

**FASCICLES
OF
FLORA OF INDIA**

FASCICLE 15

POACEAE : TRIBE—ANDROPOGONEAE

U. R. DESHPANDE

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

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Date of Publication : 26th March, 1984.

POACEAE : TRIBE—ANDROPOGONEAE†

U. R. DESHPANDE*

DICHANTHIUM

Willemet in Usteri, Neue Ann. der. Bot. 18 : 11. 1796 ; Bor, Grass. Bur. Ceyl. Ind. Pak. 133. 1960. *Andropogon* L. sect. *Gymnandropogon* Benth. subsect. *Dichanthium* Willem. in Benth. & Hook. f. Gen. Pl. 3 : 1134. 1880. *Andropogon* L. subgenus *Dichanthium* Hack. in Hook. f. Fl. Brit. Ind. 7 : 195. 1897.

Annuals or perennials, culms slender to robust, simple or branched, erect or ascending, nodes glabrous or bearded. Leaf-blades linear-lanceolate, glabrous or hairy. Inflorescence of 2- many racemes, (rarely solitary) subdigitate or in simple or compound panicle, branches sometimes capillary, joints and pedicels terete or longitudinally grooved. Spikelets paired, one sessile, the other pedicelled. Sessile spikelet dorsally compressed ; glumes 2 ; lower 2-keeled, margins narrowly inflexed, pitted or not ; upper boat-shaped, keeled, lemmas 2 ; lower hyaline nerveless ; upper reduced to hyaline base of an awn. Lodicules 2, minute ; stamens 3 ; styles free, stigmas exerted ; grain oblong-ellipsoid or oblong. Pedicelled spikelet nearly as long as the sessile or longer, awnless, male or neuter ; glumes 2 ; lemma 1.

Distrib. : Ca 45 species, distributed in tropical Old World, viz. AFRICA, AFGANISTAN, PAKISTAN, INDIA, BURMA, SRI LANKA, CHINA, MALAYSIA, SINGAPORE, THAILAND, INDONESIA, LAOS, JAVA, PHILIPPINES, AUSTRALIA ; 26 species in India, 16 species endemic.

Chr. No. : X = 10.

Notes : Due to intergeneric hybridisation (and production of fertile hybrids) between *Dichanthium* Willem., *Capillipedium* Stapf and *Bothriochloa* O. Ktze., de Wet & Harlan (Amer. J. Bot. 53 : 97. 1966 & Taxon 19 : 339-340. 1970) merged these three genera into one, the name *Dichanthium* Willem. taking priority. Following this, these three genera are treated here as sections of the genus *Dichanthium* Willem.

Roberty (Boissiera 9 : 159, 163, 170. 1960) and Clayton (Kew Bull. 32 : 579. 1978) have also transferred genera *Eremopogon* (Hack.) Stapf,

† Editor for Fam. Poaceae (Tribe Andropogoneae) S. K. Jain, Botanical Survey of India, Howrah-711 103.

* Botanical Survey of India, Pune.

Euclasta Franch. and a few species of the genus *Schizachyrium* Nees under the genus *Dichanthium* Willem. but in author's opinion they are morphologically very distinct from the genus *Dichanthium* Willem. and hence are treated here as separate genera.

- 1a. Joints and pedicels solid, not grooved ; racemes digitate or subdigitate not panicled ... 3. Sect. **Dichanthium**
- 1b. Joints and pedicels with translucent groove, if not grooved then racemes in panicles :
 - 2a. Branches of panicle stout, bearing a number of spikelets from a little above the base to the apex ... 1. Sect. **Bothriochloa**
 - 2b. Branches of panicle capillary, bearing few spikelets near the apex only ... 2. Sect. **Capillipedium**

Section 1. *Bothriochloa* (O. Ktze.) Roberty in Boissiera 9 : 159. 1960.

- 1a. Lower racemes shorter than the main rachis (that is the tip of the lower racemes not exceeding the apex of rachis) :
 - 2a. Plants aromatic ; joints and pedicels densely silky hairy ... 19. **D. odoratum**
 - 2b. Plants not aromatic ; joints and pedicels not so silky or glabrous :
 - 3a. Lower lemma of the sessile spikelet nearly as long as the lower glume ... 10. **D. glabrum**
 - 3b. Lower lemma of the sessile spikelet half as long as the lower glume ... 5. **D. caucasicum**
- 1b. Lower racemes longer than the main rachis (that is the tip of the lower racemes exceeding the apex of rachis) :
 - 4a. Joints and pedicels terete, if grooved, groove not translucent :
 - 5a. Leaf sheath inflated ... 11. **D. grahamii**
 - 5b. Leaf sheath not inflated :
 - 6a. Sessile spikelet 3-4 mm long ; anthers *ca* 2 mm long ; pedicelled spikelet 4-5 mm long ; lower glume of pedicelled spikelet *ca* 9-nerved ... 7. **D. concanensis**

6b. Sessile spikelet 4.5-6.25 mm long ; anthers 3.0-3.75 mm long ; pedicelled spikelet 5.5-9.0 mm long ; lower glume of pedicelled spikelet 15-19 nerved ... 15. **D. jainii**

4b. Joints and pedicels with translucent groove :

7a. Leaves distichously arranged ... 6. **D. compressum**

7b. Leaves not distichously arranged :

8a. Lower glume of sessile spikelet pitted ; pedicelled spikelet pitted or not :

9a. Lower glume of sessile spikelet hairy below middle ; lower glume of pedicelled spikelet 0-1 pitted ... 22. **D. pertusum**

9b. Lower glume of sessile spikelet glabrous ; lower glume of pedicelled spikelet 2-3 (- 4)- pitted ... 13. **D. insculptum**

8b. Lower glume of sessile spikelet pitted or not ; pedicelled spikelet not pitted :

10a. Lower glume of sessile spikelet glabrous :

11a. Racemes 3-6 ; sessile spikelet 4 mm long ; lower glume not pitted ; nodes glabrous ... 9. **D. foulkesii**

11b. Racemes 12-15 ; sessile spikelet 4.5-5.0 mm long ; lower glume pitted or not ; nodes thickly bearded ... 16. **D. kuntzeana**

10b. Lower glume of sessile spikelet hairy below the middle :

12a. Leaves markedly pruinose on the lower surface ; sheaths terete ... 24. **D. pseudoischaemum**

12b. Leaves green ; sheaths keeled :

13a. Leaves cauline ; lower glume of sessile spikelet 8-12 nerved ; plant smelling of camphor ... 26. **D. woodrowii**

- 13b. Leaves mainly at the base of the culm ;
lower glume of sessile spikelet 5-7
nerved ; plants not smelling of camphor
... 14. *D. ischaemum*

Section 2. *Capillipedium* (Stapf) Deshpande *Stat. nov.*

- 1a. Sessile spikelets awnless ; pedicels spathulate
... 23. *D. planipedicellatum*
- 1b. Sessile spikelets awned ; pedicels terete, not spathulate :
- 2a. Awn 4.5-6.0 cm long ; lower lemma sometimes aristate
... 18. *D. magdaleni*
- 2b. Awn 0.6-3.0 cm long ; lower lemma never aristate :
- 3a. Peduncle of raceme pectinately hairy below the lowest
spikelet ... 25. *D. pteropechys*
- 3b. Peduncle of raceme glabrous :
- 4a. Sessile spikelet shorter than the pedicelled spikelet :
- 5a. Callus shortly bearded ; sessile spikelet oblong or
linear-oblong, truncate ; pedicelled spikelet at least
0.5-1.0 mm longer than the sessile ... 3. *D. assimile*
- 5b. Callus densely bearded ; sessile spikelet oblong-
lanceolate, obtuse ; pedicelled spikelet equal to or
slightly longer than the sessile ... 8. *D. filiculme*
- 4b. Sessile spikelet as long as the pedicelled spikelet :
- 6a. Leaves rounded at the base, lower glume of sessile
spikelet channelled ... 21. *D. parviflorum*
- 6b. Leaves tapering to the base, sometimes petioled ;
lower glume of sessile spikelet not channelled
... 12. *D. huegelii*

Section 3. *Dichanthium*

- 1a. Lower glume of sessile or of pedicelled or of both spikelets pitted ;
if both spikelets not pitted then margins of lower glume of pedi-
celled spikelet armed with bulbous based bristles :
- 2a. Lower glume of both the sessile and pedicelled spikelets not
pitted ... 17. *D. maccannii*

- 2b. Lower glume of either both spikelets or only sessile spikelets pitted :
- 3a. Lower glume of sessile and pedicelled spikelets pitted
... 20. *D. panchaganiense*
- 3b. Lower glume of sessile spikelet pitted ; pedicelled spikelet not pitted
... 2. *D. armatum*
- 1b. Lower glume of spikelets not pitted ; lower glume of pedicelled spikelet armed with bulbous-based hairs :
- 4a. Lower glume of sessile spikelet oblong, bulbous-based hairs present on the keels and near the apex ; pedicels of the pedicelled spikelet equal or slightly longer than half the length of the sessile spikelet
... 1. *D. annulatum*
- 4b. Lower glume of sessile spikelet obovate, hairs without bulbous bases scattered on the dorsal surface of the glume ; pedicel of the pedicelled spikelet less than half the length of the sessile spikelet
... 4. *D. caricosum*
1. *D. annulatum* (Forssk.) Stapf in Prain, Fl. Trop. Afr. 9 : 178. 1917 ; Haines, Bot. Bih. Or. 3 : 1039. 1924 (Repr. ed. 3 : 1087. 1961) ; Fischer in Fl. Pres. Madr. 10 : 1741. 1934 (Repr. ed. 3 : 1206. 1957) ; Bor in Fl. Assam 5 : 371. 1940 ; Raizada et Jain in Ind. For. Rec. 4(7) : 233. 1957 (1961) ; Bor, Grass. Bur. Ceyl. Ind. Pak. 133. 1960 ; de Wet & Harlan in Bol. Soc. Arg. Bot. 12 : 209. 1968. *Andropogon annulatus* Forssk. Fl. Aegypt.-Arab. 173. 1775 ; Hook. f. Fl. Brit. Ind. 7 : 196. 1897 ; Prain, Beng. Pl. 2 : 1205. 1903 (Repr. ed. 2 : 908. 1963) ; Cooke, Fl. Pres. Bomb. 2 : 988. 1908 (Repr. ed. 3 : 508. 1958).

Figs. 1-2

Densely tufted perennials, *ca* 1 m high ; culms smooth, erect or ascending, nodes long hairy. Leaf-blades 5-30 × 0.3-0.6 cm ; ligule 1.0-1.5 mm long. Inflorescence digitate or sub-digitate, racemes 2-9, 2.5-8.0 cm long ; peduncle 4-13 mm long ; joints and pedicels *ca* 2 mm long hairy. Sessile spikelets *ca* 4 mm long, elliptic ; glumes equal, lower hairy below middle, margins incurved, 5-9-nerved ; upper lanceolate, keeled in the centre ; awn 1.5-2.0 cm long. Pedicelled spikelets as long as the sessile ; lower glume 7-11-nerved.

Type : Egypt : *Forsskal* s. n. (LD, Photo !).

Fls. & Frts. : Sept.-Dec.

Distrib. : INDIA : Common all over ; widely distributed from Western N. Africa to Indonesia, Australia.

Chr. No. : $2n = 20$ (de Wet et Harlan, *l. c.*).

2. *D. armatum* (Hook. f.) Blatt. et McCann in J. Bomb. Nat. Hist. Soc. 32 : 425. 1928 ; Bor, Grass. Bur. Ceyl. Ind. Pak. 134. 1960 ; de Wet et Harlan in Bol. Soc. Arg. Bot. 12 : 214. 1968. *Andropogon armatus* Hook. f. Fl. Brit. Ind. 7 : 197. 1897 ; Cooke, Fl. Pres. Bomb. 2 : 987. 1908 (Repr. ed. 3 : 507. 1958).

Figs. 3-4

Annuals, 15-45 cm high, erect, tufted, nodes bearded. Leaf-blades 10-15 cm long, linear, bulbous-hairy on both surfaces ; ligule 0.5-1.0 mm, ciliate. Inflorescence subdigitate, racemes 1-5, simple, 1.5-4.0 cm long, peduncles capillary with whorl of long hairs in the axil ; joints and pedicels ciliate, slender. Sessile spikelets 3.0-3.5 mm long ; callus bearded ; lower glume 3.0-3.25 mm long, elliptic, upper 3.0-3.5 mm long, hairy at back, awn 2.0-2.7 cm long. Pedicelled spikelets slightly longer than the sessile ; lower glume armed with marginal bulbous based, *ca* 6 mm long bristles.

Type : India : Concan Stocks (K).

Fls. & Frts. : Oct.

Distrib. : INDIA : Western Ghats in Maharashtra ; endemic.

Chr. No. $2n = 20$ (de Wet & Harlan, *l. c.*).

3. *D. assimile* (Steud.) Deshpande *comb. nov.* *Andropogon assimilis* Steud. in Zoll. Syst. Verz. 58. 1854. et in Syn. Pl. Glum. 1 : 397. 1854 ; Hook. f. Fl. Brit. Ind. 7 : 179. 1897 ; Prain, Beng. Pl. 2 : 1203. 1903 (Repr. ed. 3 : 907. 1963) ; Cooke, Fl. Pres. Bomb. 2 : 981. 1908 (Repr. ed. 3 : 501. 1958). *A. glaucopsis* Steud. in Syn. Pl. Glum. 1 : 397. 1854. *Capillipedium assimile* (Steud.) A. Camus in Lecomte, Fl. Gen. de l' Indo-Chine 7 : 314. 1922 ; Haines, Bot. Bih. Or. 3 : 1028. 1924 (Repr. ed. 3 : 1074. 1961) ; Bor in Fl. Assam 5 : 363. 1940 ; Raizada et Jain in Ind. For. Rec. 4(7) : 226. 1957 (1961) ; Bor, Grass. Bur. Ceyl. Ind. Pak. 110. 1960. *C. glaucopsis* (Steud.) Stapf in Hook. Ic. Pl. Sub tab 3085. 1922 ; Fischer in Fl. Pres. Madr. 10 : 1730. 1934 (Repr. ed. 3 : 1199. 1957). *C. subrepens* (Steud.) Henr. in Blumea 3 : 463. 1940 ; Raizada et Jain in Indian Forester 77 : 749. 1951.

Figs. 5-6

Perennials, 1.5-3.0 m high, culms decumbent, rooting at nodes, nodes glabrous. Leaf blades 4.0-17.0 × 0.2-0.6 cm acuminate; ligule hairy. Inflorescence 4-15 cm long, branched, bearded in the axils; racemes 7-10 mm long; joints and pedicels 1.5-2.5 mm long, filiform. Sessile spikelets 2-3 mm long, pale green or reddish; lower glume oblong or linear-oblong, glabrous; awn 6-12 mm long. Pedicelled spikelets 3.0-3.5 mm long, linear-lanceolate.

Type : Java Zollinger 859 (holotype, P).

Fls. & Frts. : Sept.-Dec.

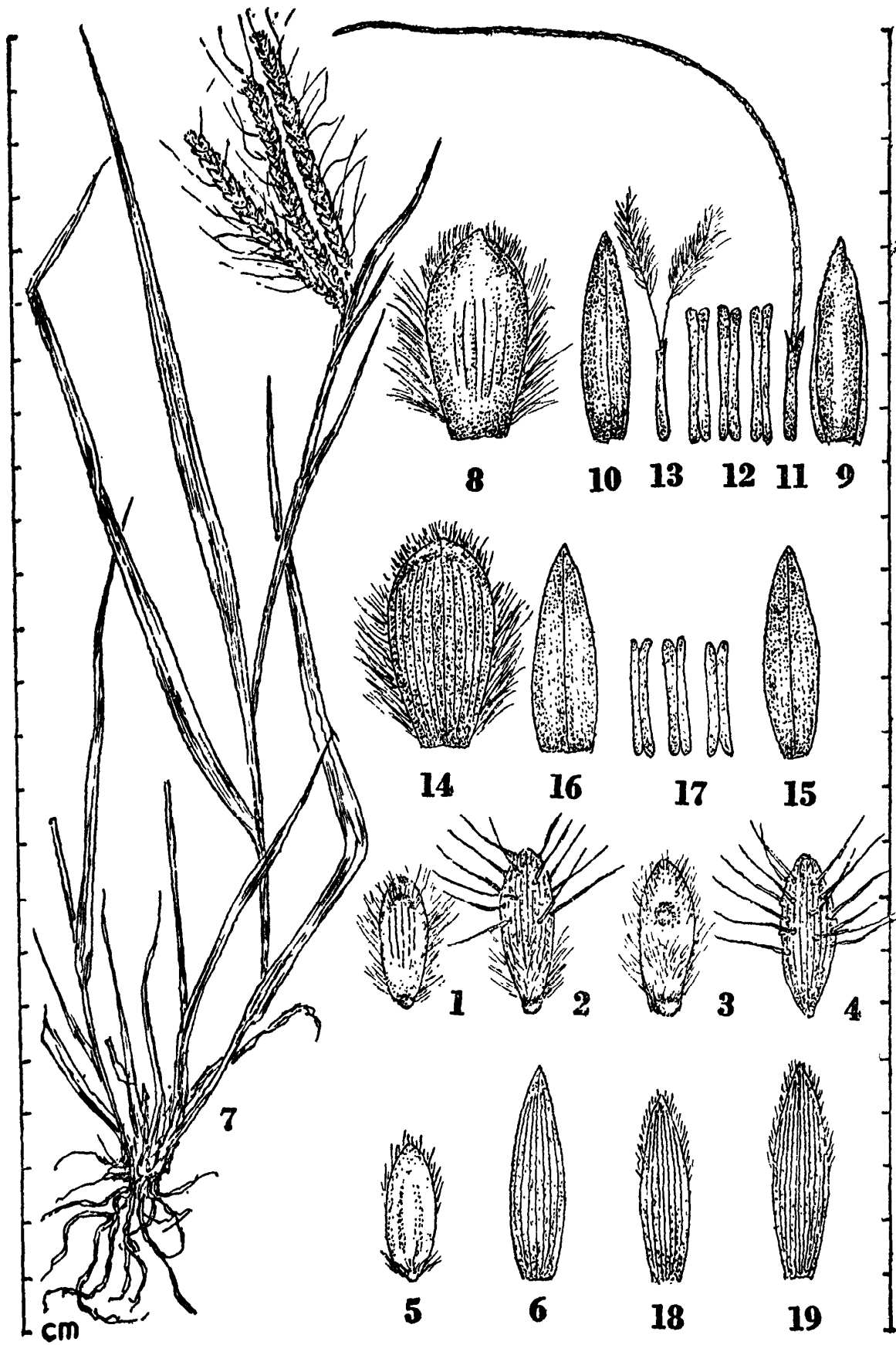
Distrib. : INDIA : Widely distributed : Himachal Pradesh, Sikkim, Arunachal Pradesh, Bihar, West Bengal, Assam, Nagaland, Manipur, Meghalaya, Rajasthan, Madhya Pradesh, Maharashtra, Andhra Pradesh, Orissa, Karnataka, Kerala; PAKISTAN, NEPAL, BHUTAN, BANGLADESH, BURMA, CHINA, JAPAN, JAVA.

Chr. No. : $n = 10$ (Khosla & Mehra in *Taxon* 22 : 647-654. 1973); $2n = 20$ (de Wet *et al.* in *Caryologia* 16 : 47-55. 1963); $2n = 40$ (Largen in *Dansk. Bot. Arkiv.* 20 : 211-275. 1963).

4. *D. caricosum* (L.) A. Camus in *Bull. Mus. Hist. Nat. Paris* 27 : 549. 1921; Haines, *Bot. Bih. Or.* 3 : 1039. 1924 (Repr. ed. 3 : 1086. 1961); Fischer in *Fl. Pres. Madr.* 10 : 1741. 1934 (Repr. ed. 3 : 1206. 1957); Bor in *Fl. Assam* 5 : 370. 1940; Raizada et Jain in *Ind. For. Rec.* 4(7) : 234. 1957 (1961); Bor, *Grass. Bur. Ceyl. Ind. Pak.* 134. 1960; de Wet et Harlan in *Bol. Soc. Arg. Bot.* 12 : 215. 1968. *Andropogon caricosum* L. *Sp. Pl.* ed. 2 : 1480. 1763; Hook. f. *Fl. Brit. Ind.* 7 : 193. 1897) incl. var. *mollicomus* Hack. in *DC. Monogr. Phan.* 6 : 569. 1889); Prain, *Beng. Pl.* 2 : 1205. 1903 (Repr. ed. 2 : 908. 1963); Cooke, *Fl. Pres. Bomb.* 2 : 987. 1908 (Repr. ed. 3 : 507. 1958). *Dichanthium nodosum* Willem in *Usteri Ann. Bot.* 18 : 11. 1796, *nom. illeg.*; Fischer *l. c.* 1741. 1934 (Repr. ed. 3 : 1207. 1957). *Andropogon aristatus* Poir. in *Lamk. Encycl. Meth. Bot. Suppl.* 1 : 585. 1810. *Apocopis pallida* Hook. f. *l. c.* 143. 1897. *Dichanthium pallidum* (Hook. f.) Stapf ex Fischer *l. c.* 1741. 1934 (Repr. ed. 3 : 1207. 1957); Bor *l. c.* 135. 1960. *D. aristatum* (Poir.) C. E. Hubb. in *Kew Bull.* 1939 : 654. 1939; Raizada et Jain in *Ind. For. Rec.* 4(7) : 232. 1957 (1961); Bor *l. c.* 134. 1960; de Wet et Harlan in *Bol. Soc. Arg. Bot.* 12 : 213. 1968. *syn. nov.*

Figs. 7-17

Perennials, 30-100 cm high, culms erect or creeping, nodes glabrous, sometimes bearded. Leaf-blades 5-30 × 0.3-0.6 cm, finely acuminate,



Figs. 1-19 : See page 9 for caption

glabrous or sparsely hairy; ligule a short ciliate membrane. Racemes 1-6, 3-10 cm long, solitary, 2-nate or digitate; peduncle below the inflorescence and pedicels of the racemes hairy or glabrous; joints and pedicels 1.0-1.5 mm long, solid, hairy on one side. Sessile spikelets 3-5 mm long, lower glume obovate or oblong 5-7-nerved, keels winged near the apex, dorsally more or less hairy; awn *ca* 2 cm long. Pedicelled spikelet nearly as long as the sessile.

Type : India *Linnaeus* s. n.(?).

Fls. & Frts. : Oct.-Dec.

Distrib. : INDIA : Jammu & Kashmir, Punjab, Uttar Pradesh, Bihar, West Bengal, Assam, Manipur, Rajasthan, Gujarat, Maharashtra, Madhya Pradesh, Andhra Pradesh, Orissa, Tamil Nadu, Karnataka, Andaman; BURMA, CHINA, MALAYSIA, THAILAND, LAOS, INDONESIA, SINGAPORE, SIAM, AFRICA.

Chr. No. : $2n = 20$ (de Wet et Harlan, *l. c.*).

Notes : Bor (*l. c.*) differentiated *D. caricosum* (L.) A. Camus and *D. aristatum* (Poir.) C. E. Hubb. by mere glabrous or hairy nature of the pedicels of the racemes. de Wet and Harlan (*l. c.*) have given some differentiating characters which appear to be useful but on practical examination of a wide range of material, they prove to be very variable and cannot be relied upon.

Cytologically these two species may be different but it is not possible to distinguish the two on the basis of morphological characters. Since the plants are very variable, as also suggested by Pandeya (J. Ind. bot. Soc. 32 : 86-100. 1953), *D. aristatum* and *D. caricosum* are treated here as conspecific.

Caption of figs. 1-19

- 1-2 : *Dichanthium annulatum* (Forssk.) Stapf. 1. Lower glume of sessile spikelet. 2. Lower glume of pedicelled spikelet.
3-4 : *D. armatum* (Hook. f.) Blatt. et McCann. 3. Lower glume of sessile spikelet. 4. Lower glume of pedicelled spikelet.
5-6 : *D. assimile* (Steud.) Deshpande. 5. Lower glume of sessile spikelet. 6. Lower glume of pedicelled spikelet.
7-17 : *D. caricosum* (L.) A. Camus. 7. Habit. 8-13 : Sessile spikelet. 8. Lower glume. 9. Upper glume. 10. Lower lemma. 11. Upper lemma. 12. Stamens. 13. Pistil. 14-17 : Pedicelled spikelet. 14. Lower glume. 15. Upper glume. 16. Lemma. 17. Stamens.
18-19 : *D. concanensis* (Hook. f.) Jain et Deshpande. 18. Lower glume of sessile spikelet. 19. Lower glume of pedicelled spikelet.

The identity of *D. pallidum* (Hook. f.) Stapf ex Fischer with reference to *D. caricosum* (L.) A. Camus is also doubtful. Recently it has been reported by Bhattacharya and Uniyal (Bull. Bot. Surv. Ind. 15 : 167. 1973) from N. India, besides its representation at Kew herbarium from 24 Parganas in West Bengal and from Nellore in Peninsular India. The distinguishing characters as given by Bor (*l. c.*) are very variable. After examining the specimen (*Bhattacharya* 13640) of this species matched and identified at Kew, no remarkable difference could be found between this species and *D. caricosum*. Therefore, *D. pallidum* is treated as a synonym to *D. caricosum* as also suggested by de Wet and Harlan (*l. c.*).

5. *D. caucasicum* (Trin.) Jain et Deshpande in Bull. Bot. Surv. Ind. 20 : 133. 1978 (1979). *Andropogon caucasicus* Trin. in Mem. Acad. Sci. Petersb. ser. 6(2) : 286. 1833. *A. intermedius* var. *caucasica* (Trin.) Hack. in DC. Monogr. Phan. 6 : 486. 1889; Hook. f. Fl. Brit. Ind. 7 : 176. 1897. *Bothriochloa caucasica* (Trin.) C. E. Hubb. in Kew Bull. 1939 : 101. 1939; Bor, Grass. Bur. Ceyl. Ind. Pak. 106. 1960.

Annuals *ca* 30 cm high, culms glabrous. Inflorescence a sub-simple panicle, 8-10 cm long; joints and pedicels hairy 2.0-2.5 mm long. Sessile spikelets *ca* 3.5 mm long; lower glume 5-7-nerved, puberulous, not pitted; upper more or less equal to lower; lower lemma nearly half as long as the lower glume; awn *ca* 6 mm long. Pedicelled spikelet *ca* 3 mm long, glabrous.

Type : Caucasus Orient *Wilheme* 1827 (holotype, LE).

Fls. & Frts. : Aug.-Oct. (Apr.).

Distrib. : INDIA : West Bengal, Manipur, Madhya Pradesh; PAKISTAN, U.S.S.R., AMERICA (introduced).

Chr. No. : $2n = 40$ (Harlan *et al.* in Oklahoma State Univ. Tech. Bull. T-72 : 5. 1958).

6. *D. compressum* (Hook. f.) Jain et Deshpande in Bull. Bot. Surv. Ind. 20 : 133. 1978 (1979). *Andropogon compressus* Hook. f. Fl. Brit. Ind. 7 : 172. 1897; Cooke, Fl. Pres. Bomb. 2 : 977. 1908 (Repr. ed. 3 : 496. 1958). *A. ensiformis* Hook. f. Fl. Brit. Ind. 7 : 175. 1897; Cooke, *l. c.* 979. 1908 (Repr. ed. 3 : 499. 1958). *Amphilophis compressa* (Hook. f.) Blatt. et McCann, Bomb. Grass. 83, t. 53. 1935; *A. ensiformis* (Hook. f.) Blatt. et McCann, *l. c.* 86. 1935. *Bothriochloa compressa* (Hook. f.) Henr. in Blumea 3 : 456. 1940; Bor,

Grass. Bur. Ceyl. Ind. Pak. 106. 1960. *B. ensiformis* (Hook. f.) Henr. in *Blumea* 3 : 457. 1940 ; Bor, l. c. 107. 1960.

Figs. 20-21

Tall or densely tufted perennials, 0.6-1.0 m high, nodes glabrous. Leaf-sheaths compressed, keeled ; blades 20.0-45.0 × 1.0 cm, linear-lanceolate, finely acuminate ; ligule scarious. Panicle *ca* 7.5 cm long ; joints and pedicels with long silky hairs. Sessile spikelets 4.0-5.0 mm long ; ovate-oblong ; lower glume 5-7-nerved ; hairy or sparsely hairy below middle ; upper 1-3-nerved ; lower lemma narrowly oblong ; awn 12.0-17.0 mm long. Pedicelled spikelets linear-oblong, as long as the sessile but narrower.

Type : India : Deccan *Lisboa* (No. 6. *A. odoratus*) (K, Photo !); Deccan *Woodrow* s. n. (K, Photo !).

Fls. & Frts. : Oct.-Nov.

Distrib. : INDIA : Western Ghats of Maharashtra ; endemic.

Chr. No. : $2n = 20$ (de Wet *et al.* in *Caryologia* 16 : 47-55. 1963).

Notes : A scrutiny of the type photos and herbarium specimens of *A. compressus* Hook. f. and *A. ensiformis* Hook. f. showed no significant difference to treat them as distinct species.

7. *D. concanensis* (Hook. f.) Jain et Deshpande in *Bull. Bot. Surv. Ind.* 20 : 134. 1978 (1979). *Andropogon concanensis* Hook. f. *Fl. Brit. Ind.* 7 : 174. 1897 ; Cooke, *Fl. Pres. Bomb.* 2 : 980. 1908 (Repr. ed. 3 : 499. 1958). *Amphilophis concanensis* (Hook. f.) Blatt. et McCann, *Bomb. Grass.* 87, t. 56. 1935. *Bothriochloa concanensis* (Hook. f.) Henr. in *Blumea* 3 : 457. 1940 ; Bor, *Grass. Bur. Ceyl. Ind. Pak.* 106. 1960.

Figs. 18-19

Perennials, 60-80 cm high. Leaf-blades 20-30 × 0.2-0.5 cm linear, finely acuminate, glabrous. Racemes 5-8, loosely fasciculate, 5-7 cm long ; rachis and peduncles filiform ; joints and pedicels 2 mm long, silky hairy. Sessile spikelet *ca* 4 mm long ; callus bearded ; glumes as long as the spikelet ; lower glume 7-9-nerved, margins incurved, keeled near the apex, shortly ciliate ; upper acuminate, faintly 3-nerved ; awn *ca* 2 cm long. Pedicelled spikelet as long as or slightly longer and narrower than the sessile.

Type : India : Bombay *Woodrow* (Herb. Bomb. n. 28) (K, Photo !).

Fls. & Frts. : Oct.-Nov.

Distrib. : INDIA : Western Ghats, Maharashtra fairly distributed, Karnataka rare; endemic.

Chr. No. : $2n = 20$ (de Wet *et al.* in *Caryologia* 16 : 47-55. 1963).

8. *D. filiculme* (Hook. f.) Jain et Deshpande in *Bull. Bot. Surv. Ind.* 20 : 134. 1978 (1979). *Andropogon filiculme* Hook. f. *Fl. Brit. Ind.* 7 : 181. 1897; Cooke, *Fl. Pres. Bomb.* 2 : 982. 1908 (Repr. ed. 3 : 502. 1958). *Capillipedium filiculme* (Hook. f.) Stapf in *Hook. Ic. Pl. subtab.* 3085. 1922; Fischer in *Fl. Pres. Madr.* 10 : 1730. 1934. (Repr. ed. 3 : 1199. 1957); Raizada et Jain in *Indian Forester* 77 : 753. 1951; Bor, *Grass. Bur. Ceyl. Ind. Pak.* 111. 1960.

Figs. 35-36

Annuals, 50-90 cm high, culms slender, trailing. Leaf-blades 5-11 × 0.3-0.5 (0.7) cm, tip filiform. Panicle 4-6 cm long, branches filiform, spikelets 2-3, pale green or white, sessile spikelets 2.5-3.0 mm long, oblong-lanceolate; lower glume 2.5-3.0 mm long, 5-7-nerved, hairy below the middle or all over, sometimes glabrous; awn 13-16 mm long. Pedicelled spikelet narrower than the sessile.

Type : Poona *Jacquemont* 310; Dhomsha *Woodrow* 26 (Syntypes, K).

Fls. & Frts. : Oct.-Dec.

Distrib. : INDIA : Maharashtra, Karnataka and Tamil Nadu; endemic.

9. *D. foulkesii* (Hook. f.) Jain et Deshpande in *Bull. Bot. Surv. Ind.* 20 : 134. 1978 (1979). *Andropogon foulkesii* Hook. f. *Fl. Brit. Ind.* 7 : 174. 1897. *Amphilophis foulkesii* (Hook. f.) Fischer in *Fl. Pres. Madr.* 10 : 1732. 1934 (Repr. ed. 3 : 1200. 1957). *Bothriochloa foulkesii* (Hook. f.) Henr. in *Blumea* 3 : 457. 1940; Bor, *Grass. Bur. Ceyl. Ind. Pak.* 107. 1960.

Perennials, ca 90 cm high, culms erect, nodes glabrous. Leaf-blades 10-35 × 0.4-0.6 cm, often involute. Inflorescence digitately fascicled, racemes 3-6, ca 10 cm long; joints and pedicels ca 2 mm long, hairy. Sessile spikelets ca 4 mm long, oblong-lanceolate; glumes as long as the spikelet, lower dorsally longitudinally depressed, 7-nerved, nerves distinct or not, upper 3-nerved; awn ca 2 cm long. Pedicelled spikelet slightly longer and narrower than the sessile.

Type : India : Pykora Aug. 1878, *King* s. n. (Syntype, CAL !); *Kaity Foulkes* s. n. (K, Photo !).

Fls. & Frts. : July-Sept.

Distrib. : INDIA : Tamil Nadu ; endemic.

Chr. No. : $2n = 20, 40$ (de Wet *et al.* in *Caryologia* 16 : 47-55. 1963).

10. *D. glabrum* (Roxb.) Jain et Deshpande in *Bull. Bot. Surv. Ind.* 20 : 134. 1978 (1979). *Andropogon glaber* Roxb. *Fl. Ind.* 1 : 267. 1820. *A. intermedius* auct. non R. Br. 1810 ; Hook. f. *Fl. Brit. Ind.* 7 : 175. 1897 ; Prain, *Beng. Pl.* 2 : 1204. 1903 (Repr. ed. 2 : 907. 1963) ; Cooke, *Fl. Pres. Bomb.* 2 : 980. 1908 (Repr. ed. 3 : 500. 1958). *A. montanus* Roxb. *Fl. Ind.* 1 : 267. 1820 ; Hook. f. *l. c.* 176. 1897. *Amphilophis glabra* (Roxb.) Stapf in *Fl. Trop. Africa* 9 : 172. 1917 ; Haines, *Bot. Bih. Or.* 3 : 1028. 1908 (excl. syn. *A. intermedius* R. Br.) (Repr. ed. 3 : 1075. 1961) ; Fischer in *Fl. Pres. Madr.* 10 : 1732. 1934 (Repr. ed. 3 : 1200. 1957). *Bothriochloa glabra* (Roxb.) A. Camus in *Ann. Soc. Linn. Lyon*, 1930, n. s. 76 : 164. 1931 ; Raizada et Jain in *Ind. For. Rec.* 4(7) : 230. 1957 (1961) ; Bor, *Grass. Bur. Ceyl. Ind. Pak.* 107. 1960. *B. intermedia sensu* Bor in *Fl. Assam* 5 : 367. 1940.

Fig. 22

Perennials, 90-100 cm high, culms tufted, glabrous. Leaf-sheaths glabrous, smooth ; blades 14-40 × 0.5-1.1 cm, linear, with a setaceous tip ; ligule truncate. Panicle 10-20 cm long, lower racemes simple or branched ; joints and pedicels 2.0-3.5 mm long, ciliate. Sessile spikelets 3.0-3.5 (-4.0) mm long ; glumes equal, lower hairy below the middle (sometimes glabrous), pitted or not. Pedicelled spikelet 2.5-3.25 mm long, linear.

1a. Sessile spikelets pitted or not ; pedicelled spikelets not pitted
... var. **glabrum**

1b. Sessile and pedicelled spikelets pitted ... var. **punctatum**

var. **glabrum**

Type : India : Bengal *Roxburgh* s. n. (Roxb. Ic. 1194, CAL !, K).

Fls. & Frts. : Sept.-Feb.

Distrib. : INDIA : Uttar Pradesh, Bihar, West Bengal, Sikkim, Assam, Manipur, Meghalaya, Rajasthan, Maharashtra, Madhya Pradesh, Orissa, Andhra Pradesh, Tamil Nadu ; PHILIPPINES.

Chr. No. : $2n = 40$ (de Wet *et al.* in *Caryologia* 16 : 47-55. 1963).

Notes : According to de Wet & Harlan (Taxon 19 : 339-340. 1970) this is a hybrid between tetraploid *D. parviflorum* (R. Br.) de Wet et Harlan and tetraploid *D. bladhii* (R. Br.) Clayton.

A scrutiny of the type photo of *A. bladhii* Retz. [*D. bladhii* (Retz.) Clayton] and Roxburgh's Icones no. 1194 of *A. glaber* Roxb. (*D. glabrum*) shows that the two taxa are entirely different, and all Indian specimens belong to *D. glabrum*. *D. bladhii* has lower racemes longer than the central axis and is not represented in India.

Supposed to be a good fodder.

var. **punctatum** (Roxb.) Deshpande *comb. nov.* *Andropogon punctatus* Roxb. Fl. Ind. 1 : 268. 1820 *syn. nov.* *Bothriochloa intermedia* (R. Br.) A. Camus var. *punctata* (Roxb.) Keng. Clav. Gram. Prim. Sin. 244. 1957 ; Bor, Grass. Bur. Ceyl. Ind. Pak. 108. 1960.

Type : India Roxburgh s. n. (Ic. 892, CAL !).

Fls. & Frts. : Sept.-Dec.

Distrib. : INDIA : Punjab, Uttar Pradesh, Bihar, West Bengal, Sikkim, Manipur, Meghalaya, Rajasthan, Maharashtra, Madhya Pradesh, Orissa, Kerala ; AFRICA.

Notes : Earlier workers, including Bor (1960), followed Keng, in treating *A. punctatus* as a variety of *A. intermedius* R. Br. (*D. bladhii*). But, in *A. punctatus* (Roxb. Ic. 892) lower racemes are shorter than the central axis and it resembles *A. glaber* more closely ; hence it is transferred here and treated as a variety of *D. glabrum*.

11. ***D. grahamii*** (Haines) Deshpande *comb. nov.* *Andropogon grahamii* Haines in Kew Bull. 1914. 189. 1914. *Bothriochloa grahamii* (Haines) Bor, Grass. Bur. Ceyl. Ind. Pak. 107. 1960.

Woody, often branched, perennials, branches fasciculate at nodes ; nodes pilose. Leaf-sheaths inflated ; blades 6-12 × 0.3-0.4 cm linear ; ligule short. Racemes 3-7, 3.5-5.0 cm long ; joints and pedicels densely ciliate. Sessile spikelet oblong, *ca* 3.5 mm long ; lower glume truncate, 5-nerved ; upper lanceolate acute, 3-nerved ; awn *ca* 2 cm long. Pedicelled spikelet narrower than the sessile spikelet.

Type : India : Central Provinces, Bewars, Lormi forests, Haines 3646 (K, Photo !).

Fls. & Frts. : May.

Distrib. : INDIA : Madhya Pradesh, rare ; endemic.

Chr. No. : $2n = 40$ (de Wet et Higgins in *Phyton* 20 : 205-211. 1963).

Notes : According to de Wet & Harlan (*Taxon* 19 : 339-340. 1970) this was an intergeneric hybrid between *Bothriochloa* [*D. bladhii* (Retz.) Clayton] and *Dichanthium* [*D. annulatum* (Forssk.) Stapf] it is one of the main grounds for merging these two genera.

12. *D. huegelii* (Hack.) Jain et Deshpande in *Bull. Bot. Surv. Ind.* 20 : 135. 1978 (1979). *Andropogon huegelii* Hack. in DC. *Monogr. Phan.* 6 : 492. 1889 ; Hook. f. *Fl. Brit. Ind.* 7 : 180. 1897 ; Cooke, *Fl. Pres. Bomb.* 2 : 982. 1908 (Repr. ed. 3 : 501. 1958). *A. foetidus* Donna Lisboa in *J. Bomb. Nat. Hist. Soc.* 6 : 205. 1891. *A. schmidii* Hook. f. *l. c.* 180. 1897. *Capillipedium huegelii* (Hack.) Stapf. in Hook. *l. c.* Pl. subtab. 3085. 1922 ; Fischer in *Fl. Pres. Madr.* 10 : 1730. 1934. (Repr. ed. 3 : 1199. 1957) ; Raizada et Jain in *Ind. For. Rec.* 4 (7) : 227. 1958 (1961) ; Bor, *Grass. Bur. Ceyl. Ind. Pak.* 111 : 1960. *C. foetidum* (Lisboa) Raizada et Jain in *Indian Forester* 77 : 752. 1951.

Figs. 29-30

Perennials, culms slender, simple or branched, 0.75-1.2 m high, nodes densely bearded. Leaf-blades 8-20 × 0.5-2.0 cm, narrowed at the base or sometimes petioled ; ligule membranous. Panicle 5-15 cm long ; joints and pedicels ciliate. Sessile spikelets 2-3 mm ; lower glume 2-3 mm, ovate, glabrous or hairy below middle. Lower lemma nearly half as long as the lower glume, ovate ; awn *ca* 3 cm long. Pedicelled spikelet equal to, or slightly longer than sessile.

Type : Asia *Huegel* 2243 (holotype, W !).

Fls. & Frts. : Aug.-Dec.

Distrib. : INDIA : Uttar Pradesh, Sikkim, Rajasthan, Gujarat, Maharashtra, Madhya Pradesh, Andhra Pradesh, Tamil Nadu, Karnataka ; endemic.

Chr. No. : $n = 20$ (Khosla & Mehra in *Taxon* 22 : 647-654. 1973) ; $2n = 20$ (de Wet *et al.* in *Caryologia* 16 : 47-55. 1963).

13. *D. insculptum* (Hochst. ex A. Rich.) Clayton in *Kew Bull.* 32 : 3. 1977. *Andropogon insculptus* Hochst. ex A. Rich. *Tent. Fl. Abyss.* 2 : 458. 1851. *A. pertusus* (L.) Willd. var. *insculptus* (Hochst. ex A. Rich.) Hack. in DC. *Monogr. Phan.* 6 : 482. 1889 ; Hook. f. *Fl. Brit.*

Ind. 7 : 174. 1897. *Amphilophis insculpta* (Hochst. ex A. Rich.) Stapf in Fl. Trop. Africa 9 : 176. 1917 ; Fischer in Fl. Pres. Madr. 10 : 1732. 1934 (Repr. ed. 3 : 1200 1957). *Bothriochloa insculpta* (Hochst. ex A. Rich.) A. Camus in Ann. Soc. Linn. Lyon, 1930, n. s. 76 : 165. 1931 ; Bor, Grass. Bur. Ceyl. Ind. Pak. 107. 1960.

Figs. 27-28

Hennu ganjalu garikai hullu (Kan.).

Tufted grass, 1.5-2.0 m high, nodes bearded. Leaf-blades 17.0-60.0 × 0.3-0.5 cm, glabrous or with few scattered hairs ; ligule *ca* 2 mm. Racemes 9-14, *ca* 9 cm long ; joints and pedicels *ca* 4 mm long, hairy. Sessile spikelets 4-5 mm, ovate, pitted ; lower glume ovate, pitted (rarely 2-pitted), 6-7-nerved, nerves obscure ; upper lanceolate, acute ; awn 1.0-2.5 cm long. Pedicelled spikelet *ca* 5 mm long, glabrous ; lower glume 2-4 pitted.

Type : Ethiopia : Sellueda Schimper 80 (isotype, K ; Photo !).

Fls. & Frts. : July-Dec.

Distrib. : INDIA : Tamil Nadu, Karnataka ; AFRICA.

Chr. No. : $2n = 50$ (de Wet *et al.* in Caryologia 16 : 47-55. 1963) ; $2n = 60$ (de Wet et Higgins in Phytion 20 : 205-211. 1963).

14. *D. ischaemum* (L.) Roberty in Boissiera 9 : 160. 1960. *Andropogon ischaemum* L. Sp. Pl. ed. 1 : 1047. 1753 ; Hook. f. Fl. Brit. Ind. 7 : 171. 1897. *Bothriochloa ischaemum* (L.) Keng in Contr. Biol. Lab. Sci. Soc. China, Bot. ser. 10 : 201. 1936 ; Bor, Grass. Bur. Ceyl. Ind. Pak. 108. 1960.

Figs. 23-24

Culms 45-90 cm high, erect or geniculately ascending, nodes glabrous. Leaf-sheaths compressed, with long hairs at mouth. Blades 6-20 cm long, narrow ; ligule short, fringed. Racemes 3-20, unequal, *ca* 7 cm long, digitate or sub-digitate ; joints and pedicels hairy *ca* 2 mm long. Sessile spikelets *ca* 4 mm long, elliptic-lanceolate ; lower glume 5-7-nerved ; upper mucronulate ; awn 1.5-2.0 cm long. Pedicelled spikelets *ca* 3 mm long.

Type : In Europe australiaris aridis *Linnaeus* (microfisch. no. 1211. 26 BSI !, K).

Fls. & Frts. : Aug.-Dec.

Distrib. : INDIA : Jammu & Kashmir, Punjab, Uttar Pradesh, Manipur, Rajasthan, Madhya Pradesh, Tamil Nadu ; PAKISTAN, AFGHANISTAN, AFRICA.

Chr. No. : $2n = 40, 60$ (de Wet *et al.* in *Caryologia* 16 : 47-55. 1963).

15. *D. jainii* (Desh. et Hem.) Deshpande in Bull. Bot. Surv. Ind. 21 : 198. 1979 (1981). *Bothriochloa jainii* Desh. et Hem. in Indian Forester 97 : 593, 1971.

Figs. 25-26

Tufted perennials, *ca* 1.5 m high, nodes bearded. Leaf-sheaths 15-25 cm long, strongly nerved, blades $30.0-65.0 \times 0.8-1.5$ cm ; ligule 2-5 mm long, lacerated. Panicle *ca* 14 cm long, racemes 3-15, 5-10 cm long ; joints and pedicels *ca* 2 mm long, hairy. Sessile spikelets 4.5-6.25 mm long ; callus with white, bristly hairs ; lower glume $4.25-6.0 \times 1.0-1.3$ mm, with a shallow channel or pit-like depression ; upper $4.25-6.0 \times ca$ 1.0 mm, 1-nerved ; awn 2.0-2.3 cm long ; anthers *ca* 3 mm long. Pedicelled spikelets $5.5-9.0 \times 1.5-2.0$ mm, acuminate.

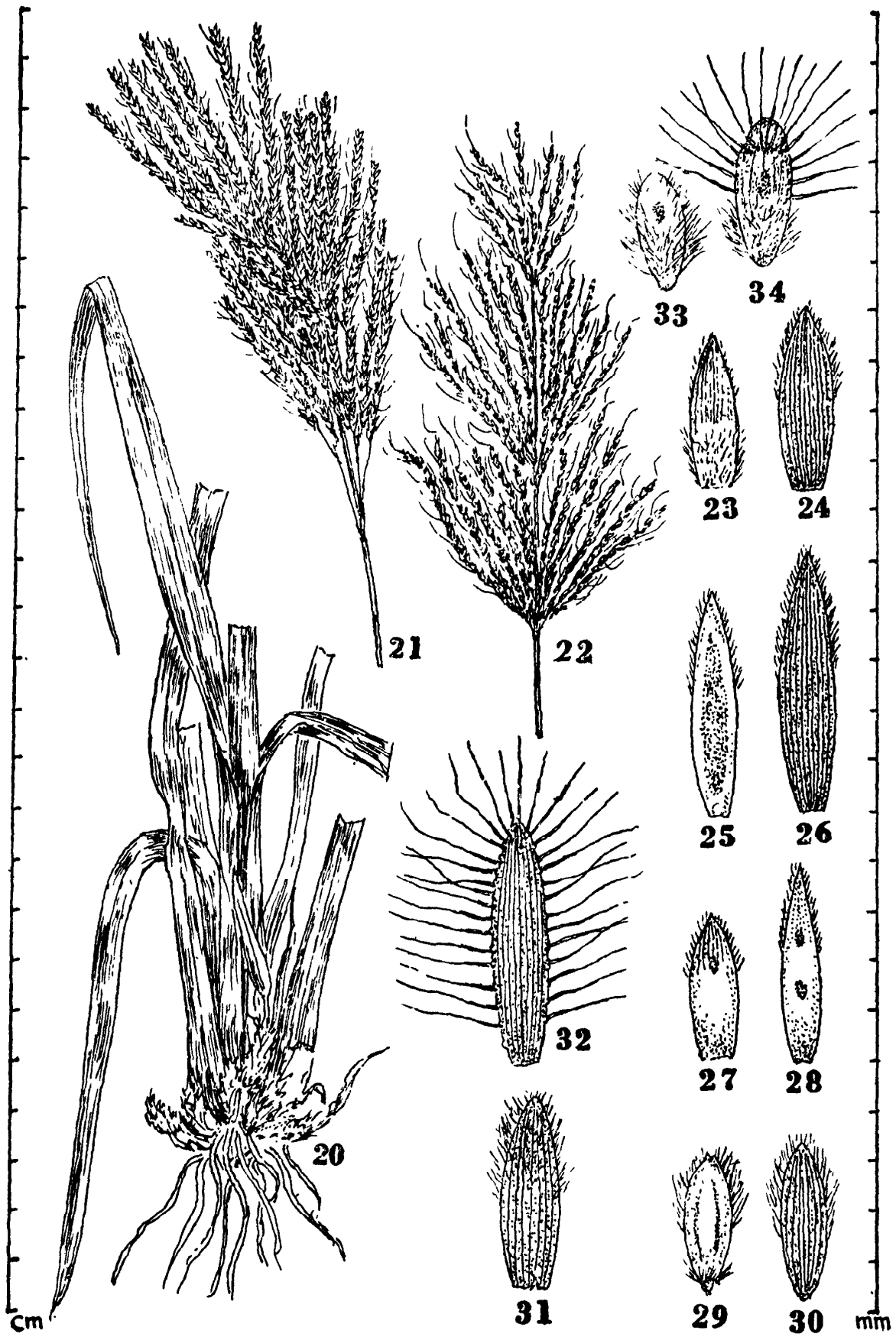
Type : India : Maharashtra, Pune. On the open top of Durga khilla, ± 2200 m, about 30 km west of Junnar, *Hemadri* 104241 A (holotype, CAL !) & 104241 B & C (isotypes, BSI !).

Fls. & Frts. : Oct.-Jan.

Distrib. : INDIA : Western Ghats in Maharashtra, grows on the open hill slopes and tops above 1000 m ; endemic.

16. *D. kuntzeana* (Hack.) Jain et Deshpande in Bull. Bot. Surv. Ind. 20 : 134. 1978 (1979). *Andropogon kuntzeana* Hack. in DC. Monogr. Phan. 6 : 478. 1889 ; Hook. f. Fl. Brit. Ind. 7 : 175. 1897 ; Cooke, Fl. Pres. Bomb. 2 : 979. 1908 (Repr. ed. 3 : 498. 1958). *A. pertusus* (L.) Willd. var. *longifolia* Hack. in DC. Monogr. Phan. 6 : 482. 1889 ; Hook. f. *l. c.* 174. 1897. *syn. nov.* *Eulalia clarkei* Haines, Bot. Bih. Or. 3 : 1017. 1924. *Amphilophis kuntzeana* (Hack.) Haines, *l. c.* 1031. 1924 (Repr. ed. 3 : 1078. 1961) ; Fischer in Fl. Pres. Madr. 10 : 1732. 1964. (Repr. ed. 3 : 1200. 1957). *Bothriochloa kuntzeana* (Hook.) Henr. in Blumea 3 : 456. 1940 ; Raizada et Jain in Ind. For. Rec. 4(7) : 231. 1957 (1961) ; Bor, Grass. Bur. Ceyl. Ind. Pak. 108. 1960. *B. longifolia* (Hack.) Bor, *l. c.* 108. 1960. *syn. nov.*

Perennials, 0.9-2.0 m high, culms erect, stout ; nodes bearded. Leaf-



Figs. 20-34 : See page 19 for caption.

blades 15-40 cm long, linear, glabrous, margins scaberulous. Inflorescence fasciculate, racemes many; joints and pedicels *ca* 2.5 mm long, densely ciliate. Sessile spikelets linear-lanceolate; lower glume *ca* 4.5 mm long, 5-nerved; upper nearly equal to the lower, lanceolate acuminate; awn *ca* 16 mm long. Pedicelled spikelets narrower than the sessile.

Type : Indiae Orientalis in Prov. Centr. Assyrigar Kuntze (NY).

Fls. & Frts. : Sept.-Jan.

Distrib. : INDIA : Uttar Pradesh, Bihar, Madhya Pradesh, Maharashtra, Andhra Pradesh; PAKISTAN.

Chr. No. : $2n = 20, 40$ (de Wet *et al.* in *Caryologia* 16 : 47-55. 1963).

Notes : A scrutiny of the type photo of *Andropogon pertusus* var. *longifolia* Hack. [*B. longifolia* (Hack.) Bor] suggests that it is not distinct from *D. kuntzeana* (Hack.) Jain et Deshpande.

17. *D. maccannii* Blatt. in J. Bomb. Nat. Hist. Soc. 32 : 357. 1927; Bor, Grass. Bur. Ceyl. Ind. Pak. 135. 1960; de Wet et Harlan in Bol. Soc. Arg. Bot. 12 : 218. 1968.

Figs. 31-32

Culms *ca* 45 cm high, erect, tufted, nodes densely long-bearded. Leaf-sheaths bulbous hairy on margins and the upper one-third, blades *ca* 10.0 × 0.6 cm, bulbous hairy all over; ligule, of bristles united at base, *ca* 1 mm broad. Racemes solitary or 2, *ca* 3.7 cm long; joints and

Caption of figs. 20-35

20-21 : *Dichanthium compressum* (Hook. f.) Jain et Deshpande. 20. Habit. 21. Inflorescence.

22 : *D. glabrum* (Roxb.) Jain et Deshpande. Inflorescence.

23-24 : *D. ischaemum* (L.) Roberty. 23. Lower glume of sessile spikelet. 24. Lower glume of pedicelled spikelet.

25-26 : *D. jainii* (Deshpande et Hemadri) Deshpande. 25. Lower glume of sessile spikelet. 26. Lower glume of pedicelled spikelet.

27-28 : *D. insculptum* (Hochst. ex A. Rich.) Clayton. 27. Lower glume of sessile spikelet. 28. Lower glume of pedicelled spikelet.

29-30 : *D. huegelii* (Hack.) Jain et Deshpande. 29. Lower glume of sessile spikelet. 30. Lower glume of pedicelled spikelet.

31-32 : *D. maccannii* Blatt. 31. Lower glume of sessile spikelet. 32. Lower glume of pedicelled spikelet.

33-34 : *D. panchganiense* Blatt et McCann. 33. Lower glume of sessile spikelet. 34. Lower glume of pedicelled spikelet.

pedicels of the lowest 3-4 pairs of spikelets glabrous and of the rest with a line of ciliate hairs. Sessile spikelets *ca* 4 mm long; lower glume *ca* 4 mm long, 7-nerved; upper slightly longer; awn *ca* 2.8 cm long. Pedicelled spikelets *ca* 5 mm long; lower glume 10-nerved, with spinous, stiff hairs on margins and apex.

Type : India : East of the third table land, Panchgani (Satara Dist.), Oct. 1925, McCann. s. n. (BLAT!).

Fls. & Frts. : Oct.

Distrib. : INDIA : Maharashtra; endemic.

Chr. No. : $2n = 20$ (de Wet et Harlan *l. c.*).

18. *D. magdaleni* (Almeida) Jain et Deshpande in Bull. Bot. Surv. Ind. 20 : 135. 1978 (1979). *Capillipedium magdaleni* Almeida in J. Bomb. Nat. Hist. Soc. 72 : 813. 1974.

Figs. 37

Perennials, *ca* 20 cm high, culms geniculate. Leaf-sheaths *ca* 3 cm long, striate; blades *ca* 4.0 × 0.3 cm, acuminate; ligule a thin membrane 0.5 mm long. Panicle 1-2 cm long, simple; rachis capillary, glabrous; joints and pedicels *ca* 1.5 mm long. Sessile spikelet *ca* 3 mm long, linear-lanceolate; lower glume *ca* 3 mm long, 5-nerved, hairy; lower lemma linear, acuminate, hyaline, sometimes looks like an awn; upper lemma a 4.5-6.0 cm long awn. Pedicelled spikelets 4-5 mm long; lower glume lanceolate, acute 7-9-nerved.

Type : India : Karnataka, Agumbe Nov. 1972, Almeida 2566, (BLAT!); Agumbe Almeida 2941 (Paratype, BSI!).

Fls. & Frts. : Nov.

Distrib. : INDIA : Karnataka, collected by the sides of a waterfall on rocky substratum only from one spot at Agumbe; endemic.

Notes : This is a very distinct species having the longest awn in the section *Capillipedium*.

19. *D. odoratum* (Lisboa) Jain et Deshpande in Bull. Bot. Surv. Ind. 20 : 134. 1978 (1979). *Andropogon odoratus* Lisboa in J. Bomb. Nat. Hist. Soc. 4 : 123. 1889; Hook. f. Fl. Brit. Ind. 7 : 177. 1897; Cooke, Fl. Pres. Bomb. 2 : 981. 1908 (Repr. ed. 3 : 500. 1958). *Amphilophis odorata* (Lisboa) A. Camus in Rev. Bot. Appl. 305. 1921; *Bothriochloa odorata* (Lisboa) A. Camus in Ann. Soc. Linn. Lyon, 1930, n. s. 76 : 165. 1931; Bor, Grass. Bur. Ceyl. Ind. Pak. 109. 1960.

Robust, aromatic perennials, 1-2 m high; leaf-sheaths compressed, glabrous; blades 30-60 × 0.4-1.0 cm, linear-lanceolate, acuminate, margins scaberulous; ligule, truncate. Inflorescence a dense panicle, racemes simple or branched, silky; joints and pedicels silky hairy. Sessile spikelets 4-5 mm long; lower glume oblong-lanceolate, hairy below middle, 7-nerved, rarely pitted; awn 13-16 mm long. Pedicelled spikelets equal to sessile, pitted or not.

Type : India : Bombay, Oct. 1890, *Lisboa* s. n. (K, Photo 1).

Fls. & Frts. : Nov.-Jan.

Distrib. : INDIA : Rare in West Bengal; widely distributed in Maharashtra; endemic.

Chr. No. : $2n = 40$ (de Wet *et al.* in *Caryologia* 16 : 47-55. 1963).

Notes : In the Plate given by Lisboa (*l. c.* opp. p. 118), the inflorescence is so made as to resemble that of *D. pertusum* (L.) Clayton.

The National Chemical Laboratory, Poona extracted an aromatic oil from this grass but it is not commercially used so far.

20. *D. panchaganiense* Blatt. et McCann in *J. Bomb. Nat. Hist. Soc.* 32 : 357. 1927; Bor, *Grass. Bur. Ceyl. Ind. Pak.* 135. 1960; de Wet et Harlan in *Bol. Soc. Arg. Bot.* 12 : 220. 1968.

Figs. 33-34

Annuals, 5-35 cm high, nodes bearded. Leaf-sheaths bulbous hairy; blades 3-8 × 0.3-0.4 cm, acuminate, bulbous hairy. Racemes 1-3, solitary or digitate, *ca* 3 cm long; peduncles capillary, *ca* 8 mm long; joints and pedicels hairy. Sessile spikelets *ca* 3 mm long; lower glume broadly oblong, pitted, 5-7-nerved, hairy except near the pit; upper oblong-lanceolate, keeled; awn 10-20 mm long. Pedicelled spikelets 3.5-4.0 mm long, glume pitted, armed with spreading marginal bulbous-based bristles.

Type : India : Maharashtra, Panchgani, Nov. 1925, *McCann* s. n. (BLAT 1, K).

Fls. & Frts. : Oct.-Nov.

Distrib. : INDIA : Maharashtra, Panchgani, Satara District; endemic.

Chr. No. : $2n = 20$ (de Wet & Harlan *l. c.*).

21. *D. parviflorum* (R. Br.) de Wet et Harlan in *Amer. J. Bot.* 53 : 97. 1966. *Holcus parviflorus* R. Br. *Prodr.* 199. 1810. *Andropogon mic-*

ranthus Kunth, Rev. Gram. 1 : 165. 1829; Hook. f. Fl. Brit. Ind. 7 : 178. 1897 (incl. var. *villosulus* Hack. in DC. Monogr. Phan. 6 : 440. 1889); Prain, Beng. Pl. 2 : 1203. 1903 (Repr. ed. 2 : 907. 1963). *Capillipedium parviflorum* (R. Br.) Stapf in Fl. Trop. Afr. 9 : 169. 1917; Haines, Bot. Bih. Or. 3 : 1027. 1924 (Repr. ed. 3 : 1074. 1961); Bor in Fl. Assam 5 : 362. 1940; Raizada et Jain in Ind. For. Rec. 4(7) : 227. 1957 (1961); Bor, Grass. Bur. Ceyl. Ind. Pak. 112. 1960.

Figs. 38-40

Perennials, 0.75-1.5 m high, culms tufted, nodes bearded. Leaf-sheaths glabrous, villous at the junction with the blade; blades 7-30 × 0.3-0.9 cm, tapering to a fine point. Panicle 10-25 cm long, branched. Racemes reduced generally to 1 sessile and 2 pedicelled spikelets, rarely 2-3 jointed; joints and pedicels *ca* 2 mm long. Sessile spikelets 3.0-4.5 mm long, oblong; awn 1.25-2.0 cm long. Pedicelled spikelets 2.8-4.2 mm long, narrower than the sessile spikelet.

Type : Australia *R. Brown* s. n. (BM).

Fls. & Frts. : Aug.-Jan.

Distrib. : INDIA : Jammu & Kashmir, Himachal Pradesh, Uttar Pradesh, Bihar, West Bengal, Sikkim, Assam, Nagaland, Manipur, Meghalaya, Rajasthan, Madhya Pradesh, Orissa; PAKISTAN, BURMA, MALAYA, JAVA, AUSTRALIA, AFRICA.

Chr. No. : $n = 11$ (Mehra & Ramanandan in Cytologia 18 : 259-270. 1973); $n = 10 + 1B$ (Mehra & Sharma in Taxon 22 : 115-118. 1973); $2n = 20, 40$ (de Wet *et al.* in Cytologia 26 : 268-273. 1961. et in Caryologia 16 : 47-55. 1963).

22. *D. pertusum* (L.) Clayton in Kew Bull. 32 : 4. 1977. *Holcus pertusus* L. Mant. Alt. 301. 1771. *Andropogon pertusus* (L.) Willd. Sp. Pl. 4 : 922. 1806; Hook. f. Fl. Brit. Ind. 7 : 173. 1897; Prain, Beng. Pl. 2 : 1204. 1903 (Repr. ed. 2 : 907. 1963). Cooke, Fl. Pres. Bomb. 2 : 978. 1903 (Repr. ed. 3 : 497. 1958). *Amphilophis pertusus* (L.) Nash ex Stapf in Agric. News W. Ind. 15 : 179. 1916; Haines, Bot. Bih. Or. 3 : 1030. 1924 (Repr. ed. 3 : 1077. 1961); Fischer in Fl. Pres. Madr. 10 : 1731. 1934 (Repr. ed. 3 : 1200. 1957). *Bothriochloa pertusa* (L.) A. Camus in Ann. Soc. Linn. Lyon 1930, n. s. 76 : 164. 1931; Bor in Fl. Assam 5 : 368. 1940; Raizada et Jain in Ind. For. Rec. 4(7) : 230. 1957 (1961); Bor, Grass. Bur. Ceyl. Ind. Pak. 109. 1960.

Figs. 42-44

Sandhur (Hind.); *Palva* (Mar.); *Palwan* (Punj.); *Chinna-karai Pully* (Tam.); *Janugaddi* (Tel.); *Basana* (Urd.).

Very variable, culms erect or geniculately ascending, 30-60 cm high, nodes densely bearded. Leaf-sheaths glabrous or villous; lower leaves short, crowded at the base, upper *ca* 30 cm long, acute or acuminate. Racemes 3-15, digitate or subdigitate, silky hairy; joints and pedicels *ca* 2.5 mm long, densely long silky hairy. Sessile spikelets 3.5-4.0 mm long, oblong-lanceolate; lower glume elliptic-oblong, obtuse or truncate, pitted, 5-9-nerved; upper lanceolate 3-5-nerved. Pedicelled spikelet narrower than sessile, pitted or not.

Type : East India Orientalis *Linnaeus* (microfische no. 1212. 16, BSI !, K).

Fls. & Frts. : Sept.-Jan.

Distrib. : INDIA : Punjab, Uttar Pradesh, Bihar, West Bengal, Assam, Rajasthan, Gujarat, Maharashtra, Madhya Pradesh, Orissa, Andhra Pradesh, Daman, Tamil Nadu, Karnataka, Kerala; BURMA, SRI LANKA.

Chr. No. : $n = 40$ (de Wet *et al.* in *Caryologia* 16 : 47-55. 1963).

23. *D. planipedicellatum* (Bor) Jain et Deshpande in Bull. Bot. Surv. Ind. 20 : 135. 1978 (1979). *Capillipedium planipedicellatum* Bor in Kew Bull. 1949 : 222. 1949 et Grass. Bur. Ceyl. Ind. Pak. 112. 1960. *Filipedium planipedicellatum* (Bor) Raizada et Jain in J. Bomb. Nat. Hist. Soc. 49 : 683, t. opp. p. 681. 1951.

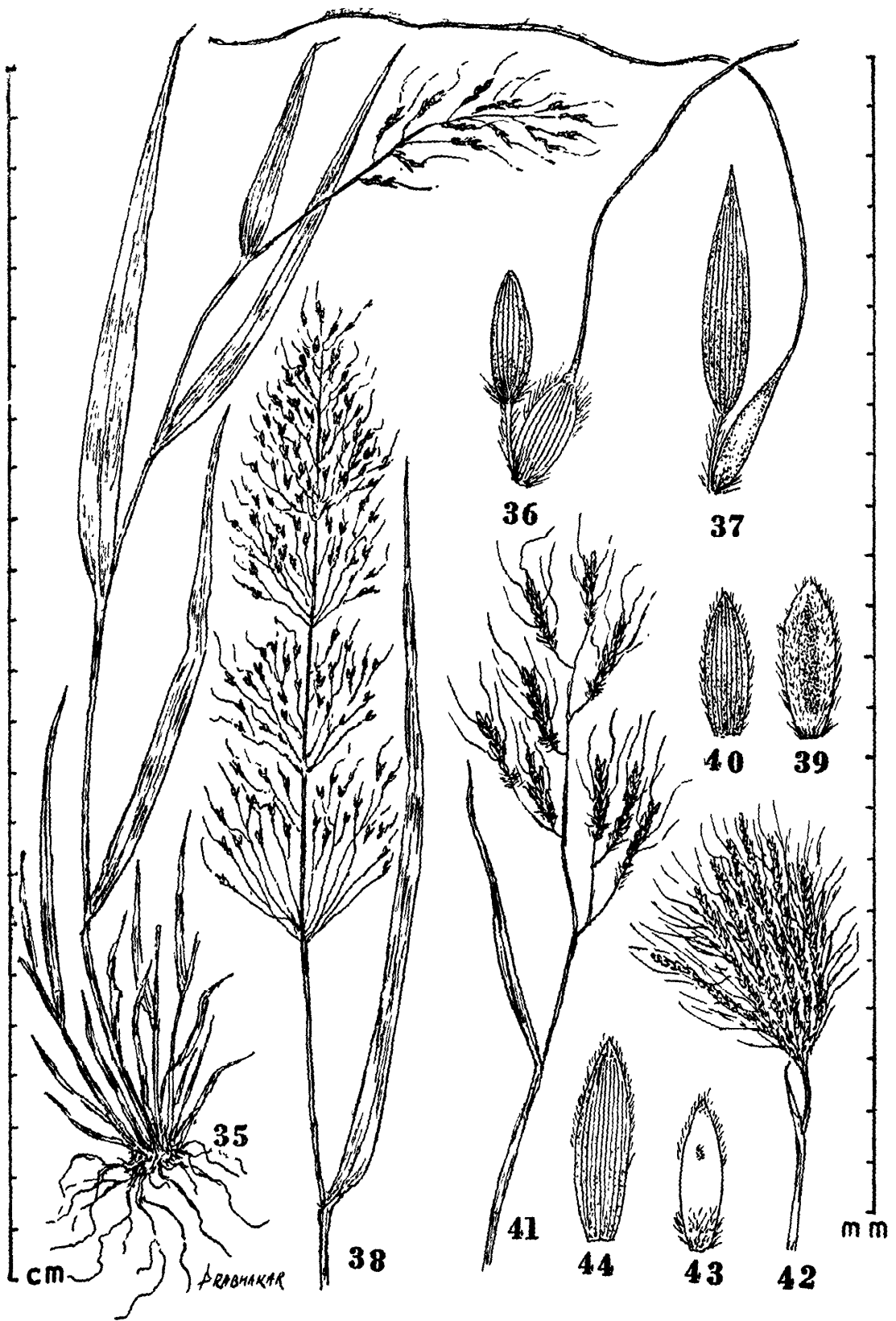
Perennials, 90-120 cm high, culms simple, erect; nodes glabrous. Leaf-sheaths striate, smooth; blades *ca* 8.0 × 0.3 cm, apex a fine point; ligule membranous, ciliate above. Panicles 15-20 cm long branched, branches whorled, capillary. Racemes fragile; joints and pedicels 1.5-2.5 mm long, glabrous; sessile spikelet 2.5-3.0 mm long, elliptic-oblong; lower glume 2.5-3.0 mm long, glabrous, 9-nerved; pedicelled spikelet *ca* 1.5 mm long, reduced to 2 small glumes.

Type : Manipur, Palci 2500 ft, 10th Oct. 1942, Bor 17059 (isotype, DD !, K).

Fls. & Frts. : Oct.

Distrib. : INDIA : Manipur State; rare and endemic.

24. *D. pseudoischaemum* (Nees ex Steud.) Jain et Deshpande in Bull. Bot. Surv. Ind. 20 : 134. 1978 (1979). *Andropogon pseudoischaemum*



Figs. 35-44 : See page 25 for caption.

Nees ex Steud. Syn. Pl. Glum. 1 : 380. 1854 ; Hook. f. Fl. Brit. Ind. 7 : 172. 1897. *A. ischaemum sensu* Roxb. Fl. Ind. 1 : 264. 1820, non L. (1753). *Amphilophis pseudoischaemum* (Nees ex Steud.) Fischer in Fl. Pres. Madr. 10 : 1731. 1934 (Repr. ed. 3 : 1200. 1957). *Bothriochloa pseudoischaemum* (Nees ex Steud.) Henr. in Blumea 3 : 457. 1940 ; Bor, Grass. Bur. Ceyl. Ind. Pak. 109. 1960.

Culms 60-100 cm high, stout, nodes bearded. Leaf-sheaths terete ; blades 15-30 cm long, acuminate, pruinose on the lower surface ; ligule very short, ovate. Spikes fasciculate, 4-10, ca 10 cm long ; joints and pedicels silky hairy. Sessile spikelet ca 5 mm long ; lower glume silky hairy, not pitted, 7-9-nerved ; upper 3-nerved ; lower lemma hyaline ; awn ca 16 mm long. Pedicelled spikelet ca 6 mm long, not pitted.

Type : Coromandel *Roxburgh* s. n. (?). Steudal (*l. c.*) cited 'Heyne herb. in Wall. Cat. nr. 8815 Ind. Or.' (microfische !) which may be treated as type.

Fls. & Frts. : July-Sept.

Distrib. : INDIA : Andhra Pradesh, Tamil Nadu ; SRI LANKA.

25. *D. pteropechys* (Clarke) Jain et Deshpande in Bull. Bot. Surv. Ind. 20 : 135. 1978 (1979). *Andropogon pteropechys* Clarke in J. Linn. Soc. (Bot.) 25 : 88, t. 38. 1899 ; Hook. f. Fl. Brit. Ind. 7 : 181. 1897. *Capillipedium pteropechys* (Clarke) Stapf in Hook. Ic. Plant. Subtab. 3085. 1922 ; Bor in Fl. Assam 5 : 364. 1940 ; Raizada et Jain in Indian Forester 77 : 753. 1951 ; Bor, Grass. Bur. Ceyl. Ind. Pak. 113. 1960.

Figs. 41

Culms 30-90 cm high, nodes bearded. Leaf-sheaths striate, glabrous, except for few long hairs at mouth ; blades 7.5-20.0 × 0.5 cm, acuminate ;

Caption of figs. 35-44

- 35-36 : *Dichanthium filiculme* (Hook. f.) Jain et Deshpande. 35. Habit. 36. A pair of sessile and pedicelled spikelets.
 37 : *D. magdalenii* (Almeida) Jain et Deshpande. A pair of sessile and pedicelled spikelets.
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 42-44 : *D. pertusum* (L.) Clayton. 42. Inflorescence. 43. Lower glume of sessile spikelet. 44. Lower glume of pedicelled spikelet.

ligule 0.5 mm long, ciliate. Panicle 5.0-8.5 cm long, sparingly branched. Racemes few, 1-2 cm long; joints and pedicels 2.0-2.5 mm long, hairy along the margins. Sessile spikelets 3.75-4.5 mm long; lower glume oblong, obtuse, 5-7 (-9) nerved, keels pectinately ciliate; upper boat shaped 3-nerved; awn 10-15 mm long. Pedicelled spikelets nearly equal to sessile but narrower.

Type : India : Kohima, alt. 5500 ft., *Clarke* 41187 (K); Jakpho, alt. 7500 ft., *Clarke*, 41896 (K).

Fls. & Frts. : Nov.

Distrib. : INDIA : Nagaland; endemic.

Chr. No. : $n = 20$ (Mehra & Sharma in *Taxon* 21 : 341. 1972).

Notes : Besides the type specimens this grass has been collected only once again from Naga hills (*Bor* 6712) in the year 1935 (DD 1).

26. *D. woodrowii* (Hook. f.) Jain et Deshpande in *Bull. Bot. Surv. Ind.* 20 : 134. 1978 (1979). *Andropogon woodrowii* Hook. f. *Fl. Brit. Ind.* 7 : 173. 1897; *Cooke*, *Fl. Pres. Bomb.* 2 : 978. 1908 (Repr. ed. 3 : 497. 1958). *Amphilophis woodrowii* (Hack.) A. Camus in *Rev. Bot. Appl.* 305. 1921. *Bothriochloa woodrowii* (Hook. f.) A. Camus in *Ann. Soc. Linn. Lyon* 1930, n. s. 76 : 165. 1931; *Bor*, *Grass. Bur. Ceyl. Ind. Pak.* 110. 1960.

Tufted grass with woody rootstock, ca 1.5 m high. Leaf-sheaths keeled, smooth; blades 30-60 × 0.3-0.4 cm, scaberulous on both surfaces; ligule ca 2.5 mm, truncate, ciliate. Racemes 3-5, ca 2.5 cm long; joints and pedicels slender, silky. Sessile spikelets ca 4 mm long, oblong-lanceolate; lower glume hairy, ovate-oblong, many-nerved; upper equal to lower one, 3-nerved; awn ca 16 mm long. Pedicelled spikelets as long as the sessile but narrower.

Type : India : Mawal, Dec. 1894. *Woodrow* 27, (isotype, BLAT ! K, Photo !).

Fls. & Frts. : Dec.

Distrib. : INDIA : Maharashtra; endemic.

Chr. No. : $2n = 40$ (de Wet *et al.* in *Caryologia* 16 : 47-55. 1963).

Notes : After its original collection in 1894, this has been collected only once by Harlan in the year 1960 and again from the type locality.

EXCLUDED SPECIES

Capillipedium nagense Bor in Brittonia 16 : 228. 1964.—*Type* : India, Naga Hills, Dzulake Valley, 2670 m, Sept. 1933, N. L. Bor's collector 353 (Holotype, K). The author has neither seen the type nor any other specimen from India. According to Bor (*l. c.*) this species differs from the closely allied *D. assimile* (Steud.) Deshpande [*C. assimile* (Steud.) A. Camus] in having larger sessile spikelet and distinctly 4-6 jointed racemes. These are qualitative and variable characters.

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CORIARIACEAE	1	Oct. 1978
PAEONIACEAE	1	Oct. 1978
DILLENiaceae	2	May 1979
POACEAE (TRIBE GARNOTIEAE)	3	Nov. 1979
SIMAROUBACEAE	4	April 1980
BALANTACEAE	4	April 1980
ORCHIDACEAE (GENUS COELOGYNE)	5	June 1980
PITTOSPORACEAE	6	Nov. 1980
LILIACEAE (TRIBE SCILLEAE)	7	Feb. 1981
LEGUMINOSAE (GENUS DERRIS)	8	July 1982
ACERACEAE	9	Aug. 1982
ANNONACEAE (TRIBE UVARIEAE)	10	Sept. 1982
CUCURBITACEAE	11	Dec. 1982
VIOLACEAE	12	Aug. 1983
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POACEAE (TRIBE ISACHNEAE)	14	Mar. 1984