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NEW GENERA OF AUSTRALIAN GRASSES

*By*

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*Walter and Eliza Hall Fellow in Economic Biology, University of Queensland.*

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# NEW GENERA OF AUSTRALIAN GRASSES.

By S. T. BLAKE, M.Sc.,

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**Dimorphochloa**\* *S. T. Blake*; genus novum, affine *Cleistochloae* C. E. Hubbard, a qua differt: gluma superiore admodum apiculata vel tridentulata (nervi medio vel etiam 2 lateralibus breviter excurrenti); lemmate anthoecii inferi basi plus minusve cartilagineo-incrassato in siccitate ruguloso, sursum herbaceo-membranaceo, eo spicularum cleistogamarum dorso convexo, haud rostellato, solum basi incrassato, marginibus haud convoluto; lemmate anthoecii superi longiuscule mucronato ejus palea sub apice bicarinata; scutello caryopsin dimidiam subaequante; inflorescentia chasmogama e racemis spicatum ordinatis constructa, cleistogama ramulos breves dense foliatis terminante.

*Spiculae* dimorphae, oblongo-ellipticae, acuminatae vel mucronatae, a dorso compressae, a pedicellis omnino deciduae, adaxiales, aliae chasmogamae in racemis subsecundis spicatum dispositis singulatim ordinatae, aliae cleistogamae solitariae apice ramulorum culmorum sitae. *Anthoecia* duo: *inferum* sterile ad lemma redactum, lemma spiculam adaequans et ejus formam congruens, tenuiter coriaceum, inferne  $\pm$  incrassatum, apice anguste subtruncatum; *superum*  $\sigma$ , spiculam adaequans, ellipticum, acuminatum, parum compressum, fere glabrum; lemma ellipticum, crustaceum, marginibus hyalinum planum sursum ciliatum et  $\pm$  convolutum, mucronatum, dorso lateribusque glabrum vel pilis perpaucis sparsis praeditum, 5–7–nervis nervis superne  $\pm$  confluentibus; palea concava, 2–nervis, lemmati textura formaque subsimilis; *lodicae* 2, cuneatae; *stamina* 3; *ovarium* glabrum; *styli* 2, distincti; stigmata plumosa. *Spiculae chasmogamae* breviter pedicellatae, alternae, distichae. *Glumae* valde inaequales; inferior brevissima, membranacea, 1–nervis, vel nulla; superior herbaceo-membranacea, 7–nervis, spicula paullo brevior, anguste truncata vel apiculata vel tridentulata. *Anthoecium inferum*: lemma prope basin incrassatum, 7–nervis. *Anthoecium superum*: lemma 6–7–nervis; antherae lineares exsertae; stigmata sub apice anthoecii exserta; caryopsis rarissime visa. *Spiculae cleistogamae* breviter pedicellatae. *Gluma inferior* nulla; superior spicula paullo brevior, herbacea, basi cartilaginea, 6–9–nervis. *Anthoecium inferum*: lemma 5–nervis, basin versus incrassatum et induratum vel spongiosum sed ocellis duobus hyalinis praeditum. *Anthoecium superum*: lemma 5–nervis, ceterum spiculis chasmogamis simile; antherae parvae inclusae; stigmata inclusa; caryopsis oblongo-elliptica, obtusa, parum compressa, dorso leviter sulcata; scutellum circiter  $\frac{2}{3}$  caryopseos adaequans, rotundato-obovatum; hilum basale.—*Gramen* perenne, caespitosum, ramosum, rigidum, pilosum; innovationes extravaginales; folia breviter, rigida, plana vel involuta, eca apice indurata leviter cymbiformia, laminis a vaginis demum disarticulantibus; ligula ad seriem ciliorum redacta; inflorescentiae dimorphae:—altera culmos hornotinos vel eorum ramos ( $\pm$  elongatos) terminans, anguste spiciformis, e racemis subsecundis erectis in rachi tenui triquetra ordinatis formata; altera lateralis, ad spiculam unicam cleistogamam redacta, ramulos foliosos breves culmorum serotinatorum terminans, foliis fere occulta, pedunculo perbrevis vaginam folii summi vix superante. (Plate I.)

\* *dis*, double; *μορφή*, form: *χλόα*, grass.

Species adhuc nota unica, austroqueenslandica, locorum siccorum saxosorum et arenosorum incola.

**Dimorphochloa rigida** S. T. Blake, species nova.

*Gramen* perenne, dense caespitosum, plerumque 50–100 cm. altum, viride; rhizomata brevia vel brevissima. *Culmi* erecti vel leviter geniculati, graciles vel subrobusti, ramosi, 7–10–nodes, rigidi, duri, crebre striati, pilis albis tenuibus erectis vel patulis e tuberculis ortis dense vel laxe hirsuti, vel glabrescentes, nodis barbati, basi ut innovationibus cataphyllis papyraceis stramineis  $\pm$  pilosis obtecti; rami culmorum hornotinorum plerumque solitarii saepe elongati, ei culmorum vel ramorum serotinorum plerumque fasciculati, breviusculi, dense foliati. *Foliorum vaginae* internodiis breviores vel eae ramulorum brevium longiores, demum laxae, striatae, ut culmi hirsutae vel glabrescentes et tuberculatae; collum pilosum; auriculae incrassatae vel subnullae; laminae lineares, in apicem durum acutum gradatim attenuatae, plerumque 2–7 vel usque ad 8 cm. longae, 2–3 mm. latae, planae vel involutae vel convolutae, rigidae, creberrime plurinerves nervis crassiusculis, marginibus incrassatis sursum scaberulae inferne tuberculatae vel rigide tuberculato-pilosae, utrinque scaberulae, pilosulae, vel glabrescentes, inferiores paucae gradatim breviores. *Inflorescentia terminalis* exserta, chasmogama, erecta, plerumque 3–8.5 cm. longa, 4–6 mm. lata; axis communis gracilis, compressus vel triqueter, scaberulus; racemi 2–8, ad axem appressi, usque ad 1.7 cm. longi, 2–6–spiculati, axis internodiis subaequales, spiculis contiguis; rachis triquetro-filiformis, scaberula, et praecipue axillis, pilosula; pedicelli laterales 0.3–0.5 mm. longi, incrassati, scaberuli et pilis albis paucis praediti. *Spiculae* oblongae vel admodum ellipticae, acutae, 4.7–5.2 mm. longae, 1.6–1.8 mm. latae, virides vel stramineae. *Gluma inferior* hyalina, oblata, obtusa, 1–nervis, usque ad 0.35 mm. longa, vel nulla. *Gluma superior* spicula paullo brevior, (explanata) oblonga, sursum gradatim rotundata, apice vel anguste subtruncata vel abrupte apiculata vel tridentulata, 7–nervis saepe nervo medio vel etiam 2 lateralibus breviter excurrenti, tenuiter herbacea, marginibus anguste hyalina, omnino pilis subpatulis albis e tuberculis ortis densissime pilosa. *Anthoecium inferum*: lemma spicula subaequilongum vel minute brevius, oblongum, sursum gradatim rotundatum, apice anguste truncatulum, 7–nervis, herbaceo-crustaceum, basi incrassatum  $\pm$  callosum, marginibus hyalinum, ut gluma superior pubescens. *Anthoecium superum* ellipticum, breviter acuminatum, mucronatum, stramineum vel pallide stramineum, 4.5–5 mm. longum; lemma ellipticum, breviter mucronatum mucrone robusto scaberulo leviter incurvo, sub apice breviter et leviter carinatum, ceterum dorso convexum, 6–7–nervis, punctulatum, marginibus parce ciliatis exceptis glabrum; palea angustior paullo brevior, minute punctulata, marginibus inferioribus parce superioribus dense ciliata, dorso insuper pubescens, ceterum glabra. *Lodiculae* submarginatae, carinato-alatae. *Antherae* lineares, circiter 2 mm. longae. *Caryopsis* nitidula, circiter 3 mm. longa, rarissime maturans. *Inflorescentia lateralis* plerumque ad spiculam unicam redacta: *pedicellus* (vel pedunculus) filiformis, pilosus, apice clavatus, vaginam foliae summae vel brevior vel adaequans vel paullo superans. *Spiculae* oblongo-ellipticae vel admodum lanceolatae, acutae, 5.2–7 mm. longae, 1.6–1.9 mm. latae, saepe fusciscentes. *Gluma inferior* nulla. *Gluma superior* spicula paullo brevior, oblongo-ovata nonnunquam obliqua, apice subtruncata vel abrupte subacuminata, 6–9– (plerumque 7–) nervis, herbacea, basi cartilaginea,

marginibus anguste hyalina, pilis albis erectis vel subpatulis e tuberculis ortis dense pubescens. *Anthoecium inferum*: lemma spicula subaequilongum, (explanatum) ellipticum, subacutum, 5-nerve, herbaceum, basin versus incrassatum et induratum vel spongiosum, ocellis duobus hyalinis exceptis, saepe cicatriciforme, marginibus anguste hyalinum, ut gluma pilosum. *Anthoecium superum* anguste ellipticum vel elliptico-lanceolatum, longe acuminatum, spiculam adaequans; lemma mucronatum mucrone robusto scabrido 0.5-0.8 mm. longo, dorso convexum, 5-nerve, marginibus ciliatis exceptis glabrum vel pilis perpaucis praeditum; palea breviter mucronata, marginibus superioribus ciliata, ceterum glabra, lemmate paullo brevior. *Lodiculae* leviter bilobulatae, membranaceae. *Antherae* 0.7-1.1 mm. longae, haud exsertae. *Caryopsis* 3-3.5 mm. longa, 1.4-1.6 mm. lata.

QUEENSLAND.—Leichhardt District: Carnarvon Range, on sandstone hills, 2400 ft., abundant, Sept. 27th, 1940, *White* 11315. Warrego District; Mt. Brandon, approx. 25° 15' S., 147° 30' E., on rocky sandstone slopes in open forest, ca. 2000 ft., April 8th, 1936, *Blake* 11153. Darling Downs District: Between Miles and Drillham, in *Eucalyptus-Acacia* forest, on shallow grey fine sand, 1100 ft., Feb. 19th, 1935, *Blake* 7711 (TYPE); near Kogan, on sandstone ridge in *Eucalyptus nobilis* forest, ca. 1250 ft., Feb. 12th, 1938, *Blake* 13268; 3 miles south-east of Kogan, on upper slopes of rocky ridge, October 13th, 1940, *Everist & Smith* 814.

*Dimorphochloa*, so far as is at present known, occurs only in a somewhat restricted area and is there confined to sandstone ridges and hills, where it is associated with the widely spread *Cleistochloa subjuncea* C. E. Hubbard.\* Although resembling this species somewhat in appearance and also species of *Entol* it is a taller plant, and the densely leafy short branchlets on the older culms give it a different aspect.

The differentiation of the culms is a characteristic feature, and suggested the generic name. The new culms are simple or sparingly branched with rather long branches; both culms and branches are terminated by chasmogamous inflorescences of usually several or many spikelets arranged in racemes scattered along a common axis. But late in the season, and in the following year, these culms and their primary branches branch freely from most of the nodes, producing fascicles of short, densely leafy branchlets terminated by a solitary cleistogamous spikelet scarcely exserted from the uppermost sheath. Intermediate states sometimes occur.

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\* Henrard, in *Blumea* iii. 161: 1938, has changed this name to *C. Hubbardiana* Henr., rejecting Hubbard's name because *Panicum subjunceum* Ekman (1911) antedates *P. subjunceum* Domin (1915), upon which Hubbard founded the genus *Cleistochloa*. But in this Henrard is wrong, for Hubbard's name is quite in accord with Art. 69 of the International Rules of Botanical Nomenclature (1935), which states that "Where a new epithet is required, an author may, if he wishes, adopt an epithet previously given to the group in an illegitimate combination, if there is no obstacle to its employment in the new position or sense." The example given is parallel to the above: "The combination *Talinum polyandrum* Hook. (in *Bot. Mag.* t. 4833: 1855) is illegitimate, being a later homonym of *T. polyandrum* Ruiz et Pav. (*Syst. Fl. Per.* 1, 115: 1798): when Bentham transferred *T. polyandrum* Hook. to *Calandrinia*, he called it *Calandrinia polyandra* (*Fl. Austral.* 1, 172: 1863). This is treated, not as a new combination, but as a new name, *C. polyandra* Benth. (1863)." It may also be noted that Hubbard correctly published his combination as *C. subjuncea* C. E. Hubbard nom. nov., and that Henrard has erred in citing the combination as *C. subjuncea* (Dom.) Hubbard.

The outstanding floral characters of the genus are (1), the two types of inflorescence and spikelets; (2) the narrowly truncate or apiculate or tridentulate upper glume; (3) the lower floret reduced to its lemma; (4) this lemma more or less thickened in the lower part, and in the cleistogamous spikelet it is there strongly thickened, callous-like, or almost spongy particularly when wet, with two prominent hyaline areas near the base; (5) the upper floret turgid, acuminate, its lemma mucronate, crustaceous with flat hyaline margins ciliate upwards and sometimes with a few hairs on the back, and its more or less convolute tip embracing the tip of the palea.

The cleistogamous spikelets are larger than the chasmogamous, and differ from them also in shape and other characters; the lower glume is always absent, the upper is sometimes oblique, is hardened and less constantly 7-nerved; the lemma of the lower floret is thickened to a greater degree and over a larger area, while its two characteristic hyaline "ocelli" are absent in the chasmogamous spikelet; the upper floret is more prominently acuminate and its lemma 5-nerved, not 6-7-nerved; the anthers are much smaller, included, and at length are found entangled among the stigmatic hairs at the top of the grain; the grain (rarely seen in the chasmogamous spikelets) is larger, and there are slight differences in the lodicules.

**Ancistrachne**\* *S. T. Blake*; genus novum, affine *Panicum* L., sed glumis et lemmate infero pilis uncinulatis praeditis, lemmate supero tenuiter cartilagineo flexili vel vix fragili punctulato marginibus plano anguste hyalino, praecipue differt.

*Spiculae* homomorphae, turgidae, a dorso compressae, muticae, pilis rigidis uncinatis e tuberculis ortis hispidae, pedicellatae, abaxiales in paniculis depauperatis vel in racemis secus axem communem dispositis, tandem a pedicellis omnino disarticulatae. *Anthoecia* duo, inferum neutrum, superum bisexuale. *Glumae* inaequales, dorso rigidae, marginibus hyalinae, nervis robustis percursae; inferior oblato-ovata vel ovata vel ovato-lanceolata, 3-5-nervis, laevis vel parce hispida; superior spiculam subaequans, obtusa vel anguste truncata, coriacea, 9-11-nervis, hispida. *Anthoecium inferum*: lemma glumae superiori simile, spicula aequilongum, obtusum, apice admodum incrassatum, 7-9-nerve, marginibus hyalinis latiusculis; palea circiter  $\frac{1}{3}$  lemmatis adaequans, anguste oblonga admodum elliptica, vel (explanata) ovata, apice leviter emarginata parce ciliata, bicarinata marginibus inflexis sese fere attingentibus, dorso pilis robustis planis appressis sparse pubescens; lodiculae et staminodia nulla. *Anthoecium superum* spiculam subaequans vel brevius, tandem brunneum, papillosum, fere glabrum, elliptico-lanceolatum vel ovato-lanceolatum, obtusiusculum et mucronatum vel acuminatum, dorso compressum, apice incurvum. *Lemma* tenuiter cartilagineum flexile, vel tandem admodum crustaceum, marginibus anguste hyalinum planumque, pilis paucis hyalinis robustis ciliatum ceterum glabrum, apice ipso incrassatum lateraliter compressum incurvum minute asperulum vel laeve, dorso convexo 7-nerve, nervo medio percurrente, nervis lateralibus apice desinentibus vel in medium confluentibus et sub apice nonnullis nervo transverso inter se conjunctis. *Palea* quoad texturam lemmati similis et ab hoc inclusa, bicarinata, dorso leviter convexa. *Lodiculae* oblique cuneatae. *Stamina* 3; antherae lineares. *Styli* terminales, distincti, longi; stigmata dense

\* ἀγκιστρώειν, to furnish with barbs; ἄχνη, husk, glume.

ramosa sed vix plumosa, apice anthoecii exserta. *Caryopsis* subellipsoidea, utrinque compressa; scutellum dimidiam caryopsin subsuperans; hilum basale.—Gramina perennia, suffruticosa vel subscandentia, ramosa; innovationes extravaginales; culmi caespitosi, multinodos nodis incrassatis, glabri, duri, rigidi, graeciles; folia brevina vel breviuscula, plana vel fere plana, haud carinata; ligulae in seriem densam ciliorum brevium dissolutae; laminae herbaceae, lanceolatae vel lineari-lanceolatae, basi subito rotundatae vel subcordatae, apice acutae admodum incrassatae, nervis crebris percursae quorum primariis circiter 5–7 similibus, saepe deflexae, demum a vaginis disarticulatae; inflorescentiae culmos et eorum ramos terminantes, breviter exsertae, haud magnae; rami adscendentes vel tandem subdivaricati, plerumque simplices; pedicelli longiusculi, subaequales, sparsi; spiculae obliquae, purpureae. (Plate II.)

*Species* duae, Australiae boreali-orientalis et insularum Philippinarum incolae. Typus: *A. uncinulata* (R.Br.) S. T. Blake.

## KEY TO THE SPECIES.

Spikelets 4.3–5 mm. long; upper floret distinctly shorter than the spikelet; culms striate, densely papillose; leaf-blades 1–6 cm. long, 1.5–4 mm. wide, the upper surface loosely pilose; collar pubescent . . . . . *A. uncinulata*

Spikelets about 3.75 mm. long; upper floret reaching to about the tip of the spikelet; “culms smooth; leaf-blades 7–13.5 cm. long, 2.5–7 mm. wide, glabrous” . . . *A. ancylotricha*

***Ancistrachne uncinulata*** (R.Br.) S. T. Blake, comb. nov. *Panicum uncinulatum* R.Br. Prodr. 191 (1810); F. Muell. Fragm. viii. 195 (1874), x. 76 (1876), xi. 129 (1881), First Census 130 (1882), Sec. Census 219 (1889); Benth. Fl. Austr. vii. 482 (1878); F. M. Bail. Syn. Queensl. Fl. 624 (1883), Catal. Pl. Queensl. 54 (1890), Queensl. Fl. vi. 1828 (1902), Compreh. Catal. 610 (1913); Moore Handb. Fl. N.S. Wales 472 (1893); J. H. Maid. Man. Grass. N.S. Wales 44 (1898); Domin in Biblioth. Bot. xx. Heft 85, 312 (1915); Maid & Betche Census N.S. Wales Pl. 18 (1916); Hughes in Kew Bull. 327 (1923).

Rather shrubby, erect or slightly spreading, up to 2 metres or so high, with spreading branches. *Culms* and their branches striate, densely papillose, the nodes annular. *Leaf-sheaths* sparingly pilose with tubercular-based hairs; collar densely pubescent; blades soon deflexed, 1–6 cm. long, 1.5–4 mm. wide, glabrous beneath, loosely pilose on the upper surface. *Inflorescence* oblong to triangular in outline, 2–14 cm. long, 1–6 cm. wide; main axis strongly flattened, slightly striate, glabrous and smooth or asperulous; primary branches up to 8 in number, 8–1–spiculate, lowermost up to 3.5 cm. long, simple or sometimes with 1–3 small 2–spiculate branchlets, at first erect, at length spreading, ± triquetrous, slightly scaberulous; pedicels 0.8–2.7 mm. long or the terminal ones much longer, mostly appressed, angular-terete to trigonous, striate, scaberulous, glabrous. *Spikelets* 4.3–5 mm. long, set obliquely on their pedicels. *Lower glume* variable, 1–2.5 mm. long, 3–5-nerved, apex rounded, minutely ciliolate, otherwise glabrous or sparsely hispid. *Upper glume* slightly shorter or about as long as the spikelet, 9–11-nerved with broad hyaline margins. *Lower lemma* as long as the spikelet with broader hyaline margins, 7–9-nerved. *Fertile floret* about four-fifths the spikelet in length when in place, pallid when young, then tawny, finally brown; lemma suborbicular when flattened. *Anthers* about 2.2 mm. long. *Grain* about 2 mm. long.

QUEENSLAND.—Port Curtis District: Marmor, between Rockhampton and Gladstone, in monsoon forest, March 8th, 1937, *Blake* 12767. Leichhardt District: Blackwater, east of Emerald, March, 1920, *Francis*; Lexington, north of Springsure, on rocky slopes of Mt. Little St. Peter, ca. 1200 ft., July 23rd, 1934, *Blake* 6994. Wide Bay District: Dundowran, near Maryborough, in rain-forest on basaltic soil, June 5th, 1932, *Blake & Bromley* 284; Dallarnil, in scrub along gully, Dec. 28th, 1939, *L. S. Smith* 670; Coalstoun Lakes, edge of rain-forest and in rain-forest tracks, at base of Coongana Rock, common, May 16th, 1931, *White* 7710. Burnett District: Gayndah, May 13th, 1917, *White*; Mundubera, March, 1931, Bloxsome 6A; Proston, in dry closed forests, 1200–1600 ft., common, May, 1940, *Blake* 14265; South Durong, Dec., 1932, *Mrs. W. Smith*: Taabinga, June, 1912, *White*. Moreton District: Somerset Dam, in small patch of monsoon forest on rocky hillside, 250 ft., Feb. 22nd, 1939, *Blake* 13956; Sunnybank, *Shirley*; Goodna, March, 1913, *White*; Tarampa Mtn., *Bailey* 3; Mt. Edwards, on cliffs on north side above the gorge, April 1st, 1934, *Everist* 608; Little Mt. Edwards, on the trachyte slopes, March 30th, 1934, *Everist* 550; Wooroolin, April, 1914, *Simmonds*; Main Range, *Hartmann*. Darling Downs District: Chinchilla, Dec., 1930, *Beasley* 4; Palardo, west of Miles, in belah (*Casuarina lepidophloia*) forest, on dark brown clay, 1000 ft., May 9th, 1934, *Blake* 5835; between Inglewood and Milmerran, common only in brigalow scrub, Jan 20th, 1934, *White* 9759; Kindon Station, 54 miles N.N.E. of Goondiwindi, on top of ridge, Dec. 6th, 1938, *L. S. Smith* 569; Goondiwindi, in brigalow-belah scrub, on light grey clay silt, 700 ft., Feb. 25th, 1936, *Blake* 10525. Maranoa District: Wallumbilla, in brigalow scrub, May, 1916, *White*; Roma, common on edge of brigalow scrub, October 25th, 1933, *White* 9572, and on gravelly hilltop in box-wilga-sandalwood (*Eucalyptus-Geijera-Eremophila*) forest, ca. 1000 ft., May 7th, 1934, *Blake* 5820; Coolibah, Mitchell, in 1930, *Haywood*; 20 miles west of Mitchell, in dense *Cadellia-Acacia* forest, on greyish gravelly silt loam, 1600 ft., March 31st, 1936, *Blake* 10950. Warrego District: Chesterton, approx. 25° 20' S., 147° 20' E., in brigalow scrub on yellowish grey fine sand, ca. 1800 ft., April 9th, 1936, *Blake* 11171; Morven, on stony hilltop with *Eremophila Mitchellii*, ca. 1400 ft., May 1st, 1934, *Blake* 5639.

NEW SOUTH WALES.—North-West Slopes—Western Plains: Pilliga Scrub, Nov., 1918, *Cleland*.

This grass is widely distributed in, and is a characteristic feature of the drier closed forest communities, including those popularly known as “dry scrubs,” and brigalow and belah “scrubs.” In spite of its wiry nature (even woody near the base) it is freely eaten by stock, and is considered quite a useful fodder. Mr. C. E. Hubbard has compared my specimens with those collected by Brown, which I have not seen.

***Ancistrachne ancylotricha* (Quis. & Merr.) S. T. Blake, comb. nov.**  
*Panicum ancylotrichum* Quis. & Merr. in Philip. Journ. Sci. xxxvii. 135, t. 2, (1928).

“*Culms* subscaudent, slender, wire-like, at least 1 m. high, 2.5 to 3 mm. in diameter below, few-branched, glabrous, smooth, the nodes glabrous; sheaths glabrous . . . ; leaf-blades . . . 7–13.5 cm. long, 2.5–7 mm. wide, glabrous. Panicles narrow, 7.5–17.5 cm. long, the branches few, ascending, glabrous, remote, slender, the lower ones up to 4 cm. long; pedicels up to 4 mm. long” (ex Quisumbing



& Merrill, l.c.). *Spikelets* "sessile and pedicelled," 3.75 mm. long. *Lower glume* about  $\frac{1}{2}$ – $\frac{2}{3}$  as long as the spikelet, ovate-lanceolate, subacute and narrowly rounded at apex, thinly coriaceous, 3-nerved, ciliolate upwards, the nerves with a few uncinuate hairs. *Upper glume* about as long as the spikelet, 9-nerved with broad hyaline margins. *Lower lemma* as long as spikelet, 7-nerved, also with broad hyaline margins. *Fertile floret* as long as spikelet, seen only in the flowering stage.

The existence of a species from the Philippines closely allied to *Panicum uncinulatum* R.Br. was first made known to me by Mr. C. E. Hubbard. Dr. J. V. Santos, at present studying Philippine Island grasses at the University of Michigan, kindly drew my attention to the above species and sent me a photograph and two spikelets from the iso-type. The original description of the spikelet is not quite correct; the upper glume and the lower lemma are said to be 7- and 5-nerved respectively, whereas they are 9-nerved and 7-nerved in the spikelets I saw, as given in the emended description above, and further, these organs are acute only in the unflattened state; when flattened, they are obtuse as in the other species. No mention is made of a palea to the lower floret, but one is present precisely similar to that of *A. uncinulata* and as given in the generic description. The peculiar thickened, laterally compressed, incurved tip of the upper lemma, with the nerves united by a cross-vein just below it, is very similar in the two species.

The plate gives a good idea of the general appearance of the spikelet and of the general nature of its parts, but the venation of the upper glume and the lower lemma is not accurately shown, and the fertile floret is unfortunately shown in back view only, so that most of its peculiar features cannot be seen.

As a genus *Ancistrachne* is distinguished from *Panicum* and its immediate allies chiefly by the flat hyaline margins of the more or less distinctly flexible fertile lemma which is punctulate and dark coloured at maturity. The thickened laterally compressed tip and the cross-vein (the latter, however, never very distinct) are additional characters, but may not be exclusive. From *Digitaria* and other allied genera with flat hyaline margins to the fertile lemma, it differs in the tip of the latter and extremely so in habit and inflorescence. From all genera of the tribe (except *Pseudechinolaena*, which differs in many other respects) it differs in the peculiar rigid, hyaline, hooked tubercle-based hairs on the upper glume and lower lemma. The latter organs are also rather tougher than usual. The inflorescence is rather difficult to describe. In its usual development, with very few spikelets, the spikelets appear to be arranged in scanty loose racemes; in the less usual larger inflorescences, with the lower branches weakly divided, the spikelets might be said to be truly paniculate, although if the pedicels were a little shorter, the inflorescence would be comparable with that of *Brachiaria reptans* (L.) Gardner & Hubbard, except for the abaxial arrangement of the spikelets.

**Zygochloa**\* *S. T. Blake*; genus novum, affine *Spinifici* L., a quo differt: capitulis haud spiniferis, spiculis masculis paniculatis nec racemosis, paniculis capitatis fere sessilibus earum rhachi vel ramis haud vel minime producta; spicularum feminearum lemmate superiore crassiore indurato marginibus

\* ζυγόν, yoke, pair; χλόα, grass; from its dioecious character.

crassiusculis plus minusve involutis nec tenuibus planisque, earum pedunculis per appendices magnas membranaceas nervosas quasi tribracteolatis.

*Spiculae* dimorphae, unisexuales, dorso leviter compressae, abaxiales, in inflorescentiis compositis capitatis dioicis ordinatae, masculae a pedicellis femineae cum pedunculo disarticulantes. *Anthoecia* duo. *Spiculae masculae* distincte pedicellatae in paniculis parvis subspiciformibus ordinatae, paniculis subsessilibus in capitulo congestis, basi bracteatis, earum ramis sub spiculis haud vel nonnunquam minime productis. *Glumae* subsimiles, spicula breviores, rigide chartaceae, 5–7–nerves. *Anthoecia* subsimilia; lemmata rigide chartacea marginibus hyalina, 5–nervia; paleae lemmatibus fere aequilongae, rigidae, infera carinis alata. *Lodiculae* fere oblongae vix cuneatae, truncatae. *Stamina* 3; antherae longe lineares loculis apiculatae. *Pistillodium* nullum. *Spiculae femineae* solitariae, specie terminales (vide infra) et cum pedunculo caducae vel tandem ab eo disarticulantes; pedunculi breves, appendicibus tribus membranaceis sub anthesi valde accrescentibus oblique ovatis multinerviis praediti, in capitulis bracteatis aggregati. *Glumae* subaequales, spiculam subadaequantes, rigide chartaceae, 7–9–nerves. *Anthoecium inferum* neutrum; lemma rigidum, admodum induratum, 5–nerve; palea carinis marginata. *Anthoecium superum* specie hermaphroditum, lanceolatum, acutum, nitidum; lemma crustaceum, marginibus firmis involutum, 5–nerve; palea texturae subsimilis, 2–nervis, apice obtecta. *Lodiculae* majusculae, spathulato-obovatae. *Staminodia* evoluta; antherae parvae sine polline. *Styli* longi, tenuissimi, basi connati; stigmata dense plumosa, apice anthoecii exserta, stylis multo longiora. *Caryopsis* non visa.—Gramen fruticosum, intricatum, rigidum, durum, rhizomatotum; culmi dense caespitosi, multinodes, iteratim specie 2–4–chotomi; rami subdivaricati, duri; folia brevina, lanceolata vel lineari-lanceolata, inferiora caduca, sicco involuta; ligulae ad seriem ciliatorum densorum brevium redactae; capitula parva, solitaria vel aggregata, hic inde composita, terminalia, vaginis reductis chartaceis involucreta; spiculae majusculae. (Plate III.)

Species unica, desertorum arenosorum Australiae interioris incola.

***Zygochloa paradoxa*** (R.Br.) S. T. Blake, comb. nov. *Neurachne paradoxa* R.Br. in Sturt, Exped. Centr. Austr. ii. App. 89 (1849). *Panicum pseudo-neurachne* F. Muell. Fragm. viii. 199 (1874). *Spinifex paradoxus* (R.Br.) Benth. in Hook. Ic. Pl. tt. 1243, 1244 (1877) et Fl. Austr. vii. 504 (1878); F. Muell. Sec. Cens. 220 (1889); F. M. Bail. Syn. Queensl. Fl. 631 (1883), Catal. Pl. Queensl. 55 (1890), Queensl. Fl. vi. 1836 (1902), Compreh. Catal. 612 (1913); Tate Handb. Fl. Extratr. S. Austr. 191 (1890); Moore, Handb. Fl. N. S. Wales 475 (1893); J. H. Maid. Man. Grass. N.S. Wales 62 (1898); Ewart & Davies Fl. N. Territ. 40 (1917); J. M. Black Fl. S. Austr. 62 (1922); Ewart Fl. Vict. 134 (1930).

A dense, green, spreadingly branched, bushy, dioecious shrub up to 1.5 metres high and as much in diameter, with stout creeping rhizomes, very coarse roots, and intravaginal innovations. *Culms* up to at least 8 mm. in diameter, with their branches terete or somewhat angled with a shallow channel on the adaxial face, glabrous, striate and somewhat punctulate otherwise smooth. *Leaf-sheaths* shorter to much shorter than the internodes or the lowermost somewhat longer, at first tight but soon becoming loose and more or less spreading, glabrous or pubescent at and above the nodes, margins glabrous or

ciliolate; hairs of ligule up to about 1 mm. long; collar pubescent or puberulous; blades gradually acute, somewhat narrowed and rounded at the base, the lowermost up to about 30 cm. long and almost 1 cm. wide but mostly short to very short, keeled only at the somewhat thickened tip but the midrib slightly prominent throughout on both surfaces, closely nerved, with up to 13 primary nerves on the lower leaves, margins somewhat thickened and slightly scaberulous, pubescent to laxly pilose on the upper surface, glabrous beneath. *Male heads* semi-orbicular to orbicular in outline, 1-2 cm. diam., pallid green to straw-coloured; lowermost bract mostly exceeding the head, usually with a very short lamina rarely green, the other bracts gradually shorter, the upper concealed in the head; spiciform partial panicles few in the head, few- to several-flowered; axis angular, scaberulous on the margins; branches and pedicels short, scaberulous to finely pilose at the angles and the subdiscoid tips, the former sometimes produced as a smooth tooth or point beyond the uppermost pedicel. *Spikelets* about 7-8 mm. long, lanceolate, acute. *Glumes* ovate to elliptic-ovate, acute, glabrous or with a few scattered hairs, the lower about  $\frac{2}{3}$ - $\frac{3}{4}$ , the upper about  $\frac{3}{4}$ - $\frac{4}{5}$  as long as the spikelet. *Lemmas*, when flattened out, elliptic-oblong, obtuse but the upper slightly mucronate, glabrous, the nerves somewhat confluent near the apex. *Paleas* minutely ciliolate at the very obtuse tip, the lower one scaberulous on the keels, both otherwise glabrous and smooth. *Anthers* about 4-4.5 mm. long. *Female heads* hemispherical to globular but more or less flattened in herbarium specimens, 2.5-3.5 mm. diam.,  $\pm$  echinate by reason of the curved points of the bracteoles; bracts shorter than the heads; primary branches within the head very short, shortly and sparsely hairy; peduncles of the partial inflorescences 1-1.5 mm. long; bracteoles  $\pm$  lanceolate in young flower, but soon enlarging and becoming irregularly ovate or even oblate-ovate with  $\pm$  toothed or irregularly lobed and flexuous, scaberulous margins, prominently nerved with the nerves  $\pm$  anastomosing, the lowermost with two keels, united above, the upper two with one keel each, in all the keels green and produced into a rigid, triquetrous, curving point or stout awn, the bases  $\pm$  cordate and decurrent on the peduncle; pedicel minute, apex somewhat ciliate. *Spikelets* ellipsoid or narrowly ovoid, acute and somewhat acuminate, turgid, 6-10 mm. long. *Glumes* ovate with acute to subobtuse triangular tips or the upper somewhat acuminate, prominently nerved, margins hyaline, glabrous and smooth. *Lower floret*: lemma ovate-acute (when flattened), glabrous, prominently nerved, about as long as the spikelet, somewhat similar to the upper glume but distinctly hardened; palea with very broad overlapping flaps, scaberulous on the keels otherwise glabrous and smooth, narrowly oblong and rather acute, but when flattened out oblong, obtuse. *Upper (fertile) floret* reaching to the top of the spikelet, yellowish, finally brown; lemma (when flattened) broadly ovate, abruptly acuminate, margins hyaline and flat in the upper part, thicker, firm, and  $\pm$  inrolled below; palea included, broadly ovate and abruptly acuminate when flattened, margins hyaline.

QUEENSLAND.—Gregory North District: 30 miles south of Bedourie, on sandhills, July 21st, 1936, *Blake* 12281. Gregory South District: Birdsville, on the sides of desert sand-dunes, July 19th, 1936, *Blake* 12240; about 30 miles south-east of Betoota, on a sand-hill, July 16th, 1936, *Blake* 12161; "between Stokes Range and Cooper's Creek, *Howitt*" (ex Benth.).

And in Western N.S. Wales, North-west Victoria, South Australia, Central Australia.

*Zygochloa paradoxa* is a characteristic member of the flora of the sand hills of the Arunta (Simpson) Desert, and is commonly known as "sand-hill canegrass." Its rhizomes, dense bushy habit, and extreme resistance to dry conditions make it an excellent sandbinder, while it is also said to be eaten by cattle.

The inflorescence of this grass is peculiarly complicated in structure. It is, in effect, a condensed leafy panicle in which all the internodes are much shortened, some to a minimum. In the male inflorescence, the head consists of a few primary branches, shortened almost to the point of fusion; at each node there is a leaf usually reduced to a short sheath, though a much-abbreviated blade may be developed on the lower or lowermost. In the axil of each sheath arises a short branch with a dorsal 2-keeled prophyll. Such a branch may almost immediately branch again on its adaxial side, the branchlet also bearing a prophyll. The branch and its branchlets bear near the upper extremity a much-reduced leaf-sheath, apparently homologous with the spathe or spatheole of such genera of the *Andropogoneae* as *Cymbopogon*, *Hyparrhenia*, *Themeda*, and *Iseilema*. Beyond this is the ultimate partial unit of the inflorescence, which is a short few- to several-flowered spiciform panicle. The branches and further divisions of this are short but quite distinct, the ultimate ones sometimes bearing a short point of varying length, but always very much shorter than the spikelet. This seems to represent a tendency towards the production of a prolongation of the floral axis seen in *Pseudoraphis*, *Paspalidium*, etc., and its relationship to the spine of *Spinifex* is discussed below.

The female inflorescence at first sight differs very considerably from the male, due largely to the prominent "bracteoles." The primary divisions in the head are similar to those of the male head, but the ultimate partial unit is a solitary spikelet, not a panicle. But important modifications occur resulting in the curious "bracteoles." It would seem that these are of quite diverse homologies. The lowermost appears to represent the prophyll of the final branch and has become fused with it. Its position at the base of the "peduncle," its relation to the other parts of the inflorescence, and its 2-keeled nature, all seem to support this view. The upper two are inserted just below the spikelet at approximately the same level; an internode may be present, but its presence cannot be ascertained without a study of serial sections. It would seem, however, that one of these represents a "spathe" as in the male inflorescence, while the third is the dilated prolongation of the "peduncle." This prolongation is coplanar with the spikelet which is abaxial to it, and seems to be homologous with the spine behind the female spikelets of *Spinifex*. In young inflorescences, these "bracteoles" are small, and the rigid tip of the upper is then much more prominent than in the lower.

In the genus *Spinifex*, the inflorescences are less densely capitate, and considerably larger. The ultimate partial inflorescence of the male is a spike, the axis of which is produced into a prominent spine. Otherwise, except for the looseness of the heads due to the longer internodes, the general structure is as described above for *Zygochloa*. In its broad features the structure of the female inflorescences of the two genera is also comparable. The differences are firstly, the loosening of the entire inflorescence in *Spinifex*; secondly, the prolongation of the "peduncle" in this genus into a very long, rigid, scarcely compressed, tapering spine; thirdly, the "bracteoles" in this genus being two only, and remaining little modified, the lower little different from ordinary

prophylls, and the upper like a reduced sheath; and fourthly, in *Spinifex* the mature inflorescences disarticulate in their entirety from the rest of the plant, whereas in *Zygochloa* the heads appear to break up, the spikelets falling separately with their peduncles and bracteoles, the latter acting as "sails" for wind distribution, and probably also assisting in seed-burial.

In the structure of its fertile floret, *Zygochloa* resembles *Spinifex* in most features, but the lemma is thicker, more indurated, with the margins thicker and more or less prominently inrolled, at least in the lower part, not flat and hyaline throughout.

Brown described the species as *Neurachne paradoxa* from a fragment of a female plant collected by Charles Sturt, probably near the junction of the borders of South Australia, New South Wales, and Queensland. He remarks, however, that it "differs materially in habit from the original species, *N. alopecuroides*, as well as from *N. Mitchelliana* of Nees, while these two species differ widely from each other in several important points of structure." Although the type has not been seen, there seems no reason to doubt Bentham's identification of this remarkable plant.

It may be remarked that some of the species at present included in *Neurachne* rather closely resemble *Zygochloa* and *Spinifex* in many points of spikelet structure, particularly as to the fertile floret. About five or six species are at present referred to *Neurachne*, but most of them differ widely from one another in spikelet characters. The genus has usually been placed in the tribe *Zoisceae*, but the two-flowered spikelet with lower floret male or neuter and the structure of the upper floret are essentially those of the *Panicaceae*.

Among the tribe *Panicaceae*, the only other genus with an inflorescence at all comparable with *Zygochloa* and *Spinifex* is *Xerochloa* R.Br., from the extreme north of Australia. Superficially, the inflorescence of this genus appears to be spike-like, with a group of spikelets in the axils of distant, short, somewhat hardened, nearly bladeless, leaf-sheaths. Careful dissection of a number of these spikelet-clusters, however, has shown that they are in reality reduced leafy panicles, very similar to those of the female inflorescences of *Spinifex* and *Zygochloa*, except that whereas in these genera the primary internodes are much abbreviated except in those specimens of *Spinifex* with a second or third fascicle below the terminal head, in *Xerochloa* they are always elongated. The clusters result from a repeatedly branched short branch arising in the axil of the sheath, it and the succeeding branchlets with a dorsal prophyll, all divisions very short, the ultimate branchlet or peduncle with reduced prophyll and "spathe" and produced behind the solitary spikelet as a flattened appendage, which may be considered a stage between the spine of *Spinifex* and the winged appendage of *Zygochloa*, but it is very much smaller than in either of these genera, and seems to have no particular importance in seed-dispersal.

#### EXPLANATION OF PLATES.

PLATE I.—*Dimorphochloa rigida* S. T. Blake (from Blake 7711).

FIG. 1, part of plant showing the two kinds of culms, and lateral inflorescences at A<sub>1</sub>, A<sub>2</sub>, A<sub>3</sub>, natural size; 2, part of terminal inflorescence, × 3; 3, entire lateral branchlet with cleistogamous spikelet, × 3; 4-12, details of terminal inflorescence:—4, 5, spikelet, as seen from front and back respectively; 6, lower glume, flattened; 7, upper glume, flattened;

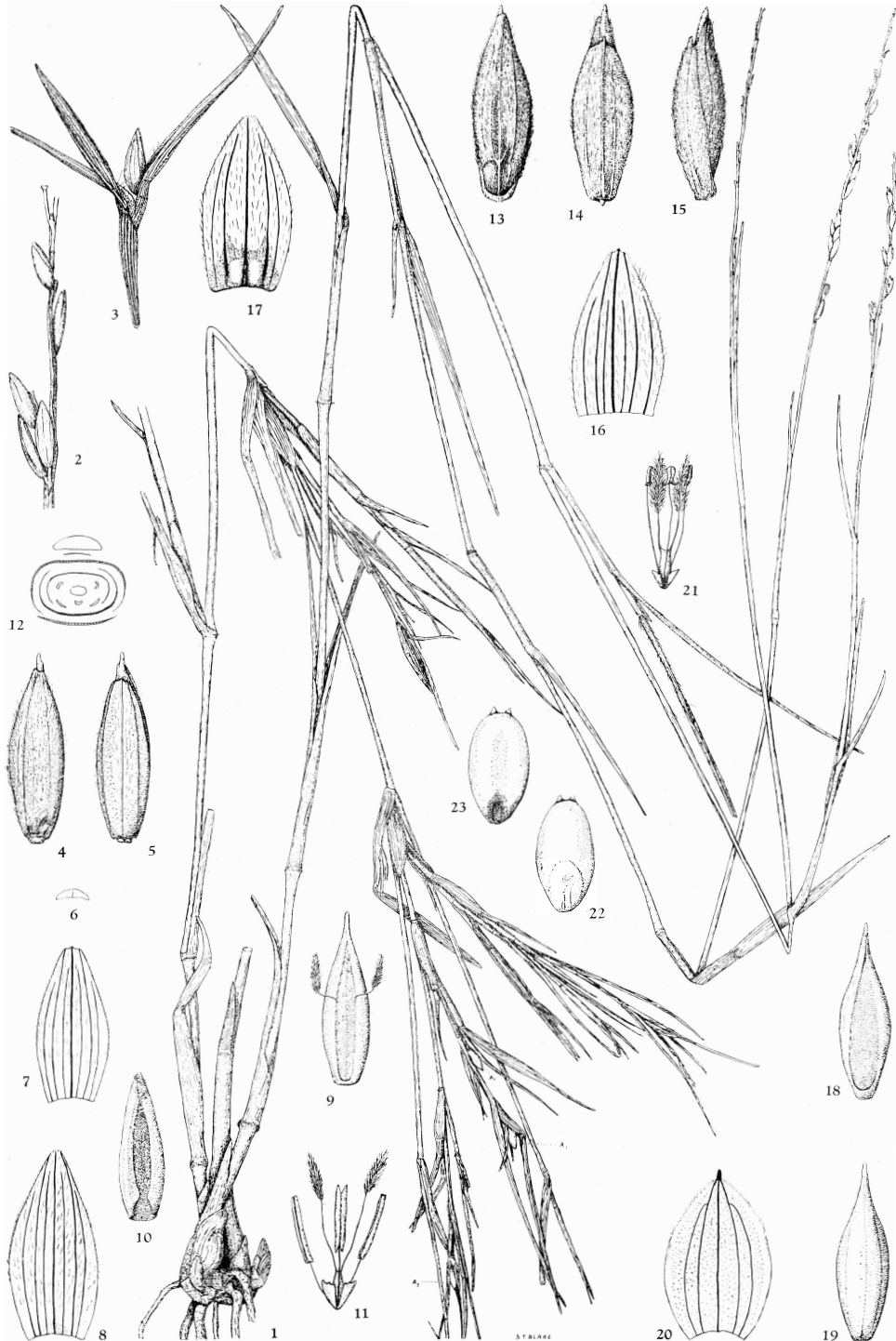
8, lower lemma, flattened; 9, upper floret, from in front; 10, palea of upper floret, in its natural state; 11, flower; 12, diagram of spikelet; 13-23, details of lateral inflorescence:—13, 14, 15, spikelet, as seen from the front, back, and side, respectively; 16, upper glume, flattened; 17, lower lemma, flattened; 18, 19, upper floret, as seen from front and back respectively; 20, lemma, flattened; 21, flower; 22, 23, caryopsis.—Figs. 4-11 and 13-23  $\times$  8.

PLATE II.—*Ancistrachne uncinata* (R.Br.) S. T. Blake (from *Blake* 10950).

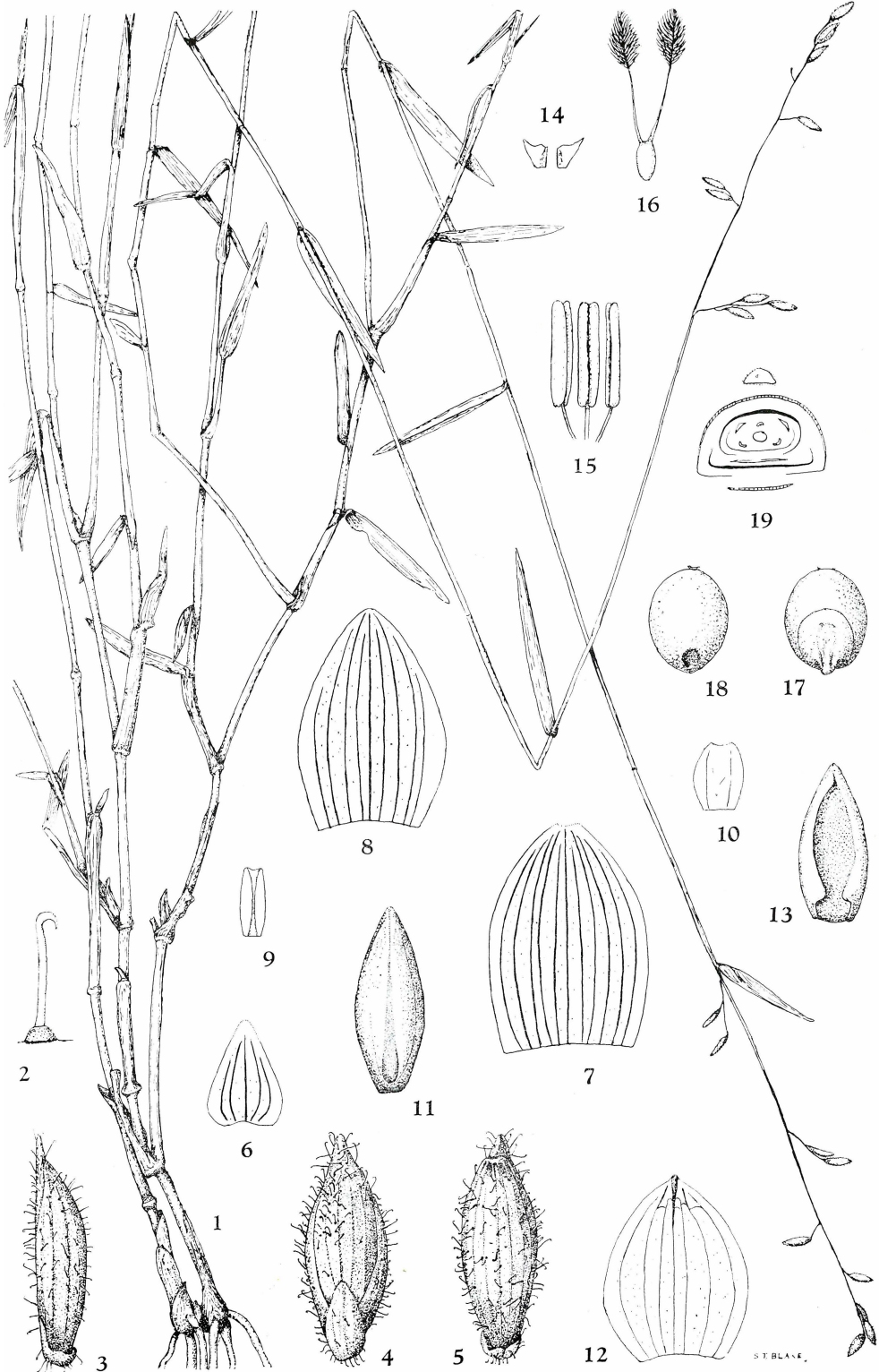
FIG. 1, part of a rather small plant, *natural size*; 2, hair from spikelet,  $\times$  50; 3, 4, 5, spikelet, as seen from the side, front, and back, respectively; 6, lower glume, flattened, inside view; 7, upper glume, flattened, inside view; 8, lower lemma, flattened, inside view; 9, palea of lower floret; 10, the same, opened out and flattened; 11, upper floret, as seen from in front; 12, lemma, flattened; 13, palea; 14, lodicules; 15, stamens; 16, pistil; 17, 18, caryopsis; 19, diagram of spikelet.—Figs. 3-18  $\times$  8.

PLATE III.—*Zygochloa paradoxa* (R.Br.) S. T. Blake (chiefly from *Blake* 12240).

FIG. 1, plant, showing habit,  $\times$  1/20 (from photograph of plants from which the specimens comprising *Blake* 12161 were taken); 2, piece of male plant, *natural size*; 3, piece of female plant, *natural size*; 4-14, details of male plant:—4, portion of a capitulum, with bracts, bracteoles, and all but one of the spikelets removed, to show the paniculate structure,  $\times$  4; 5, lower glume, flattened; 6, upper glume, flattened; 7, lemma of lower floret, flattened; 8, palea of lower floret containing a  $\sigma$  flower, side view; 9, upper floret, from in front; 10, its lemma, flattened; 11, its palea, from in front; 12, the same, opened out and flattened; 13, flower; 14, diagram of spikelet; 15-27, details of female plant:—15, partial inflorescence, showing the solitary spikelet with its three bracteoles (from *Blake* 12161)  $\times$  4; 16, 17, 18, spikelet, with styles removed, as seen from side, front, and back, respectively; 19, lower glume, flattened; 20, upper glume, flattened; 21, lower lemma, flattened; 22, palea from lower floret, from in front; 23, 24, upper floret as seen from front and back respectively; 25, upper lemma, flattened; 26, flower, with lodicules separated; 27, diagram of spikelet.—Figs. 4-13 and 16-26  $\times$  6.

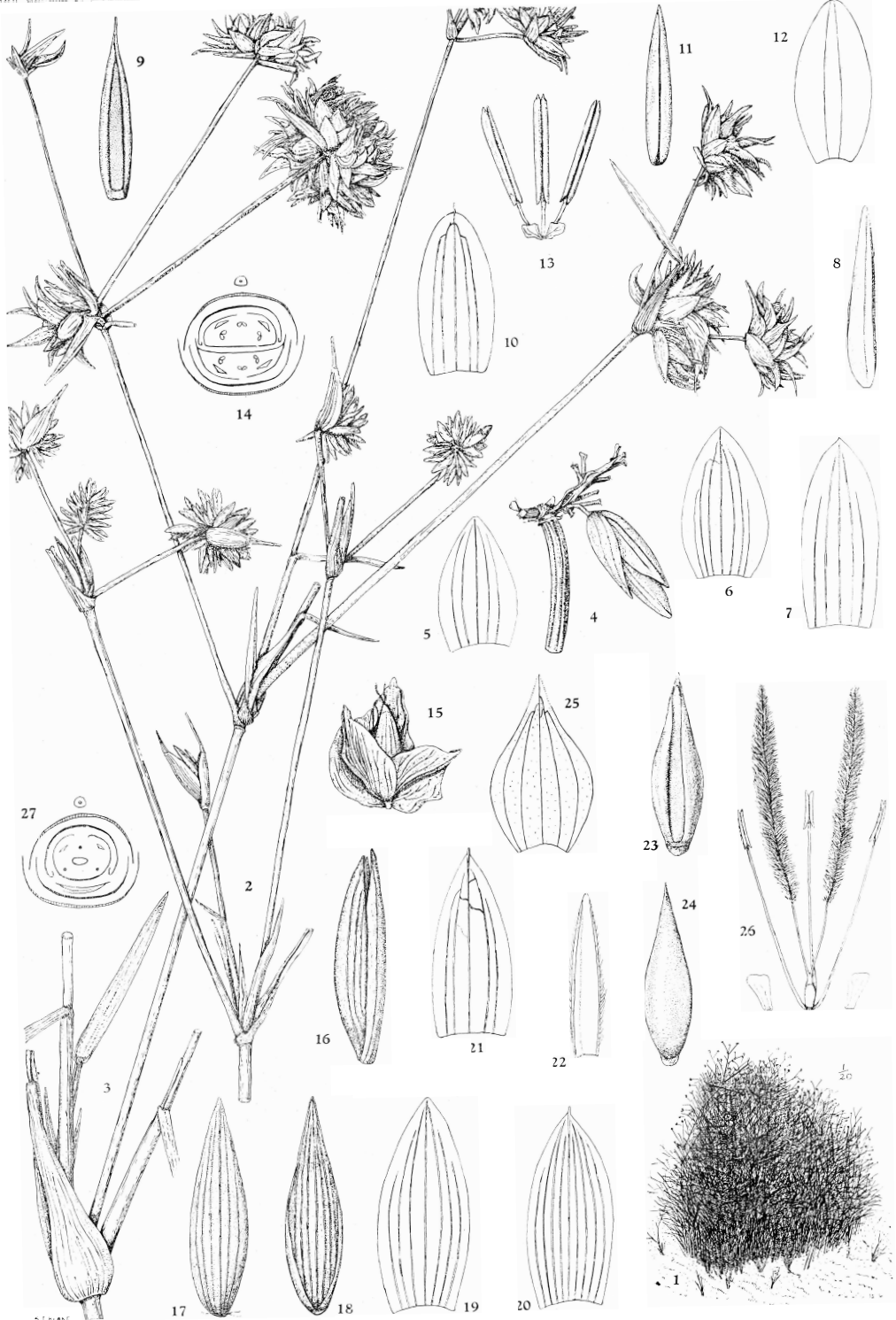


*Dimorphochloa rigida* S. T. Blake (from Blake 7711).



*Ancistrachne uncinulata* (R.Br.) S. T. Blake (from Blake 10950).





*Zygocloa paradoxa* (R.Br.) S. T. Blake (chiefly from Blake 12240).