

**FASCICLES
OF
FLORA OF INDIA**

FASCICLE 14

POACEAE : TRIBE—ISACHNEAE

VED PRAKASH AND S. K. JAIN

**BOTANICAL SURVEY OF INDIA
P. O. BOTANIC GARDEN
HOWRAH-711 103**

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POACEAE : TRIBE—ISACHNEAE

VED PRAKASH* AND S. K. JAIN**

ISACHNEAE

Benth. in J. Linn. Soc. (Bot.) 19 : 30, 92. 1881, *pro parte*; C. E. Hubb. in Hook. Ic. Pl. t. 3432. 1943; Pilger in Engl. & Prant. Die Naturl. Pflanzenfam. 14D : 193. 1956; Bor, Grass. Bur. Ceyl. Ind. Pak. 574. 1960.

Annual or perennial grasses, usually with slender culms. Leaf-sheaths mostly loose; ligule a fringe of hairs or 0; blades usually broad and flat. Inflorescence a panicle or infrequently raceme or spike. Spikelets alike, 1 or 2-flowered, hermaphrodite, small to minute, often plump, mucicous; rachilla disarticulating between the florets and above the glumes, not produced beyond the upper floret. Florets 1 or 2, ♂ when 1, similar or dissimilar when 2, with mostly lower ♂ or ♀ and upper ♀ or ♂, the two often separated by a very short or minute rachilla. Glumes 2, usually deciduous, persistent in some, usually subequal, shorter than or as long as spikelet, membranous, 3-9(-11)-nerved, rarely nerveless or 1-nerved. Lower lemma (when more than one) usually longer than upper, firmly membranous to chartaceous or coriaceous, nerveless or obscurely 5-7-nerved; palea as long as lemma, nerveless or 2-nerved. Upper lemma and palea similar to the lower or often smaller and firmer, sometimes thinner in texture. Lodicules 2, cuneate, truncate. Stamens 3 or 2 with linear-oblong anthers. Pistil with 2 distinct styles and plumose stigmas. Caryopsis free between the lemma and palea, ovoid or ellipsoid, plano-convex; embryo one-third to half the length of caryopsis.

Distrib. : 5 genera and *ca.* 125 species in the tropics and subtropics. 4 genera and 34 species in India. 1 genus and 20 species endemic to India.

Ecol. : Mostly hygrophilous or in forests and their margins, from sea level to *ca.* 3000 m alt.

Chr. No. : X=10 or 9.

Family Editor for Poaceae : Dr. S. K. Jain.

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** Botanical Survey of India, Howrah-711 103.

Anatomy : (i) *Leaf-epidermis* : Short cells in long rows with alternating silica and cork cells, usually present in costal zones only; silica bodies roughly cross-shaped, more or less cubical or rectangular with concave sides and acutely angled; long cells between the veins (on abaxial surface) relatively very small, cubical, hexagonal to polygonal with non-sinuous walls, and mostly bearing one large globose papilla; microhairs mostly present with nearly equal basal and distal cells; stomata with variable subsidiary cells. (ii) *Leaf-anatomy*: Vascular bundles mostly of 3 types and conspicuously angular in outline with well-developed outer sheath, made up of single or multilayered, large parenchymatous cells and without chloroplast; inner sheath scarcely evident or absent; mesophyll cells very long, narrow (elongated), somewhat loosely and distinctly radially arranged, but not as in chloridoid and panicoid grasses.

These characters show that the tribe Isachneae is panicoid in most characters, but the small, cubical intercostal long cells with papillae, narrow, elongated and radially arranged mesophyll cells and nature of outer bundle sheath are very characteristic of Isachneae and distinct from other panicoid grasses. The authors support Metcalfe's view in recognising *Isachneae* subtype under panicoid group in Anatomical grouping (Potzta in Bot. Jahrb. 75 : 551-559. 1952; Tateoka in Bot. Mag. Tokyo 70 : 119-125. 1957; Metcalfe, Anat. Monocot. Vol. 1. 1960).

Notes : Originally, Bentham (*l.c.*) included 7 genera in his tribe Isachneae, these were: *Prionachne* Nees, *Isachne* R. Br., *Zenkeria* Trin., *Micraira* F. Muell., *Coelachne* R. Br., *Airopsis* Desv. and *Eriachne* R. Br.

C. E. Hubbard (*l.c.*) recircumscribed Isachneae to include five genera viz. *Isachne* R. Br., *Coelachne* R. Br., *Limnopoa* C. E. Hubb., *Sphaerocaryum* Nees ex Hook. f. and *Heteranthoecia* Stapf; this was supported by subsequent studies on morphology, anatomy, cytology, etc.

Spikelets in the tribe Isachneae share the characters of both the subfamilies Panicoideae & Pooideae. Based on combined studies of morphology, anatomy, cytology, ecology and starch grains, the authors are of the view that "the tribe Isachneae is panicoid in nature in most of the characters (e.g. Chr. No. X=10; silica cells cross-shaped or rectangular; starch grains simple, hexagonal, pentagonal or rectangular; seedling-leaf broad, spreading; distribution hygrophilous in tropics and subtropics), yet it stands apart from true panicoid grasses in some unique morphological and anatomical characters. Consequently, the tribe Isachneae should be placed either in the subfamily Panicoideae near Paniceae or it should better be treated as an independent subfamily.

1a. Spikelets 2-flowered:

2a. Inflorescence a small, solitary (occasionally two) spike-like raceme;
plants aquatic ...3. **Limnopoa**

2b. Inflorescence open or contracted panicles, or racemes; plants
aquatic or not:

3a. Upper floret indurated (coriaceous), borne on short to minute
rachilla. Glumes longer or subequal to spikelet, rarely shorter;
eventually deciduous ...2. **Isachne**

3b. Upper floret membranous to hyaline, borne on long rachilla.
Glumes much shorter than the spikelet, persistent
...1. **Coelachne**

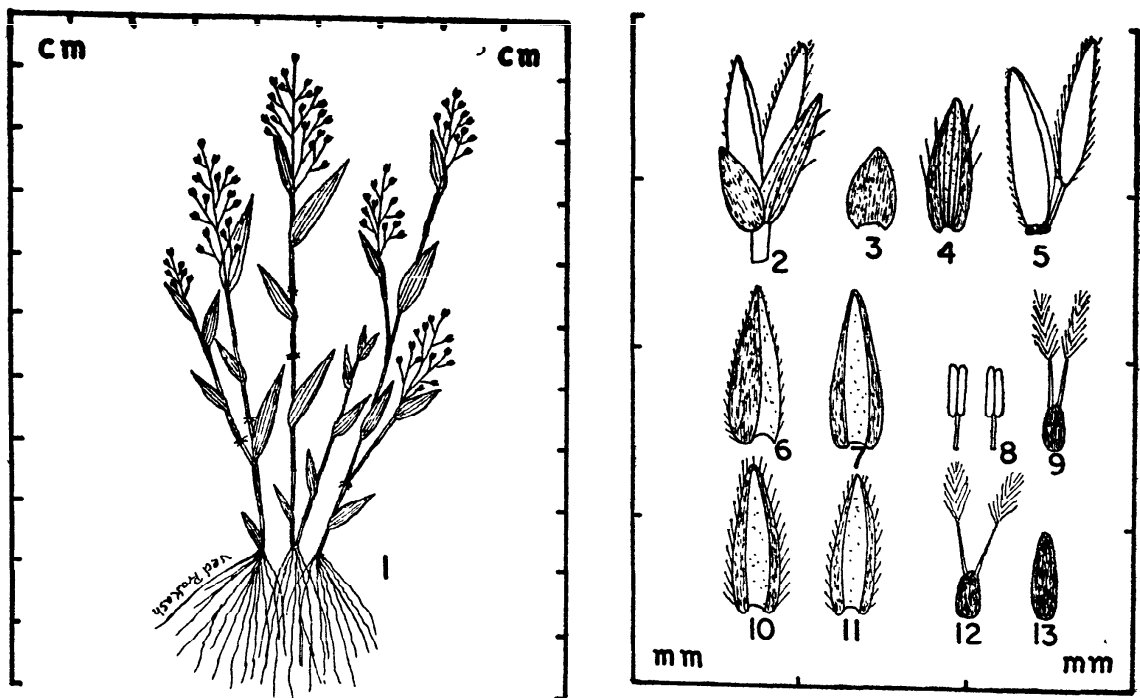
1b. Spikelets 1-flowered. Inflorescence small, open panicles. Glumes
separately deciduous ...4. **Sphaerocaryum**

1. COELACHNE

R. Br. Prodr. Fl. Nov. Holl. 187. 1810; Benth. & Hook. f. Gen. Pl. 3 : 1156.
1883; Hook. f. Fl. Brit. Ind. 7 : 270. 1897; Bor, Grass. Bur. Ceyl. Ind. Pak.
576. 1960.

Annual or perennial marsh grasses with slender culms. Leaf-sheaths loose, glabrous or hirsute; ligule absent or minute fringe of hairs; blades small, striate and scaberulous above, glabrous or hirsute beneath. Inflorescence an open or interrupted spiciform panicle with appressed and congested branches, sometimes a raceme. Spikelets small to very minute, ovate-oblong, awnless, gaping, 2-flowered; rachilla elongate between the florets; pedicels short unequal; callus bearded or glabrous. Glumes persistent, lower mostly shorter than upper, both much shorter than the spikelet, broadly ovate to elliptic or subrotund, membranous. Florets 2, exserted; lower ♂, subsessile, longer and thicker; upper ♀, stipitate, shorter and thinner. Lower lemma ovate-elliptic, obtuse, margins incurved, coriaceous, nerveless to obscurely 5-nerved, glabrous or sparsely hairy, its palea similar to lemma, nerveless or 2-nerved. Upper lemma ovate-lanceolate, obtuse, membranous, sometimes hyaline, 2-nerved, 2-keeled, hairy along keels and all over dorsal surface or nerveless, not keeled, glabrous, its palea similar to lemma.

Distrib. : ca. 10 species in the tropics and subtropics of Old World.
3 species in India. 1 species and 1 variety endemic to India.



Coelachne minuta Bor

Figs. 1-13 : 1. Habit. 2. Spikelet. 3. Lower glume. 4. Upper glume. 5. Florets. 6. Lower lemma. 7. Lower palea. 8. Stamens. 9. Pistil. 10. Upper lemma. 11. Upper palea (3, 4, 6, 7, 10, 11 all in ventral view). 12. Pistil. 13. Caryopsis (B. G. Kulkarni 131615)

1a. Spikelets 1.0-1.3 (-1.5) mm long. Stamens usually 2 ...1. *C. minuta*

1b. Spikelets over 1.5 mm long. Stamens 3:

2a. Panicles few-flowered, very lax. Spikelets 2.5-4.0 mm long. Florets densely bearded at base ...2. *C. perpusilla*

2b. Panicles many-flowered, mostly contracted spiciform. Spikelets 1.5-2.5 (-3.0) mm long. Florets glabrous at base

...3. *C. simpliciuscula*

1. *Coelachne minuta* Bor in J. Bomb. nat. Hist. Soc. 58 : 317. 1961.
C. ghatica Naik in Reinwardtia 9 : 393. 1980.

Figs. 1-13 (P. 4)

Annual, tufted, *ca.* 5-15 cm high, erect with very slender culms. Leaf-blades 0.5-3.0 × 0.1-0.4 cm, lanceolate, acute. Panicle 2-8 cm long, effuse, branches up to 1.5 cm long, capillary, spreading. Spikelets 1.0-1.3 (-1.5) mm long, globosely obovoid. Glumes glabrous or with few bristles, lower *ca.* 0.25-0.5 mm long, nerveless or 1-3-nerved, upper 0.5-1.0 mm long, 3-5-nerved. Lower lemma 1.0-1.2 mm long, folded, nerveless or obscurely 5-nerved, its palea elliptic, grooved, nerveless, glabrous; anthers 0.3-0.5 mm long. Upper lemma and palea 0.8-1.0 mm long, lanceolate, 2-keeled, hairy along keels and on dorsal surface.

Type : India: Bombay (Maharashtra), Mahabaleshwar, Sept. 14, 1958, H. Santapau 22731 (K, Photo 1).

Fls. & Frts. : Aug.-Sept.

Distrib. : INDIA : Western ghats, endemic to Maharashtra at *ca.* 650-1375 m alt. Grows in open, rocky, moist grassland with species of *Utricularia*, *Eriocaulon*, *Murdania* and *Isachne*.

Notes : This is a very rare grass, represented by a few collections (Maharashtra, Ratnagiri Dt., Amboli, Aug. 12, 1971, B. G. Kulkarni 131615 (BSI, CAL); Amboli Hill station, Sept. 13, 1971. V. N. Naik 1300 (BSI, Marathwada Univ.).

2. *C. perpusilla* (Arn. ex Steud.) Thw. Enum. Pl. Zeyl. 373. 1864; Hook. f. in Trim. Fl. Ceyl. 5 : 270. 1900; Fischer in Fl. Pres. Madr. Pt. 10: 1804. 1934 (Repr. ed. 3 : 1249, 1957); Senaratna, Grass. Ceyl. 111. 1956; Bor, Grass. Bur. Ceyl. Ind. Pak. 576. 1960. *Panicum perpusillum* Arn. ex Steud. Syn. Pl. Glum. 1 : 96. 1854.

Perennial, densely tufted, *ca.* 12-40 (-50) cm tall, ascending. Leaf-blades *ca.* 0.6-3.5 cm long, filiform, involute, or linear-lanceolate, flat. Panicle up to 8 cm long, lax, branches up to 3 cm long, distant, spreading. Spikelets

2.5-4.0 mm long, obovoid-oblong. Lower lemma 2-3 mm long, folded, coriaceous, nerveless, glabrous or sparsely hairy near the base, its palea elliptic, grooved, 2-nerved or nerveless; glabrous or sparsely hairy; stamens 3.

1a. Culms capillary with involute filiform blades. Spikelets 2.5-3.0 mm long. Lower glume 1.0-1.5 mm long, 3-7-nerved; upper glume 1.5-2.0 mm long, 7(-9)-nerved. Upper lemma and palea 1.5-2.0 mm long, 2-keeled, 2-nerved, hairy along keels and all over dorsal surface. Anthers 0.8-1.0 (-1.5) mm long ...var. **perpusilla**

1b. Culms slender with flat linear-lanceolate blades. Spikelets 3.5-4.0 mm long. Lower glume 1.7-2.0 mm long, 1-3-nerved; upper glume 2.3-2.5 mm long, 7-nerved. Upper lemma and palea \pm 2.5 mm long, not keeled, nerveless (-1-nerved), glabrous or sparsely hairy in lower half. Anthers 1.5-1.7 mm long ...var. **nilagirica**

var. **nilagirica** Ved Prakash & Jain in Bull. bot. Surv. Ind. 24 : 187. 1983.

Type : India : Tamil Nadu, Nilgiri Dt., Parthimund, 2300 m, July 11, 1970, J. L. Ellis 34627 (Holotype, CAL !; Isotype, MH !).

Fls. & Frts. : July-Sept.

Distrib. : So far known only by type collections.

var. **perpusilla**. *C. pulchella* var. *perpusilla* (Arn. ex Steud.) Hook. f. Fl. Brit. Ind. 7: 271. 1897; *C. pulchella* var. *gracillima* Hook. f. l.c.; *C. pulchella* var. *gardneri* Hook. f. l. c.; *C. perpusilla* var. *muscosa* Hook. f. in Trim. Fl. Ceyl. 5: 270. 1900.

Type : Ceylon (Sri Lanka), Wight 2043 (K, Photo !).

Fls. & Frts. : Sept.-Nov.

Distrib. : INDIA : Tamil Nadu; SRI LANKA. In marshy places at ca. 1200-2100 m alt.

Note : This variety has not been collected from India during this century and it is so far known only by two collections [Nilgiri, *Schmid s. n.* (K); Nilgiri, *Stahl s. n.* (K) from India].

3. *C. simpliciuscula* (Wight et Arn. ex Steud.) Benth. in J. Linn. Soc. (Bot.) 19 : 93. 1881; Bor in Fl. Assam 5 : 193.1940; Bor, Grass. Bur. Ceyl. Ind. Pak. 576. 1960; *Panicum simpliciusculum* Wight et Arn. ex Steud. Syn. Pl. Glum. 1 : 96. 1854. *C. pulchella* auct. non R. Br. (1810) : Hook. f. Fl. Brit. Ind. 7 : 270. 1897, *pro parte*; Fyson, Fl. Nilgiri Pulney Hill-tops 1 : 460, t. 570. 1915; Fyson, Fl. South Ind.

Hill Stat. 1 : 673, t. 602. 1932; Blatter & McCann, Bomb. Grass. 200, t. 131. 1935. *C. pulchella* var. *simpliciuscula* (Wight et Arn. ex Steud.) Hook. f. *l. c.* 271. 1897; Fischer in Fl. Pres. Madr. 10 : 1804. 1934 (Repr. ed. 3 : 1249. 1957). *C. pulchella* var. *spicata* Hook. f. *l. c.* 271. 1897; Prain, Bengal Pl. 2 : 1903 (Repr. ed. 2 : 915.1963); Haines, Bot. Bih. Or. 2 : 954. 1925 (Repr. ed. 3 : 999. 1961). *C. pulchella* var. *brachiata* Hook. f. *l. c.* 271. 1897.

Annual, tufted, *ca.* 5-45 cm long, prostrate or ascending. Leaf-blades 0.5-3.5 × 0.15-0.5 cm, linear-lanceolate. Panicle 1.5-10.0 cm long, interrupted spiciform or open, branches up to 1 (-1.5) cm long densely crowded with spikelets. Spikelets 1.5-2.5 (-3.0) mm long, lanceolate. Glumes glabrous, lower 0.8-1.0 mm long, 3-nerved, upper 1.0-1.2 mm long, (4-) 5(-6)-nerved. Lower lemma 1.5-2.5 mm long, nerveless, glabrous or sparsely hairy, its palea similar but narrower; stamens 3, anthers 0.3-0.4 mm long. Upper lemma and palea 1-2 mm long, nerveless, 2-keeled, hairy along keels and on dorsal surface.

Type : Ceylon (Sri Lanka), Wight 2044 (K, Photo !).

Fls. & Frts. : Throughout the year.

Distrib. : Widely distributed in S. E. Asia at 550-1800 m alt. INDIA : Sikkim, Arunachal Pradesh, Assam, Nagaland, Meghalaya, West Bengal, Bihar, Orissa, Andhra Pradesh, Madhya Pradesh, Maharashtra, Karnataka, Tamil Nadu, Kerala; NEPAL, CHINA, BURMA, THAILAND, LAOS (INDOCHINA), SRI LANKA, MALAGASY.

Grows gregariously and forming a dense mat in damp and marshy places, also weed in paddy fields.

Chr. No. : $2n=36$ (Gould & Soderstrom in Canad. J. Bot. 52 : 1075-1090. 1974) ; $n=10$ (Mehra & Sood in Taxon 24 : 512. 1975) ; $2n=18$ (Sindhe & Narayan in Taxon 25 : 158. 1976).

Notes : This species shows much variation in the size of plants, spikelets and form of panicle. It is closely allied to *C. pulchella* R. Br. and Hooker (*l. c.*) placed Indian specimens under 3 varieties of the latter. *C. pulchella* R. Br. is known from Queensland, Australia and it was insufficiently described until Hubbard (Hook. Ic. Pl. t. 3440. 1943) redescribed it.

2. ISACHNE

R. Br. Prodr. Fl. Nov. Holl. 196. 1810; Benth. & Hook. f. Gen. Pl. 3 : 1100, 1883; Hook. f. Fl. Brit. Ind. 7 : 21. 1897; Bor, Grass. Bur. Ceyl. Ind. Pak. 576. 1960.

Annual or perennial, mostly hygrophilous. Culms tufted, very slender to robust, often rooting at lower nodes. Leaf-sheaths loose, glabrous or hirsute with tubercle based hairs; ligule a fringe of hairs or absent; blades mostly broad and flat, striate above, glabrous or hirsute on one or both surfaces. Inflorescence an open panicle, occasionally raceme. Spikelets small to very minute, subglobose or obovoid, gaping, 2-flowered, awnless; rachilla short, disarticulating above the glumes and between the florets; pedicels unequal with or without glandular bands. Glumes separately deciduous (except *I. setosa*) at maturity, longer, equal or subequal to spikelet, ovate, elliptic or orbicular-oblong, acute to acuminate, slightly concave, margins incurved, 5-11-nerved, herbaceous, glabrous or setose on back. Florets 2, ellipsoid-hemispherical, similar or dissimilar in shape, size and texture; both fl. variable in sex (♂, ♂; ♂, ♀; ♂, ♀; ♂, ♂; rarely ♀, ♀ or ♀, ♂). Stamens 3.

Distrib. : ca. 110 species in the tropics and subtropics of both hemispheres. 29 species in India. 18 species endemic to India.

- 1a. Lower and upper floret almost similar in shape, size and texture; both fl. subequal, plano-convex, indurate, subsessile (sometimes upper fl. slightly smaller and stipitate). Lemmas elliptic to hemispherical, concave, coriaceous-crustaceous, nerves obscure (-5-nerved), mostly pubescent on back. Paleas similar to lemmas but flat, nerveless (-2-nerved) with incurved margins ...Sect. 1. **Albentes**
- 1b. Lower and upper floret dissimilar (Heteromorphous); lower fl. longer, flatter, thinner, subsessile; upper fl. shorter, plano-convex, indurate, stipitate. Lower lemma elliptic, slightly concave, thinly chartaceous, 5(-7)-nerved, glabrous. Upper lemma ovate-elliptic (-hemispherical), deeply concave, coriaceous-crustaceous, nerves obscure, pubescent on back. Paleas similar to respective lemmas but flat, nerveless (-2-nerved) ...Sect. 2. **Isachne**

Section 1. Albentes Ved Prakash & Jain *Sect. nov.*

Sect. *Euisachne* Honda in J. Fac. Sci. Univ. Tokyo Sect. III, Bot. 3 : 278. 1930, *pro parte*, quoad descript., exclud. type sp. *I. globosa*.

Sect. *Pseudoisachne* Ohwi ex Jansen in Reinwardtia 2 : 290. 1953, *nom. invalid.*

Herba annua perennisve laminis linearibus ad lanceolatis ovatisve. Inflorescentia plerumque paniculata. Spiculae flosculis subsimilaribus. Flosculus superior inferiorque subaequalis, plano-convexus, anguste ad late ellipsoideus vel hemisphaericus induratus, glaber pubescensve.

Species typica—*I. albens* Trin.

- 1a. Spikelets 1.0-1.3 (-1.5) mm long :
- 2a. Plants very delicate, 3.0-8.5 cm high, leaf-blades short, ovate :
- 3a. Leaf-sheaths and blades glabrous. Spikelets \pm 1.5 mm long. Lemmas with woolly hairs at the base
...28. **I. veldkampii**
- 3b. Leaf-sheaths and blades hirsute. Spikelets \pm 1.2 mm long. Lemmas glabrous or pubescent on dorsal side
...21. **I. mysorensis**
- 2b. Plants not very delicate, (6-) 10-50 cm high; leaf-blades elliptic, lanceolate or ovate:
- 4a. Leaf-blades distant, ovate, thick, stiff, pectinately ciliate along margins. Ligule absent
...7. **I. confusa**
- 4b. Leaf-blades elliptic or lanceolate, thin soft, not ciliate on margins. Ligule a fringe of 0.5-1.0 mm long hairs
...6. **I. clarkei**
- 1b. Spikelets 1.5-4.5 mm long:
- 5a. Spikelets 3.5-4.5 mm long (Panicle very long lax, few-flowered. Plant robust)
...29. **I. walkeri**
- 5b. Spikelets 1.5-3.5 mm long:
- 6a. Glumes conspicuously longer than the spikelet:
- 7a. Leaf-blades linear. Culms wiry, climbing, woody (bamboo like), ca. 1-2 m long. Spikelets 2.3-2.6 mm long
...2. **I. angladei**
- 7b. Leaf-blades lanceolate or ovate to ovate-lanceolate. Culms not as above:
- 8a. Florets hemispherical. Glumes densely setose all over dorsal surface. Spikelets 2.5-3.0 mm long, few on short, setose and horizontally spreading branches
...18. **I. lisboae**
- 8b. Florets barge-shaped or ellipsoid. Glumes glabrous or sparsely setose in upper-half only. Spikelets 2.5-3.5 mm long, many on rather long, glabrous and erect branches
...17. **I. kunthiana**
- 6b. Glumes shorter, equal or slightly longer than the spikelet:

- 9a. Florets broadly ellipsoid to hemispherical. Spikelets mostly globose:
- 10a. Leaf-blades linear:
- 11a. Leaf-blades 15-35×0.2-1.0 cm. Culms up to 5 mm wide ...19. *I. meeboldii*
- 11b. Leaf-blades up to 15×0.6 (-0.8) cm. Culms up to 2.5 mm wide:
- 12a. Florets with tuft of long, copious, woolly hairs. Panicle lax, narrow. Spikelets 2.5-3.0 mm long
...4. *I. borii*
- 12b. Florets without tuft of hairs. Panicle loose to compact, ovoid, densely-flowered. Spikelets 2.0-2.5 mm long
...10. *I. elegans*
- 10b. Leaf-blades narrowly to broadly lanceolate:
- 13a. Plants 35-95 cm tall, robust. Leaf-blades 5-16×0.5-1.7 cm. Panicle 8-18 cm long
...27. *I. swaminathanii*
- 13b. Plants up to 40 cm tall. Leaf-blades up to 4.5×0.8 cm. Panicle up to 7 cm long, few-flowered:
- 14a. Spikelets (2-) 2.2-3.2 mm long, purple. Florets rounded on back. Panicle branches and pedicels with one to several glandular bands
...3. *I. bicolor*
- 14b. Spikelets 1.8-2.0 mm long, not purple. Florets flattened like crumpets or milestones. Panicle branches and pedicels without glandular bands ...9. *I. dimyloides*
- 9b. Florets narrowly ellipsoid or barge-shaped. Spikelets ellipsoid or oblong or obovoid to obovoid-elliptic:

- 15a. Leaf-blades linear (sometimes narrowly lanceolate in *I. himalaica*) :
- 16a. Culms mostly densely tufted and branched mainly at base. Leaf-blades 1-3(-4) mm broad, hairy beneath, hairs very soft and fugacious
...8. *I. deccanensis*
- 16b. Culms solitary or loosely tufted, branches all along the culm or not. Leaf-blades 2-7 (-9) mm broad, occasionally narrowly lanceolate, glabrous or scabrous
...14. *I. himalaica*
- 15b. Leaf-blades narrowly lanceolate to broadly lanceolate:
- 17a. Spikelets (1.0-) 1.5-1.8 mm long. Panicles decom-pound, densely flowered:
- 18a. Panicle branches and pedicels with conspicuous glandular bands. Leaf-sheaths densely hirsute and ciliate with long hairs along margins
...15. *I. hirsuta*
- 18b. Panicle branches and pedicels without glandular bands :
- 19a. Leaf-sheaths mostly hirsute with tubercle-based hairs in upper half; ligules 2.5-5.5 mm long hairs, blades very scabrid, only mid-nerve prominent beneath. Spikelets deciduous
...24. *I. scabrosa*
- 19b. Leaf-sheaths glabrous; ligules 1-2 (-3) mm long hairs; blades glabrous, mid-nerve and 3-6 pairs of lateral nerves very prominent beneath. Spikelets persistent
...1. *I. albens*
- 17b. Spikelets (1.8-) 2.0-2.5 mm long, smooth, shining. Panicle not densely flowered :
- 20a. Leaf-blades 2-5 mm broad, elliptic or linear-lanceolate, soft, hairy, without cartilaginous thickened margins. Pedicels without glandular bands
...26. *I. sikkimensis*

- 20b. Leaf-blades 5-10 mm broad, lanceolate, stiff, hairy or glabrous, distichously arranged with cartilaginous thickened margins. Pedicels with 1-3 glandular bands
 ...16. *I. kinabaluensis*

Section 2. *Isachne*

- 1a. Spikelets 1 mm long. Leaf-blades elliptic ...13. *I. gracilis*
- 1b. Spikelets 1.5-4.0 mm long :
- 2a. Inflorescence a raceme. Plants up to 5 cm high ...11. *I. fischeri*
- 2b. Inflorescence a panicle; plants mostly much taller (except *I. setosa*):
- 3a. Spikelets 3-4 mm long; glumes often setose, much longer than the rest of the spikelet ...5. *I. bourneorum*
- 3b. Spikelets 1.5-3.0 mm long; glumes setose or not, shorter or equal to spikelet, rarely longer (*I. setosa*) :
- 4a. Upper floret about half the length of the lower floret, mostly both fl. included within the glumes:
- 5a. Plants 3-18 cm high; glumes caudate-acuminate, mostly setose with tubercle-based hairs on dorsal side ...25. *I. setosa*
- 5b. Plants *ca.* 40 cm high; glumes acute-obtuse, smooth ...22. *I. oreades*
- 4b. Upper floret more than half the length of the lower floret, mostly both or at least lower fl. protruding beyond the glumes:
- 6a. Spikelets (1.2-) 1.5-1.6 (-1.8) mm long. Anthers of lower floret 0.3-0.6 mm long. Glumes unequal, lower shorter and narrower than upper ...23. *I. pulchella*
- 6b. Spikelets 1.8-2.8 mm long. Anthers of lower floret 1.0-1.5 mm long. Glumes subequal :
- 7a. Leaf-blades 1.0-2.5 (-3.5) cm long, mostly without cartilaginous margins. Ligules 0.8-1.5 (-2.0) mm long hairs. Nodes hairy. Spikelets 1.5-2.0 (-2.2) mm long
 ...20. *I. miliacea*

7b. Leaf-blades (1.5-) 3.0-12.0 cm long, mostly with cartilaginous thickened margins. Ligules (1.5-) 2.0-3.5 mm long hairs. Nodes glabrous. Spikelets (1.8-) 2.0-2.8 mm long

...12. **I. globosa**

1. **Isachne albens** Trin. Sp. Gram. 1, t. 85, 1828; Duthie, Grass. N. W. Ind. 2. 1883; Hook. f. Fl. Brit. Ind. 7 : 22. 1897; Lisboa, Bomb. Grass. 7. 1897; Collet, Fl. Simlensis 580. 1921; Bor in Fl. Assam 5 : 196. 1940; Anonymous, Wealth of India 5 : 270. 1959; Bor, Grass. Bur. Ceyl. Ind. Pak. 579. 1960.

Perennial, 20-150 cm high, erect or ascending with slender to stout culms. Leaf-blades 5.0-24.5×0.5-2.4 cm, linear-lanceolate to broadly lanceolate, acute to acuminate, flat, occasionally hirsute, nerves very prominent beneath. Panicle 7-40 cm long, decomposed, effuse; branches up to 16 cm long, profusely divided, densely flowered, eglandular. Spikelets (1.0-) 1.2-1.6 (-1.8) mm long, oblong or globosely obovoid. Glumes subequal to spikelet. Florets ± 0.8-1.3 mm long.

Type : Nepal : Sanko, Aug. 1821, *Wallich s. n.*, Wall. Num. List No. 8658 (CAL !, K, Photo !).

Fls. & Frts. : Throughout the year.

Distrib. : Widely distributed in South-East Asia and Himalayan region at 300-2000 m alt. INDIA: Himachal Pradesh, Uttar Pradesh, West Bengal, Sikkim, Assam, Arunachal Pradesh, Manipur, Nagaland, Meghalaya; NEPAL, BHUTAN, BANGLADESH, BURMA, THAILAND, MALASIA, CHINA.

Uses : This grass is readily eaten by cattle.

Chr. No. : n=20 (Mehra & Sharma in Taxon 22 : 117. 1973); n=20 (Mehra & Sharma in Cytologia 40 : 453-462. 1975).

2. **I. angladei** Fischer in Kew Bull. 1932 : 323; Fischer in Fl. Pres. Madr. Pt. 10 : 1797. 1934 (Repr. ed. 3 : 1244. 1957); Bor, Grass. Bur. Ceyl. Ind. Pak. 579. 1960.

Perennial, *ca.* 1-2 m long, climbing or spreading. Culms wiry, bamboo like, profusely branched, branching often one-sided and very long. Leaf-sheaths very loose, splitting, glabrous; blades 3-12×0.15-0.7 cm, linear, flat or involute. Panicle 5-8 cm long with erect-spreading, up to 4 cm long branches. Spikelets 2.3-2.6 mm long, obovoid. Glumes 2.3-2.6 mm long, longer than the florets, cuspidate, glabrous or hirtellous at tip. Florets 1.5-2.0 mm long, included.

Type : India : Palni Hills, Shembagnur, 6000 ft (± 1800 m), *L. Anglade* 914 (Holotype, K, Photo !); Shembagnur, 5500 ft (± 1650 m), *Van Malderen* 1283 (Paratype, CAL !); Anaimalai, 4000-5500 ft (1200-1650 m), May 1917, *E. Blatter & Hallberg* 182 (Paratype, CAL !, K).

Fls. & Frts. : Oct.-May.

Distrib. : INDIA : Endemic to Tamil Nadu at 1200-1800 m alt. (known only from Palni and Anaimalai Hills).

Notes : It was known only from the original collections until one of us relocated it after several decades in 1978 [Tamil Nadu, Madurai Dt., Kodaikanal, Silver cascade ± 1800 m, March 5, 1978, *Ved Prakash* 91A, B (CAL)].

3. *I. bicolor* Naik et Patunkar in Bull. bot. Surv. Ind. 15 : 157-158. 1973 (1976).

Perennial, 14-40 cm long, ascending with rhizomatous base and stiff culms. Leaf-blades 1.0-4.5 \times 0.2-0.8 cm, linear-lanceolate to ovate-lanceolate, acute, sparsely hirsute above, densely hirsute beneath, margins cartilaginous thickened and serrulate. Panicle 2-7 cm long, few-flowered, on long-exserted peduncle; branches and pedicels with one to several glandular bands. Spikelets 2.2-3.2 mm long, globose-obovoid, dark purple. Glumes slightly shorter than spikelet, glabrous or sparsely setose on dorsal side. Florets almost similar, 1.7-2.5 mm long.

Type : India : Maharashtra, Aurangabad Dt., Mhaismal 600 m, Oct. 8, 1973, *B. W. Patunkar* 1849A (Holotype, CAL !); *B. W. Patunkar* 1849 B-E (Isotypes, Marathwada Univ.).

Fls. & Frts. : Sept.-Oct.

Distrib. : INDIA : Endemic to Maharashtra at 600-1000 m alt. Grows in open, moist grassland with *Eriocaulon*, *Swertia*, *Utricularia*, *Cyperus* and small grasses.

Notes : This species was collected from first table land of Panchgani (Maharashtra) in Oct. 1979 [*Ved Prakash* 346 A-F (CAL)]. It is difficult to locate plant of this species in the field as the panicles with few dark purple spikelets on a naked peduncle are the only erect and visible part; the branching culms with leaf-blades remain at the creeping base.

4. *I. borii* Hemadri in Indian For. 97 : 223-225. 1971.

Annual, 15-75 cm high, erect with slender culms. Leaf-blades 6-15 \times 0.25-0.6 cm, linear, flat, hirsute with tubercle-based hairs, margins cartila-

ginous thickened. Panicle 5-20 cm long, with capillary branches up to 5 cm long; pedicels with one to several glandular bands. Spikelets globose. Glumes equal to or slightly shorter than the spikelet, setosely hirsute on dorsal side. Florets almost similar, subequal, 2.0-2.8 mm long.

Type : India : Maharashtra, Pune Dt., Dhak Khilla \pm 27 km west of Junar, Sept. 27, 1968, *Hemadri* 117968 A (Holotype, CAL !), B-I (Isotypes, B-D in BSI!; F in K; G in L; H in MO; I in LE); Bushi lake, Ambavne near Lonavla, Aug. 20, 1964, *Reddi* 98672 A-E (Paratype, BSI!).

Fls. & Frts. : Aug.-Dec.

Distrib : INDIA : Endemic to Maharashtra (so far known only from the type collections).

Notes : This recently described species is quite distinct from all other known species of this genus owing to the presence of long, copious woolly hairs on the callus of both florets.

5. *I. bourneorum* Fischer in Kew Bull. 1932 : 324; Fischer in Fl. Pres. Madr. Pt. 10 : 1796. 1934 (Repr. ed. 3 : 1244. 1957); Bor, Grass. Bur. Ceyl. Ind. Pak. 579. 1960. *I. kunthiana* sensu Fyson, Fl. Nilg. & Pul. Hill-tops 1 : 448. 1915, *non* Wight et Arn. ex Thw. 1864.

Figs. 1-15 (P. 16)

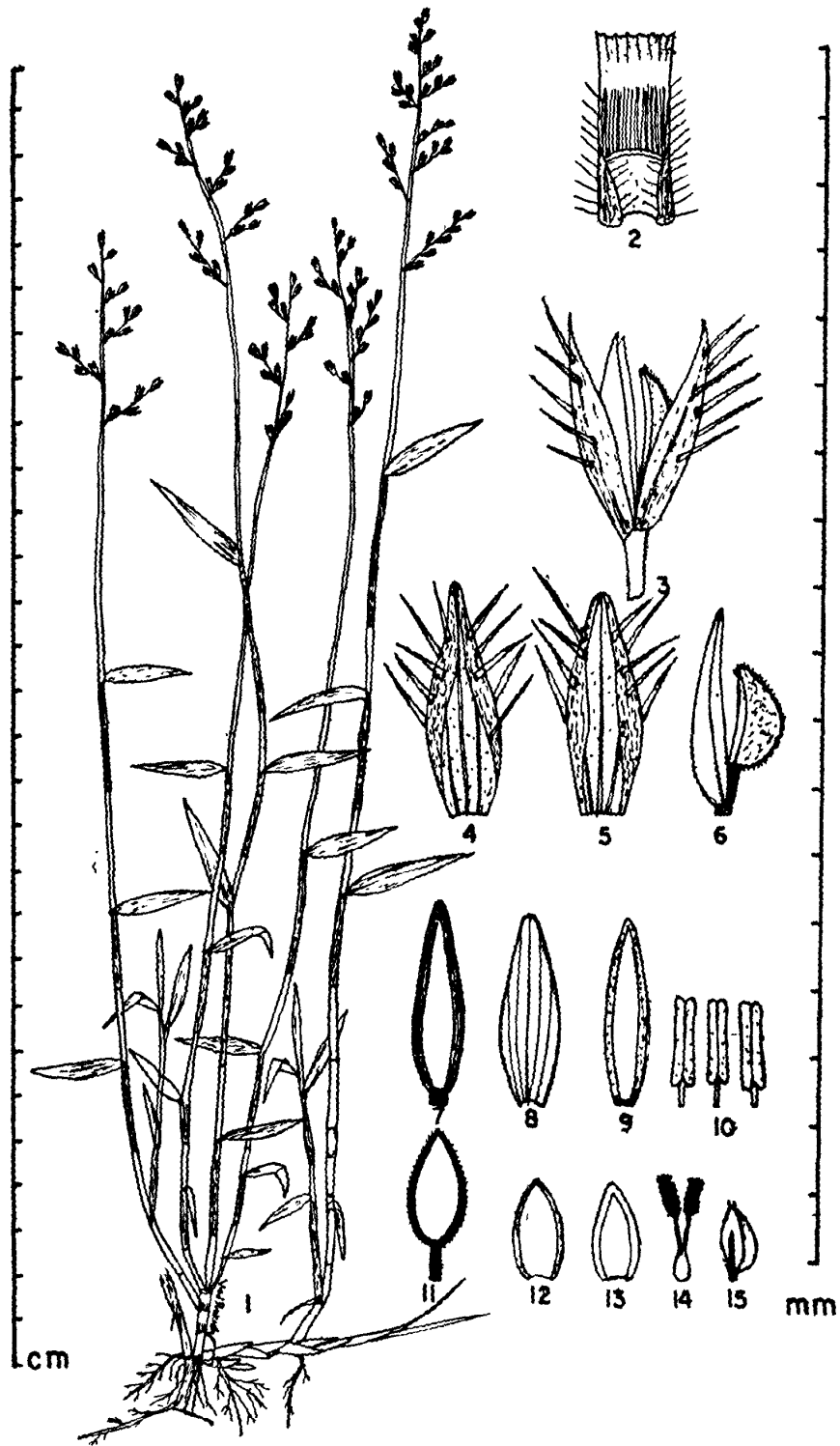
Perennial, 10-105 cm tall, erect or ascending with profusely branched culms and rhizomatous base. Leaf-blades 1.5-6.5 \times 0.2-1.0 cm, elliptic-lanceolate or ovate-lanceolate or linear-lanceolate, glabrous or hirsute, margins cartilaginous thickened. Panicle 2-13 cm long, lax; branches 0.5-6.0 cm long stiff, angular (-winged), often with tuft of hairs near the base. Spikelets obovoid. Glumes 3-4 mm long, much longer than the florets, cuspidate-acuminate, often setose with long, stiff, tubercle-based hairs. Florets included, dissimilar (heteromorphous): lower \pm 2.0-3.2 mm long, upper \pm 1-2 mm long, stipitate, plano-convex, thick-leathery.

Type : India : Palni Hills, Kodaikanal, 6500 ft (\pm 1950 m), June, 14, 1898, *Sir A. G. & Lady Bourne* 2491 (Holotype, K, Photo !; Isotype, CAL!, K).

Fls. & Frts. : Aug.-June.

Distrib. : INDIA : Endemic to Tamil Nadu and Kerala at *ca.* 1200-2200 m alt.

6. *I. clarkei* Hook. f. Fl. Brit. Ind. 7 : 24. 1897; Bor in Fl. Assam 5 : 195. 1940; Bor, Grass. Bur. Ceyl. Ind. Pak. 579. 1960.



Isachne bourneorum Fischer

Figs. 1-15 : 1. Habit. 2. Ligule. 3. Spikelet. 4. Lower glume. 5. Upper glume. 6. Florets (lateral view). 7. Lower floret. 8. Lower lemma. 9. Lower palea. 10. Stamens. 11. Upper floret. 12. Upper lemma. 13. Upper palea (4, 5, 7-9, 11-13 all in ventral view). 14. Pistil. 15. Caryopsis. (B. V. Shetty 26611).

Annual, (6-) 10-40 (-50) cm long, erect with weak and slender culms. Leaf-blades 1-8 × 0.2-0.8 cm, mostly elliptic, acute, hirsute. Panicle 1-11 cm long, effuse; branches up to 5 cm long, often horizontally spreading at maturity. Spikelets 1.0-1.3 (-1.5) mm long, globose. Glumes almost as long as spikelet, sparsely hairy on dorsal side. Florets (0.8-) 1.0-1.25 mm long, upper fl. often slightly larger and stipitate.

Type : India : Lachoong Valley, 8000-11000 ft (Lachung valley, ± 2400-3300 m), *J. D. Hooker s. n.* (Syntype, K); Kohima, 5000 ft (± 1500 m), *C. B. Clarke s. n.* (Syntype, K, Photo!).

Fls. & Frts. : Aug.-Dec.

Distrib. : INDIA : Endemic to Sikkim, Meghalaya and Nagaland at ca. 1500-3300 m alt. Grows in shady and damp places, also in paddy fields.

Chr. No. : n=20 (Mehra & Sharma in *Cytologia* 40 : 453-462. 1975); n=10 (Mehra & Sood in *Taxon* 24 : 512. 1975).

7. *I. confusa* Ohwi in *Bull. Tokyo Sci. Mus.* 18 : 14. 1947; Jansen in *Reinwardtia* 2 : 282. 1953; Bor, *Grass. Bur. Ceyl. Ind. Pak.* 579. 1960. *I. rigida auct. non* Nees ex Steud. : Hook. f. *Fl. Brit. Ind.* 7 : 24. 1897. *I. rhignon* Ohwi in *Bot. Mag. Tokyo* 55 : 541. 1941, *Excl. syn.*

Perennial, 15-50 cm high, ascending with slender culms. Leaf-sheaths very short, tubercled or hispid; blades 0.5-2.0 × 0.2-0.65 cm, ovate, acute, amplexicaul, striate, margins ciliate with tubercle-based hairs. Panicle 1.5-3.5 cm long, narrow, few-flowered; branches up to 1 cm long, horizontally spreading at maturity, pedicels with glandular bands. Spikelets ± 1.2 mm long, globose. Glumes 1.0-1.2 mm long, setose on dorsal side. Florets ± 1 mm long.

Type : Sumatra: Ins. Bangka, *Bunnemeijer* 1577 (BO, Photo!).

Fls. & Frts. : Sept.-Oct. (-Feb.).

Distrib. : Widely distributed. INDIA : Nicobar Islands; BURMA (Tenasserim), SUMATRA, JAVA, BORNEO, NEW GUINEA, AUSTRALIA.

Notes : Although Ohwi named it as *I. confusa*, but this species could hardly be mistaken for anything else. Its very short leaf-sheaths, small, ovate, pectinately ciliate blades and minute spikelets make it quite distinct from all other species of the genus.

8. *I. deccanensis* Bor in Kew Bull. 1949 : 95; Bor, Grass. Bur. Ceyl. Ind. Pak. 579. 1960.

Perennial, ca. 19-62 cm high, ascending with branched, slender culms and wiry rhizomes. Leaf-blades 1-11 × 0.1-0.4 (-0.6) cm, linear, stiff, scabrid, often hairy beneath, hairs very soft and fugacious. Panicle 4-10 cm long, compact or effuse; branches up to 5 cm long, capillary, flexuous; pedicels with or without glandular bands. Spikelets 1.6-2.2 (-3.0) mm long, obovoid, mostly purple. Glumes as long as spikelet or slightly shorter to longer than the spikelet, glabrous or hirtellous. Florets 1.3-1.8 mm long.

Type : India : Nilgiri, Ootacamund, Aramby 7500 ft (\pm 2250 m), Aug. 1884, *J. S. Gamble* 15290 (Holotype, K, Photo !; Isotype, DD ! K).

Fls. & Frts. : May-Oct.

Distrib. : INDIA : Endemic to Tamil Nadu at \pm 2000-2250 m alt.

Notes : This species is very allied to *I. himalaica* Hook. f. but they inhabit areas apart as also suggested by their names. They are similar in many characters and under certain circumstances it is difficult to say which is which. The important distinguishing character of *I. deccanensis* is softly pilose leaf-blade, but it is not always helpful as the hairs are fugacious. There are slight differences in habit and panicle of both species, which also give clue for identification.

9. *I. dimyloides* Bor in Kew Bull. 1949 : 96; Bor, Grass. Bur. Ceyl. Ind. Pak. 580. 1960.

Annual, weak, up to ca. 32 cm high, ascending. Leaf-blades 1-3 (-4.5) × 0.3-0.7 (-1.0) cm, lanceolate, acute, glabrous, margins cartilaginous thickened. Panicle 1.5-2.0 cm long, narrow, few-flowered; branches up to 8 mm long, pyramidal, ascending. Spikelets 1.8-2.0 mm long, globose. Glumes subequal, almost as long as spikelet. Florets almost similar, \pm 1.5-1.7 mm long flattened like milestones, smooth mostly upper fl. slightly smaller and stipitate.

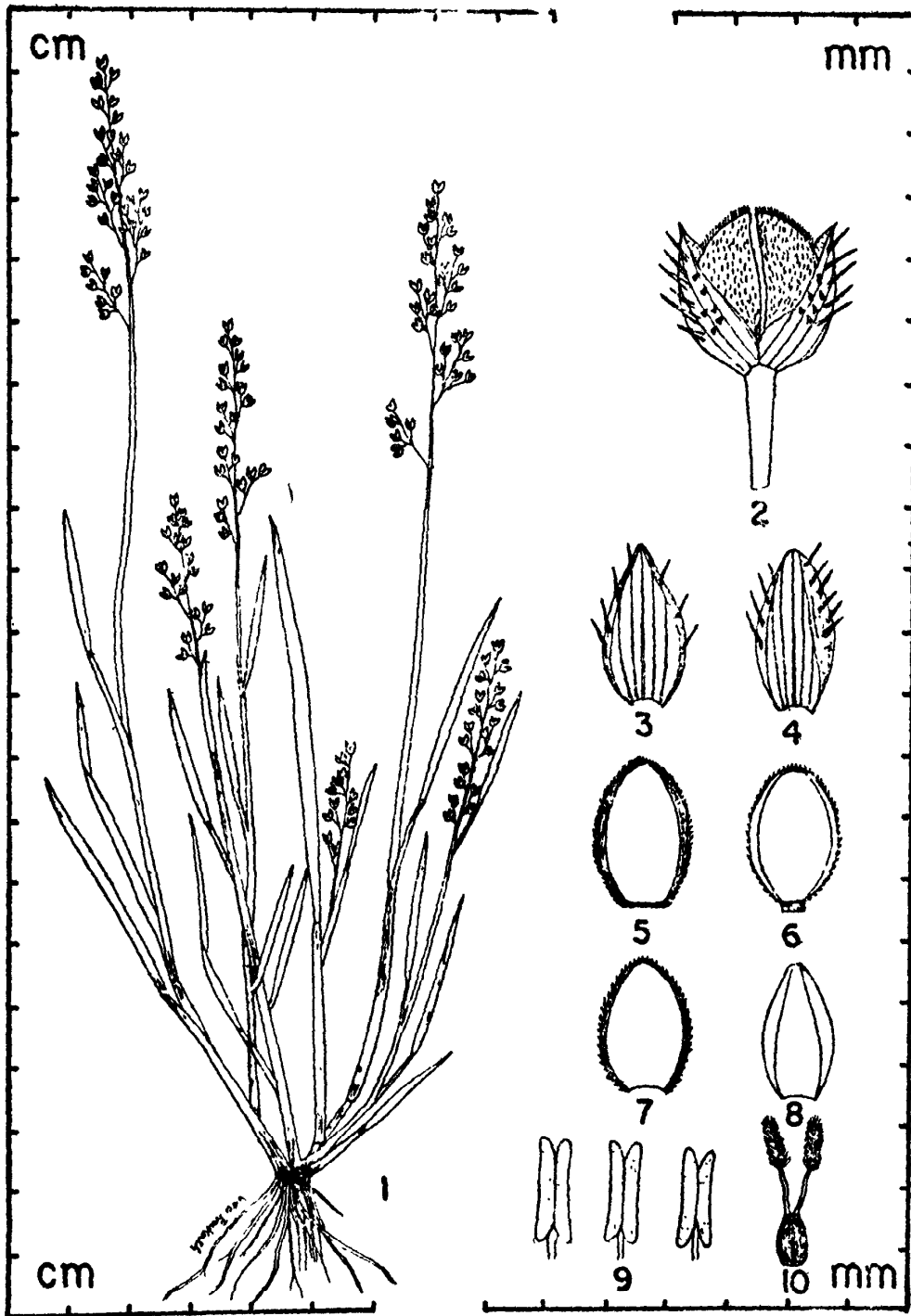
Type : India : Sikkim Terai, Dulkajhar, 5000 ft (\pm 1500 m), Oct. 16, 1884, *C. B. Clarke* 36764 (Holotype, K, Photo !; Isotype, CAL !).

Fls. & Frts. : Aug. -Nov.

Distrib. : INDIA : Sikkim; a very rare grass, so far known only from the type collections.

Note : Panicle with few small spikelets (\pm 1.8-2.0 mm long) and flattened florets make it distinct from other species.

10. *I. elegans* Dalz. in Dalz. & Gibs. Bomb. Fl. 291. 1861; Hook. f. Fl. Brit. Ind. 7: 23. 1897, *pro parte* (excl. specimens Woodrow and Stocks);



Isachne elegans Dalz.

Figs. 1-10 : 1. Habit. 2. Spikelet. 3. Lower glume. 4. Upper glume. 5. Lower floret. 6. Upper floret. 7. Lemma. 8. Palea (3-8 all in ventral view). 9. Stamens. 10. Pistil (*Ved Prakash 349A*).

Lisboa, Bomb. Grass. 7. 1897; Cooke, Fl. Pres. Bomb. 2 : 923. 1908
(Repr. ed. 3 : 439. 1958), Bor, Grass. Bur. Ceyl. Ind. Pak. 580. 1960

Figs. 1-10 (P. 19)

Deonda (Mar.).

Annual, densely tufted, 13-32 cm high, erect with many slender fibrous roots. Leaf-blades 1.0-10.5×0.1-0.4 (-0.8) cm, linear, occasionally linear-lanceolate, margins cartilaginous thickened. Panicle 3.5-14.5 cm long, loose to compact, densely flowered; branches 0.8-4.0 cm long, erect, alternate, subcapillary; pedicels mostly eglandular. Spikelets (1.8-) 2.0-2.5 mm long, globose or globose-obovoid. Glumes glabrous or setose on dorsal side. Florets almost similar, subequal, 1.4-2.4 mm long. Lemmas pubescent and mostly purple in upper-half on back.

Type : India : Deccan, *Dalzell s.n.*, on the margins of rivulets in the Deccan (?). Following specimens may be regarded as type : Bombay, *Dalzell s. n.* (Herb. of N. Dalzell, Bombay, purchased in 1878) (CAL !, DD !, K, Photo !).

Fls. & Frts. : Aug.-Jan.

Distrib. : INDIA: Endemic to Western Ghats, Maharashtra, Karnataka? at ca. 600-1000 m alt. Grows gregariously along the margins of swamps.

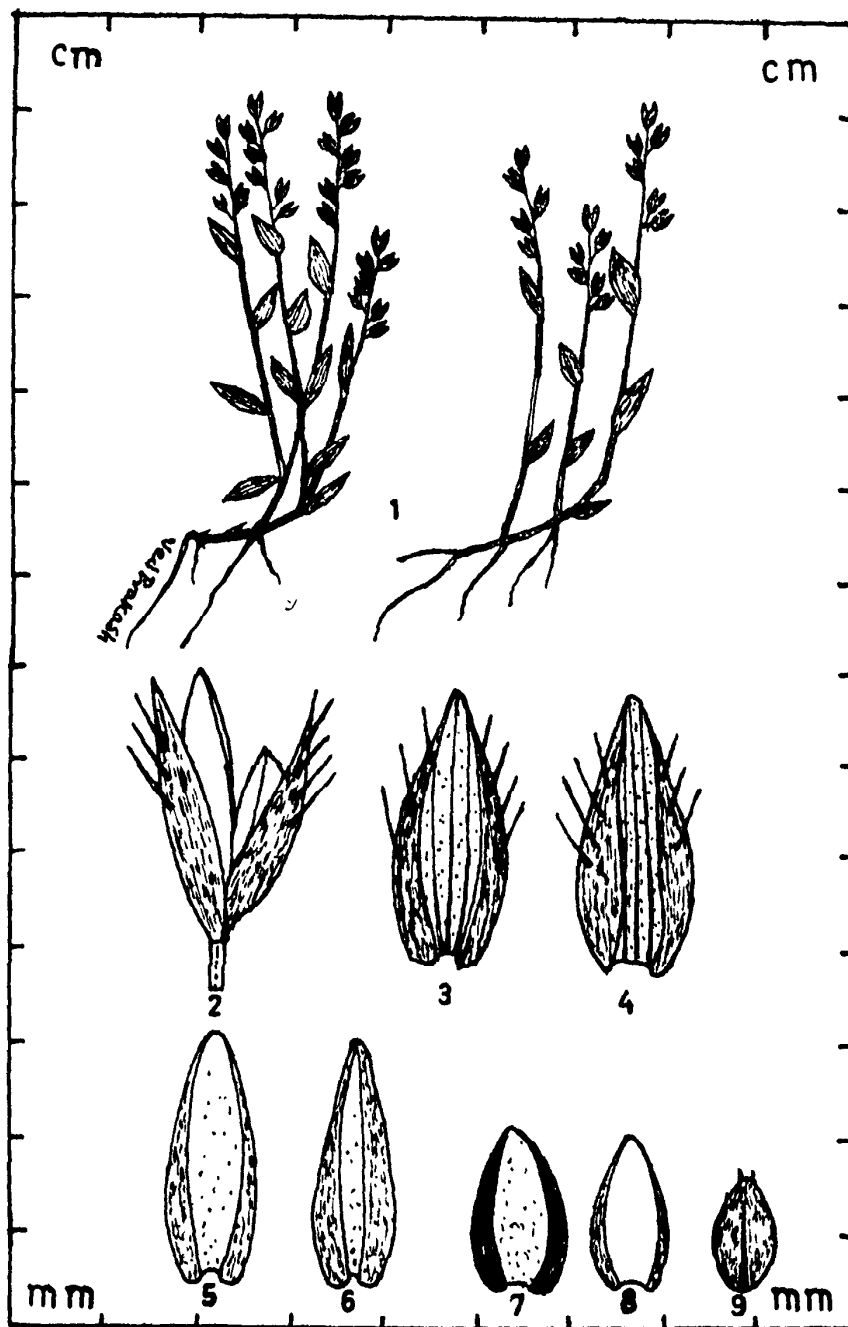
Notes : Fischer (in Fl. Pres. Madr. Pt. 10 : 1797. 1934), Tiwari (Indian For. 81 : 109. 1955), Panigrahi *et al.* (Bull. bot. Surv. Ind. 6 : 237-266.1964) and Kanodia & Rao (Ann. Arid Zone 5 : 49-62. 1962) reported it from Tamil Nadu, Madhya Pradesh, Orissa and Rajasthan respectively. But a critical examination of material reveals that interestingly this species is endemic to Western Ghats (mainly in Maharashtra). The specimens from other regions on which new distributions were reported belonged to another species i.e. *I. globosa*.

Blatter & McCann (Bomb. Grass. 187, t. 121. 1935) had erroneously included specimens of several species under it. For example, the specimens *McCann 9555*, *Woodrow 175*, *Blatter 5080*, *Talbot 2305*, quoted by them belong to *I. swaminathanii*, *I. globosa*, *I. bicolor* and *I. meeboldii* respectively.

11. *I. fischeri* Bor in Kew Bull. 1949: 69; Bor, Grass. Bur. Ceyl. Ind. Pak. 580. 1960. *I. kunthiana* Wight & Arn. ex Thw. var. *nana* Fischer in Fl. Pres. Madr. Pt. 10 : 1796. 1934.

Figs. 1-9 (P. 21)

Annual, low grass up to 5 cm high, erect or ascending. Leaf-blades 5-8×1.0-3.5 mm, lanceolate or elliptic, hirsute on both surfaces. Inflo-



Isachne fischeri Bor

Figs. 1-9 : 1. Habit. 2. Spikelet. 3. Lower glume. 4. Upper glume. 5. Lower lemma. 6. Lower palea. 7. Upper lemma. 8. Upper palea (3-8 all in ventral view). 9. Caryopsis (B. V. Shetty 26533).

rescence a simple raceme (-panicle), up to 1.5 cm long, lax, few-flowered. Spikelets 2.7-3.0 mm long, obovoid-oblong, geminate on unequal pedicels. Glumes 1.8-2.8 mm long, cuspidate-acuminate, setose on dorsal side. Florets: lower 2.5-3.0 mm long, upper 1.5-2.0 mm long, shortly stipitate, plano-convex, indurate. Lower lemma elliptic, thinly chartaceous, 5-7-nerved, glabrous. Upper lemma ovate-elliptic, concave, coriaceous, nerves obscure, pubescent on back.

Type : India : Kerala (formerly Madras), summit of Anaimudi, Travancore, High range, 8840 ft (± 2650 m), Sept. 1933. *E. Barnes s. n.* (K, Photo !).

Fls. & Frts. : Sept.-Nov.

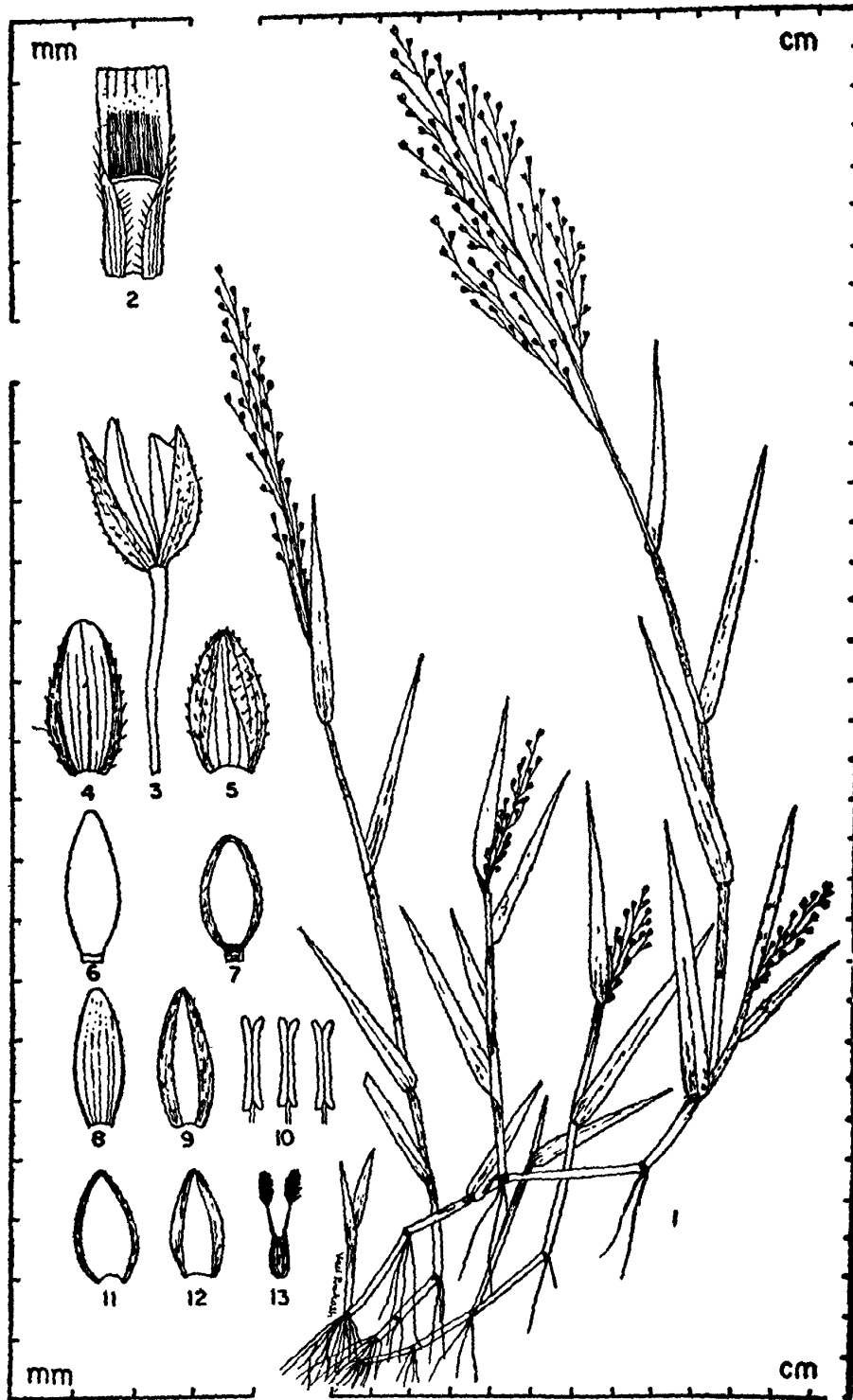
Distrib. : INDIA : Endemic to Kerala at above 2,500 m alt.

Note : It is a very rare grass which has been collected only once after the type [Kerala, Kottayam Dist., Anaimudi summit, 2575 m, Nov. 19, 1965, *B. V. Shetty* 26533 (MH)].

12. *I. globosa* (Thunb.) O. Ktze. *Rev. Gen. Pl.* 2 : 778. 1891; Henrard in *Blumea* 3 : 463. 1940; Senaratna, *Grass. Ceyl.* 109. 1956; Anonymous, *Wealth of India* 5 : 270, 1959; Bor, *Grass. Bur. Ceyl. Ind. Pak.* 580. 1960; Monod de Froideville in Van den Brink, *Fl. Java* 3 : 581. 1968. *Milium globosum* Thunb. *Fl. Japan* 49. 1784. *I. australis* R. Br. *Prodr. Fl. Nov. Holl.* 1 : 196. 1810; Hook. f. *Fl. Brit. Ind.* 7 : 24. 1897; Lisboa, *Bomb. Grass.* 7. 1897; Prain, *Beng. Pl.* 2 : 1172. 1903 (Repr. ed. 3 : 439. 1958); Haines, *Bot. Bih. & Or.* 984. 1925 (Repr. ed. 3 : 1030, 1961); Fyson, *Fl. Nilg. & Pul. Hilltops* 1 : 448. 1915; Fyson, *Fl. South Ind. Hill Stat.* 1 : 655. 1932; Blatter & McCann, *Bomb. Grass.* 188, t. 122, 1935. *Panicum violaceum* Klein ex Thiele in *Linnaea* 9 : 307, 1834. *P. lepidotum* Steud. *Flora* 29 : 19. 1846. *I. lepidota* (Steud.) Walp. *Ann. Bot.* 1 : 924. 1848. *P. nodibarbatum* Hochst. ex Steud. *Syn. Pl. Glum.* 1 : 95. 1854. *I. australis* R. Br. var. *effusa* Trim. ex Hook. f. *Fl. Brit. Ind.* 7 : 25. 1897. *I. globosa* (Thunb.) O. Ktze. var. *effusa* (Trim. ex Hook. f.) Senaratna, *Grass. Ceyl.* 109. 1956; Bor, *Grass. Bur. Ceyl. Ind. Pak.* 580. 1960. *I. nodibarbatum* (Hochst. ex Steud.) Henrard in *Blumea* 3 : 646. 1940. *I. dispar auct non Trin.* 1828 : Hook. f. *Fl. Brit. Ind.* 7 : 26. 1897, *pro parte*; Duthie, *Grass. N. W. Ind.* 2. 1883; Lisboa, *Bomb. Grass.* 8. 1897; Fischer in *Fl. Pres. Madr. Pt.* 10 : 1797. 1934 (Repr. ed. 3 : 1244. 1957); Bor, *Grass. Bur. Ceyl. Ind. Pak.* 580. 1960, *pro parte*.

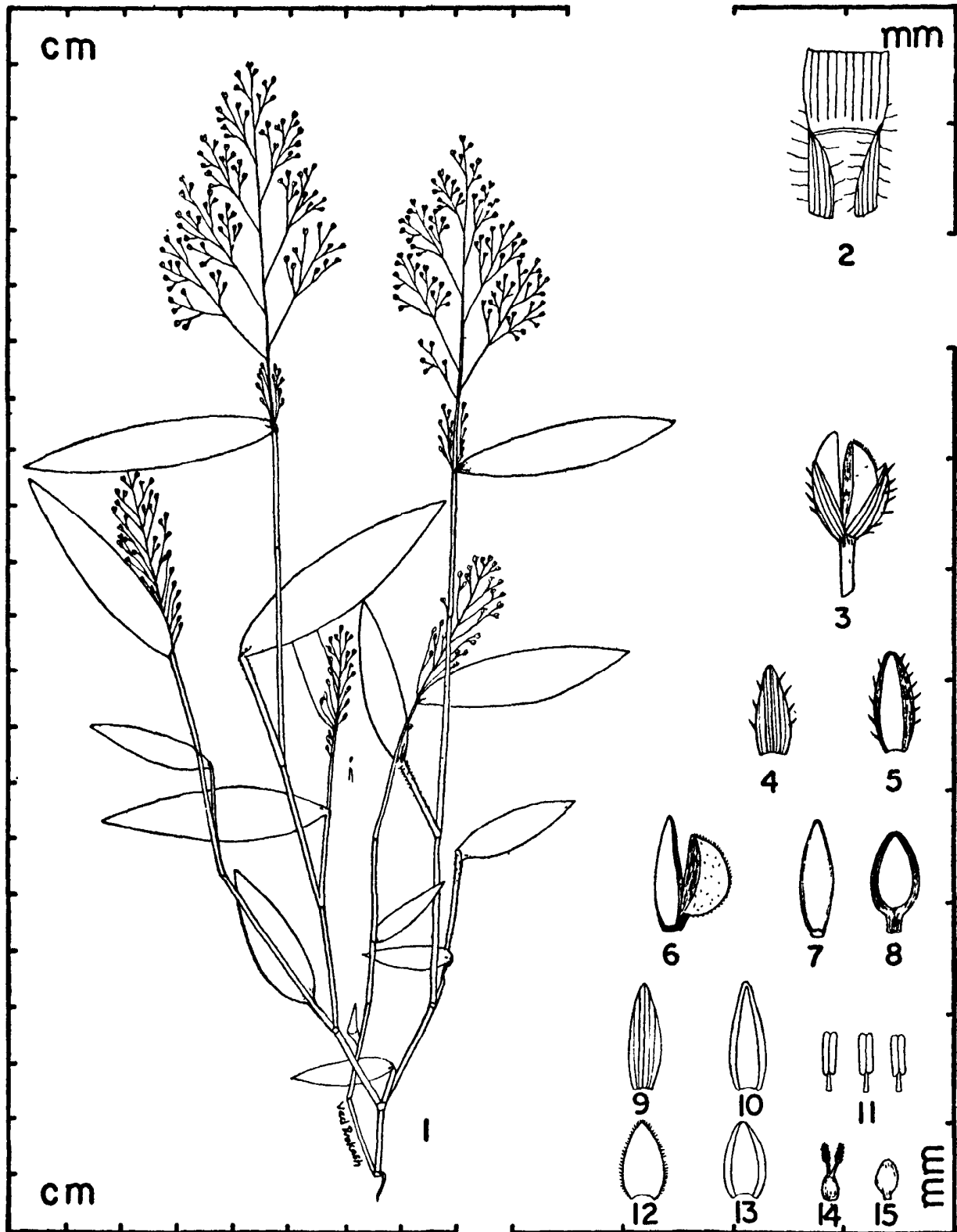
Figs. 1-13 (P. 23)

Annual or perennial, tufted (10-) 20-80 cm high, erect or ascending with slender branched culms. Leaf-blades 3-12 \times 0.3-1.2 cm, linear-lanceolate to



Isachne globosa (Thunb.) O. Ktze.

Figs. 1-13 : 1. Habit. 2. Ligule. 3. Spikelet. 4. Lower glume. 5. Upper glume. 6. Lower floret. 7. Upper floret. 8. Lower lemma. 9. Lower palea. 10. Stamens. 11. Upper lemma. 12. Upper palea (4-9, 11, 12 all in ventral view). 13. Pistil (*Ved Prakash* 331).



Isachne gracilis C. E. Hubb.

Figs. 1-15 : 1. Habit. 2. Ligule. 3. Spikelet. 4. Lower glume. 5. Upper glume. 6. Florets (lateral view). 7. Lower floret. 8. Upper floret. 9. Lower lemma. 10. Lower palea. 11. Stamens. 12. Upper lemma. 13. Upper palea (4, 5, 7, 8, 9, 10, 12, 13 all in ventral view). 14. Pistil, 15. Caryopsis (*Ved Prakash* 332).

ovate-lanceolate, occasionally hirsute on one or both surfaces. Panicle up to 18 cm long, compact or effuse; branches up to 9 cm long, ascending, capillary, flexuous; pedicels with or without glandular bands. Spikelets (1.8-) 2.0-2.5 (-2.8) mm long, globose or globose-obovoid. Glumes glabrous or setosely hirsute on dorsal side. Florets: lower as long as spikelet, mostly protruding beyond the glumes; upper 1.5-2.0 (-2.4) mm long. Lower lemma elliptic, thinly chartaceous, obscurely 5-nerved, glabrous. Upper lemma ovate-elliptic, concave, coriaceous, nerves obscure, often pubescent on back.

Type : Japan, *Thunberg s.n.* [UPS, Microfiche (No. 2041)!].

Fls. & Frts. : Throughout the year.

Distrib. : Widely distributed from sea level to 2000 m alt., grows gregariously in wet and marshy places, often troublesome weed in rice fields. INDIA : Uttar Pradesh, Assam, Manipur, West Bengal, Bihar, Orissa, Madhya Pradesh, Rajasthan, Gujrat, Maharashtra, Goa, Daman, Nagar Haveli, Andhra Pradesh, Karnataka, Kerala, Tamil Nadu ; SRI LANKA, BURMA, CHINA, JAPAN, MALAYSIA, SUMATRA, JAVA, AUSTRALIA, NEW ZEALAND.

Uses : The species is regarded as a good fodder. The grass is ploughed in as green manure. Tender tops are reported to be eaten in Java.

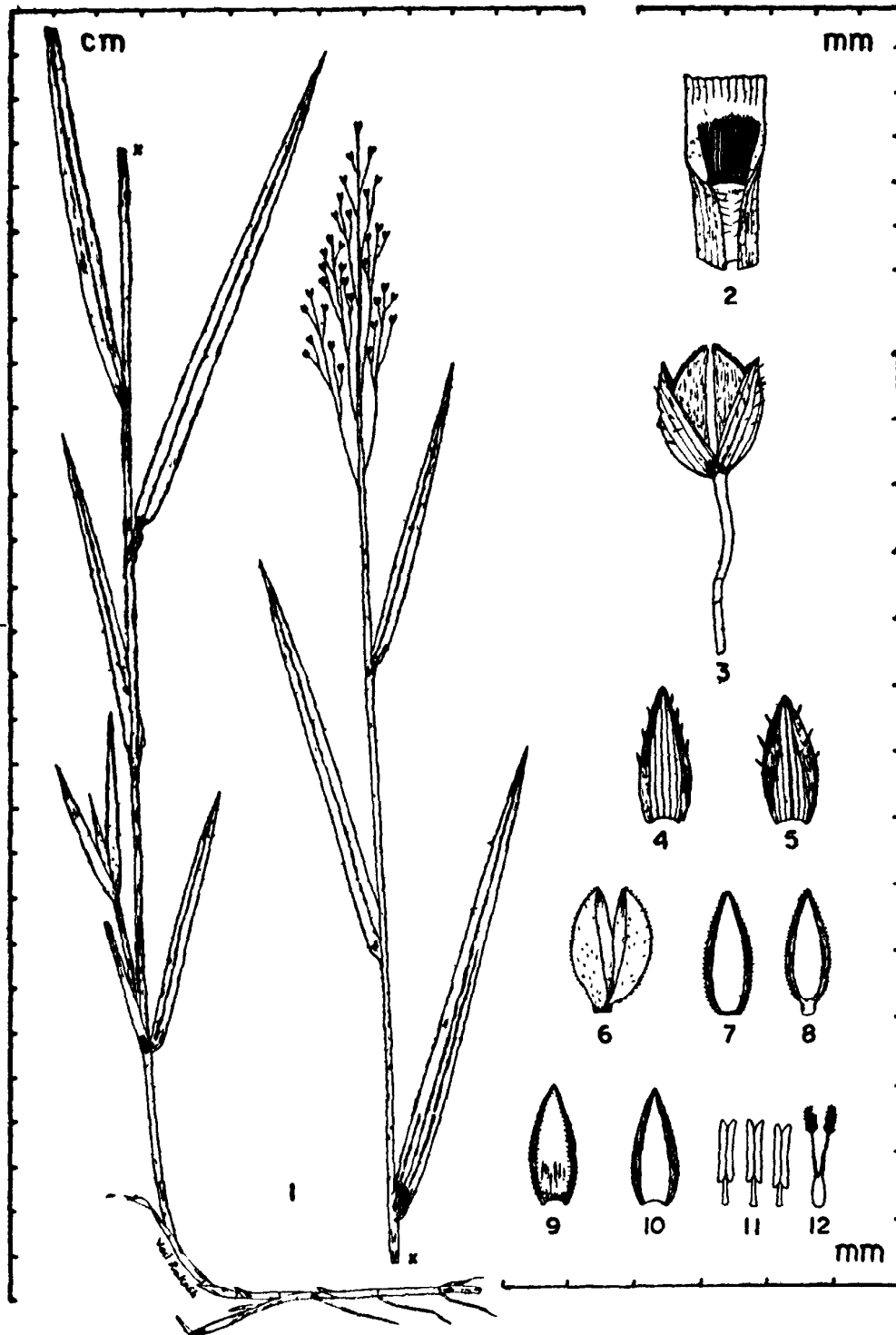
Chr. No. : $2n = 60$ (Tateoka in *Curr. Sci.* 28 : 78-79. 1959); $2n = 60$ (Gould & Soderstrom in *Canad. J. Bot.* 52 : 1075-1090. 1974).

Notes : This is a polymorphic species, showing great variation in qualitative and quantitative characters. The variation in this wide-spread species is complex and it is not possible to segregate the material into more than one taxon due to intergradation of characters among the specimens.

13. *I. gracilis* C. E. Hubb. in *Kew Bull.* 1927 : 77; Fischer in *Fl. Pres. Madr. Pt. 10* : 1796. 1934 (Repr. ed. 3 : 1244. 1957); Bor, *Grass. Bur. Ceyl. Ind. Pak.* 581. 1960.

Figs. 1-15 (P. 24)

Annual, very weak and delicate, 12-30 (-40) cm high, erect from the decumbent base. Leaf-blades 1-7×0.25-1.4 cm, elliptic, acute, very thin and soft, glabrous or sparsely hirsute. Panicle 2-8 cm long, effuse with 0.8-2.5 cm long capillary branches; reddish glandular bands on branches and pedicels. Spikelets ± 1 mm, globose. Glumes setosely hirsute on back; lower $\pm 0.7-0.85$ mm long, 7-nerved; upper 0.9-0.95 mm long, 7-9-nerved. Florets : lower ± 1 mm long, subsessile; upper 0.5-0.55 mm long stipitate, plano-convex, indurate.



Isachne himalaica Hook. f.

Figs. 1-12 : 1. Habit. 2. Ligule. 3. Spikelet. 4. Lower glume. 5. Upper glume. 6. Florets (lateral view). 7. Lower floret. 8. Upper floret. 9. Lemma. 10. Palea (4, 5, 7-10 all in ventral view). 11. Stamens. 12. Pistil (*Ved Prakash 231A*).

Type : India : Mysore (Karnataka), Bababudan Hills, Santaveri, 4000 ft (± 1200 m), Oct. 1908, *Meebold* 10781 (Holotype, K, Photo !; Iso-type, CAL !).

Fls. & Frts. : Aug.-Nov.

Distrib. : INDIA : Madhya Pradesh, Maharashtra, Karnataka, endemic. Very delicate and handsome grass grows in deep shade on rocks and walls in moist places at elevations from *ca.* 620-1800 m alt.

14. *I. himalaica* Hook. f. *Fl. Brit. Ind.* 7 : 23. 1897; Lisboa, *Bomb. Grass.* 7. 1897; Collett, *Fl. Simlensis* 580. 1921; Bor in *Fl. Assam* 5 : 197. 1940; Stewart in *Brittonia* 5 : 453. 1945; Bor, *Grass. Bur. Ceyl. Ind. Pak.* 581. 1960. *I. australis sensu* Duthie, *Grass. N. W. Ind.* 2. 1883, *non* R. Br. 1810.

Figs. 1-12 (P. 26)

Perennial, 30-100 cm high, erect or ascending with rhizomatous base. Blades 4.5-15.0 (-20.0) \times 0.2-0.9 cm, linear (-linear-lanceolate), acuminate, stiff, glabrous or hirsute, margins cartilaginous thickened. Panicle 4-14 cm long effuse with up to 5 cm long, subcapillary flexuous branches, pedicels with 1-3 glandular bands. Spikelets (1.5-) 2.0-2.5 mm long, globose-ovoid, often purple. Glumes glabrous or hirtellous. Florets 1.3-2.1 mm long.

Type : India : Khasi Hills, 4000-5000 ft (± 1200 -1500 m), *J. D. H. & T. T. s. n.* (Syntype, CAL !, K, Photo !).

Fls. & Frts. : Aug.-Dec.

Distrib. : Himalayan region at 1000-1500 m alt. in damp places along beds of streams. INDIA : Jammu & Kashmir, Punjab, Himachal Pradesh, Uttar Pradesh, Assam, Meghalaya; NEPAL, PAKISTAN, AFGHANISTAN.

Chr. No. : $2n=50$ (Mehra & Sood in *Taxon* 23 : 807-808. 1974).

15. *I. hirsuta* (Hook. f.) Keng in *Acta Phytotax. Sin.* 10 : 11. 1965. *I. albens* Trin. var. *hirsuta* Hook. f. *Fl. Brit. Ind.* 7 : 23. 1897; Bor, *Grass. Bur. Ceyl. Ind. Pak.* 579. 1960.

Perennial. *ca.* 50-100 cm high, ascending. Leaf-sheaths densely hirsute with tubercle-based hairs; sparsely hairy beneath, margins cartilaginous thickened, midrib and lateral nerves slightly distinct beneath. Panicle 8-19 cm long, open compound; branches up to 8 cm long, pyramidal; branches and pedicels with one to several glandular bands. Spikelets 1.5-1.8 mm long, oblong or ovoid. Glumes 1.4-1.8 mm long, sparsely hirsute on back. Florets 1.3-1.5 mm long.



Isachne kunthiana (Wight et Arn. ex Steud.) Thw.

Figs. 1-10 : 1. Habit. 2. Ligule. 3. Spikelet. 4. Lower glume. 5. Upper glume. 6. Lower floret (4-6 ventral view). 7. Upper floret (lateral view). 8. Lemma. 9. Palea (8, 9 ventral view). 10. Stamens, pistil and lodicules (flower) (K. M. Sebastine 4788).

Type : India : Cachar, June 1874, *R. L. Keenan s.n.* (Syntype, K, Photo !); Bangladesh: Sylhet, Sept. 1820, *Wallich s.n.* Wall. Num. List No. 8657 (Syntype, K, Photo !).

Fls. & Frts. : Aug.-March.

Distrib. : INDIA : Assam; BANGLADESH, MALAYSIA, CHINA.

Note : It has not been collected so far from Indian subcontinent after the type.

16. *I. kinabaluensis* Merr. in J. Str. Br. Roy. Asiat. Soc. 76 : 77. 1917; Jansen in Reinwardtia 2 : 283. 1953; Bor, Grass. Bur. Ceyl. Ind. Pak. 581. 1960; Ved Prakash in Bull. bot. Surv. Ind. 21 : 180-182. 1979. *I. javana sensu* Hook. f. Fl. Brit. Ind. 7 : 24. 1897, *non* Nees ex Steud. 1854.

Perennial, 20-90 cm high, ascending with semi-robust culms. Leaf-sheaths mostly overlapping, hirsute; blades 2-9×0.5-1.0 cm, lanceolate, erecto-patent, margins cartilaginous thickened, mostly hirsute with tubercle-based hairs beneath, glabrate in age. Panicle 6-16 cm long, effuse, compound; branches up to 11 cm long, spreading, capillary, flexuous. Spikelets 1.8-2.2 (-2.5) mm long, globose smooth. Florets 1.6-2.0 mm long. Lemmas elliptic, concave, coriaceous, nerves obscure, pubescent on upper quarter.

Type : British North Borneo, Mount Kinabaleu, 1450-3000 m, Nov. 15, 1916, *Clemens* 10704 (L).

Fls. & Frts. : Aug.-March.

Distrib. : South-East Asia at ±1500-2000 m alt. INDIA : Meghalaya; BURMA, THAILAND, MALAYSIA, SUMATRA, BORNEO.

Note : Occurrence of this grass in India has recently been reported by Ved Prakash (*l.c.*).

17. *I. kunthiana* (Wight et Arn. ex Steud.) Wight et Arn. ex Thw. Enum. Pl. Zeyl. 362. 1864; Hook. f. Fl. Brit. Ind. 7 : 21. 1897; Fischer in Fl. Pres. Madr. Pt. 10. 1796. 1934 (Repr. ed. 3 : 1244. 1957); Senaratna, Grass. Ceyl. 108. 1956; Bor, Grass. Bur. Ceyl. Ind. Pak. 581. 1960. *Panicum kunthianum* Wight et Arn. ex Steud. Syn. Pl. Glum. 1 : 96. 1854, *excl. syns. et specim.* Zoll. 271. *I. elatior* Hook. f. Fl. Brit. Ind. 7 : 22. 1897. *I. kunthiana* var. *latifolia* Hook. f. Fl. Brit. Ind. 7 : 22. 1897, *syn. nov.* *I. kunthiana* var. *elatior* (Hook. f.) Alst. Suppl. Fl. Ceyl. 316. 1931, *syn. nov.* *I. metzii* (Hochst ex Steud.) Henr. in Blumea 3 : 467. 1940.

Figs. 1-10 (P. 28)

Perennial, 15-120 cm tall, erect or ascending from long creeping and rooting base. Leaf-sheaths mostly hirsute with tubercle-based hairs; blades 1.5-10.0×0.3-1.7 (-2.5) cm, ovate to ovate-lanceolate or elliptic to elliptic-lanceolate or lanceolate, acute, amplexicaul, hirsute, margins cartilaginous thickened. Panicle 2-13 cm long, lax, branches up to 6 cm long, canaliculate, winged, stiff, often setose at the base. Spikelets (2-) 2.5-3.5 mm long, obovoid-elliptic. Glumes (2.0-) 2.5-3.5 mm long, much longer than the florets, cuspidate-acuminate, setose mostly in upper half. Florets included, almost similar, 1.5-2.5 mm long.

Type : Ceylon (Sri Lanka), *Wight* 1659 (K, Photo!).

Fls. & Frts. : Throughout the year.

Distrib. : Widely distributed in South-East Asia at *ca.* 1500-2600 m alt. INDIA : Tamil Nadu, Kerala, Karnataka; SRI LANKA, SUMATRA, JAVA, BORNEO, MALAYSIA.

Chr. No. : $2n=60$ (Gould & Soderstrom in *Canad. J. Bot.* 52 : 1075-1090. 1974); $2n = 60$ (Munniyamma & Narayan in *Taxon* 24 : 367. 1975).

Notes. : There is a great variation in the size of the plants and size & shape of leaf-blades. The two varieties namely *I. kunthiana* var. *elatior* and *I. kunthiana* var. *latifolia* were entirely based on quantitative characters. After the study of large number of specimens, it is seen that there is a continuous range of variation in size of plants and leaf-blades. Consequently it has not been considered proper to maintain these two as distinct varieties.

18. *I. lisboae* Hook. f. *Fl. Brit. Ind.* 7 : 22. 1897; Lisboa, Bomb. Grass. 6.1897; Cooke, *Fl. Pres. Bomb.* 2 : 922. 1908 (Repr. ed. 3 : 438. 1958); Fischer in *Fl. Pres. Madr. Pt.* 10 : 1797. 1934 (Repr. ed. 3 : 1244, 1957); Blatter & McCann, *Bomb. Grass.* 187. 1935; Bor, *Grass. Bur. Ceyl. Ind. Pak.* 581. 1960.

Annual, 6-23 cm long, prostrate or ascending with creeping base and long wiry roots. Leaf-sheaths very loose, hirsute or glabrous; blades 1.0-3.5×0.25-1.3 cm lanceolate (elliptic), amplexicaul, thin, soft, hirsute above, margins pectinately ciliate with long tubercle-based hairs. Panicle 1.5-6.0 cm long, lax, few-flowered; branches few, up to 2 cm long, erect to horizontally spreading, angular, stiff, setose; pedicels very short. Spikelets globose. Glumes 2-3 mm long, distinctly longer than the florets, obtusely-cuspidate, densely setose on back. Florets included, \pm 1.5-1.8 (-2.0) mm long. Lemmas hemispherical, glistening-punctulate.

Type : India : Mahabaleshwar, *Lisboa s. n.* (K, Photo!).

Fls. & Frts. : Aug.-Nov.

Distrib. : INDIA : Endemic to Maharashtra and Karnataka at $\pm 1000-1500$ m alt. (Western Ghats). Subgregarious in marshy places.

Notes : This is a rare grass apparently inhabiting only the Panchgani and Mahabaleshwar plateau (Maharashtra). Only once collected from Bababudan Hills, Karnataka. The populations of this species seem to be decreasing; we failed to find it at Mahabaleshwar in 1979.

19. *I. meeboldii* Fischer in Kew Bull. 1932 : 323 & in Fl. Pres. Madr. Pt. 10 : 1797. 1934 (Repr. ed. 3 : 1244. 1957), Bor, Grass. Bur. Ceyl. Ind. Pak. 581. 1960.

Perennial, up to ca. 80 cm high, erect, with long fibrous roots. Leaf-sheaths broad at base, splitting & tapering at apex, glabrous; blades $15-35 \times 0.2-1.0$ cm, linear, flat, tapering from middle towards base and apex, hirsute. Panicle 10-24 cm long, compact or effuse, densely flowered; branches up to 9 cm long, subcapillary, glabrous; pedicels & branches with 1-3 reddish glandular bands. Spikelets ca. 2.0-2.5 mm long, globose. Glumes setose on back. Florets included or slightly exerted, 1.5-1.8 mm long.

Type : India : Mysore, Shimoga, 2000-3000 ft ($\pm 600-900$ m), Oct. 1908, *A. Meebold* 10747 (Holotype, K, Photo!; Isotype, CAL !); *A. Meebold* 10746 (Paratype, CAL ! K); Kumsi, 2000-3000 ft ($\pm 600-900$ m), Oct. 1908, *A. Meebold* 10745 (Paratype, CAL!, K).

Fls. & Frts. : Sept.-Nov.

Distrib. : INDIA : Endemic to Karnataka at $\pm 600-900$ m alt. A weed in rice fields.

20. *I. miliacea* Roth ex Roem. et Schult. Syst. Veg. 2 : 476. 1817; Roth, Nov. Pl. Sp. 58. 1921; Hook. f. Fl. Brit. Ind. 7 : 25. 1897; Henrard in Blumea 3 : 467. 1940; Senaratna, Grass. Ceyl. 109. 1956; Anonymous, Wealth of India 5 : 270. 1959; Bor, Grass. Bur. Ceyl. Ind. Pak. 582. 1960, *excl. Specim. Duthie* 9961; *I. geniculata* Griff. Not. Pl. Asiat. 3 : 41. 1851. *I. stigmatosa* Griff. Not. Pl. Asiat. 3 : 42. 1851. *I. dispar auct. non Trin.* 1828; Bor in Fl. Assam 5 : 197. 1940, *pro parte*; Bor, Grass. Bur. Ceyl. Ind. Pak. 580. 1960, *pro parte*. *I. dispar* var. *villosa* Fischer in Fl. Pres. Madr. Pt. 10 : 1797. 1934 (Repr. ed. 3 : 1244. 1957).

Perennial, low, weak, 8-35 (-50) cm high, erect or ascending with long creeping and rooting base. Leaf-blades 1-3 (-6) \times 2.5-6.0 (-10) cm, ovate-lanceolate to lanceolate (-linear-lanceolate), mostly obtuse, striate and rough above, glabrous or sparsely hirsute on one or both surfaces, margins not cartilaginous. Panicle up to 6 (-10) cm long lax; branches up to 3.5 cm long, capillary, flexuous, glabrous; branches and pedicels with or without

glandular bands. Spikelets (1.5-) 1.7-2.0 mm long, obovoid. Florets : lower as long as spikelet; upper 1.0-1.6 mm long.

Type : India Orientali, 1814, *B. Heyne s. n.* (Holotype, B, Photo !).

Fls. & Frts. : Aug.-Nov.

Distrib. : Widely distributed in South-East Asia from sea level to 2000 m alt. INDIA : Sikkim, Assam, Meghalaya, West Bengal (N. Bengal), Maharashtra?, Andhra Pradesh, Karnataka, Kerala, Tamil Nadu, Andaman & Nicobar Islands; SRI LANKA, BURMA, THAILAND, CHINA, MALAYSIA, SUMATRA, JAVA.

Uses : A good fodder readily eaten by cattle and horses.

Chr. No. : $n=10$ (Christopher & Abraham in *Cytologia* 41 : 621-637. 1976); $2n=40$ (Munniyamma & Narayan in *Taxon* 24 : 367. 1975); $2n=40$ (Sindhe in *Taxon* 26 : 268. 1977).

Notes : This species is very allied to *I. globosa* (Thunb.) O. Ktze. and sometimes it is very difficult to definitely assign certain specimens to proper species. As Hooker (*l.c.*) stated that small plants of *I. miliacea* (mostly from Eastern India : Assam, Meghalaya) look very different from typical *I. globosa*, but larger (mostly from South India) appear to unite them by many intermediates. Both are wide spread species and show qualitative and quantitative variation in all characters. The major distinction between the two species is in spikelet size: in *I. miliacea* spikelets are usually 1.5-2.0 mm and these are 2.2-2.8 mm in *I. globosa*.

The identity of *I. miliacea* in Indian Floras (Prain, Beng. Pl. 2 : 1172. 1903; Cooke, Fl. Pres. Bomb. 2 : 923. 1908; Haines, Bot. Bih. & Or. 984. 1925; Fischer in Fl. Pres. Madr. Pt. 10 : 1797. 1934; Blatter & McCann, Bomb. Grass. 189, t. 123. 1935; Bor in Fl. Assam 5 : 198. 1940) is doubtful because this species is apt to be confused with *I. pulchella* Roth which is also found in most of the states in India but is not treated in any Indian Floras.

The grass referred in Indian Floras as *I. dispar* Trin. had throughout been wrongly identified. The scrutiny of protologue, illustration and type of *I. dispar* [Trin. Sp. Gram. 1 : t. 86. 1828.; Nepal, *Wallich s.n.* (K, Photo !)] revealed that it is very close to *I. globosa* and *I. miliacea* in structure of spikelets but it differs from the latter in having different types of leaf-blades which are mostly short, ovate-lanceolate or ovate-elliptic with conspicuous cartilaginous thickening on undulate margins. This type of leaf-blades are not found in Indian plants and the specimens which were assigned to *I. dispar* in Indian Herbaria & Floras actually belong either to *I. globosa* or to *I. miliacea*.

21. *I. mysorensis* Raghavan in Indian For. 97 : 304-307. 1971.

Annual, delicate grass up to 8 cm high, erect. Leaf-sheaths hirsute; blades 7-12×3-8 mm, ovate to ovate-elliptic, amplexicaul, soft, hirsute near the apex. Panicle up to 2.3 (-3.0) on long, lax; branches up to 0.8 cm long, capillary; pedicels with reddish glandular bands. Spikelets ± 1.2 mm long, globose. Glumes setosely hirsute on back; lower ± 1 mm long, nerveless; upper ± 1.2 mm long, 5-nerved. Florets ± 0.9 mm long. Lemmas elliptic, concave, coriaceous, nerves obscure, glabrous or pubescent.

Type : India : Karnataka (Mysore), Shimoga Dist., Kundaguda near Agumbe, Aug. 19, 1963; *Sundararaghavan* 90008 A (Holotype, CAL !); *Sundararaghavan* 90008 B-E (Isotypes, BSI !).

Fls. & Frts. : Aug.-Nov.

Distrib. : INDIA : So far known only from the type collection from Karnataka, endemic.

22. *I. oreades* (Domin) Bor, Grass. Bur. Ceyl. Ind. Pak. 582. 1960. *Panicum oreades* Domin Bibl. Brt. 20 : 297. 1915. *P. aequiglume* Hook. f. Fl. Brit. Ind. 7 : 44. 1897, non Hack. et Arechav. 1894.

Perennial, up to *ca.* 40 cm high, ascending. Leaf-blades 2.5-6.0 × 0.5-1.0 cm, lanceolate, sparsely hirsute on one or both surfaces, margins cartilaginous thickened. Panicle up to ± 8.5 cm long, effuse; axis subangular, conspicuously flexuous; branches up to ± 3.5 cm long, horizontally spreading, capillary, flexuous; pedicels with or without glandular bands. Spikelets 2.0-2.7 mm long, ellipsoid, acute or obovoid, gaping, dorsally subcompressed. Glumes glabrous. Florets included, lower 1.8-2.7 mm long.

Type : India : Tamil Nadu, Nilgiri Hills, Goodaloor Ghat, 5000 ft (Gudalur, 1500 m), *Lawson* 6 (K, Photo!).

Fls. & Frts. : Aug.-Nov.

Distrib. : INDIA : Tamil Nadu, endemic to Nilgiri Hills at ± 1500-2000 m alt.

Notes : This species is allied to *I. globosa* (Thunb.) O. Ktze., but can be distinguished from the latter in having obovoid spikelets, included florets and conspicuously flexuous axis and branches of panicles.

It is a rare grass so far known only from the type locality (Nilgiri). It has been collected after several decades by one of us [Nilgiri, near Cinchona plantations Pykara, Feb. 24. 1978, *Ved Prakash* 2 (CAL)].

23. *I. pulchella* Roth ex Roem. et Schult. Syst. Veg. 2 : 476. 1817; Roth, Nov. Plant. Sp. 59. 1821; Bor in Kew Bull. 1952 ; 321-323; Bor, Grass. Bur. Ceyl. Ind. Pak. 582. 1960.

Annual, tufted or not, 6-76 cm high, ascending. Culms slender, freely branched upwards, often glandular band ± 1 mm below each node. Leaf-sheaths short with tubercled hairs or glabrous; blades 1.5-4.0 \times 0.3-1.0 cm, ovate-lanceolate to ovate-elliptic, amplexicaul, hirsute on both surfaces, ciliate with long, tubercled hairs near the base, margins cartilaginous. Panicle 1.0-7.5 cm long; branches up to 3.5 cm long, spreading at maturity, capillary, glabrous; 1-3 reddish glandular bands on branches and pedicels. Spikelets (1.2-) 1.5-1.6 (-1.8) mm long, globose-obovoid. Glumes glabrous; lower 1.0-1.3 mm long, 5 (-7)-nerved; upper 7(-9)-nerved. Florets : lower 1.2-1.6 mm; upper 1.0-1.25 mm long.

Type : India Orientali, 1814, *Heyne s. n.* (Holotype, B, Photo!).

Fls. & Frts. : Sept.-Feb.

Distrib. : Widely distributed in South-East Asia up to *ca.* 1400 m alt. INDIA : Tamil Nadu, Andhra Pradesh, Maharashtra, Orissa?, Madhya Pradesh, Uttar Pradesh, Bihar, West Bengal, Assam, Nagaland, Manipur, Nicobar Islands ; BURMA, THAILAND, MALAYSIA, JAVA, BORNEO, SUMATRA, PHILIPPINES.

Notes : Hooker (Fl. Brit. Ind. 7 : 246 : 1897) relegated *I. pulchella* Roth under *Sphaerocaryum elegans* Nees (now correctly known as *S. malaccense* (Trin.) Pilger, a name based on earlier *Panicum malaccense* Trin. But (as Bor also stated in Kew Bull. : 321-323. 1952), it is a perfectly good species of *Isachne* which has been neglected and is not treated in any Indian floras.

This species is apt to be confused with *Isachne miliacea* Roth and recently latter has been reduced under *I. pulchella* Roth by Gilliland (Fl. Malaya 3 : 120. 1971). Most obvious distinguishing characters between these are : Spikelets 1.5-1.6 mm long; anthers 0.3-0.5 mm long and blades with thick cartilaginous margins in *I. pulchella* and spikelets 1.8-2.0 mm long, anthers 1.0-1.5 mm long and blades without cartilaginous margins in *I. miliacea*. The description given by Gilliland (*l. c.*) fits only for *I. pulchella*.

24. *I. scabrosa* Hook. f. Fl. Brit. Ind. 7 : 23. 1897; Bor in Fl. Assam 5 : 196. 1940; Bor, Grass. Bur. Ceyl. Ind. Pak. 582. 1960.

Perennial, *ca.* 30-120 cm high, suberect or rambling and geniculate at base. Leaf-sheaths loose, hirsute in upper half; blades 3.5-16.5 \times 0.5-1.4 cm, linear-lanceolate (-lanceolate), acuminate, rigid, very scabrid, sparsely hairy on one or both surfaces, only mid-rib prominent beneath. Panicle 6-20 cm long, compound, effuse; branches up to 11 cm long, pyramidal, capillary, eglandular. Spikelets 1.5-1.8 mm long, globose. Florets 1.0-1.3 mm long.

Type : India : Khasi Hills, 4500-5000 ft, *C. B. Clarke s. n.* (CAL. !).

Fls. & Frts : Aug.-Nov. (-April).

Distrib. : INDIA : Endemic to Meghalaya (Khasi Hills) at 1200-1800 m alt. Grows in shady places along the bank of streams with ferns & other grasses.

Note : This species has recently been reported from Nepal by Hara *et al.* (Enum. Fl. Pl. Nepal 1 : 136. 1978). However the identity needs checking.

25. *I. setosa* Fischer in Kew Bull. 1932 : 247; Fischer in Fl. Pres. Madr. Pt. 10 : 1797. 1934 (Repr. ed. 3 : 1244. 1957); Bor, Grass. Bur. Ceyl. Ind. Pak. 582. 1960.

Annual, low, 3-18 cm long, erect with slender culms and fibrous roots. Leaf-sheaths mostly hirsute; blades 0.5-2.8 × 0.2-1.0 cm, ovate to ovate-elliptic, margins slightly cartilaginous, hirsute with tubercle-based hairs. Panicle up to 5 cm long, narrow, branches up to 1.5 cm long, angular, stiff, glabrous; pedicels eglandular. Spikelets 2.0-3.0 mm long, obovoid-elliptic, often secund. Glumes 2.0-3.0 mm long, often longer than the florets, caudate-acuminate setose with tubercle-based hairs. Florets : lower 1.9-2.4 mm long, thinner ; upper 0.9-1.5 mm long.

Type : India : Cochin, at Kavalai, 3000-4000 ft (\pm 900-1200 m), *A. Meebold* 12125 (Holotype, K, Photo!); Travancore, at Devicolam, 6000 ft (\pm 1800 m), *A. Meebold* 13586 (Paratype, in Breslau herbarium).

Fls. & Frts. : July-Sept.

Distrib. : INDIA : Endemic to South India at 290-1800 m alt., Tamil Nadu, Kerala, Karnataka.

Notes : The upper glume is always distinctly longer than the floret (in situ). The relative length of lower glume and lower floret is variable. The lower glume may be slightly shorter or as long as or distinctly longer than the lower floret. The indumentum of glumes is also variable. They may be setose with tubercle-based hairs or completely glabrous. This species is allied to *I. bourneorum* Fischer.

26. *I. sikkimensis* Bor in Kew Bull. 1949: 115; Bor, Grass. Bur. Ceyl. Ind. Pak. 582. 1960; Hara *et al.* in Enum. Fl. Pl. Nepal 1 : 136. 1978.

Annual, weak, up to *ca.* 40 cm tall, erect from the decumbent base. Leaf-sheaths glabrous or sparsely hirsute, margins densely ciliate; blades 1.5-6.0 × 0.2-0.5 cm, narrowly elliptic or linear-lanceolate, acute, soft, hirsute. Panicle 5-10 cm long, effuse; branches up to 4 cm long, capillary, flexuous, eglandular. Spikelets \pm 2 mm long, ellipsoid, smooth, shining. Florets

included, 1.4-1.5 mm long, often upper slightly smaller. Lemmas ovate-elliptic, obtuse, concave, coriaceous, nerves obscure, glabrous.

Type : India : Sikkim, Karponang, 8500 ft (\pm 2550 m), Aug. 5, 1948, Dr. Bor's Collector No. 781 (Holotype, K, Photo !; Isotype, DD!).

Fls. & Frts. : July-Sept. (-Nov.).

Distrib. : INDIA : Eastern Himalaya at \pm 1800-2800 m alt., Sikkim, West Bengal, (Uttar Pradesh?); NEPAL.

Chr. No. : $n=20$ (Mehra & Sharma in Taxon 21 : 340-341. 1972); $n=20$ (Mehra & Sharma in Cytologia 40 : 453-462. 1975).

27. *I. swaminathanii* Ved Prakash et Jain in Proc. India Acad. Sci. (Pl. Sci.) 92 : 19-22. 1983.

Perennial, 30-95 cm tall, erect from decumbent base, with stiff culms. Leaf-blades 5-16 \times 0.5-1.7 cm, linear-lanceolate to broadly-lanceolate, acute-acuminate, hirsute with tubercle-based hairs, margins cartilaginous thickened. Panicle 8-18 cm long, pyramidal, effuse; branches up to 6 cm long, subcapillary, flexuous, glabrous; one to several glandular bands on branches and pedicels. Spikelets 2.2-2.5 (-2.7) mm long, globose. Glumes glabrous or sparsely setose. Florets (1.8-) 2.0-2.2 mm long.

Type : India : Maharashtra, Satara Dist., Mahabaleshwar, 1372 m, Oct. 9, 1979. *Ved Prakash* 337 A (Holotype, CAL !); *Ved Prakash* 337 B-E (Isotype, CAL !).

Fls. & Frts. : Sept.-Oct.

Distrib. : INDIA : Endemic to Maharashtra above 600 m alt. Grows in damp and shady places in sandy rocky soil.

28. *I. veldkampii* Bhatt & Nagendran in Curr. Sci. 52 : 258-259. 1983.

Annual, very low grass, 3.0-8.5 cm high, erect. Leaf-sheaths glabrous; blades up to 15 \times 7 mm, ovate, glabrous or scabrous above on nerves, panicle branches up to 5 mm long with glandular bands. Spikelets \pm 1.5 mm long globose. Glumes minutely hairy with few long hairs at the tip; lower \pm 1.1 mm long, faintly 3-nerved; upper 1.2-1.4 mm long, faintly 5-nerved. Florets 1.2-1.5 mm long. Lemmas elliptic, concave coriaceous, nerves obscure, woolly hairs at base.

Type : India : Karnataka, South Kanara Dist., Manipal, 150 m, Oct. 29, 1977, K. G. Bhatt 468A (Holotype, CAL; Isotypes, L, MH, BSI & Mysore Univ.).

Fls. & Frts. : Oct.

Distrib. : INDIA : So far known only from the type collection from Karnataka, endemic. Grows in marshy places.

29. *I. walkeri* (Arn. ex Steud.) Wight et Arn. ex Thw. Enum. Pl. Zeyl. 361. 1864; Hook. f. Fl. Brit. Ind. 7 : 26. 1897; Fischer in Fl. Pres. Madr. Pt. 10 : 1797. 1934 (Repr. ed. 3 : 1244. 1957); Bor, Grass. Bur. Ceyl. Ind. Pak. 582. 1960. *Panicum walkeri* Arn. ex Steud. Syn. Pl. Glum. 1 : 97. 1854.

Perennial, 60-150 cm tall, robust, erect or ascending with stout culms & long slender roots. Leaf-blades (3.5-) 6-22 × 0.5-2.4 cm, lanceolate (-linear-lanceolate), acuminate, smooth above, glabrous or sparsely hairy beneath, margins cartilaginous thickened. Panicle 10-27 cm long, very lax, few flowered; branches up to 17 cm long, pyramidal, subcapillary, conspicuous, glandular bands on branches and pedicels. Spikelets 3.5-4.5 mm long, obovoid. Glumes glabrous or sparsely hairy on back. Florets 3-4 mm long.

Type : Ceylon (Sri Lanka), *Wight* 2046 (?); India : Nilgiri, Sispara, *Hohenacker* 1280 (Syntype, K, Photo!).

Fls. & Frts. : Aug.-June.

Distrib. : INDIA : Tamil Nadu, Kerala; SRI LANKA. Grows as under-wood on slopes of hills at 100-2000 m alt.

Chr. No. : $2n=40$ (Gould & Soderstrom in Canad. J. Bot. 52 : 1075-1090. 1974).

3. LIMNOPOA

C. E. Hubb. in Hook. Ic. Pl. t. 3432. 1943; Bor, Grass. Bur. Ceyl. Ind. Pak. 583. 1960.

Aquatic, annual or perennial (?) with very slender culms and small leaf-blades. Inflorescence a terminal, solitary (occasionally two) spike-like raceme; rachis and pedicels flattened, slightly convex on back. Spikelets mostly in pairs, one sessile, the other pedicelled, obovoid-oblong, 2-flowered, hermaphrodite, disarticulating between the florets and above the glumes. Glumes subequal, oblong to elliptic-oblong, obtuse, membranous glabrous; lower narrower, 3-nerved; upper broader, 5-nerved. Florets 2 dissimilar: lower ♂, subsessile, as long as spikelet, flatter, thinner, glabrous; upper ♀, stipitate ca. two-third the length of lower, plano-convex, indurate pubescent. Lower lemma elliptic oblong, truncate, margins incurved, thinly chartaceous, 5-nerved, glabrous, its palea equal to lemma, subacute, hyaline, 2-nerved. Upper lemma elliptic-oblong, rounded at the apex, margins incurved,

concave, coriaceous, 1-nerved, pubescent on back, its palea similar to lemma, chartaceous, nerveless. Caryopsis oblong, obtuse, plano-convex.

Distrib. : A monotypic genus, endemic to Kerala (India).

Limnopoa meeboldii (Fischer) C. E. Hubb. in Hook. Ic. Pl. t. 3432. 1943; Bor, Grass. Bur. Ceyl. Ind. Pak. 583. 1960. *Coelachne meeboldii* Fischer in Kew Bull. 169. 1934.

Plants very delicate, elongate, floating on the surface of water. Leaf-sheaths very short; ligules fringe of \pm 0.5 mm long hairs; blades 0.5-1.8 \times 0.1-0.25 cm, linear-lanceolate, acute-acuminate, mostly bent downwards, glabrous. Spike-like raceme up to 3 cm long. Spikelets 3.5-4.0 mm long, obovoid-oblong, borne mostly in pairs, one sessile, the other pedicelled, pedicels 2.0-3.5 mm long, flattened. Glumes subequal, 2.5-3.0 mm long. Lower lemma \pm 3-4 mm long; upper lemma 1.5-2.0 mm long. Stamens 3, anthers \pm 2(-2.7) mm long. Caryopsis \pm 1.5-1.6 mm long.

Type : India : Cochin, Chalakudi, Nov. 1910, A. Meebold 12520 (Holotype, K, Photo!; Isotype, CAL J & Breslan Herb.).

Fls. & Frts. : Sept.-Nov.

Distrib. : INDIA : Endemic to Ernakulam Dist. (Cochin State), Kerala.

Grows apparently in tanks, forming thick mass of tangled stems on the surface of water in association with *Sacciolepis interrupta*, *Nymphoides indicum* & *Hydrilla* sp.

Notes : This strange aquatic grass has been found only in the type locality and is perhaps a very rare species which is represented only by a few populations. It was known only from the original collection made by A. Meebold in 1910 until Dr. Cook relocated it in 1973 and 1979. Dr. Cook (in Litt.) stated "A single population of this rather strange aquatic grass was found at Chottanikare, ca. 14 km S. E. of Ernakulam (Cochin), Kerala. I first found this population in 1973, in 1979 it was unchanged. The population contains several hundred plants and occupies an area of about 100 \times 300 m in a vast flood plane. That is otherwise uniform. An intense search was made surrounding the population but no additional plants were found".

4. SPHAEROCARYUM

Nees ex Hook. f. Fl. Brit. Ind. 7 : 246. 1897; Pilger in Engl. & Prant. Die Naturl. Pflanzenfam. 14d : 64. 1956 ; Senaratna, Grass. Ceyl. 59. 1956; Bor, Grass. Bur. Ceyl. Ind. Pak. 583. 1960. *Graya* Arn. ex Steud. Syn. Pl.

Glum. 1 : 119. 1854, *non* Arn. ex Steud. 1840, *nec* Hook. et Arn. 1840.
Steudelella Honda in J. Fac. Sci. Imp. Univ. Tokyo, Sect. III, Bot. 3 : 258.
1930.

Annual, ascending from prostrate and rooting base. Culms slender to semirobust with short leaf-sheaths and ovate blades. Inflorescence an effuse, pyramidal panicle. Spikelets minute, 1-flowered, hermaphrodite, dorsally subcompressed, disarticulating above the glumes, glumes and florets separately deciduous. Glumes membranous, glabrous; lower shorter, nerveless; upper as long as spikelet, 1-nerved. Lemma equal to upper glume or slightly shorter, nerves obscure, pubescent on back. Palea similar to lemma but narrower. Stamens 3. Caryopsis *ca.* 1 mm long, terete with remnants of styles and basal appendages.

Distrib. : A monotypic genus; Tropical Asia.

Sphaerocaryum malaccense (Trin.) Pilger in Fedde, Rep. Sp. Nov. 45 : 2.
1938; Bor, in Fl. Assam 5 : 156. 1940; Bor, Grass. Bur. Ceyl. Ind. Pak.
583. 1960. *Panicum malaccense* Trin. Gram. Panic. 204. 1826.

Figs. 1-11 (P. 40)

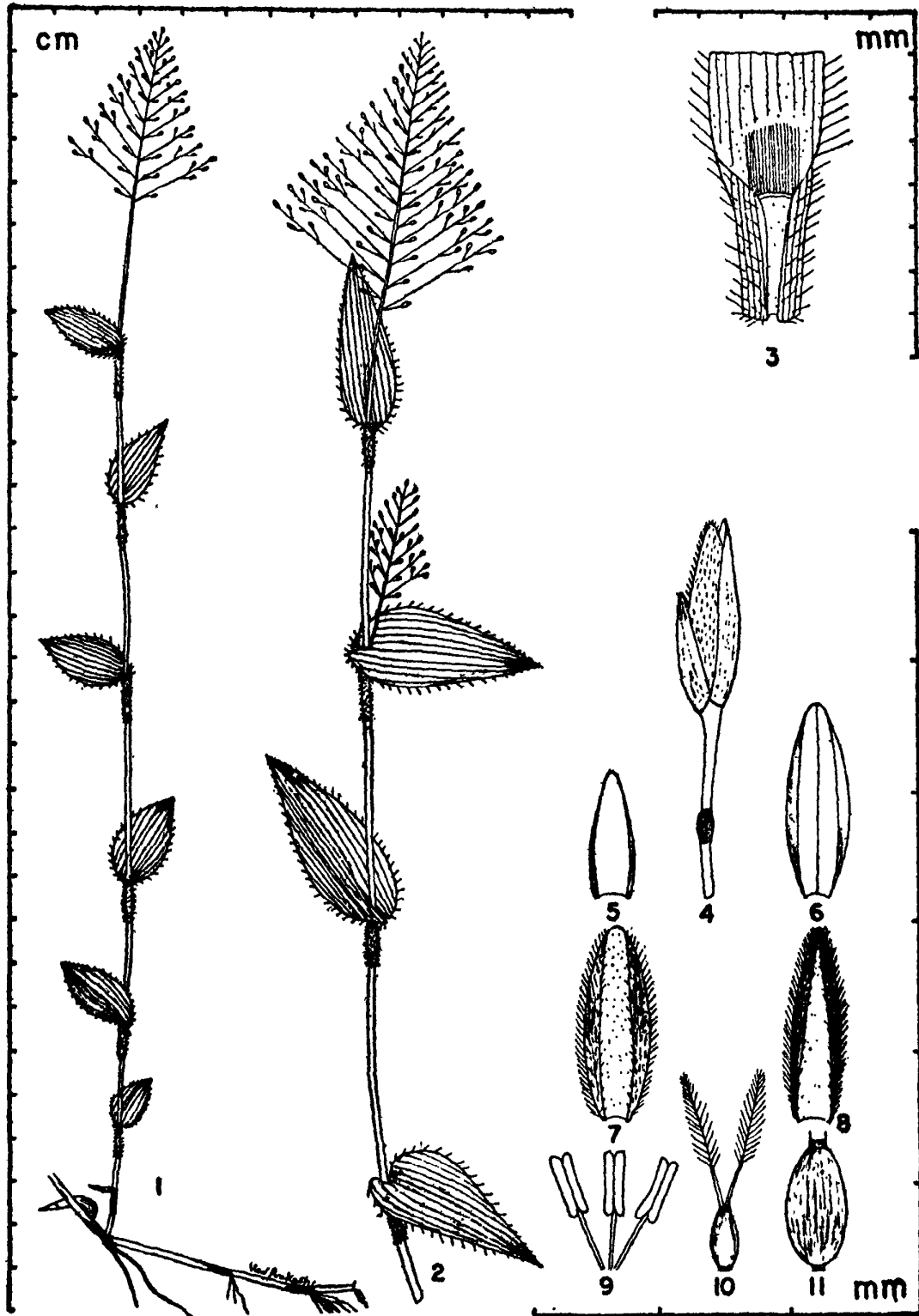
Annual, 15-85 cm long, erect from decumbent base. Leaf-sheaths very short, hirsute or glabrous; ligules fringe of 1.0-1.5 (-2.0) mm long hairs; blades 1.0-5.5 × 0.8-2.0 cm, ovate to ovate-elliptic, acute, amplexicaul, margins mostly ciliate with tubercle-based hairs. Panicle 2-11 cm long, pyramidal, effuse; branches up to 4.5 cm long, capillary; glandular bands on branches and pedicels. Spikelets 1.0-1.5 mm long, ellipsoid or ovoid or obovoid. Glumes readily deciduous, oblong to elliptic-oblong, obtuse; lower 0.7-1.0 mm long, upper as long as spikelet. Lemma & palea as long as or slightly shorter than upper glumes. Anthers ± 0.5 mm long.

Type : Malacca, *Willdenow s. n.* (LE, Photo !).

Fls. & Frts. : Aug.-Nov. (June-July).

Distrib. : Widely distributed in South-East Asia at ±100-1800 m alt.
INDIA : Assam, Meghalaya, Nagaland; BANGLADESH, BURMA, MALAYSIA,
SRI LANKA, SINGAPORE, CHINA, JAPAN. Grows gregariously in forest margins,
shady banks, on damp or in swampy places.

Notes : This widespread species shows great variation in vegetative characters. Some plants are tender with small blades (up to 2.5 cm) and very slender culms, while others are tougher, tend to be semirobust with large blades (2.5-5.5 cm) and thicker culms, but the variation is not considered to be of enough taxonomic significance.



Sphaerocaryum malaccense (Trin.) Pilger

Figs. 1-11 : 1. and 2. Habit. 3. Ligule. 4. Spikelet. 5. Lower glume. 6. Upper glume. 7. Lemma. 8. Palea. 9. Stamens. 10. Pistil. 11. Caryopsis (Ved Prakash 188, 189).

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CORIARIACEAE	1	Oct.	1978
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DILLENiaceae	2	May	1979
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SIMAROUBACEAE	4	April	1980
BALANITACEAE	4	April	1980
ORCHIDACEAE (GENUS COELOGYNE)	5	June	1980
PITTOSPORACEAE	6	Nov.	1980
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LEGUMINOSAE (GENUS DERRIS)	8	July	1982
ACERACEAE (GENUS ACER)	9	Aug.	1982
ANNONACEAE (TRIBE UVARIEAE)	10	Sept.	1982
CUCURBITACEAE	11	Dec.	1982
VIOLACEAE	12	Aug.	1983
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