

A REVISION OF *GERMAINIA* BALANSA & POITRASSON (GRAMINEAE)

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S U M M A R Y

A revision is given of *Germainia* BALANSA & POITRASSON (Gramineae-Andropogoneae) and it is attempted to give the genus its correct taxonomic position. *Sclerandrium* C.E. HUBBARD and *Chumsriella* BOR are reduced. Nine species have been accepted, one remained dubious, one is reduced to synonymy and one is transferred to *Apocopis* NEES. A new species endemic to Thailand is described.

I N T R O D U C T I O N

The current paper was made during a ten month stay at the Rijksherbarium in Leiden. The first intention was to work up the genus for Thailand alone, but as this country is apparently central to the distribution of the genus, harbouring all but two species, it was decided to revise the genus for its whole area.

The genus was established by BALANSA & POITRASSON in 1873, based upon the species *G. capitata*, found near Saigon, and named after its collector, R. GERMAIN. The monotypic genus was taken up by HACKEL in his Monograph of the Andropogoneae (1889), but in 1891 he separated part of it as a new species, *G. khasyana*. J.D. HOOKER described another new one, *G. lanipes* from Burma in 1896. A. CAMUS described two more species from Indo-china, *G. thorelii* (1919) and *G. schmidiana* (1957). The latter is the only one of all species published has been sunk into synonymy.

In 1904, O. KUNTZE considered the name to be confused with *GERMANEA* LAMK. (1787, *Labiatae*), especially this name was also misspelled as *GERMANIA* by J.D. HOOKER (1885) and the grass as *GERMAINEA* by BENTHAM & HOOKER (1883). He renamed the genus *BALANSOCHLOA*, but this name was taken up by no-one and no combinations have been made.

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From HACKEL on *Germainia* has been considered as closely allied to *Themena* FORSSK. and *Iseilema* ANDERSS. ROBERTY (1960) went so far as to unite *Germainia* with *Themeda*, reducing *G. khasyana* and *G. thorelii* to varieties of *Th. capitata*, not mentioning the other species. He has remained alone in this.

In fact *Themeda* and *Iseilema* differ significantly from *Germainia* by the paniculate, spatheate inflorescence, the presence of lodicules and 3 stamens. The true relation must be sought in the genera around *Apocopis* NEES which have digitate, espatheate inflorescence, no lodicules and only 2 stamens. This relationship has been hinted at by BOR (Dansk Bot. Ark. 23: 162, 1965) and S.T. BLAKE (Proc. Roy. Soc. Queensl. 80: 82, 1969). Indeed there are two genera which are not significantly distinguished from *Germainia*, i.e. *Sclerandrium* C.E. HUBBARD and *Chumsriella* BOR. They have been merged here with *Germainia*. *Germainia* differs from *Apocopis* by the teneceous rhachis and the strictly ♂, muticous sessile spikelets, the upper lemma is rarely mucronate from an acute apex. *Apocopis* has a fragile rhachis and the sessile spikelets have the lower floret ♂ and the upper ♀ with the upper lemma awned from a bifid apex. Some species of *Sclerandrium* have been ascribed to *Lophopogon* by the presence of an entirely dehiscent inflorescence, leaving only a discoid callus at the end of the peduncle, homomorphous pairs of spikelets, the sessile spikelet with an aristate upper glume and without lemmas, the pedicelled spikelets being biflorous, the lower floret ♂ and the upper ♀ with the upper lemma aristate from a bifid apex.

Germainia is usually described and defined by the presence of "basal pairs of homogamous involucreal spikelets, surrounding the 3 central fertile awned spikelets". But the basic arrangement, as in all *Andropogoneae*, is of paired spikelets along an axis. In some species of *Germainia* the lower pairs are reduced to the sessile spikelets, but the higher are paired. Because of the reduction of the axis, the inflorescence becomes capituliform, but never are there central, solitary, pedicelled, awned, ♀ spikelets.

In *G. khasyana* HACK. there are usually 3 sessile and 3 pedicelled spikelets, which may be placed alternately when the axis is completely reduced. The pedicels are covered by the glumes of the sessile spikelets and indeed a central group seems to be present. The axis is usually developed, although very short, and then it can be seen, that the lowest sessile spikelet is solitary, the next is binate, while the terminal is ternate (as is often the case with the terminal group in *Andropogoneae*), thus adding up to 3 sessile and 3 pedicelled spikelets.

The most reduced raceme are of *G. thorelii* A. CAMUS and *G. pilosa* sp. nov. which have 2 sessile and 1 pedicelled spikelet. It is no doubt that the lower is solitary and the upper is binate.

When the axes of the racemes are better developed, which can be found also in the variability of *G. capitata* and *G. lanipes*, and when the lowest spikelets are binate, the species have been included in *Sclerandrium* and *Chumsriella*. It is obvious, however, that they merely form one end of the range of the variability of the genus, as they agree in all other characters with *Germainia*: rhachis not disarticulating, sessile spikelets ♂, biflorous, muticous and pedicelled spikelets ♀ uniflorous (rarely biflorous, with an epaleate sterile lemma), and awned.

ACKNOWLEDGEMENTS

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I am thankful to the directors of the Herbaria of Paris and Kew for the specimens on loan and to the staff members of the Herbaria of the British Museum and of Kew for their kind help during my short visit there.

GERMAINIA

BALANSA & POITRASSON, Bull. Soc. Hist. Nat., Toulouse 7 (1873) 344; *fig.*; HACK. in E. & P., Pfl. Fam. 2, 2 (1887) 30; Mon. Androp. (1889) 685; HOOK. *f.*, Fl. Br. Ind. 7 (1896) 163; E.G. & A. CAMUS, Fl. Gén. I.-C. 7 (1922) 366; PILGER in E. & P., Pfl. Fam., ed. 2, 14e (1940) 180; M. SCHMID, l'Agr. Trop. 13 (1958) 235; BOR, Grasses of Burma, Ceylon, India and Pakistan (1960) 159.—*Anthistiria* LINNE *f. sect. Germainea* BENTH. & HOOK. *f.*, Gen. Pl. 3 (1883) 1136 (misspelling).—*Balansochloa* O.KTZE. in POST, Lexicon (1904) 55, 616.—*Sclerandrium* STAPF & C.E. HUBB. ex C.E. HUBB. in HOOK. *f.*, Ic. Pl. 33 (1935) t. 3262, *p.p.*; PILG. in E.&P., Pfl. Fam., ed. 2, 14e (1940) 124; GARDNER, Fl. W. Austral. 1, 1 (1952) 302.—*Themeda* FORSSK. *sect. Germainia* ROBERTY, Mon. Androp. (1960) 101;—*Apocopis* NEES *sect.*—*Lophopogon* ROBERTY, *l.c.* 327, *p.p.*—*Chumsriella* BOR, Dansk Bot. Ark. 23 (1968) 467.

Tufted perennials or annuals, rarely stoloniferous. Internodes usually glabrous and terete. Basal sheaths persistent, upper somewhat inflated. Ligules short, truncate, membranous. Blades erect. *Peduncle* usually exserted, rarely enclosed in uppermost sheath, espatheate. *Raceme* solitary, capitate to elongate or 2-6 digitate to sub-digitate, closely appressed to divergent. Rhachis not disarticulating, tenaceous. *Spikelets* heteromorphous, binate, sometimes basal pairs reduced to the sessile spikelets forming an involucre. *Sessile spikelet*: biflorous (sometimes uniflorous in *G. tenax*, *G. thailandica*), ♂, muticous, persistent. *Lower glume* conspicuous, oblong to lanceolate, dorsally convex to flat, smooth, coriaceous to herbaceous, nerves (5-) 7-9, sometimes anastomosing or tessellate. *Upper glume* longer than lower, oblong, lanceolate to linear, erose, membranous, nerves 3-5. *Lower floret*: sometimes absent if present, *lemma* lanceolate to linear with ciliate, erose apex, hyaline, nerves (0-) 1-5. *Palea* oblong, lanceolate to linear, with erose, ciliate apex, hyaline, nerves 2. *Upper floret*: *lemma* absent if present linear, obtuse or acute to mucronate, hyaline, never 1. *Palea* similar to the lower. *Lodicules* absent. *Stamens* 2. *Pedicelled spikelet*: uniflorous, rarely biflorous with an epaleate sterile lemma (*G. truncatiglumis*), ♀, awned, caducous. *Pedice* fusiform, at least upper part pilose. *Callus* acuminate to obtuse, brown to yellowish pilose. *Glumes* subequal, ovate-oblong to lanceolate with ciliate apex, dorsally strigose, involute, chartaceous, nerves (0-) 1-5. *Lower floret*: usually absent rarely present with sterile lemma. *Upper floret*: *lemma* reduced to the narrow stipitate base of a geniculate awn with a twisted column. *Palea* ovate-oblong to rectangular, truncate, erose, hyaline, nerveless. *Lodicules* absent. *Ovary* fusiform; *styles* apical, free at base; *stigmas* plumose, exserted. *Caryopsis* oblong, free within the palea: hilum basal, punctiform; *embryo* 2/3 the length of the caryopsis.

Type species: *G. capitata* BALANSA & POITRASSON.

Distribution: 9 spp. in continental Asia (from Khasi Hills, Assam, to Canton South China), Malesia (New Guinea, 2 spp.) and N. Australia (N. Queensland and Northern Territory).

Note: J.D. HOOKER (1896) cited the genus for Africa but neither specimens nor other references have come to my notice.

KEY TO THE SPECIES

1. Small tufted annuals, up to 15 cm high. Leaf-blades densely, patently pilose with tubercle-based hairs. Lower glume of the sessile spikelet chartaceous to membranous

2. Sheath pilose. Ligule glabrous. Peduncle exserted, slender, uppermost sheath with a reduced blade. Raceme much reduced with 2 sessile and 1 pedicelled spikelet. Callus of the pedicelled spikelet acuminate

3. *G. pilosa*

2. Sheath glabrous except the upper part pilose. Ligule ciliate. Peduncle enclosed in uppermost sheath which has a well developed blade. Racemes 2, with more than 5 sessile and pedicelled spikelets. Callus of the pedicelled spikelet obtuse

2. *G. thailandica*

1. Plants much higher, tufted annuals or perennials or stoloniferous (*G. tenax*). Leaf-blades not as above. Lower glume of the sessile spikelet usually coriaceous rarely chartaceous (*G. tennax*)

3. Plant with stolons, flowering culm unbranched, up to 3 noded. Lower glume of the sessile spikelet chartaceous. Callus of the pedicelled spikelet obtuse. Awn much reduced 3-4.7 mm long

1. *G. tenax*

3. Plants without stolons, culms well-developed, branched or not, more than 3-noded. Lower glume of the sessile spikelet coriaceous. Callus of the pedicelled spikelet acuminate. Awn at least 1.5 cm long

4. Leaf-blades linear-lanceolate, up to 4 cm long. Internodes more than 5. Sessile spikelets 2-3 per raceme

5. Two sessile and one pedicelled spikelet per raceme. Lower glume of the sessile spikelet truncate with lateral caudate teeth up to 3.5 mm long. Leafblades up to 2.5 cm long

4. *G. thorelii*

5. Three sessile and three pedicelled spikelets per raceme. Lower glume of the sessile spikelet truncate to retuse without lateral caudate teeth. Leafblades 2.5-4 cm long

5. *G. khasyana*

4. Leaf-blades linear, longer than 7 cm. Internodes up to 5. Sessile spikelets 4 to many per raceme

6. Basal sheaths white- or yellow-lanate; culms branched

7. *G. lanipes*

6. Basal sheaths at most tomentose; culms simple

7. Sessile spikelets 4-11 per raceme. Lower glume of the sessile spikelet at least 13 mm long. Awn 6-9.5 cm long, column much longer than subule

6. *G. capitata*

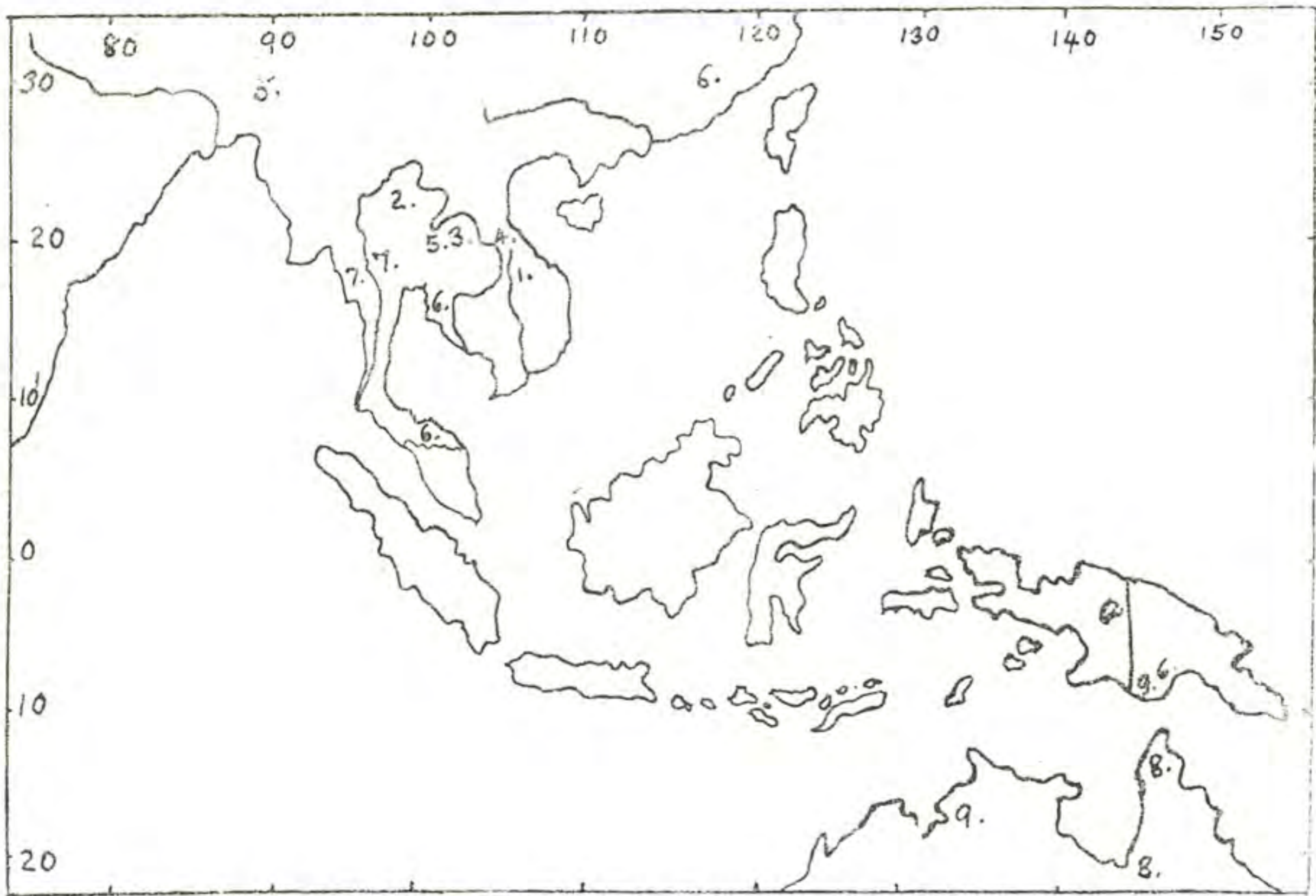


Figure 1. Distribution of *Germainia* spp.

1. *Germainia tenax* (BAL.) comb. nov.
2. *G. thailandica* (BOR) comb. nov.
3. *G. pilosa* sp. nov.
4. *G. thorelii* A. CAMUS
5. *G. khasyana* HACK.
6. *G. capitata* BAL.
7. *G. lanipes* HOOK. f.
8. *G. grandiflora* (S.T. BLAKE) comb. nov.
9. *G. truncatiglumis* (F. v. M. ex. BENTH.) comb. nov.

7. Sessile spikelets 10 to many per raceme. Lower glume of the sessile spikelet at most 10 mm long. Awn up to 5.3 cm long, column shorter than to as long as subule

8. Racemes 2-4, digitate. Lower glume of the sessile spikelet 6-10 mm long, margins glabrous. Awn 2.5-5.3 cm long

8. *G. grandiflora*

8. Racemes 3-6, subdigitate. Lower glume of the sessile spikelet 3-4.5 mm long, margins appressed pilose, Awn up to 2.5 cm long

9. *G. truncatiglumis*

1. *Germainia tenax* (BALANSA) *comb. nov.*—*Lophopogon tenax* BALANSA in MOROT, J. Bot. 4 (1890) 83; E.G. & A.CAMUS, Fl. Gén. I.-C.7 (1922) 287; M.SCHMID, Agr. Trop. 13 (1958) 175 + fig. 19-1.—*Sclerandrium tenax* (BALANSA) PILG. in E. & P., Pfl. Fam., ed. 2, 14e (1940) 124.—*Apocopsis tridentatus* (ROXB.) BENTH. var. *tenax* (BALANSA) ROBERTY, Mon. Androp. (1960) 327. Fig. 1, 1.

Tufted perennial with stolons, up to 30 cm high. Stolons branched at nearly every node into a flowering culm with at base up to 3 glabrous cataphylls and up to 3 leaves and virtually without internodes. Sheaths glabrous, slightly inflated. Ligules ca .5 mm long, truncate, ciliate. Blades linear-lanceolate, up to 4 cm by 3 mm, smooth, upper surface at base pilose, upwards sparsely pubescent to glabrous, lower surface glabrous. Peduncle 7-19 cm long, glabrous smooth. Racemes 2(-3), digitate, divergent, 1-2 cm long. Sessile spikelets 6-14 per raceme, the basal homogamous usually absent, or if present with one floret only. Sessile spikelet: lower glume oblong, 2.7-3.5 by .9-1.2 mm, truncate, 2-3-denticulate, ciliate apex, chartaceous, nerves 5(-6), not anastomosing. Upper glume ovate-oblong, 3.2-4.5 by 1.5-2 mm, apex shortly puberulous, acute. Lower floret absent if present barren, epaleate, lemma filiform, 1.2-1.7 by .1 mm. Upper floret: lemma filiform, 2.2-3.6 by .1-.2 mm, palea ovate-lanceolate, 3-3.7 by 1-1.2 mm, truncate. Filaments up to 4 mm long, anthers ca 2.5 mm long. Pedicelled spikelet: pedicel 1-2 mm long somewhat glabrous, callus obtuse, densely yellowish brown pilose, hairs as long as spikelet. Glumes oblong, obtuse, patently yellowish brown pilose, nerve 0, lower glume slightly shorter than the upper, 2.2-2.7 by .7-1 mm: upper glume 2.5-3 by 1.2-1.5 mm. Awn much reduced, 3-4.7 mm, nearly glabrous, column slightly longer than the subule, 1.9-2.5 mm long, subule scaberulous. Palea ovate-oblong, 2.5-2.7 by .7-1 mm, obtuse to deeply bifid. Caryopsis 1.2 mm long, embryo half as long.

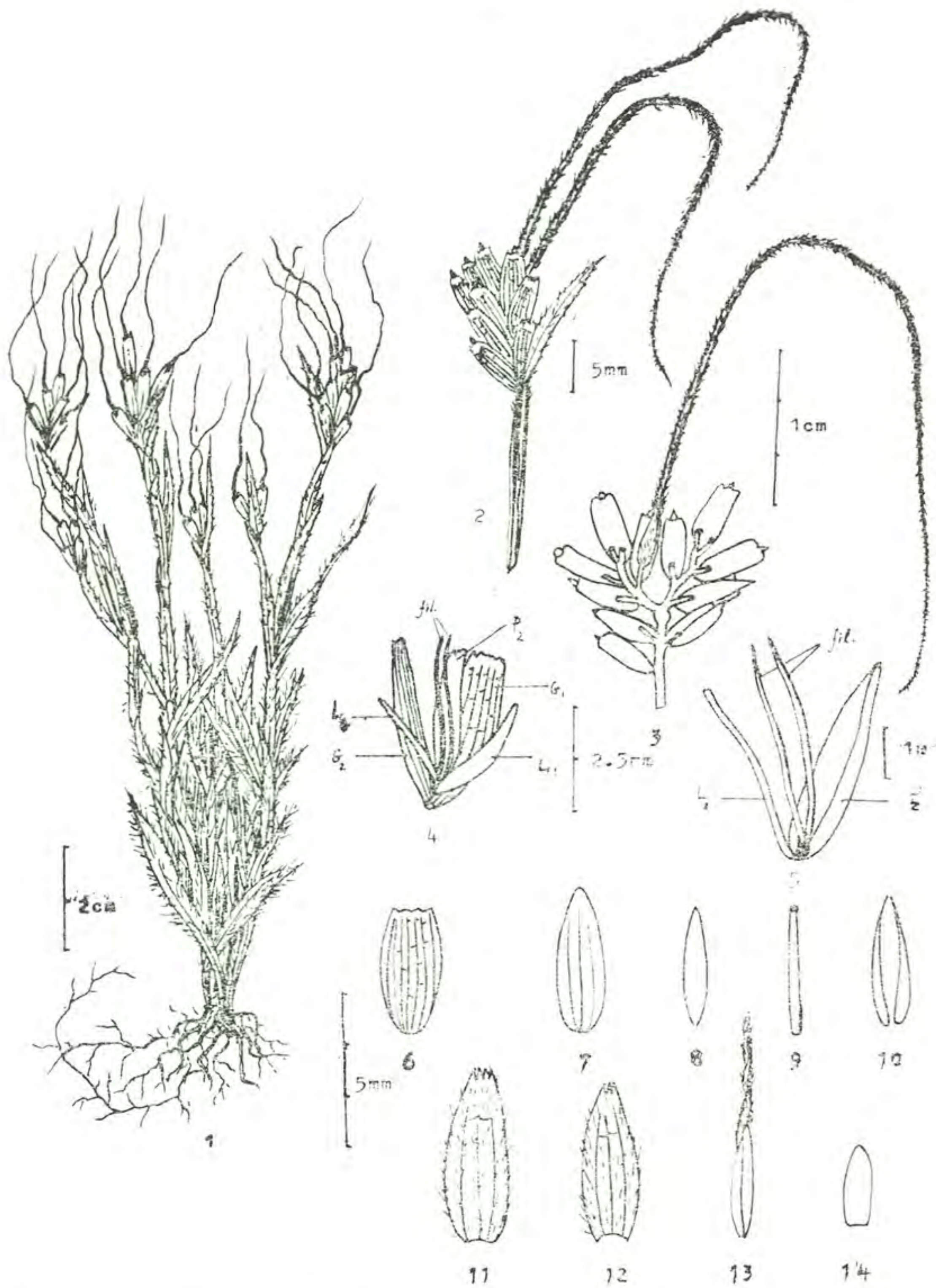


Figure 2. *Germainia thailandica* (Bor) 1. Habit; 2. raceme in the uppermost sheath; 3. raceme when expanded; 4. sessile spikelet showing lower glume (G1), upper glume (G2), lower lemma (L1), upper lemma (L2), upper palea (P2) and 2 filaments; 5. upper floret of sessile spikelet showing lemma (L2), palea (P2) and 2 filament; 6, 7, 8, 9, 10. lower glume, upper glume, lower lemma, upper lemma, upper palea of sessile spikelet; 11, 12, 13, 14. lower glume, upper glume, lemma, palea of pedicelled spikelet.

Type: HARMAND, *s.n.*! (Holo. L).

Distribution: Laos, Cambodia and South Vietnam, along the rivers Me Kong and Bassac. So far not collected in Thailand but is likely to occur.

Ecology: Sand-banks in river-beds, apparently low land.

2. ***Germainia thailandica*** (BOR) *comb. nov.*—*Chumsriella thailandica* BOR, Dansk Bot. Ark. 23 (1968) 467+fig. Fig. 1, 2 and Fig. 2.

Small tufted annual up to 10 cm high, culms branched; internodes 5-8. Sheaths longer than internodes, glabrous except the upper part pilose. Ligules up to 1 mm long, ciliate. Blades linear-lanceolate, 10-20 by 2-3 mm, densely patentely pilose with tubercle-based hairs on both surfaces. *Peduncle* enclosed in the uppermost sheath which has a well developed blade. *Raceme* 1-1.5 cm long, one forked 1-3 mm above base, more or less divergent. Sessile spikelets 5-12, basal solitary (homogamous) absent or 1. *Sessile spikelet*: *lower glume* oblong, 3.5-4.5 by 1.2-2 mm, retuse to truncate, 2-4-denticulate, margins and apex scarious, chartaceous to membranous, nerves 7-9, tessellate. *Upper glume* ovate-lanceolate, 4-5 by 1-1.2 mm, with truncate, emarginate and ciliate apex, faintly 1-nerved. *Lower floret*: absent if present barren, epaleate, *lemma* linear-lanceolate, 2.7-3.7 by .3-.5 mm, truncate. *Upper floret*: *lemma* filiform, 4-4.5 by .1 mm. *Palea* lanceolate, 4-4.2 by .7-1 mm. *Filaments* 4-4.5 mm long, *anthers* not seen. *Pedicelled spikelet*: *pedicel* 1-1.5 mm long, sparsely hairly, glabrous, *callus* obtuse, yellowish pilose. *Glumes* ovate-oblong, truncate to retuse, ciliate apex, dorsally yellowish pilose, nerves 3, anastomosing: *lower glume* 4-4.3 by 1-1.2 mm; *upper glume* 2.8-3.2 by .8-1 mm. *Awn* 2.5-4.5 cm long, column shorter than or as long as subule, *palea* oblong 1-1.7 by .5-.7 mm, acute to obtuse. *Caryopsis* not seen.

Type: BOONCHUAY 1436 ('BOONCOEHENGH'; Holo. K; Iso. BKF, L).

Distribution: Thailand, endemic (Doi Intanon).

Ecology: ca 1000 m altitude.

Note: This species looks very much like *G. pilosa* in its habit but it is very closely related to *G. tenax*. These two species differ from the other members of the genus by the absence of barren floret of the sessile spikelet, by the filiform (little wider than the filaments) upper lemma of the sessile spikelet and by the obtuse callus of the pedicelled spikelet.

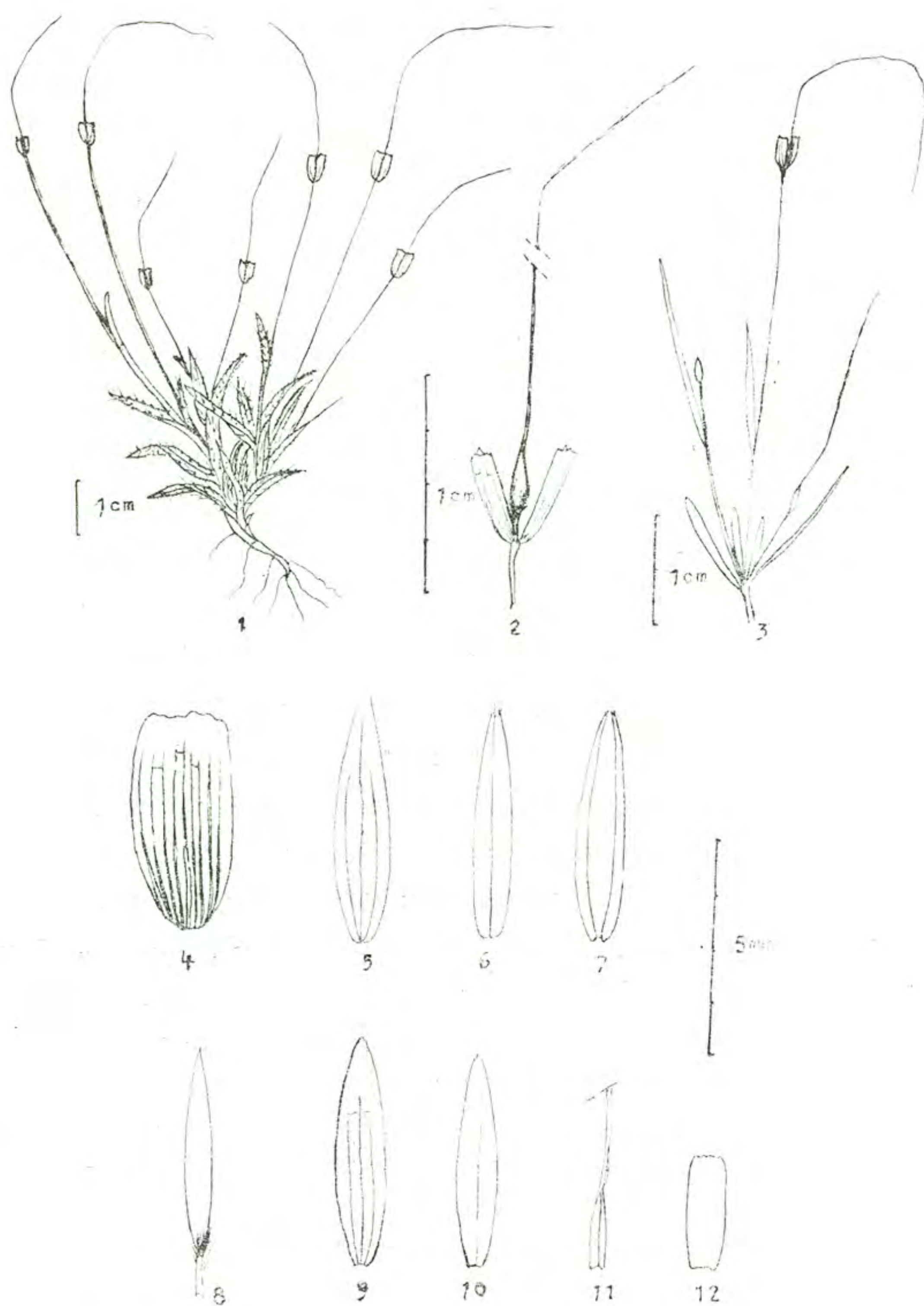


Figure 3. *Germainia pilosa* sp. nov. 1. Habit; 2. raceme; 3. raceme branches when expanded; 4, 5, 6, 7. lower glume, upper glume, lower lemma, lower palea of sessile spikelet; 8. pedicelled spikelet; 9, 10, 11, 12. lower glume, upper glume, lemma, palea of pedicelled spikelet.

3. **Germainia pilosa** *sp. nov.* Fig. 1, 3 and Fig. 3.

Germainia thorelii affinis sed multo minor, vaginis laminisque magis puberulis, conspicueque pilis patentibus basi bulbosis induta. Glumae inferiores spicularum sessilium chartaceae, nervis anastomosantibus, apice truncato, denticulato, cornibus lateralibus nullis.

Small, tufted annual, culm up to 15 cm high, branched, internodes 5-10. Sheaths and blades puberulous and patently pilose with tubercle-based hairs. Sheaths not aggregated at base, rounded at the back, upwards slightly keeled, longer than internodes. Ligules up to .8 mm long, glabrous. Blades linear-lanceolate, 10-20 by 2-2.5 mm, flat. *Peduncle* 3-6 cm long, glabrous. *Raceme* 6-7 mm long (*excl.* awn), much reduced with 2 sessile and 1 pedicelled spikelet. *Sessile spikelet*: lower glume oblong, 3.5-5.5 by 2-2.2 mm, truncate, denticulate, reddish brown, chartaceous, nerves 7-9, anastomosing below the apex; upper glume linear-lanceolate, 4.5-6.5 by .8-1 mm, obtuse, ciliate apex, nerve 3. *Lower floret*: lemma linear-lanceolate, 4-5 by 1 mm, obtuse, nerve 1; palea lanceolate ca 5 by 1 mm, obtuse. *Upper floret*: lemma absent; palea similar to the lower palea. *Anthers* 2-3.5 mm long, filaments 3-6 mm long. *Pedicelled spikelet*: pedicel up to 1.3 mm long, glabrous except the upper part pilose. *Callus* ca 1 mm long, acuminate. *Lower glume* ovate-lanceolate, 4.5-5.5 by 1-1.4 mm, acute to obtuse, nerves 3, anastomosing below the apex. *Upper glume* lanceolate, 3.5-5 by 1-1.2 mm, acute, nerve 1. *Awn* 3-4.5 cm long, column slightly longer than the subule, 1-2.5 cm long. *Palea* oblong, ca 3 by 1 mm. *Caryopsis* not seen.

Type: A. CHANTANAMUCK 224 (Holo. BKF; Iso. BK, K, L).

Distribution: Thailand, endemic (Sakon Nakhon).

Ecology: On sandy soil in open area, ca 600 m altitude.

Note: This new species is closely related to *G. thorelii* but differs in being much smaller plant, in being more puberulous and pilose with tubercle-based hairs on sheaths and blades, and by the chartaceous lower glume of the sessile spikelet which has a truncate, slightly denticulate apex without lateral teeth.

4. **Germainia thorelii** A. CAMUS, Bull. Mus. Nat. Hist. Nat. **25** (1919) 287; E. G. & A. CAMUS, Fl. Gén. I.-C. **7** (1922) 368+fig. 38, 1-3; M. SCHMID, Agr. Trop. **13** (1958) 237+fig. 46,1. — *Themeda capitata* (BALANSA & POITRAS) ROBERTY var. *thorelii* ROBERTY, Mon. Androp. (1960) 102. Fig. 1, 4 and Fig. 4.

Culms 30-50 cm high, slender, branched; internodes 5-11. Sheaths shorter than internodes, appressed-pubescent to glabrous. Ligules up to 1 mm long, glabrous. Blades linear-lanceolate, 15-25 by 2-3 mm, basal similar to upper, scabrous, upper surface appressed strigose. *Peduncles* 9-14 cm long, glabrous.

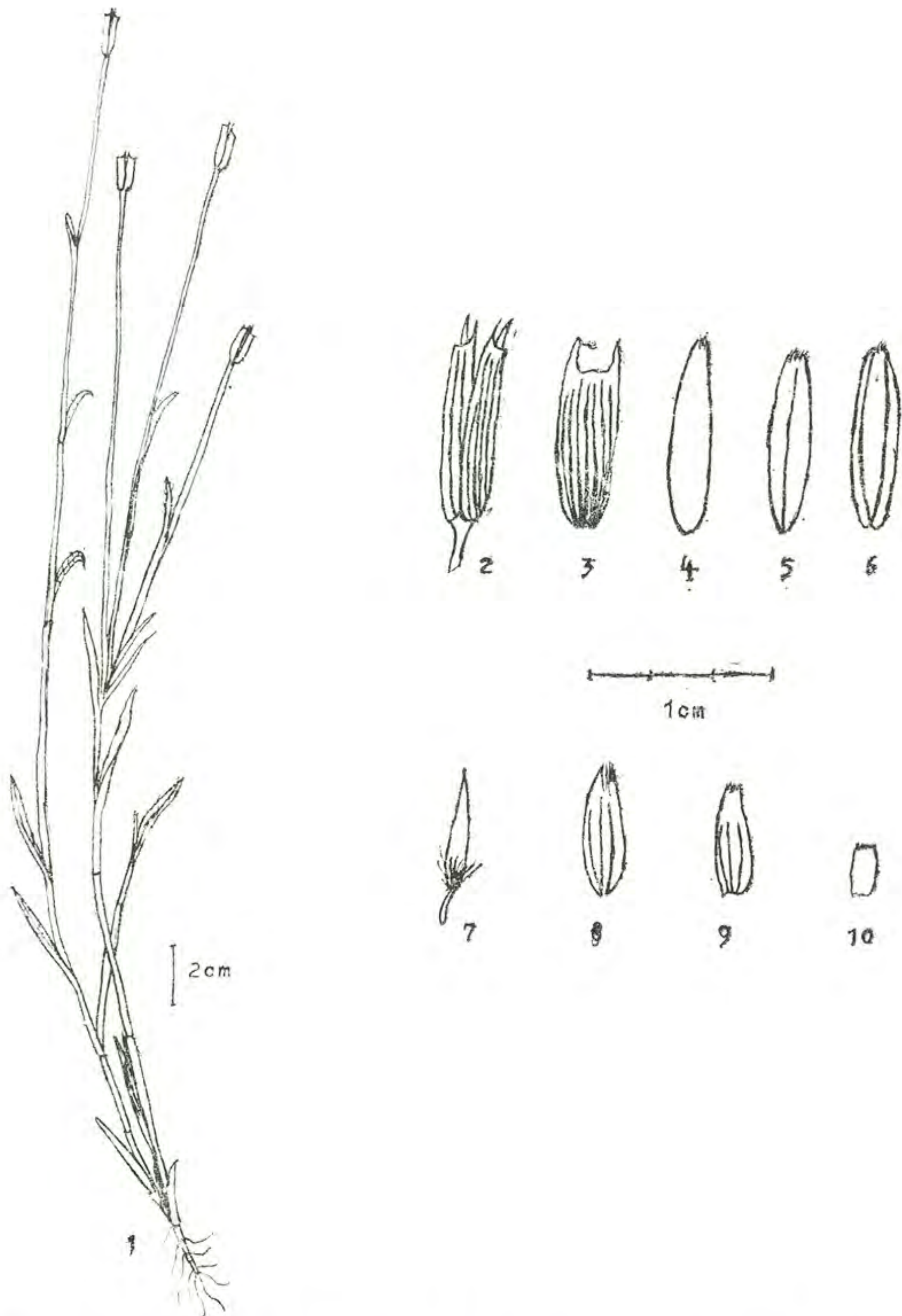


Figure 4. *Germainia thorelii* A. Camus 1. Habit; 2. raceme; 3, 4, 5, 6. lower glume, upper glume, lower and upper lemma, lower palea, upper palea of the sessile spikelet; 7. pedicelled spikelet; 8, 9, 10. lower glume, upper glume, palea of the pedicelled spikelet.

Racemes much reduced, 10-13 cm long (*excl.* awns), with 2 sessile and 1 pedicelled spikelet. *Sessile spikelet*: lower glume oblong, 9-12 by 2-3 mm, truncate with two lateral caudate, 1-3.5 mm long teeth, glabrous, coriaceous, nerves 7-9, not anastomosing. *Upper glume* linear-lanceolate, 10-11 by 1.8-2 mm, obtuse, faintly 3-nerved. *Lower floret*: lemma linear, 8-10 by .8-1 mm, 1-nerved. *Palea* linear, 8-9 by .8-1 mm, obtuse. *Upper floret*: lemma absent, if present similar to lower lemma. *Palea* similar to lower palea. *Filaments* up to 9 mm long: *anthers* not seen. *Pedicelled spikelet*: pedicel up to 3.2 mm long; callus 2 mm long, acuminate. *Glumes* ovate-lanceolate, obtuse to truncate 3-nerved, lower up to 7 by 2 mm; upper 5-6.5 by 1.5-1.8 mm. *Awn* ca 6.5 cm long (*fide* M. SCHMID, *l.c.*, *fig.*). *Palea* rectangular, 3 by 2 mm. *Caryopsis* up to .6 mm long.

Type : THOREL, *s.n.* ! (Holo. P).

Distribution : Indo-China (likely to occur in Thailand).

Ecology : Prairies on lime soil, ca 900 m altitude. (M. SCHMID, *l.c.*), locally common.

5. ***Germainia khasyana* HACK.**, Oest. Bot. Zeitsch. **41** (1891) 50; HOOK. *f.* Fl. Br. Ind. **7** (1896) 163; BOR, Fl. Assam **5** (1940) 415; Grasses of Burma, Ceylon, India and Pakistan (1960) 159.—*Themeda capitata* (BAL. & POITR.) ROBERTY *var. khasiana* ROBERTY, Mon. Androp. (1960) 102. Fig. 1, 5.

Perennial, 25-40 cm high, culms branched; internodes up to 20. Sheaths lax, sparsely-patently-pilose at base, the rest glabrous. Ligules up to 1.5 mm long, glabrous. Blades linear-lanceolate, 25-40 by 2-3 mm, basal similar to upper, margins scabrous, upper surface and margins sparsely-patently-pilose, glabrescent. *Peduncles* 6-14 cm long, glabrous. *Racemes* much reduced, 1-1.5 cm long (*excl.* awns), with 3 sessile and 3 pedicelled spikelets, rarely with 2 or 4 sessile spikelets. *Sessile spikelet*: lower glume oblong, 10-12 by 3-4 mm, truncate to retuse, coriaceous, nerves 7-9, not anastomosing. *Upper glume* linear-lanceolate, 15-17 by 2-3 mm, obtuse, erose, nerves 3. *Lower floret*: lemma linear ca 14 by 1.4 mm, acute, dorsally puberulous in upper part, nerve 1. *Palea* linear-lanceolate, 10-14 by 1-1.5 mm, obtuse. *Upper floret*: lemma absent. *Palea* similar to lower palea. *Filaments* ca. 1 mm long; *anthers* ca 4 mm long. *Pedicelled spikelet*: pedicel 2.5-4 mm long; callus 1-1.2 mm long, acuminate. *Glumes* ovate-oblong, lower ca 6 by 2 mm, truncate, nerves 0-5, upper ca 5 by 1.8 mm, obtuse, nerves 0-3. *Awn* 3.5-5.5 cm long, column longer than subule, 2.5-4 cm long. *Palea* rectangular, 2.5-3 by 1.5 mm, truncate to bifid. *Caryopsis* up to 3.2 mm long.

Type : C.B. CLARKE 44830 ! (44830 A *fide* BOR, 1960). (Holotype. K; BM).

Distribution: India (Khasi Hills, type), Burma and Thailand.

Ecology: On grassland, swampy places, often in abandoned rice fields, 150-1200 m altitude.

Note: According to ROBERTY, CLARKE 14568 is the lectotype of this species. This is incorrect as HACKEL cited only CLARKE 44830 and 42558.

6. *Germainia capitata* BALANSA & POITRASSON, Bull. Soc. Hist. Nat. Toulouse 7 (1873), 344, fig.; HACK., Mon. Androp. (1889) 686; RENDLE in FORBES & HEMSLEY, J. Linn. Soc. Bot. 36, (1904) 379; E.G. & A. CAMUS, Fl. Gen. I-C. 7 (1922) 367; HITCHCOCK, Lingnan Sc. J. 7 (1931) 252; REEDER, J. Arn. Arb. 29 (1948) 375; M. SCHMID, Agr. Trop. 13 (1958) 236; E. E. HENTY, Bot. Bull. 1 (1969) 105.—*Anthistiria caudata* (vix. NEES ex STEUD.) HANCE in TRIMEN, J. Bot. 16 (1878) 234; BENTH. & HOOK. f., Gen. Pl. 3 (1883) 1136.—*Germania schmidiana* A. CAMUS, Bull. Mus. Hist. Nat. Paris 2, 29 (1957) 186; M. SCHMID, Agr. Trop. 13 (1958) 235.—*Themeda capitata* ROBERTY var. *capitata*, Mon. Androp. (1960) 101. Fig. 1, 6.

Tufted perennial, 30-90 cm high, culm simple, internodes 3-5, appressed pubescent to glabrous. Basal sheaths tomentose to glabrous, persistent, upper shorter than internodes. Ligules up to 1.5 mm long. Blades linear, 7-38 cm by 3-9 mm, margins scabrous, stiff, flat or involute, appressed pubescent to glabrous. *Peduncle* 20-30 cm long, apically appressed pubescent or glabrous. *Raceme* 2-3.5 cm long (excl. awns) capitulate to elongate, usually with one main axis rarely with two very closely appressed. Sessile spikelets 4-11, basal homogamous 1-4. *Sessile spikelet*: lower glume rectangular-oblong, 13-22 by 3-4.5 mm, retuse to obliquely bidentate, teeth acute to obtuse, dorsally glabrous or sparsely appressed pilose, coriaceous, nerves 7-9, usually not anastomosing. *Upper glume* lanceolate, 16-23 by 3-4 mm rounded to truncate, dorsally puberulous. *Lower floret*: lemma linear-lanceolate, 15-20 by 1.5-3 mm, faintly 1-nerved; *palea* ovate-lanceolate to linear, 13-19 by 1.5-4 mm, ciliate. *Upper floret*: lemma linear, 15-20 by 1.5-1.8 mm, acute to obtuse, 1-nerved; *palea* lanceolate, 15-20 by 2-4 mm. *Filaments* 15-20 mm long, *anthers* 8-9 mm long. *Pedicelled spikelet*: *pedicel* 5-7 mm long; *callus* 1-1.3 mm long, acuminate. *Glumes* ovate-lanceolate, rounded to truncate, 3-nerved, lower glume, 8-11 by 1.5-2.5 mm, upper glume 7-9 by 1.1-1.8 mm. *Awn* 6-9 cm long, column 4-6 cm long. *Palea* oblong, 5 by 2 mm, truncate. *Caryopsis* up to 3 by 1 mm.

Type: GERMAIN, s.n. ! (Holo. L).

Distribution: South China (Canton) to Thailand and Malesia (New Guinea).

Ecology: In open grassy pine forest, on dry sandy soil; 5-2000 m altitude.

Notes: 1. *G. schmidiana* A. CAMUS is included here although the type (SCHMID 2349, central Vietnam) has not been seen. The description given by CAMUS and SCHMID show that the plant falls entirely within the variability of *G. capitata*. The dimension given by CAMUS for the peduncle, 14-15 mm and the callus, 1.8-2 cm, are no doubt misprints for cm and mm respectively.

2. *G. kerrii* C.E. HUBB. mss is rather pubescent, broad-leaved plant with rather large spikelets, but can not be distinguished clearly from large, pubescent forms of *G. capitata*

3. This species is the most variable one in the genus. It can be roughly divided according to its ecology:—

(1) A form of higher altitudes, 1000-2000 m. Plants are pubescent to nearly glabrous. Racemes with 1-2 closely appressed axes which reduced with 6-9 sessile spikelets and the lower glume of the sessile spikelet pubescent, or the axes better developed with up to 11 sessile spikelets and the lower glume of the sessile spikelet $\pm$ glabrous.

(2) A form of lower altitudes, 5-50 m. Plants are less pubescent. Axes of the racemes much reduced with 4-6 sessile spikelets and the lower glume of the sessile spikelet $\pm$ glabrous.

As can be seen these forms are difficult to distinguish and the description of the two taxa does not seem warranted, both forms occurring in continental S.E. Asia and in New Guinea. It is curious that no specimens from an intermediate altitude have been collected.

7. ***Germainia lanipes*** HOOK. f., Fl. Br. Ind. 7 (1896) 163; BOR, Grasses of Burma, Ceylon, India and Paskistan (1960) 159; Dansk Bot. Ark. 23 (1965) 161. Fig. 1, 7.

Perennial up to 45 cm high, culm branched nearly every node, slender; internodes 3-5. Basal sheaths densely white to yellow lanate, upper shorter than internodes and sparsely pubescent at base and at throat to glabrous. Ligules of the lower leaves with fringe of long hairs. Basal blades wirely, 20-30 cm by 2-3 mm, scabrous, keeled, upper much reduced. Peduncles 8-11 cm long. Racemes 1 or 2 closely appressed, 1.5-2.5 cm long (excl. awn); sessile spikelets 4-11, basal (homogamous) usually 2. Sessile spikelet; lower glume oblong, 9-12 by 1.8-3 mm, retuse to truncate, glabrous, coriaceous, nerves 7-9, not anastomosing. Upper glume linear, 10-15 by 1-1.5 mm, acute to obtuse, nerves 3. Lower floret: lemma linear, 9-10 by 1-1.4 mm, acute, nerve 1. Palea linear-lanceolate, 8-9 by 1-1.5 mm, obtuse. Upper floret: lemma absent to filiform, 8-10 by .2-.4 mm,

a single nerve running into a mucronate apex. *Palea* similar to the lower, 7-11 by 1-1.5 mm., *Anthers* ca 2 mm long. *Pedicelled spikelet*: *pedicel* 2-3 mm long, pilose, *callus* .5-1 mm long, acuminate. *Glumes* ovate-lanceolate, obtuse, *lower* 5-7 by 2.2-1.5 mm, nerves 3-5, *upper* 5-6 by 1-1.2 mm, nerves 3. *Awn* 3-5 cm long, column $\pm$ as long as subule. *Palea* 2.8-3.2 by 1.2-2 mm. *Stigmas* 6-9 mm long. *Ovary* 1 mm long.

Type: HELFER, *s.n.* ! (Holo. K).

Distribution: Burma (Tenasserim, type) and Thailand.

Ecology: On slope of limestone hills in open grassy *Shorea-Phoenix humilis* vegetation; 400 m altitude.

8. ***Germainia grandiflora*** (S.T.BLAKE) *comb. nov.*—*Sclerandrium grandiflorum* S.T.BLAKE, Austral. J. Bot. 2 (1954) 108 + fig. 1; Proc. Roy. Soc. Queensland 80 (1969) 82. Fig 1, 8.

Tufted perennial, up to 1 m high, culm simple; internodes 4-5. Sheaths glabrous, upper shorter than internodes. Ligules ciliate, up to 1 mm long. Blades linear, 7-30 cm by 2-5 mm, scabrous, stiffly erect, flat, glabrous to appressed moderately pubescent, throat with some long hairs. *Peduncles* up to 35 cm long, glabrous. *Racemes* 2-4 digitate, closely appressed to divergent, 3.5-7 cm long. Sessile spikelets 10 to many, basal (homogamous) usually absent, rarely 2. *Sessile spikelet*: *lower glume* ovate-oblong, 6-10 by 2-4.5 mm, truncate with 2-4 denticulate, ciliate apex, coriaceous, nerves 7, sometimes apically anastomosing. *Upper glume* ovate-oblong, 6.5-12 by 2-3.8 mm, acute to truncate, ciliate apex, nerves 3. *Lower floret*: *lemma* ovate-lanceolate, 6-9.5 by 1.5-3.5 mm, acute to truncate. *Palea* similar to lemma, 4.5-11 by 1.5-3 mm, acute, margins and apex sparsely appressed pubescent. *Upper floret*: *lemma* linear-lanceolate, 6.5-12.5 by .8-1.2 mm, acute to bidentate, muticous or with shortly mucro, up to 2.5 mm long. *Palea* ovate-lanceolate, 6-11 by 2-3 mm, as the lower in other aspects. *Filaments* 7-10 mm long, *anthers* 4-5 mm long. *Pedicelled spikelet*: *pedicel* 1.7-2 mm long, appressed-white-pubescent; *callus* .5-1 mm long. *Lower glume* ovate-oblong, 4-7 by 1.5-2.5 mm, obtuse to truncate, faintly 3-5-nerved, *upper* somewhat shorter. *Awn* 2.5-5.3 cm long, column white-pilose, subule scabrous to puberulous, yellowish, column shorter than or as long as subule. *Palea* oblong 3.5-4.8 by 1.2-2 mm, truncate. *Stigmas* ca 1 cm long. *Caryopsis* not seen.

Type: S.T.BLAKE 16405 (Holo. BRISB, *n.v.*)

Distribution: Australia (Northern Territory and Queensland).

Ecology: Sandy, often swampy soil along marshes, rivers and on flats among *Cyperaceae* and in savannas with *Eucalyptus spp.* (Bloodwood) and *Melaleuca spp.* (Tea trees). Up to ca 100 m altitude.

9. *Germainia truncatiglumis* (F. v. M. ex BENTH.) *comb. nov.*—*Ischaemum truncatiglume* F. v. M. ex BENTH., Fl. Austral. 7 (1878) 518.—*Lophopogon truncatiglumis* (F. v. M. ex BENTH.) HACK., Mon. Androp. (1889) 225.—*Scherandrium truncatiglume* (F. v. M. ex BENTH.) STAPF & C.E. HUBB. ex C.E. HUBB. in HOOK. f. Ic. Pl. 33 (1935) t. 3262; CHASE, J. Arn. Arb. 20 (1939) 314; REEDER, J. Arn. Arb. 29 (1948) 340; GARDNER, Fl. W. Austral. 1. 1 (1952) 302 + fig. 88 B; E.E. HENTY, Bot. Bull. 1 (1969) 170.—*Apocopis tridentatus* (ROXB.) BENTH. var. *truncatiglumis* (F. v. M. ex BENTH.) ROBERTY, Mon. Androp. (1960) 327. Fig. 1, 9.

Tufted perennial, up to 1.50 m high, culm simple; internodes 4-5. Sheaths glabrous, upper shorter than internodes. Ligules 1-2 mm long, ciliate or somewhat long hairs. Blades linear, up to 50 cm by 10 mm, uppermost much smaller (2-9 cm long), fold at base, glabrous or with sparsely pilose throat, smooth, stiffly erect. Peduncles 20-40 cm long, glabrous. Racemes 3-6 subdigitate along, .5-1 cm long axis with often blackish axils, 5-12 cm long, slightly divergent, axes white-pilose. Sessile spikelets many, basal (homogamous) usually absent. Sessile spikelet: lower glume elliptic, 3-4.5 by 1.2-3 mm, truncate to 2-3-dentate, appressed-pilose along margins, coriaceous, nerves 7, sometimes anastomosing below the apex; upper glume ovate-lanceolate, 5-6.5 by 1.2-1.5 mm, truncate, shortly appressed pilose at the apex and along the margins. Lower floret: lemma ovate-lanceolate, 3.5-5.2 by 1-1.2 mm, truncate to obtuse, nerves 1 (-3). Palea ovate-oblong, 4-5.5 by .7-2 mm, rounded, puberulous in upper half. Upper floret: lemma linear-lanceolate, 2.7-5 by .3-.5 mm, acute to mucronate (mucro up to 3 mm long, scaberulous). Palea ovate-oblong, 3.5-5 by 1.2-1.7 mm, obtuse, puberulous in upper half. Filaments up to 7 mm long, anthers 2.5-3.5 mm long. Pedicelled spikelet: pedicel 1-2 mm long, appressed-white-pilose; callus ca .5 mm long, acute. Lower glume ovate-lanceolate, 3.2-4 by 1-1.2 mm, truncate, appressed-white-pilose along margins and in upper half, nerves 3-5. Upper glume ovate-oblong, 3.3 by 1-1.2 mm, truncate, nerves 1-3. Lower floret sometimes present with an epaleate sterile lemma. Awn 1.5-2.5 cm long, column shorter than subule, 5-9 mm long, patently white-pilose, subule scabrous, yellowish. Palea 2.5-2.8 by .5-1 mm, truncate. Stigmas ca 5 mm long. Caryopsis not seen.

Type: F. v. MUELLER, s. n. ! (Iso. K).

Distribution: Australia (Northern Territory: SPECHT 1259!; WILSON 304!), Malesia (Western Division, Papua: BRASS 8665!).

Ecology: Sandy, temporarily inundated places in savanna-forest, on banks of streams. Probably lowland.

Dubious Species

1. *Germainia flosculosa* (F. v. MUELLER) C.E. HUBB., Kew Bull. (1934) 45. *Anthistiria flosculosa* F. v. MUELLER, Pragm. Phyt. Austral. 10 (1876) 75. Type; C. MOORE, *s.n.*!, Port Curtis District, Queensland (MELB.; K!).

I have seen the isotype at Kew which is only one leaf remained and I can not make out of it. As far as the original description and some remarks by C.E. HUBBARD are concerned, it appears to me to be very closely allied to *G. capitata*, in its habit, in having reduced racemes with 6-8 sessile spikelets. But it is slightly different from the latter by the longer glume of the pedicelled spikelet (*ca* 17 mm in *G. flosculosa* and at most 11.5 mm in *G. capitata*) and the shorter awn (at least 5.1 cm long in *G. flosculosa*, at least 6 cm long in *G. capitata*).

Excluded Species

1. *Sclerandrium intermedium* (A. CAMUS) C. E. HUBB. in HOOK. f. Ic. Pl. 33 (1935) t 3262. *Lophopogon intermedius* A. CAMUS, Bull. Mus. Nat. Hist. 25 (1919) 285; E.G. & A. CAMUS, Fl. Gén. I.-C. 7 (1922) 286+fig. 34, 1-5; M. SCHMID, 1' Agr. Trop. 13(1958) 175. *Apocopis wightii* NEES ex THWAITES var. *spiculis majoribus* BALANSA in MOROT, J. Bot. 4 (1890) 84. *Apocopis tridentatus* (ROXB.) BENTH. var. *intermedius* ROBERTY, Mon. Androp. (1960) 327.

= *Apocopis intermedius* (A.CAMUS) *comb. nov.*

This species can hardly be placed in *Lophopogon* or *Germainia*. It differs significantly by the presence of a bisexual, awned upper floret in the sessile spikelets which are never solitary and by the fragile rhachis of the racemes. It falls in *Apocopis* where it occupies a position similar to that of *A. anomalus* BOR in having a developed-pedicelled-spikelet which is ♂ in the former and *A. collinus* BALANSA but ♀ in the latter and this species.

Index of Collector's Numbers

Allen 26 (9)

Blake 14542 (8), 17237 (9) — Boonchaury 1436 (2) Brass 5727, 6555 (6), 8537 (9), 8637 (6), 8665 (9), 11722 (6), 18558, 18871 (8) — B.W. (Versteegh) 12512 (6)

Chantanamuck 224 (3) — Clarke 6447 (5), 14568 (6), 42558, 44830 (5)

Germain s.n. (6)

Harmand s.n. (1) — Helfer s.n. (7)

Joseph 8022 (4)

Kerr 8831, 9583, 13687 (6)

Lace 6054 (5) — Larsen 2369 (6) 9134 (7), 11231 (5) — Leeuwen
& v.d. Ree s.n. (6)

MacGregor 7 (6) — Moor c. s.n. (dubius) — Mueller s.n. (9)

N.G.F. 9370, 10429 (6)

Phengkhlai 352 (7) — Pradit 700 (5)

Sampson s.n. (6) — Schmid 2349 (6) — Smitinand 367, 1794, 3598,
5856, 7154 (6) — Specht 1237 (8), 1259 (9) — Suvanakoses 2016 (3)

Thorel s.n. (4)

Umpai 107 (6)

Wilson 304 (9)