or on the outside of the sheath. A **cross-section** refers to the shape a blade would have if it were cut across its width, with the cut viewed end-on. Cross-sections 1 cm distal from the collar vary from **flat**, to being in the shape of a "U" or a "V", or a **winged rib**. A winged rib consists of a prominent median rib with much reduced blade surfaces on either side. A winged rib is illustrated in Fig. 1c.

The Inflorescence. The inflorescence is the flowering part of the plant. In this key characteristics of the inflorescence are provided occasionally as additional characteristics to aid in confirming an identification. The inflorescences of grasses consist of numerous **spiklets**, which in turn are made up of **florets**. Some grasses have bristle-like **awns** arising from the florets.

When using these characteristics, bear the following in mind:

Serrations may be very minute, are often more fully developed near the distal end of the blade, and may be more fully developed or apparent on one margin than on the other. Unless stated otherwise, the presence or absence of serrations was determined on the margins at the blade's midpoint.

Sometimes a blade will have a few hairs within a few centimeters of the collar, or very few hairs scattered elsewhere on the blade. Such blades should be considered glabrous.

Ligules with jagged tips should not be mistaken for ligules tipped with hairs.

The sheath below the collar often opens more widely as the plant matures. Never consider senescent leaves when determining the distance from the collar at which the sheath overlaps or closes.

Dimensions are given for large, mature blades on non-flowering stems. Remember that the examination of more than one specimen will lessen the likelihood of keying an individual with exceptional characteristics.

#### HOW TO USE THE KEY

If need be, the reader should first become familiar with the terms and definitions in the preceeding section. The text of the key should then be read, comparing the characteristics of the grass with the description given. Choose the line (a or b) with the description which matches the grass (use the 10X eyepiece!), and proceed to the next indented line. Continue in this manner until there are no further choices, and a dotted line leads to a

number at the right margin. For example, a grass with a ligule which is a membrane, entire blade margins, tubercle based hairs, and a ligule tipped with hairs would lead one through the following sequence: 1b--ligule present, 8a--ligule a membrane, 9a--blade margin entire, 10a--blade margins with tubercle based hairs, 11a--ligule tipped with hairs, which leads to grass number 6.

The next step is to find the resulting number in the section on species characteristics. This section gives a number of characteristics of each grass species, along with its name. Identification should not be considered complete until the characteristics listed are checked against those of the grass being identified. If the characteristics accurately describe the grass keyed as No. 6, one would conclude that the grass is Arundinella mesophylla.

If the listed characteristics do not match that of the unknown grass, it is necessary to start over with the key, making sure that each step to the final grass number has been made correctly.

Several grass numbers occur more than once in the key, as it was our judgment that the reader might reasonably key that species in more than one way. In addition, we strove to avoid continuous variables (e.g. length and width), but we did include them when they were very different, or in combination with other characteristics.

#### KEY TO THE GRASSES OF ERAVIKULAM NATIONAL PARK

- 1a Ligule absent
  - 2a Blade margins entire
    - 3a Blade width 15 mm or more.....No.1
    - 3b Blade width 6 mm or less
      - 4a Blades linear, less than 2 mm wide, about 25-30 cm long .....No.2
      - 4b Blades lanceolate-linear, 3-6 mm wide, about 5-14 cm long .....No.3
  - 2b Blade margins serrate or barbed (if even minutely)
    - 5a Blades 1.5-5 cm long, lanceolate .....No.4
    - 5b Blades 5 cm or longer, linear or lanceolate-linear
      - 6a Leaves convolute, shoots circular at base .....No.1
      - 6b Leaves conduplicate, shoots compressed at base
        - 7a Blades linear, 20-50 cm long .....No.5
        - 7b Blades lanceolate-linear, 5-14 cm long .....No.3
- 1b Ligule present as a membrane or ring of hairs
  - 8a Ligule a membrane
    - 9a Blade margin entire (not serrate or barbed)
      - 10a Blade margins with tubercle based hairs
        - 11a Ligule is a membrane tipped with hairs .....No.6

- 11b Ligule is a membrane not tipped with hairs
  - 12a Blade length 30-45 cm, lower surface densely haired .....No.7
  - 12b Blade length 5-15 cm, lower surface haired
    - 13a A perennial, blades 7-14 mm wide, 8-15 cm long .....No.8
    - 13b An annual, blades 5-8 mm wide, 5-10 cm long .No.9
- 10b Blade margins without tubercle based hairs
  - 14a Blade tightly folded concealing upper surface when fresh .....No.10
  - 14b Blade not tightly folded
    - 15a Upper surface of blade glabrous
      - 16a Sheath overlapping or closing less than 1 cm below collar
        - 17a Ligule clasping stem
          - 18a Blade margins with a thin hyaline membranous edge .....No.11
          - 18b Blade margins without a thin hyaline membranous edge
            - 19a Median rib prominent with light keel ..No.12
            - 19b Median rib present, indistinct .....No.13
        - 17b Ligule not clasping stem
          - 20a Median rib absent, annual .....No.14
          - 20b Median rib present, perennial
            - 21a Median rib keeled, ligule 2mm long ....No.11
            - 21b Median rib without keel, ligule minute .....No.3
      - 16b Sheath open 1 cm or more below collar
        - 22a Ligule minute, blade lower surface sparsely haired .....No.3
        - 22b Ligule 2 mm long, blade lower surface glabrous
          - 23a Median rib prominent and keeled .....No.11
          - 23b Median rib inconspicuous .....No.15
  - 15b Upper surface of blade haired
    - 24a Median rib absent .....No.16
    - 24b Median rib present
      - 25a Median rib present, but not prominent
        - 26a Blade lower surface furry, blades up to 60 cm high .....No.7
        - 26b Blade lower surface sparsely haired, up to 15 cm high .....No.3
      - 25b Median rib conspicuous, usually keeled
        - 27a Plants covered with dense rust colored hairs at very base .....No.17
        - 27b Plants not covered with dense rust colored hairs at very base
          - 28a Upper surface of blade sparsely haired, blade length 5-11 cm, ligule 3-4 mm long .....No.18

- 28b Upper surface of blade hairy. Blade length 25 to 65 cm, ligule 0-2 mm
- 29a Hairs on blade surfaces tubercle based .....No.19
- 29b Hairs on blade surfaces not tubercle based .....No.1
- 9b Blade margins serrate, barbed (even minutely)
- 30a Blade margins with hairs arising from tubercles
- 31a Leaves convolute, plants circular at base
- 32a Blade lower surface sparsely haired or glabrous, blades 8-15 cm long, hairs 1 mm .....No.8
- 32b Blade lower surface densely haired (furry), blades 30-45 cm long, hairs 2-6 mm on blades and margins .....No.7
- 31b Leaves conduplicate, plants compressed at base
- 33a Lower surface of blade haired .....No.20
- 33b Lower surface of blade glabrous .....No.21
- 30b Blade margins without hairs arising from tubercles
- 34a Blade cross section 1 cm from collar a winged rib
- 35a Lower surface of blade glabrous
- 36a Blade length 10-17 cm, blade width 4-6 mm ...No.22
- 36b Blade length 75-105 cm, blade width 7-14 mm .No.23
- 35b Lower surface of blade hairy
- 37a Upper blade surface glabrous .....No.24
- 37b Upper blade surface haired
- 38a Upper blade surface sparsely haired, blade length 5-11 cm, ligule 3-4 mm .....No.18
- 38b Upper blade surface hairy, blade length 35-65 cm, ligule 0-2 mm
- 39a Hairs on blade surfaces tubercle based ..No.19
- 39b Hairs on blade surfaces not tubercle based .....No.1
- 34b Blade cross section 1 cm from collar a "V", "U", or flat
- 40a Ligule membrane tipped with small hairs
- 41a Lower surface of blade glabrous
- 42a Blades 10-13 cm long, 4-7 mm wide, purplish-brown in senescence, lower surface not shiny .....No.21
- 42b Blades 10-45 cm long, 5-19 mm wide, not purplish-brown in senescence, lower surface shiny
- 43a Upper surface of collar glabrous, blade width 8-19 mm .....No.25
- 43b Upper surface of collar haired, blade width 5-9 mm .....No.26
- 41b Lower surface of blade haired
- 44a Lower surface of blade sparsely haired, width 2-3 mm .....No.20
- 44b Lower surface of blade densely haired, width 5-7 mm .....No.7

- 40b Ligule membrane not tipped with small hairs
  - 45a Upper surface of blade haired or sparsely haired
    - 46a Lower surface of blade haired
      - 47a Hairs on upper surface of blade tubercle based .....No.27
      - 47b Hairs on upper surface of blade not tubercle based
        - 48a Blade length 3-5 cm, annual .....No.28
        - 48b Blade length 5-14 cm, perennial .....No.3
    - 46b Lower surface of blade glabrous or nearly so
      - 49a Blades 7-10 cm long, ligule 2 mm long ...No.12
      - 49b Blades 18-50 cm long, ligule minute
        - 50a Median rib prominent above and below, barbed on distinct keel .....No.5
        - 50b Median rib inconspicuous above, keeled at collar, not barbed .....No.26
  - 45b Upper surface of blade glabrous
    - 51a Blades lanceolate, 1-3 cm long .....No.14
    - 51b Blades linear or lanceolate-linear, 5-35 cm long
      - 52a Single indentation on blade as if previously constricted (see Fig. 2) .....No.26
      - 52b Blade without indentation
        - 53a Median rib not keeled
          - 54a Ligule minute .....No.3
          - 54b Ligule 2-3 mm .....No.13
        - 53b Median rib keeled
          - 55a Blade lower surface with hairs increasing distally .....No.29
          - 55b Blade lower surface glabrous
            - 56a Blades linear, 7-10 cm long .....No.30
            - 56b Blades lanceolate or lanceolate-linear, 30-35 cm long .....No.11
- 8b Ligule a ring of hairs
  - 57a Blade margins entire and hairless
    - 58a Plants covered with dense rust colored hairs at very base .....No.17
    - 58b Plants not covered with dense rust colored hairs at very base
      - 59a Blades 5-11 cm long, leaves conduplicate .....No.31
      - 59b Blades 2-3 cm long, leaves convolute .....No.32
  - 57b Blade margins haired or serrate or barbed
    - 60a Blade margins hairless or with tubercle based hairs
      - 61a Blade length 0.5-4 cm
        - 62a Blade width 4-9 mm .....No.33
        - 62b Blade width 1.5-3 mm
          - 63a Blade lower surface sparsely very finely haired .....No.34
          - 63b Blade lower surface glabrous

- 64a Terrestrial, blade margins serrate .....No.35
- 64b Aquatic, growing submerged in ponds or streams, blade margins usually entire .....No.32
- 61b Blade length at least 5 cm
  - 65a Sheath (outside) without tubercle based hairs
    - 66a Upper surface of blade haired
      - 67a Leaves conduplicate .....No.5
      - 67b Leaves convolute
        - 68a Blade length 5-10 cm, upper surfaces often beet purple .....No.36
        - 68b Blade length 15-45 cm, upper surfaces not beet purple
          - 69a Blade width 5-9 mm. Single indentation on blade as if previously constricted (see Fig. 2) .....No.26
          - 69b Blade width 9-21 mm. without indentation on blade .....No.37
    - 66b Upper surface of blade glabrous
      - 70a Lower surface of blade with hairs increasing distally .....No.29
      - 70b Lower surface of blade glabrous
        - 71a Leaves convolute, plants circular at base .....No.26
        - 71b Leaves conduplicate, plants compressed at base .....No.31
  - 65b Sheath (outside) with tubercle based hairs
    - 72a Blade length 5-10 cm, width 3-4 mm, margins turn dark reddish-brown when approaching senescence .....No.6
    - 72b Blade length 30-45 cm, width 5-7 mm, margins do not turn dark reddish-brown when approaching senescence .....No.7
- 60b Blade margins with hairs, not tubercle based
  - 73a Blade lower surface glabrous
    - 74a Blade length 20-50 cm, width 2-4 mm .....No.5
    - 74b Blade length 10-14 cm, width 12-20 mm .....No.38
  - 73b Blade lower surface haired
    - 75a Sheath overlapping or closing in less than 1 cm, blades 1.5-5 cm long .....No.4
    - 75b Sheath open more than 1 cm, blades 30-45 cm long .....No.7

#### SPECIES CHARACTERISTICS

Characteristics for each species in the key are given below. The abbreviation a.k. means "also keyed" and refers to alternate ways of arriving at the particular species from the key.

#### No.1 Garnotia exaristata Gould

Blade characteristics: Blades lanceolate-linear, 25 to 35 cm long, 16-21 mm wide. Margins very minutely serrate (a.k.

entire). Blade top surface is finely haired. Bottom surface is glabrous near base, haired near tip. Median rib is prominent and keeled. Blade exit 25 deg.

Additional characteristics: Perennial to 75 cm high with flowering stem to 130 cm. Ligule absent (a.k. membrane) but 2 lateral tufts of hair present. Sheath is open for several cm. Leaves convolute.

No.2 Tripogon ananthaswamianus Sreekumar et al.

Blade characteristics: Blades linear, 25-30 cm long, less than 2 mm wide. Blade margins smooth and entire. Blade top surface very finely haired (seen only with 10x). Median rib with 2 lateral and 2 sub-marginal veins (1 on each side).

Additional characteristics: Perennial to 25 cm high, with drooping flowering stems to 50 cm. No ligule. Sheath is glabrous, compressed, variable in opening. Blade exit 40 deg or less.

No.3 Eragrostis unioloides (Retz.) Nees ex Steudel

Blade characteristics: Blades lanceolate-linear, 5-14 cm long, 3-6 mm wide. Margins entire or serrate (midpoint to tip), hairless. Blade top surface is glabrous or sparsely haired (ca 2 mm long). Bottom surface very sparsely haired. Median rib without a keel, absent distally and indistinct above. Blade exit 30 deg.

Additional characteristics: Perennial to 15 cm high with flowering stems to 23 cm. Ligule absent or a minute membrane. Sheath closure variable. Leaves conduplicate.

No.4 Garnotia courtallensis (Arn. & Nees) Thwaites

Blade characteristics: Blades lanceolate, 1.5-5 cm long, 2-5 mm wide. Margins serrate (midpoint). Blade top and bottom surfaces with a few long silky hairs. Young blades are glabrous. Median rib prominent. Blade exit 45 deg.

Additional characteristics: Perennial to 12 cm high, flowering stem to 50 cm. Ligule a ring of hairs (a.k. absent), 2 thin hyaline internal tissue projections present. Sheath overlapping or closing is less than 1 cm, and ribbed. Nodes at base hairy.

No.5 Chrysopogon zeylanicus (Nees) Thwaites

Blade characteristics: Blades linear, 20-50 cm long, 2-4 mm wide, minutely barbed or serrate. Blade surface top sparsely, minutely haired, blade bottom glabrous. Median rib prominent, keeled, and barbed, with 4-5 lateral veins.

Additional characteristics: Perennial 50-70 cm high with flowering stems to 80 cm. Ligule a ring of hairs (a.k. absent, a minute membrane). Margins moderately hairy. Blades exit at 30 deg, either straight or drooping. Sheath open for more than 1 cm, compressed, keeled, and with a row

of keel hairs. Usually in conspicuous clumps, leaves conduplicate.

No.6 Arundinella mesophylla Nees ex Steudel

Blade characteristics: Blade lanceolate, 5-10 cm long, 3-4 mm wide. Margins entire with some tubercles at base of hairs. Blade top and bottom surfaces are moderately hairy with hairs arising from tubercles. Median rib is faint, evident only on the proximal half of the blade.

Additional characteristics: Perennial 20-25 cm high, flowering stems 40-45 cm. Ligule is a very short membrane tipped with short hairs (<2 mm, a.k. a ring of hairs). Sheath overlaps or closes in ca 1 cm. Margins turn dark reddish-brown before senescence.

No.7 Arundinella vaginata Bor

Blade characteristics: Blades lanceolate-linear, 30-45 cm long, 5-7 mm wide. Margins are densely hairy, tubercles more readily visible on less densely haired senescent blades (up to 6 mm long, a.k. without tubercle based hairs). Margins very minutely serrate (a.k. entire). Blade top surface is haired, 2-3 mm long. Bottom surface is densely haired or furry. Median rib is present but inconspicuous. Blade exit 20 deg.

Additional characteristics: Perennial to 60 cm high, with flowering stems to 100 cm. Ligule is a row of hairs, 2 mm, above a 0.5 mm membrane. Sheath is open 1 cm or more. Leaf sheath very hairy (tubercle based). Grass is furry and light green in appearance.

No.8 Arundinella purpurea Hochst. ex Steudel

Blade characteristics: Blades lanceolate-linear, 8-15 cm long, 7-14 mm wide. Margins with regularly spaced tubercle-based hairs, pointing distally. Margins are entire centrally, minutely serrate distally. Blade top and bottom surfaces are sparsely haired (hairs with tubercles at base), or glabrous. Median rib is present and keeled. Blade exit 20-30 deg.

Additional characteristics: Perennial to ca 30 cm high, with flowering stems 35-50 cm high. Ligule is level (even lengthed) membrane. Sheath overlaps or closes in less than 1 cm except in senescence. Leaves convolute.

No.9 Arundinella ciliata (Roxb.) Nees ex Miq.

Blade characteristics: Blades lanceolate, 5-10 cm long, up to 5-8 mm wide. Margins entire with numerous hairs arising from tubercles. Blade top and bottom surfaces also have numerous hairs arising from tubercles. Median rib is present. Blade exit 20 deg.

Additional characteristics: Annual about 10 cm high, but up to 25 cm, with flowering stems 25-50 cm high. Ligule is a membrane. Sheath closure variable.

No.10 Aira elegantissima Schur.

Blade characteristics: Blades lanceolate-linear. Two forms:

Blade length	(a) 4-8 mm	(b) 15-25 cm
Blade width	(a) 1 mm folded	(b) to 6 mm
Margins	(a) entire	(b) entire
Top surface	(a) hidden	(b) glabrous
Bottom surface	(a) glabrous	(b) glabrous
Median rib	(a) absent	(b) absent
Blade exit	(a) 5 deg	(b) 0 deg

Additional characteristics: Annual to 10 cm high with flowering stems 15-22 cm high. Ligule is a thin hyaline membrane (4 mm). Sheath open for more than 1 cm. Two types of blades: (a) thin inrolled (folded), and (b) broad, enclosing inflorescence and extending past it. Leaves conduplicate.

No.11 Bothriochloa sp. x Dichanthium sp. (Bothriochloa foulkesii (Hook. f.) Henrard)

Blade characteristics: Blades lanceolate or lanceolate-linear, 30-35 cm long, 4-7 mm wide. Margins entire or serrate, with a hyaline membranous edge. Blade top and bottom surfaces are glabrous. Median rib is present and keeled. Blade exit 10-30 deg.

Additional characteristics: Perennial to 45 cm high with flowering stems to 95 cm. Ligule is a clasping (a.k. not clasping) hyaline membrane, ca 2 mm, with a few hairs. Sheath overlapping or closing within 1 cm (a.k. open). Stem nodes are glabrous.

No.12 Digitaria wallichiana (Wight & Arn.) Stapf

Blade characteristics: Blades lanceolate-linear, 7-10 cm long, 3-5 mm wide. Margins serrate (midpoint, a.k. entire). Blade top and bottom surfaces are glabrous or with a few hairs near margin. Median rib is prominent and lightly keeled. Blade exit 20 deg.

Additional characteristics: Perennial with trailing runners. Ligule is a membrane (2 mm), clasping the stem. Sheath overlapping or closed within 1 cm.

No.13 Agrostis peninsularis Hook. f.

Blade characteristics: Blades linear, 10-20 cm long, 2-3 mm wide. Margins very finely serrate and can only be felt and seen with difficulty at the midpoint and tip (10x, a.k. entire). Blade top and bottom surfaces are glabrous. Bottom surface has small hairs, pointing forward, and difficult to see. Median rib is present but difficult to distinguish from others (about 14, both sides).

Additional characteristics: Perennial 25-40 cm high with flowering stems 40-70 cm. Ligule is a prominent clasping membrane (2-3 mm), glabrous throughout. Sheath usually closes within 1 cm, but some are open for 2-3 cm. Sheath is glabrous. Leaves convolute.

No.14 Jansenella griffithiana (C. Muell.) Bor

Blade characteristics: Blades lanceolate, 1-3 cm long, 2-3 mm wide. Margins with a few hairs at base of blade and serrate (midpoint, a.k. entire). Blade top and bottom surfaces are glabrous. Median rib absent.

Additional characteristics: Annual to 15 cm high with flowering stems to 25 cm. Ligule is a membrane. Sheath overlapping or closing within 1 cm.

No.15 Helictotrichon asperum (Munro ex Thw.) Bor

Blade characteristics: Blades lanceolate-linear, 25-35 cm long, 3-5 mm wide. Blade top and bottom surfaces are glabrous. Margins are smooth and entire. Median rib is indistinct below. Blade exit variable.

Additional characteristics: Perennial to 65 cm high with flowering stems to 120 cm. Ligule is a membrane (2 mm). Sheath is haired and open more than 1 cm.

No.16 Tripogon bromoides Roemer & Schultes

Blade Characteristics: Blades linear, 10-20 cm long, 2-3 mm wide. Blade margins hairy and minute serrations are often visible at tip (but not at midpoint). Blade top surface densely hairy (ca 2 mm long), bottom surface with few fine hairs. Median rib absent, about 2 dozen veins.

Additional characteristics: Perennial 10-15 cm high with flowering stem ca 20 cm (drooping). Blade exit about 60 deg. Sheath overlaps or closes in 2 mm and is hairy. Ligule is a fine membrane, tipped with hairs, laterally hairs sometimes appearing as pointed tufts. Leaves convolute.

No.17 Eulalia phaeothrix (Hackel) Kuntze

Blade characteristics: Blades lanceolate-linear, 10 to 25 cm long, 4 to 8 mm wide. Blade margins entire and smooth, somewhat inrolled, and serrate near distal end. Blade top surface usually hairy (ca 4 mm), hairs erect, sometimes sparsely haired or glabrous. Bottom surface usually hairy (ca 2 mm), often leaves from flowering stalks have few or no hairs. Median rib present, sometimes lightly keeled. Blade exit 20-30 deg.

Additional characteristics: Perennial to 25 cm high, flowering stems 40-55 cm. Ligule a membrane with 2 lateral "horns" of hair (a.k. ring of hairs). Sheath glabrous or hairy, closing or overlapping in 3 mm. Joints on flowering stems

glabrous, sometimes bent at 10-15 deg. Base of plants with dense rust-colored hairs.

No.18 Ischaemum hirtum Hackel

Blade characteristics: Blades lanceolate-linear, 5-11 cm long (rarely 18 cm), 7-12 mm wide. Margins vary: some haired, some serrate (a.k. entire), serrations often end abruptly about midpoint. Blade top surface has a few hairs, tubercle based. Bottom surface is hairy. Median rib is evident, keeled. Blade exit variable.

Additional characteristics: Perennial, 10-15 cm high with flowering stems to 40 cm. Ligule is a prominent membrane, clasping 3-4 mm (rarely 5 mm). Sheath is open for more than 1 cm. Often one side of blade is serrate, the other haired. Many blades with a constriction at the base, leaving the median rib to form a 1-2 cm "petiole".

No.19 Andropogon polyptichus Steudel var. polypitchus

Blade characteristics: Blades lanceolate-linear, 35-45 cm long, 7-9 mm wide. Margins entire, smooth, or serrate. Blade top surface is hairy, lightly furred, tubercle based. Bottom surface is also hairy, especially along median rib and near margins. Median rib is keeled, conspicuous below. Blade exit 20 deg.

Additional characteristics: Perennial to 70 cm high with flowering stems to 110 cm. Ligule a membrane, 1-2 mm, surrounded by dense hairs. Sheath overlapping or closing before 1 cm. Stem nodes with rings of dense hairs, blades widest at about 2/3 length.

No.20 Themeda triandra Forsskal

Blade characteristics: Blades linear, 30-35 cm long, 2-3 mm wide. Margins minutely serrate, some with sparse 3-5 mm hairs arising from tubercles (a.k. without hairs arising from tubercles). Blade top and bottom surfaces sparsely haired. Median rib lightly keeled with 4 lateral veins. Blade exit 20 deg or less.

Additional characteristics: Perennial 20-50 cm high with flowering stems to 65 cm. Ligule is a membrane tipped with small hairs. Sheath is open for 3 cm or more. Leaves conduplicate.

No.21 Themeda tremula (Nees ex Steudel) Hackel

Blade characteristics: Blades lanceolate-linear, 10-13 cm long, 4-7 mm wide. Margins finely serrate (midpoint and end), with or without a few tubercle based hairs (3-7 mm long, nearly perpendicular to surface, more numerous proximally). Blade top and bottom surfaces are glabrous. Median rib is evident. Blade exit 30 deg. Purplish brown in senescence.

Additional characteristics: Perennial. Ligule is a hyaline membrane, 1 mm, tipped with short hairs. Sheath is

overlapping or closing in less than 1 cm. Stem with numerous joints. This species found trailing or "leaning" on other grasses. Leaves conduplicate.

No.22 Andropogon lividus Thwaites

Blade characteristics: Blades lanceolate-linear, 10-17 cm long, 4-6 mm wide. Margins serrate (midpoint and tip). Blade top and bottom surfaces are glabrous. Median rib evident in a slight keel. Blade exit 20 deg.

Additional characteristics: Perennial up to 30 cm high with flowering stems to 45 cm. Ligule a prominent membrane, clasping stem 3-4 mm. Sheath opening variable, usually closing within 1 cm. Purplish tinge to leaves and inflorescence.

No.23 Cymbopogon flexuosus (Nees ex Steudel) Watson

Blade characteristics: Blades lanceolate-linear, 75-105 cm long, 7-14 mm wide. Margins serrate. Blade top and bottom surfaces are glabrous. Median rib is prominent and keeled. Blade exit 20 deg.

Additional characteristics: Perennial to 100 cm high with flowering stems to 200 cm. Ligule is a membrane, 2-7 mm. Sheath is open for more than 1 cm. A large grass. Leaves conduplicate.

No.24 Andropogon polyptichus var. deccanensis Bor

Blade characteristics: Blades lanceolate-linear, 25-40 cm long, 2-3 mm wide. Margins serrate (midpoint and tip). Blade top surface is glabrous. Bottom surface with many fine hairs pointing distally. Median rib is prominent, keeled. Blade exit 30 deg.

Additional characteristics: Perennial to 30 cm high. Ligule is a membrane surrounded by hairs. Sheath is open for more than 1 cm. Distinctive in having blades with an inverted "w" cross section distally, margins inrolled on bottom.

No.25 Anthoxanthum horsefieldii (Bennett) Reeder

Blade characteristics: Blades lanceolate-linear, 10-30 cm long, 8-19 mm wide. Margins haired or glabrous with minute serrations. Margins are sometimes wavy and inrolled. Blade top surface is very sparsely haired or glabrous. Bottom surface is glabrous and shiny. Median rib is present but hard to distinguish from 24 or so other veins on top surface. Median rib is keeled on bottom. Blade exit 20-30 deg.

Additional characteristics: Perennial 60 cm high with flowering stalks to 80 cm. Ligule is a membrane tipped with very small hairs. Sheath varies--closing in 0-3 cm. A conspicuous light yellow-green color in fall. Leaves convolute.

No.26 Eragrostis nigra Nees ex Steudel

Blade characteristics: Blades lanceolate-linear, 18-43 cm long, 5-9 mm wide. Margins serrate (midpoint and distal end), hairless. Blade top surface is glabrous or with scattered hairs, ca. 3 mm in length (more numerous near collar and margins). Bottom surface is glabrous and shiny. Median rib is keeled at the collar to almost inconspicuous at blade tip, indistinct on upper surface.

Additional characteristics: Perennial to 20 cm high with flowering stems to 35 cm. Ligule is a minute hairlike membrane below a thin ring of 3-4 mm hairs (clasping, a.k. membrane tipped with hairs, ring of hairs). Sheath closure is variable. A single indentation occurs, usually in the upper half of the blade, as if previously constricted (Fig 2). Leaves convolute.

No.27 Ischaemum indicum (Houtt.) Merrill

Blade characteristics: Blades lanceolate-linear, 5-15 cm long, 8-12 mm wide. Blade margins serrate. Blade top surface has numerous, erect (2-3 mm) hairs, tubercle based. Bottom surface also hairy. Median rib present and keeled (not heavy). Blade exit 20-30 deg.

Additional characteristics: Perennial to 25 cm high, flowering stems 30-50 cm. Ligule a membrane (2 mm). Sheath is compressed and keeled, glabrous or somewhat hairy near distal end, and open 2-3 cm. Nodes are bearded.

No.28 Dichanthium oliganthum (Hochst. ex Steudel) Cope

Blade characteristics: Blades lanceolate-linear, 3-5 cm long, 2-4 mm wide. Margins finely serrate. Blade top and bottom surfaces are haired. Median rib is evident below, inconspicuous from above. Blade exit 20 deg.

Additional characteristics: Annual to 30 cm high with flowering stems to 35 cm (often less). Ligule is a hyaline membrane. Sheath overlaps or closes within 1 cm.

No.29 Eulalia thwaitesii (Hackel) Kuntze

Blade characteristics: Blades lanceolate-linear, 7-13 cm long, 3-6 mm wide. Margins minutely serrate throughout. Blade top surface is glabrous. Bottom surface haired (few or none proximally, increasing distally). Median rib is present and keeled. Blade exit 30 deg.

Additional characteristics: Perennial to 25 cm high with flowering stems to 50 cm. Ligule of hairs, irregular and variable, with small membrane below hairs (a.k. membrane). Sheath overlapping or closing within 1 cm.

No.30 Poa annua L.

Blade characteristics: Blades linear, 7-10 cm long (shorter on flowering stems), rarely to 14 cm, 2-4 mm wide. Margins hairless, serrate (midpoint and tip), serrations widely spaced at midpoint. Blade top and bottom surfaces are glabrous. Median rib lightly keeled, visible but not prominent on upper surface.

Additional characteristics: Annual to ca 15 cm high with flowering stems to ca 25-30 cm (supported by other vegetation). Ligule is a membrane not tipped with hairs, ca 2 mm (ca 3 mm on flowering stem). Sheath overlapping or closing within 1 cm on new growth, but opening to more than 1 cm with age. Leaves conduplicate.

No.31 Heteropogon contortus (L.) P. Beauv. ex Roemer & Schultes

Blade characteristics: Blades linear, 5-11 cm long, 4-5 mm wide. Margins serrate (tip to midpoint, a.k. entire). Blade top and bottom surfaces are glabrous. Median rib is present and keeled. Other veins are also present, ca 5 per side. Blade exit 25 deg.

Additional characteristics: Perennial. Ligule is a brushy row of hairs with margins having long silky hairs. Sheath is variable, overlapping or closing 0-2 mm. Leaves conduplicate, glabrous. Blades often fold together to a "closed" V exit after leaving stem. Florets with long awns that twist around each other. Some blades end abruptly at collar.

No.32 Coelachne simpliciusceula (Wight & Arn.) Munro ex Benth.

Blade characteristics: Blades lanceolate, 2-3 cm long, 1.5-2.5 mm wide. Margins entire (a few margins with minute serrations distal of midpoint), hairless. Blade top and bottom surfaces are glabrous. Median rib is inconspicuous, but faintly visible below, absent above.

Additional characteristics: Grass is variable in height. Ligule is a ring of hairs. Sheath closure variable. Aquatic, leaves convolute.

No.33 Isachne bourneorum C. E. C. Fischer

Blade characteristics: Blades lanceolate, 2-4 cm long, 4-9 mm wide. Margins minutely serrate, with a few tubercle hairs (variable). Blade top and bottom surfaces are glabrous, or with a few tubercle based hairs. Median rib is indistinct or absent. Blade exit 90 deg.

Additional characteristics: Perennial to 25 cm high with flowering stems to 40 cm. Ligule is a ring of hairs just under 1 cm. Sheath overlaps or closes within 1 cm. Sheaths are hairy, from tubercles. Grass has trailing runners.

No.34 Isachne setosa C. E. C. Fischer

Blade characteristics: Blades broadly lanceolate, 0.5-0.9 cm long, 2-3 mm wide. Margins minutely serrate. Blade top surface glabrous or nearly so. Bottom surface sparsely very finely haired. Median rib is absent on blade but present on sheath. Blade exit 45 deg.

Additional characteristics: Perennial to 4 cm high, with flowering stems 4-7 cm high. Ligule is of a few hairs. Sheath is overlapping or closed within 1 cm. Veins are prominent on upper blade surface, absent below. Nodes hairy.

No.35 Coelachne perpusilla (Arn. ex Steudel) Thwaites

Blade characteristics: Blades lanceolate, 1-2.3 cm long, 2-3 mm wide. Margins serrate (midpoint and distal end) and hairless. Blade top and bottom surfaces are glabrous. Median rib absent or nearly so.

Additional characteristics: Annual to 15 cm high with flowering stems to 17 cm. Ligule is a ring of hairs, 0.5 mm. Sheath overlapping or closed (less than 1 cm). Leaves convolute. Nodes hairy.

No.36 Setaria pumila (Poirot) Roemer & Schultes

Blade characteristics: Blades lanceolate, 5-10 cm long, 5-7 mm wide. Margins are hairless and serrate (midpoint and tip). Blade top surface has a few long silky hairs (3-4 mm). Bottom surface is glabrous. Median rib is prominent and keeled. Blade exit 30 deg.

Additional characteristics: Perennial. Ligule of hairs. Sheath overlaps or closes in less than 1 cm. Upper surfaces are often beet-purplish. Bottom surfaces green. Leaves convolute.

No.37 Zenkeria sp.

Blade characteristics: Blades lanceolate-linear, 35-45 cm long, 9-21 mm wide. Margins hairless, serrate on hyaline margins (midpoint and tip). Blade top surface is sparsely haired. Bottom surface is glabrous and shiny. Median rib absent on upper surface, but roundly keeled on proximal half of lower surface. Blade exit 20 deg.

Additional characteristics: Perennial to 40 cm high with flowering stems to 65 cm. Ligule is of hairs (1 mm). Sheath is open for more than 1 cm. Grows in clumps on rock outcrops, usually precariously placed. Leaves convolute. One margin especially prone to roll in, giving appearance and hyaline characteristic only on opposite margin.

No.38 Garnotia arundinacea Hook. f.

Blade characteristics: Blades lanceolate, 10-14 cm long, 12-20 mm wide. Margins finely serrate with hairs. Blade top and

bottom surfaces are glabrous. Median rib is prominent and keeled.

Additional characteristics: Perennial to 150 cm high with flowering stems to 200 cm. Ligule is of hairs. Sheath overlaps or closes within 1 cm.

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#### REFERENCES

- HARRINGTON, H.D. 1957. How to indentify plants. Swallow Press, Chicago.
- HARRINGTON, H.D. 1977. How to indentify grasses and grasslike plants (sedges and rushes). Swallow Press, Chicago.
- ACHARIYAR, R.B.K.R. and C.T. MUDALIYAR. 1921. A handbook of some South Indian grasses. Bishen Singh Mahendra Pal Singh, Dehra Dun.

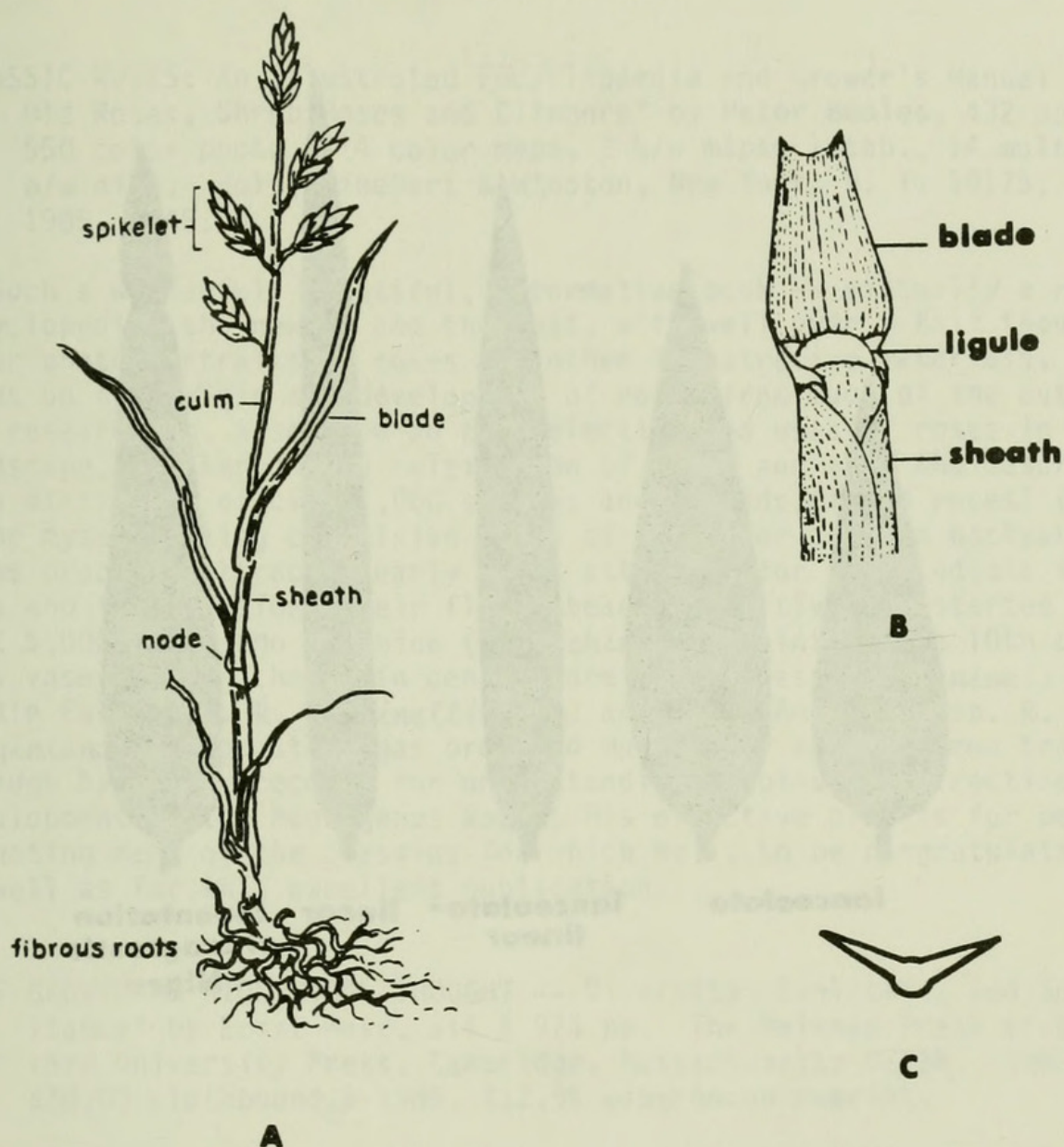


Fig. 1a. The main parts of a grass plant. 1b. Juncture of the sheath and blade, showing location of the ligule (reproduced with permission from Harrington, H.D. 1977. How to indentify grasses and grasslike plants (sedges and rushes). Swallow Press, Chicago). 1c. A winged rib consists of a prominent median rib with two much reduced blade surfaces on either side.

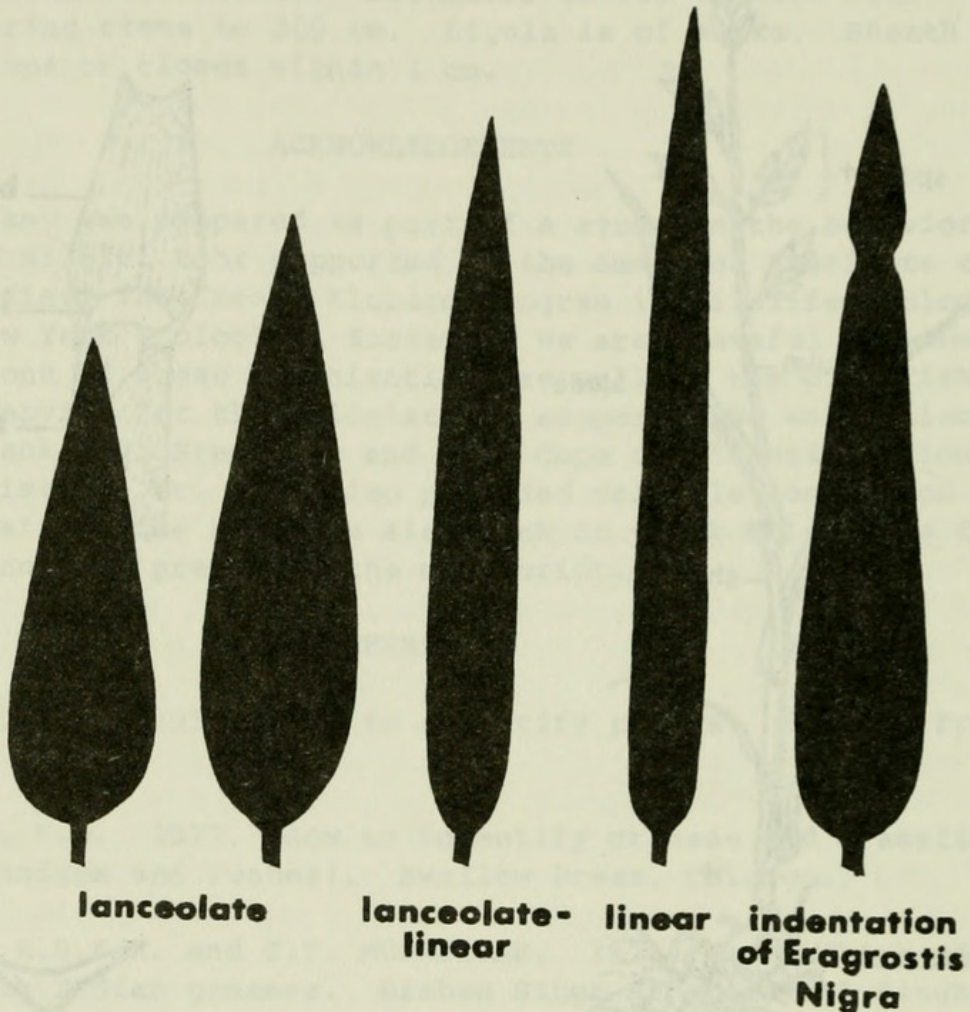


Fig. 2. Grass blade shapes.



Rice, C G and Edblom, G. 1986. "AN ARTIFICIAL KEY TO THE GRASSES OF ERAVIKULAM NATIONAL PARK KERALA INDIA BASED ON VEGETATIVE CHARACTERISTICS." *Phytologia* 59, 291–310.

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