

A REVISION OF ERIACHNE R. BR. (GRAMINEAE) IN ASIA AND MALESIA

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SUMMARY

A revision has been made for the species of *Eriachne* R. Br. (*Gramineae*) occurring in Asia and Malesia and including *Massia* Balansa. Four taxa may be recognized: *E. burkittii* Jansen var. *burkittii*, *E. pallescens* R. Br., *E. squarrosa* R. Br., and *E. trisetata* Nees ex Steud. (= *Massia trisetata* Balansa). *E. squarrosa* is proposed as the generic lectotype. The Australian *E. laidlawii* Jansen is reduced to a variety of *E. burkittii*. *Pheidochloa* S. T. Blake is the only clear relative, but seems derived from *Eriachne*. A tribe *Eriachneae* (Ohwi) *stat. nov.* is proposed for them, provisionally placed near the *Danthonieae*.

INTRODUCTION

Eriachne R. Br. (*Gramineae*) at latest count is estimated to consist of 35 species (W. V. Brown, 1977) and has its greatest development in Australia. Only four taxa may be found beyond its borders: two are restricted to a few localities in eastern Malesia (*E. burkittii* Jansen var. *burkittii* and *E. squarrosa*), two others range to continental southeast Asia (*E. pallescens* R. Br. and *E. trisetata* Nees ex Steud.). Two other species have been mentioned for New Guinea, viz. *E. rara* R. Br. (Ridsdale, 1968) and *E. armittii* F. Muell. ex Benth. (Bentham, 1878; Hitchcock, 1936; Henty, 1969), but the records turned out to belong to *E. burkittii* and *E. squarrosa*, respectively.

TYPIIFICATION OF THE GENUS

As far as could be ascertained *Eriachne* has never been typified. R. Brown (1810) described ten new species simultaneously, of which the wide-spread *E. squarrosa* fits the generic description well; it is therefore here proposed as the lectotype.

TAXONOMIC POSITION

The taxonomic position of *Eriachne* is not quite clear. It has generally been included in the *Aveneae* (Bentham & Hooker f., 1883; Hackel, 1888; Pilger, 1954; Hubbard, 1973). Ohwi (1942), regarded it as a separate subtribe of the *Aveneae*, thereby indicating its exceptional position there. Other suggestions have been the *Isachneae* (Bentham, 1881, who soon joined it with the *Aveneae*: Bentham & Hooker f., 1883), the *Festuceae* (Gardner, 1952), and the *Danthonieae* (Bor, 1960; Watson & Clifford, 1976), or close to the latter and the *Aristideae* (W. V. Brown, 1977).

Contrary to the general opinion, *Eriachne* does not belong to the *Aveneae*; the latter are festucoid in their leaf-anatomy and embryo-type, while *Eriachne* has panicoid leaves (see also Metcalfe, 1960) and, as could be ascertained from personal

research, the embryo of *E. pallescens*, *E. trisetata*, and the related *Pheidochloa vulpioides*, is panicoid (P—PP in Reeder's terminology, 1957). These characters also rule out the *Festuceae* and the *Isachneae*, but point at panicoid affinities. Within the *Panicaceae*, however there seems to be no satisfactory position; *Eriachne* is immediately different from all by the two fertile florets. Two fertile florets are present in some *Andropogoneae*, but there the awns are not terminal, the branching system of the inflorescence is quite different, as is the consistency of glumes and lemmas, etc., so that tribe seems unlikely too.

There is one tribe left, the *Danthonieae*, a rather mixed group of apparently relict-genera, and possibly not as related as the inclusion in one tribe would suggest. The leaves are generally non-Kranz, while those with a panicoid anatomy are of doubtful position (e.g. *Alloochaeta*, *Astenatherum*). The embryo, as far as known, is P—PF. Nearly all species of *Eriachne* are restricted to Australia proper, so it would seem a reasonable assumption that the genus originated there. All representatives off the *Danthonieae* there (*Chionochloa*, *Erythranthera*, *Monachater*, *Notodanthonia*, *Plunthanthesis*, *Pyrrhanthera*) are quite different, however, in the leaf-anatomy (festucoid), insertion of the awn between two lobes, indefinite number of florets per spikelet with a developed rachilla-process, etc., and are obviously derived from the north-temperate *Danthonia*. *Notodanthonia*, for instance, is a name used in Australia and New Zealand for what is called *Rytidosperma* in S. America, and pertains to a genus which differs from *Danthonia* s.s. in only a few characters. It seems unlikely that *Eriachne* is derived from these genera. W. V. Brown's remark, after a study of material and a survey of the literature, that '*Eriachne* is derived from a xeric offshoot of the *Danthonieae* close to, but separate from, the origin of the *Aristideae*' is a valuable suggestion, but not necessarily correct. It is curious to note that he included *Eriachne*'s only obvious relative, *Pheidochloa*, in the *Danthonieae* (l.c. 64), and under *Eriachne* (l.c. 72) stated that it has 'silica cells... undulate-rectangular, quite different from those of the *Aristideae* or most *Eriachne*.' (spacing mine). A separate tribe, *Eriachneae* (OHWI) *stat. nov.* (*Eriachninae* OHWI, Acta Phytotax. & Geobot. 11, 1942, 183), seems warranted, with as type *Eriachne* R. Br., and provisionally placed in the neighbourhood of the *Danthonieae*.

As stated above, the only genus obviously related to *Eriachne* is *Pheidochloa*. *Massia* has been distinguished by the excessively elongated awns of the palea, but this feature is only of specific value. The palea in *Eriachne* is a variable organ and no generic or even infra-generic value can be attributed to the length of its teeth. As there seem to be no other morphological or anatomical characters to distinguish *M. trisetata* from *Eriachne* it is here included in the latter.

Pheidochloa differs from *Eriachne* by the presence of very unequal glumes, separated by a conspicuous internode, a cylindric, not longitudinally furrowed caryops, while the undulate-rectangular silica cells are only found in 'some' *Eriachne*. There are two rather local species, one in New Guinea, and one in Queensland. The genus may be considered as derived from *Eriachne*.

INFRA-GENERIC RELATIONSHIPS

R. Brown (1810) divided the genus into two subordinate taxa without indication of rank, the '*Aristatae*' and the '*Muticae*', apparently basing himself on the presence or absence of a well-developed awn on the lemma.

Beauvois (1812) considered that species with awned and muticous lemmas should not be included in one single genus, and he found it therefore necessary to segregate these two groups. The 'Muticae' he included in *Eriachne* s.s. and the 'Aristatae' were placed in *Achneria*.

Nees (1841) used *Achneria* as a sub-generic name under *Eriachne*. Munro (1868) erroneously referred seven S. African species to *Achneria*. Bentham & Hooker f. (1883) reduced *Achneria* again to *Eriachne*; they treated the S. African species as an independent genus, for which they illegitimately retained the name *Achneria*. These species are now considered to belong either to *Pentaschistis* or to *Afrachneria*.

As only the Malesian species were extensively studied, it was beyond the scope of this partial revision to study a possible subdivision along other lines more thoroughly, but it seems that none can be made; as stated above even *Massia* cannot be recognized above the specific level.

MORPHOLOGY

Indument. The indument of the vegetative parts is very variable. Young parts are densely hairy, while old parts shed their hairs. In general the hairs are bulbous-based, the tubercles persisting, which can be observed easily under some magnification.

The glumes may also be glabrescent, which has sometimes not been realized, leading to wrong delimitations of the taxa.

Such tubercle-based hairs have been called bb-hairs here.

Flowers. The flowers may be either cleistogamous or chasmogamous. A flower has been considered to be cleistogamous when the anthers were still present, enclosed between the chaffs, in the fruiting stage. They are then entangled with the also persistent stigmas, apparently yellow, rarely somewhat purplish in life, and smaller than the always purple anthers of the chasmogamous flowers. As far as could be observed, an entire plant is either one form or the other. The species of *Eriachne* in Malesia are both cleistogamous and chasmogamous with the possible exception of *E. burkittii*, of which only a few, all chasmogamous, collections were seen.

Palea. The presence or absence of two teeth at the apex of the palea was a delimitative feature in previous descriptions and keys. From the material studied it appeared that this very variable character is to be used with great caution. The teeth may vary between inconspicuously small projections and awns, the latter sometimes up to 14 mm long.

ACKNOWLEDGMENTS

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ERACHNE

- Eriachne* R. Br., *Prod.* (1810) 183; Benth., *Fl. Austr.* 7 (1878) 626; Hack. in E. & P., *Nat. Pfl. Fam.* II, 2 (1888) 53; Nachtr. (1897) 43; Hook. f., *Fl. Br. Ind.* 7 (1898) 269; Camus, *Fl. Gén. I.-C.* 7 (1923) 529; Back., *Handb. Fl. Java* 2 (1928) 212; Pilg., *Bot. Jb.* 76 (1954) 167, 317; Schmid, *l'Agron. Trop.* 13 (1958) 488, 490; Bor, *Grasses* (1960) 479; Lazarides, *Grasses C. Austr.* (1970) 149; Gill., *Rev. Fl. Mal.* 3 (1971) 92. — *Lectotype*: *E. squarrosa* R. Br. (See introduction).
- Achneria* Beauv., *Agrost.* (1812) 72, 146; Nees, *Fl. Afr. Austr.* 1 (1841) 273; Niles & Chase, *Contr. U. S. Nat. Hb.* 24, 6 (1925) 181, 205. — *Lectotype*: *A. obtusa* (R. Br.) Beauv. (= *E. obtusa* R. Br.) (Niles & Chase, 1925).
- Massia* Balansa in Morot, *J. Bot.* 4 (1890) 165; Hack. in E. & P., *Nachtr. Nat. Pfl. Fam.* (1897) 43; Pilg., *Bot. Jb.* 76 (1954) 166, 317; Bor, *Grasses* (1960) 479, 481; Gill., *Rev. Fl. Mal.* 3 (1971) 94. — *Type*: *Massia trisetata* (Steud.) Balansa (= *E. trisetata* Steud.).

Erect, tufted perennials; cataphylls ovate to ovate-oblong, appressedly pubescent. *Leaves* variously b.b.-pubescent, glabrescent with persistent tubercles, to glabrous; usually at least the margins involute; all nerves similar; collar setose; ligule a rim of short hairs. *Panicles* effuse to rather dense; spikelets laterally compressed, 2-flowered, chasmogamous or cleistogamous. *Glumes* persistent, subequal, boat-shaped, ovate-oblong to linear-lanceolate, rounded on the back, apex acuminate, (7—)9—11(—14)-nerved, often separated by a short internode. *Lower glume* with a straight base, margin not membranous. *Upper glume* with an amplexicaul base, margins distinctly membranous. *Lemmas* subequal, boat-shaped, rounded on the back, 5—9-nerved; margins involute and tightly clasping the keels of the palea, cartilaginous, with b.b.-hairs; callus villous; awn apical, false, antrorsely scabrous, neither twisted nor geniculate. *Paleas* obovate-linear, 2-keeled, \pm flat between the

keels; the incurving margins embracing the caryops; apex notched to bidentate to 2-awned, b.b.-pubescent. *Lodicules* 2, narrowly obconical, few nerved, membranous, glabrous; upper margin wavy. *Stamens* 2 or 3. *Styles* 2, distinct; stigmas feathery, purple. *Caryops* obovate-oblong, concave-convex in transverse section; hilum subbasal, punctiform, dark to red-brown; embryo 0.2–0.3 times as long as the caryops.

Distribution. 40 species from India to S. China, through Malesia to Australia.

Ecology. Dry exposed rocky or sandy areas, waste places, open savannah forests.

KEY TO THE ASIAN AND MALESIAN TAXA

- 1a. Apex of the palea with two 6.8–14.5 mm long awns. 4. ***E. trisetata***
- b. Apex of the palea notched or with two up to 4.4 mm long teeth. 2
- 2a. Lemma and palea hairy in the lower 0.5–0.75th. Callus hemi-globose. (*E. burkittii*) 3
- b. Lemma and palea hairy all over. Callus obconical 5
- 3a. Glumes densely b.b.-setose except for the lower 0.1–0.15th. Lemma and palea hairy in the lower 0.75th 1c. ***E. burkittii* var. *laidlawii***
- b. Glumes glabrous, margin sometimes with a few b.b.-hairs. Lemma and palea hairy in the lower 0.5th 4
- 4a. Sheaths, blades, and internodia glabrous to sparsely b.b.-pubescent
 - 1a. ***E. burkittii* var. *burkittii***
 - b. Sheaths, blades, and internodia densely pubescent.
 - 1b. ***E. burkittii* var. *hirsutissima***
- 5a. Panicle effuse. Glumes 3–5.5 mm long. Awn of the lemma 1.9–5.6 mm long. Stamens 2. 2. ***E. pallescens***
- b. Panicle contracted. Glumes 6.6–10.3 mm long. Awn of the lemma 7–26 mm long. Stamens 3. 3. ***E. squarrosa***

1. *Eriachne burkittii* Jansen. — Fig. 1a

Eriachne burkittii Jansen, Meded. Rijks herb. Leiden 59 (1930) 1. — Lectotype: *Burkitt* 12 (holo in L; iso in MELB, n.v.), here proposed.

[*Eriachne rara* auct., non R. Br.: Ridsdale, Trans. P. N. G. Sc. Soc. 9 (1968) 13, 21.]

a. var. *burkittii*.

Perennial forming small tufts, (35–)60–140 cm high. *Culms* smooth, glabrous, rarely branched, usually with 2–4 dark brown, constricted (s.s.), \pm glabrous to b.b.-hairy nodes; hairs 1–4 mm long. *Cataphylls* 8.2–10.6 by 2.9–4.4 mm, shortly ciliate, 14–19-nerved. *Sheaths* smooth, glabrous to sparsely b.b.-pubescent, glabrescent; collar with hairs up to 4.4 mm long; ligules 0.5–0.75 mm long; blades flat, (7–)18–36 cm by (1.5–)2–3.2 mm, smooth, glabrous, rarely with a few b.b.-hairs. *Peduncle* glabrous to sparsely strigulose; panicle effuse, 7–19 by 1.5–7 cm; lower branches 3–9.5 cm long, sparsely pubescent. *Spikelets* chasmogamous, 5.6–8.1 by 2.5–6.3 mm (excl. awns). Glumes oblong-ovate, 5–7(–8.4) by 1.5–3.2 mm, glabrous, margins sometimes with a few b.b.-hairs, cartilaginous.

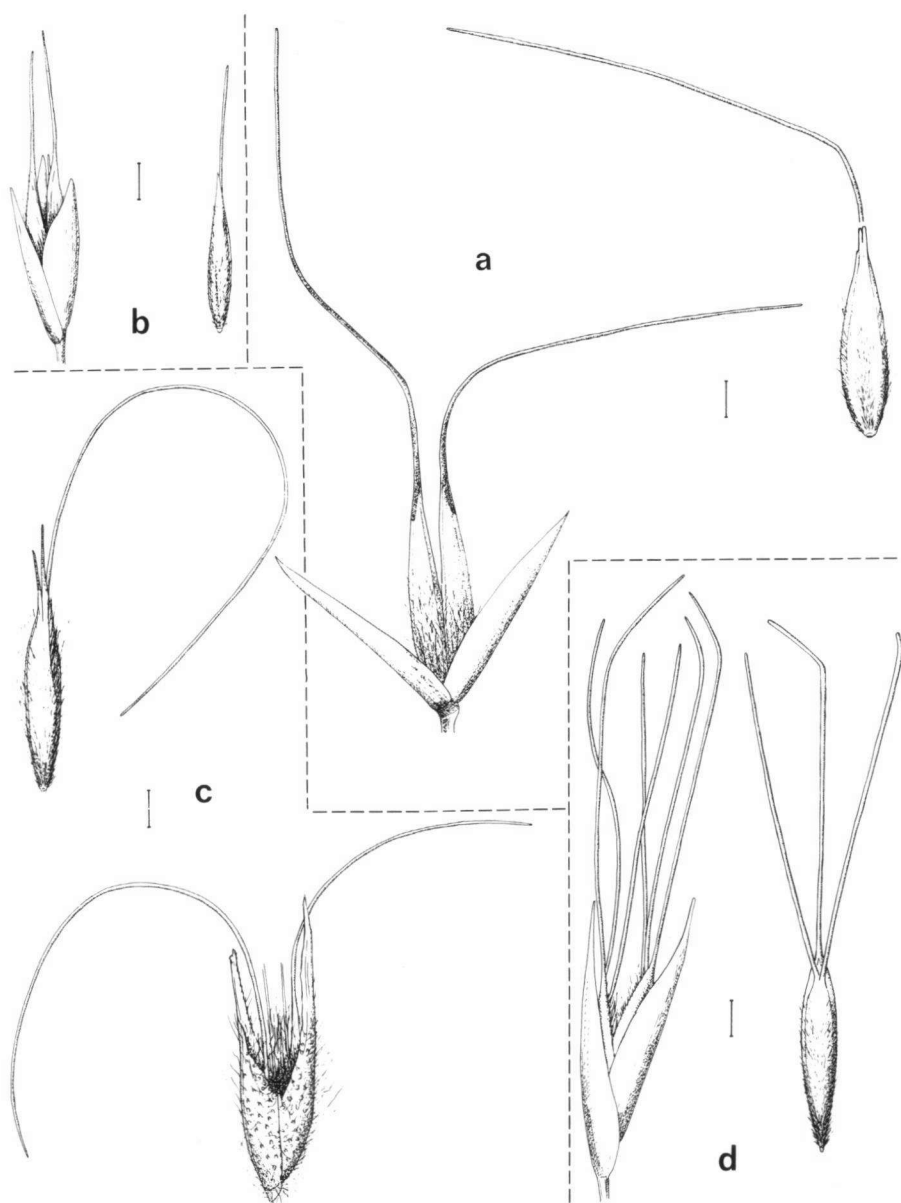


Fig. 1. — a. *Eriachne burkittii* Jansen (after Burkitt 9, paratype). — b. *Eriachne pallescens* R. Br. (after Brass 25972). — c. *Eriachne squarrosa* R. Br. (after Carr 12488). — d. *Eriachne trisetia* Steud. (after Khiem 83). — the bar drawn in the figures represents a length of 1 mm. The drawings are made by Dr. J. F. Veldkamp.

Lower glume 8–14-nerved at base; upper glume 7–12-nerved at base; internode virtually absent. *Lemmas* 3.9–6.8 by 0.6–1.8 mm, 7-nerved, hairy in the lower half, hairs up to 2 mm long; callus hemi-globose, 0.3–0.65 mm long; awns 1–3.3 cm long with a distinctly callose base. *Palea* longer than the body of the lemma, 5.6–7.6 by 0.6–2 mm, gradually acuminate; apex inconspicuously retuse; teeth ciliolate; hairy in the lower half; hairs up to 1.7 mm long. *Lodicules* 0.45–0.6 mm long. *Stamens* 3; anthers 2.2–3.7 mm long, purplish. *Caryops* not seen.

Distribution. Malesia: Papua New Guinea, W. Distr.; Australia: N. Terr.
Ecology. Grey to black silty, clayey soil, savannahs with *Melaleuca*, *Acacia* and *Eucalyptus*.

Notes. Jansen (1930) erroneously described the 'paleas and lemmas with hairs in the upper half'.

NGF 38728 (*Henty & Katik*) differs slightly by having glumes with sometimes a few hairs along the margins, and by the apex of the palea, which has two small teeth.

b. var. *hirsutissima* Jansen

Eriachne burkittii Jansen var. *hirsutissima* Jansen, Meded. Rijksherb. Leiden 59 (1930) 1. — Type: *Burkitt 8* (holo in L; iso in MELB, n.v.)

Internodes, sheaths, and blades densely pubescent. Glumes glabrous. Lemmas and paleas hairy in the lower half.

Distribution. Australia: N. Terr., Port Darwin. Only known from the type.

Ecology. Not recorded, probably as the typical variety.

Note. This variety is tentatively maintained. Jansen (1930) distinguished it from var. *burkittii* also by the size of the panicle and the length of the culms. All these characters do set the specimen apart from the others seen, but it can not be ruled out that it is just an exceptionally hairy, large individual.

c. var. *laidlawii* (Jansen) v. Eck, *comb. & stat. nov.*

Eriachne laidlawii Jansen, Meded. Rijksherb. Leiden 59 (1930) 1. — Type: *Burkitt 11* (holo in L; iso in MELB, n.v.).

Nodes glabrous to retrorsely bearded, collar and upper surface of the blades at base sparsely b.b.-pilose. Glumes densely b.b.-setose except for the lower 0.1–0.15th. Lemmas and paleas hairy in the lower 0.75th.

Distribution. Australia: N. Terr., Port Darwin. Only known from the type.

Ecology. Not recorded, probably as the typical variety.

Note. Without intermediary specimens this collection is here maintained as a variety.

2. *Eriachne pallescens* R. Br. — Fig. 1b.

Eriachne pallescens R. Br., Prod. (1810) 184; Benth., Fl. Austr. 7 (1878) 627; Hook. f., Fl. Br. Ind. 7 (1898) 269; Merr., Philip. J. Sc. 1, Suppl. (1906) 376; Ridl., Mat. Fl. Pen. 3 (1907) 172; Camus, Fl. Gén. I.-C. 7 (1923) 529, fig. 43; Back., Handb. Fl. Java 2 (1928) 212; Back. in Heyne, Nut. Pl. Ned. Ind. ed. 3 (1950)

262; Vickery, Contr. N. S. W. Nat. Herb. 2 (1953) 81; Schmid, l'Agron. Trop. 13 (1958) 488, 490, fig. 95b; Bor, Grasses (1960) 479; Metcalfe, Anat. Monoc. 1 (1960) 200; Henty, Bot. Bull. Lae 1 (1969) 100, fig. 35b; Gill., Rev. Fl. Mal. 3 (1971) 94, pl. 10d, fig. 15. — *Aira effusa* Spreng., Syst. Veg. 1 (1824) 278, non *A. pallescens* R. & S. (1817). — **T y p e**: *Banks & Solander s.n.* ('Endeavor River, Queensland') (BM, holo, see note).
Aira chinensis Retz., Obs. Bot. 3 (1783) 10, non *Eriachne chinensis* Hance (1861). — *Tricholaena chinensis* Domin, Bibl. Bot. 85 (1915) 327, *comb. inval.* (§34.2). — **T y p e**: *Bladh s.n.* ('China') (LD, holo).
Eriachne gracilis Brongn. in Duperr., Voy. Coquille, Bot. (1829) 25; Kunth, Enum. Pl. 1 (1833) 310; Miq., Fl. Ind. Bat. 3 (1857) 428. — **T y p e**: *Dumont d'Urville s.n.* ('Bourou') (P, holo).
Eriachne chinensis Hance, Ann. Sc. Nat. Bot. IV, 15 (1861) 228; J. Linn. Soc. London 13 (1873) 136. — **L e c t o t y p e**: *Hance 7424* ('Whampoa, Oct. 1861') (W, iso), here proposed.
[*Eriachne hookeri* Munro, J. Linn. Soc. London, Bot. 6 (1861) 42, *nomen.* — *Hb. Hooker s.n.* (K), *Osbeck s.n.* (LINN, n.v.).]

Tufted perennial, (40–)50–90(–105) cm high; culms smooth, glabrous, rarely branched; nodes (2–)3–7(–10), glabrous. *Cataphylls* ovate, (0.8–)1.5–3(–4) by (0.7–)1.2–2.4(–3) mm, appressedly ciliate, glabrescent. *Sheaths* smooth, glabrous to b.b.-pubescent, hairs up to 0.5 mm long; margins sparsely b.b.-pubescent, hairs up to 0.4(–0.5) mm long; collar with hairs up to 2.5(–3.7) mm long; ligules 0.4–0.6(–1) mm long; blades erect, \pm flat with involute margins to involute, 2.3–16.6(–21) cm by (0.4–)0.8–3(–4) mm (when expanded); margins at base with a few b.b.-hairs up to 1.5(3.5) mm long, the latter becoming smaller and appressed; apex gradually acuminate. *Peduncle* glabrous. *Panicle* effuse, very lax, (2.6–)4–15.4 by (0.5–)1–7(–19) cm, lower branches (1.7–)3–10.5(–12.2) cm long with (1–)2–8(–14) spikelets, glabrous; pedicels 1.5–39 mm long, glabrous. *Spikelets* cleistogamous or chasmogamous, 5.2–10.3(–11.4) by 1.4–4 mm (excl. awns). *Glumes* oblong-ovate, (8–)9(–14)-nerved at base; lower glume 3–5.5(–6.5) by 1.2–2.3 mm, glabrous to sparsely b.b.-pubescent, hairs up to 0.5 mm long; internode (0.25–)0.35–0.55 mm long, glabrous; upper glume (3.6–)4–4.9(–5.5) by 1.5–2.7 mm, rarely short-hairy; hairs then up to 0.35 mm long. *Lemmas* (1.2–)3–4.6(–5.5) by 0.7–1.2(–1.4) mm (excl. awns), densely b.b.-hairy all over, hairs up to 1.5 mm long; nerves 1–5(–7); callus obconical, 0.2–0.55 mm long, hairs up to 1.1 mm long; awn (1–)1.9–5.6(–6.6) mm long. *Palea* \pm subequal to the body of the lemma, 3–4.4(–5.5) by 0.6–1.7 mm, hairy all over, hairs up to 0.8 mm long; apex notched with a fascicle of hairs or with 2 teeth up to 0.9 mm long. *Lodicules* 0.4–0.5 mm long, shortly adnate to the palea at base. *Stamens* 2; anthers either 0.3–0.8 mm long, yellowish (cleistogamous), or 1.7–3.2 mm long, purple (chasmogamous). *Caryops* 2–2.75 by 0.6–1.1 mm; embryo ca. 0.2 times as long.

D i s t r i b u t i o n . India (Assam), Bangla Desh, Nicobars, Burma (Tenasserim), Thailand (Peninsular: Surat Thani, Nakhon Si Thammarat, Pattani), Vietnam (Cao Lang, Vinh Phu, Hai Phong, Binh Tri Thien, De Nang, Kien Giang), China (Kwangtung, Hong Kong, Fukien), Malaya (Perlis, Kelantan, Trengganu, Pahang, Selangor, Malacca, Johore, Penang, Singapore), Sumatra (W. Coast, Palambang, Banka, Riouw Arch.), Lesser Sunda Is. (Sumbawa), Borneo (Sarawak, West Kalimantan, Sabah, Labuan, Balambangan I.), Philippines (Palawan, Culion I., Harmana Major I.), Celebes (Kendari), Moluccas (Buru, Ceram), N. Guinea (Vogelkop, Sentani, Merauke, West Sepik, Western Dist., Rossel I., Fergusson I.), Australia (N. Territory: Pine Creek; Queensland), Micronesia (Caroline I.)

E c o l o g y . Locally common and vegetation-forming on dry, exposed rocky or

sandy areas, coastal dunes, waste places, open savannah forests with Eucalyptus; fire resistant; up to 300 m alt.

A n a t o m y . Leaf (Metcalf, 1960).

U s e . Inferior fodder-plants (Backer, 1950).

V e r n a c u l a r n a m e . *Ungak rupit* (Biliton).

N o t e s . Three quarters of the specimens studied were cleistogamous, but the rate is not evenly distributed over the area as is shown by the following survey: Asia (25 cleistogamous and 31 chasmogamous plants), Malaya (19/2), Sumatra (5/0), Borneo (8/0), Philippines (2/4), Celebes (1/0), Sumbawa (1/0), Moluccas (2/0), New Guinea (10/6), Micronesia (1/0), Australia (18/2).

R. Brown (1810) cited as the type of (6). *E. pallescens* '(T) v.v.', i.e. Northern Australia around the Bay of Carpentaria and collected by himself. There are no Brown-collections known, however, but in the BM there are instead several made by Banks & Solander at the Endeavor River, Queensland, of which one has been annotated on the reverse side of the field-label by R. Brown '6. *Eriachne pallescens*', and another label has been added by J. Lewis, noting that 'the v.v. of Prodrum is an error'.

3. *Eriachne squarrosa* R. Br. — Fig. 1c.

Eriachne squarrosa R. Br., Prod. (1810) 183; Brongn. in Duperr., Voy. Coquille, Bot. (1829) 24, t. 3; Benth., Fl. Austr. 7 (1878) 628; Hartley, J. Linn. Soc. London 52 (1942) 342; Lazarides, J. Roy. Soc. W. Austr. 44 (1961) 78; Henty, Bot. Bull. Lae 1 (1969) 100. — **T y p e :** Banks & Solander s.n. ('Bustard Bay, Bay of Inlets & Endeavor River, Queensland') (BM, holotype).

Eriachne armitii auct., non Benth.: Hitchc., Brittonia 2 (1936) 114; Ridsdale, Trans. P. N. G. Sc. Soc. 9 (1968) 13, 21; Henty, Bot. Bull. Lae 1 (1969) 97, fig. 35a.

Tufted perennial, (13–)40–85(–100) cm high, culms smooth, glabrous to sparsely b.b.-pubescent, especially distally and just above the nodes; nodes 1–5(–6), antorsely b.b.-barbate; hairs up to 4.5 mm long. *Cataphylls* 2.6–9.8 by (1.5–)1.8–2.9 mm, 6–19-nerved, shortly ciliate. *Sheaths* smooth, glabrous to b.b.-pubescent, sometimes along the margins only, glabrescent; collar with hairs up to 4 mm long; ligules 0.3–1(–1.7) mm long; blades with flat margins, 8–29(–32.5) cm by 2–4.4 mm, smooth, sparsely or more densely b.b.-pubescent, especially near the base, glabrescent. *Peduncle* patently b.b.-hairy, sometimes only below the panicle. *Panicle* densely to interruptedly contracted to spike-like, 3–10 by 1.5–6(–7) cm; lower branches 1–4 cm long with 2–13[–22] spikelets, patently b.b.-hairy; pedicels \pm absent to 6 mm long, patently b.b.-hairy. *Spikelets* rarely cleistogamous (6.1–)7.3–13.7(–15.7) by (1.9–)2.2–5.2 mm (excl. awns). *Glumes* ovate-oblong to linear-lanceolate, 6.6–10.3[–15.7] by 1.8–3(–3.5) mm, the lower somewhat larger than the upper, densely long-b.b.-hairy, glabrescent; hairs up to 2.8 mm long; lower glume 6–11-nerved; internode 0.1–0.25 mm long; upper glume usually 7(–10)-nerved. *Lemmas* 2.4–4[–4.9] by 1–2.4 mm (excl. awns), 3–5-nerved, densely long-b.b.-hairy, hairs up to 3.6 mm long; callus obconical, 0.5–1 mm long, hairs up to 2.7 mm long; awns 7–26[–32] mm long, \pm retrorsely circinnate to falcate to nearly straight. *Palea* longer than the body of the lemma (3.9–)4.1–9.8[–12.7] by 0.8–1.6(–2) mm (incl. the 2 teeth or awns), densely b.b.-pubescent all over; apex with two teeth or awns 0.5–4.4 mm long. *Lodicules* 0.5–1 mm long. Stamens 3; anthers 4.6–5.9 mm long, purplish (chasmogamous) or 0.7–1.1 mm long, yellowish (cleistogamous). Caryops 1.5–2.4 by 0.5–1 mm; embryo 0.25–0.3 times as long.

Distribution. Moluccas (Buru), New Guinea (Vogelkop, Merauke; Western, Central, and Milne Bay Distr., Sudest I., Aru I.), Australia (N. Territory, Queensland).

Ecology. Savannah woodland with *Acacia*, *Grevillea*, *Melaleuca* and *Eucalyptus*, in grassland on clayey soil, on sandy granite ridges; up to 600 m alt.

Use. Probably grazed by cattle (Lazarides, 1970).

Notes. Two collections made by Lazarides (*Lazarides 7103*, *Lazarides & Adams 230*) differ from the other specimens in several characters: the larger blades have cartilagineous, white, crenate margins and shortly aculeate apices; the larger number of spikelets on the lower branches of the panicle (16–22); the larger spikelets (12.3–15.7 by 2–5.2 mm), and their parts. The dimensions and numbers have been given in the description between square brackets. A separate status for these specimens does not seem warranted.

E. armittii F. Muell. ex Benth. is a close relative. It differs by the presence of numerous very short culms at the base between the longer ones, all bearing terminal inflorescences, which habit suggests a semi-annuality. The glumes are sparsely b.b.-hairy, but the hairs occur only along the margins and in the middle, and then appear to form a transverse band; the latter hairs are often fugacious, but their bases remain. *E. armittii* is known from the Northern Territory and Queensland.

4. *Eriachne trisetata* Nees ex Steud. — Fig. 1d.

Eriachne trisetata Nees ex Steud., Syn. 1 (1854) 237; Hook. f., Fl. Br. Ind. 7 (1897) 269; Ridl., Mat. Fl. Mal. Pen. 3 (1907) 172; Camus, Fl. Gén. I.-C. 7 (1923) 529; Ridl., Fl. Mal. Pen. 5 (1925) 240; Back., Handb. Fl. Java 2 (1928) 212; Back. in Heyne, Nutt. Pl. Ned. Ind., ed. 3 (1950) 263; Schmid, l'Argron. Trop. 13 (1958) 490, fig. 95c, d; Henty, Bot. Bull. Lae 1 (1969) 100, fig. 35c. — *Massia trisetata* Balansa in Morot. J. Bot. 4 (1890) 165; Bor, Grasses (1960) 479. — Type: *Walker s.n.* ('Ceylon') (holo in P, n.v. iso in K). [*Aristida biflora* Moon, Cat. Pl. Ceylon (1824) 9, nomen. —] *Megalachne zeylanica* Thw., Enum. Pl. Zeyl. (1864) 372, 444, nom. inval. (§34.1) — *Thwaites CP 3247* (holo in PER, n.v., iso in K, NY, P, US, W) (see note).

Tufted perennial, (25–)35–80 cm high, culms smooth, glabrous to sparsely b.b.-pubescent, glabrescent; nodes 2–7, glabrous. *Cataphylls* ovate to ovate-oblong, (2.4–)3.5–9 by (1.4–)1.7–4 mm, 7–17-nerved, appressedly ciliate. *Sheaths* smooth, glabrous to sparsely b.b.-pubescent, glabrescent; collar with hairs up to 1.6 mm long, glabrescent, sometimes shortly setose; ligules 0.25–0.65 mm long; blades erecto-patent, \pm curved, slightly pungent, \pm filiform with involute margins, 6.3–18.5 cm by 0.7–2 mm (when expanded), smooth, glabrous to sparsely b.b.-pubescent. *Panicle* effuse, 4–14(–18) by 1–4(–7) cm; lower branches 4–8.5 cm long with (3–)6–8 spikelets, glabrous; pedicels absent to 19 mm long, glabrous. *Spikelets* usually cleistogamous, 14.2–24.9 by (0.75–)2–4.9 mm (incl. the paleate awns, excl. the lemmatic ones). *Glumes* ovate-oblong to lanceolate, 7.4–12 by 1.7–2.6(–3.6) mm, the upper one usually somewhat larger and broader than the lower, 9–13 nerved, glabrous to sparsely b.b.-pubescent, usually purplish; internode (0.25–)0.5–0.7(–0.8) mm long. *Lemmas* (3.7–)3.9–5(–5.4) by (0.6–)1–1.2(–1.5) mm, (5–)7(–14) nerved, densely short-b.b.-hairy all over, hairs up to 0.8(–1) mm long; callus obconical, 0.8–1.2(–1.4) mm long, hairs up to 0.6 mm long; awn 7–19 mm long. *Palea* usually somewhat smaller than the body of the lemma, 3.4–4.8(–5.2) by (0.5–)0.8–1.2 mm, b.b.-hairy, hairs up to 0.3(–0.5) mm long; apex with two (5.9–)6.8–14.5 mm long awns. *Lodicules* 0.4–1 mm long, sometimes shortly adnate at base with the palea. *Stamens* 2;

anthers either (2.2–)2.6–3.4 mm long, purple (chasmogamous), or 0.25–0.5 mm long, yellowish (cleistogamous). *Caryops* 2.3–3.8 by 0.5–0.8 mm; embryo 0.2–0.25 times as long.

Distribution. Ceylon, India (? : *Griffith KD 6651*), Thailand (Peninsular: Songkhla, Satun; Eastern: Chantaburi, Trat), Cambodia (Svay Rieng), Vietnam (Nghia Binh, Saigon), Malaya (Trengganu, Pahang, Negri Sembilan, Malacca), Sumatra (unlocalized: v. d. Voort 2), Borneo (Sarawak, Labuan), Philippines (Palawan, Culion, Luzon), New Guinea (Merauke, Western Distr.), Australia (N. Territory, Queensland).

Ecology. Sandy heaths, dry exposed rocky places, savannah forests and wet depressions on river flats; up to 100 m alt.

Use. Inferior fodderplants (Backer, 1950).

Vernacular name. *Pini tuttiri* (Sinhalese).

Notes. Only 8 of the 62 plants studied were chasmogamous, the rough distribution is as follows: Asia (18 cleistogamous and 2 chasmogamous plants), Malaya (8/2), Borneo (3/1), Philippines (6/0), New Guinea (9/0), Australia (10/3).

The size of the spikelets is very variable, in particular in Asia. The spikelets of Malayan plants are larger than those from Borneo, the Philippines and New Guinea: Asia 12–17.6 mm, Malaya 19.1–22.3 mm, Borneo 15.3–17.2 mm, Philippines 12–17.6 mm, New Guinea 12–18.1 mm.

The pubescence of the lemmas and paleas of the Bornean plants is denser than that from elsewhere.

Aristida biflora Moon is a *nomen nudum*; a possible isotype is in US, annotated 'Collector A. Moon? Nov. 1820? C.P. 3247, Cinnamon Gardens, Colombo?'. The number and locality are the same as those given for *Megalachne zelanica* Thw., a name retracted by Thwaites (1864) in his Addenda, and therefore invalid (Art. 34.1.a).

IDENTIFICATION LIST

In the following list only those collections have been included which have both a known collector and a collector's number; their identity is indicated by the taxon-number, used in the revision above. Serial numbers are cited under the series only. Collections cited in the literature, but not seen, have been included when their identification seemed fairly certain; the taxon-number is then given between brackets.

- Adams 1753: 1a; Anta 1352: 2.
 Balansa 375: 2; 376-I: 2; 376-II: 2; 1711: 2; 4849: 2; Barber 268: 2; S. T. Blake 8970: 3; 9363: 4; 13555: 3; 14561: 3; 21863: 3; Bois 2204: 4; Bon 2638: 2; 2639: 2; 5598: 2; Brass 5736: 3; 5929: 4; 5963: 3; 5964: 2; 6525: 4; 6526: 3; 7935: 3; 8577: 4; 8652: 3; 8881: 2; 18364: 4; 18409: 2; 18480: 3; 18482: 4; 18505: 2; 18690: 4; 18719: 2; 18824: 3; 18872: 4; 18873: 2; 18889: 4; 18955: 2; 19006: 3; 19137: 2; 19533: 2; 19629: 4; 25972: 2; 27808: 3; BS 44613: (4); Bunnemeijer 1383: 2; 2345: 2; 6366: 2; Burkitt 8: 1b; 9: 1a; 11: 1c; 12: 1a; Buwalda 5521: 3; BW 8013 (Koster): 3.
 Carr 12281: 3; 12488: 3; Chung 5339: 2; Clayton 5447: 4; 5529: 4; Clemens 3750: 2; 9585: 4; 9678: (2); 51260: 2; CP 3247 (Thwaites): 4.
 Eberhardt 2436: 2; Enoch 414: 2.
 Forster 11: 4; 13: 2.
 Gebo 417: 3; Gilliland 6: 2; 5233: 4; 5289: 4; Gjellerup 708: 2; Griffith *KD 6651*: 4.
 Hance 146: 2; 7424: 2; 't Hart & v. Leeuwen K2: 2; K3: 3; K11: 2; Henderson 591: 2; 703: 2; Heyligers 1251: 3; 1285: 3; Hitchcock 18718: 2; 18851: 2; 18921: 2; 18994: 2; 19326: 2; Hoogerwerf 253: 4; 260: 4; 263: 3; Hose 102: 2; 128A: 2; 128B: 4; Hosokawa 70: 2; Hozet 14: 2; C. E. Hubbard 2216: 2; 2732: 2; 3320: 2; C. E. Hubbard & Winders 6623: 2; 6691: 4.

- Jacobs 5664: 2; Johnson 959: 2.
 Kanehira & Hatusima 12965: (2); KEP 79214 (Wyatt-Smith): 4; Kerr 7238: 2; 9424: 4; 13680: 4; 14723: 4; 15097: 2; 15664: 2; 17591: 4; Kjellberg 1159: 2; KLU 585 (Carrick): 2; 1174 (Poore): 2; 1175 (id.): 4; 4279 (Merton): 4; 6175 (Stone): 4; 12099 (id.): 2; Koorders 22303: (2).
 Lazarides 7103: 3; 7109: 1a; 7179: 3; Lazarides & Adams 175: 2; 188: 1a; 229: 2; 230: 3; 249: 1a; 333: 2; Levine 10223: 2; 10224: 2.
 McClure 10274: 2; McKee 1925: 2; 1926: 2; 9503: 2; 10245: 2; Maxwell 72539: 4; Merrill 8: (2); 520: 2; 870: 4; 1215: 2; 1644: 2; 9582: 2; 10192: 2; 11074: 2.
 NGF 5854 (Womersley & v. Royen): 3; 9350 (Womersley): 2; 9361 (id.): 2; 10430 (White & Grey): 3; 16825: 3; 27051 (Henty): 2; 27106 (id.): 3; 33550 (Ridsdale): 3; 33772 (id.): 1a; 33773: (4); 38684 (Henty & Katik): 3; 38728 (id.): 1a; 38730 (id.): 2; 49340 (Henty & Foreman): 2; 49397 (id.): 4; 49875 (Henty): 2; 49900 (id.): 2; Nguyen Van Khiem 83: 4; 128: 4; 190: 2; NIFS 26: 3.
 Oersipuny 26: (3).
 Paymans 1006: 3; Pételot 3846: 2; 6041: 2; PNH 14159 (Edāno): 4; Polak 199: 2; Pullen 3330: 3; 3389: 3; 6697: 3; 6951: 3; 7091: 2; 7095: 4; 7164: 2; 7249: 4; Put 1543: 2; 1669: 2; 4162: 2; 4271: 4.
 Rant 177: (2); Ridley 9: 2; 65: 2; 569: 4; 1034: 4; 1051: 2; 1569: 4; 7773: 2; 8046: 2; 9106: 2; 13394: 2; 14857: 2; v. Royen 2875: 2; 4874: 4; 4927: 2; Ruttner 76: (2).
 Sampson 71: 2; SAN 19184 (Meijer): 2; 19777 (id.): 4; Santos 6171: 2; 6179: 4; SF 10485 (Henderson): 2; 15151 (Holttrum): 4; 19335 (id.): 2; 19336 (Henderson): 2; 19997 (id.): 2; 24088 (id.): 2; 29883 (Corner): 4; 37962 (Symington): 2; 38593 (Sinclair): 2; 40382 (Sinclair & Kiah): 4; 47125 (Symington): 2; Shiu Ying Hu 5670: 2; 6382: 2; 8018: 2; 8024: 2; 8029: 2; 8029a: 2; 8265: 2; 8335: 2; 8932: 2; 12298: 2; N. G. Smith 91: 3; Smitinand 4052: 4; 45679: 4; Smitinand & Abbe 6360: 4; Sørensen e.a. 10082: (4); Specht 119: 4; 246: 4; 320: 3; 623: 4; 793: 4; 1230: 4; v. Steenis 17859: 4.
 Tang 1655: 2; Ting & Hsi 978: 2; 19614: 2; 244273: 2.
 Usteri 120: 2.
 Verboom 51: 2; Vesterdal 75: 2; v. d. Voort 2: (4).
 Wang 2866: 2; C. T. White 205: 3; Wilson 228: 1a.