

New taxa of tropical Australian grasses (Poaceae)

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Abstract

Lazarides, M. New taxa of tropical Australian grasses (Poaceae). Nuytsia 5(2): 273-303(1984). The morphology of 15 new taxa of grasses, chiefly from wet tropical parts of Western Australia and the Northern Territory, is described and illustrated. They include *Symplectrodia*, a genus of 2 species, allied to *Plectrachne* Henr. and *Triodia* R. Br., 5 species in *Micraira* F. Muell. and 4 in *Plectrachne* Henr. *Chloris scariosa* F. Muell. and *Panicum deschampsii* Domin are segregated as new genera, viz. *Oxychloris* and *Arthragrostis* respectively. *Heteropholis* C. E. Hubb., represented by an endemic species, is recorded for Australia for the first time. The circumscriptions of *Plectrachne* Henr. and of *P. hynoei* C. E. Hubb., which is based on a relatively uncommon, ecotypic variant, are emended to include significant new morphological data.

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Introduction

The object of this paper is to validate the names of new taxa required chiefly for 3 projects, viz. an intensive survey of the world's grass genera being undertaken in Kew, the Flora of Australia project, and for regional treatments of the flora of the Kimberleys of Western Australia and other regions.

Symplectrodia (Eragrostideae) Lazarides, gen. nov.

Gramina perennia; culmi nodis 3-4 pilosis; laminae arcte conduplicatae incrassatae teretes pungentes; ligula ciliata. Panícula racemosa laxa. Spicula flosculis 3-6; flosculus basalis hermaphroditus; ceteri neutri, sine paleis, saepe reducti. Glumae subaequales cartilagineae obscure paucinervatae, dorsaliter rotundatae vel complanatae. Lemma basale cartilagineum integrum aristulatum obscure paucinervatum, nervis lateralibus submarginalibus. Callus curvatus vel obliquus, pungens, barbatus autem glaber prope apicem. Palea adnata rhachillae, cartilaginea binervata in parte infera, libera membranacea bicarinata in parte supera. Caryopsis vix compressa, rostrata, ad basim acuminata, in superficie hili sulcata. Rhachilla articulata, internodium basale adnatum dorso paleae flosculi fertilis; internodia supera ad basim juncta et partim inclusa lemmatibus cassis, maturitate elongata. Lemmata cassa cartilaginea trilobata inaequaliter triaristata (laterales media breviores), sursum aristis redacta. Aristae complanatae, scaberulae.

Typus: S. lanosa Lazarides

Non-resinous *perennials*; culms erect, terete, with 3-4 hairy nodes; leaf sheaths shorter than culm internodes; blades thickened, tightly conduplicate, terete, pungent; ligule ciliate. *Inflorescence* a loose racemose *panicle* of solitary spikelets pedicelled and approximate to distant on simple (rarely divided), 1-nate branches; divisions pubescent-scabrous; axis ribbed or striate; branches and pedicels triquetrous or compressed, the latter thickened below spikelet. *Spikelet* 3-6-flowered; the basal floret hermaphrodite; the remainder neuter, without paleas, often reduced. *Glumes* persistent, subequal, cartilaginous, lanceolate-elliptic, acuminate, entire, muticous or aristulate, usually glabrous, rounded or flattened on the back, weakly few-nerved. *Basal lemma* cartilaginous, lanceolate, acuminate, entire, aristulate, weakly 3-nerved (laterals close to margins). *Callus* curved or oblique, pungent, glabrous near tip otherwise densely bearded, with a linear-elliptic scar. *Palea* adnate to rhachilla and cartilaginous in the lower part, free and membranous above, acute, entire, muticous; keels prominent in upper free part, scaberulous, represented in the lower hardened part by 2 nerves; flaps prominent, membranous with hyaline margins, incurved. *Lodicules* at first thickened, becoming hyaline or membranous, often firm near base and hyaline above, many-nerved, oblong or cuneate, truncate, glabrous, irregular or entire on the apical margin. *Anthers* laterally exerted near apex of floret, reddish, large. *Styles* free. *Caryopsis* slightly compressed dorsally, oblong to oblanceolate, abruptly narrowed into a truncate apical beak, acuminate at base, with a longitudinal depression on the hilar face; embryo c. 1/3 as long as the grain itself; hilum sub-basal, linear to narrowly oblong; pericarp tardily free. *Rhachilla* stout, compressed, glabrous, jointed with horizontal circular articulations; basal internode adnate to back of palea of the fertile floret for most of its length; the upper internodes joined at base to, and partly enclosed within, the empty lemmas, elongating with maturity. Empty lemmas cartilaginous, glabrous or almost so, scaberulous, 3-lobed, 3-nerved, unequally 3-awned (median longer than laterals), reduced upwards to the awns, at first clustered close above the fertile floret and mostly enveloped by the glumes, becoming distant and prominently exerted with the elongation of the rhachilla. *Awns* flattened, scaberulous, becoming longer upwards.

Species 2, in the Northern Territory of Australia

Key to *Symplectrodia* and allied genera

1. Lemmas minutely 3-toothed or 3-lobed (rarely entire), the lobes small or sometimes half as long as the lemma itself, awnless or rarely 1-aristulate; glumes usually much shorter than spikelet, awnless or rarely aristulate; callus absent or minute and obtuse *Triodia*
1. Lemmas deeply 3-lobed or sometimes entire, 1-3 awned; glumes often as long as the spikelet or longer, awnless or awned; callus minute to small, acute.
 2. Rhachilla elongating with maturity, the basal internode adnate to palea of the fertile floret; hermaphrodite florets one; glumes awnless or aristulate; basal lemma entire *Symplectrodia*
 2. Rhachilla not changing with maturity, free; hermaphrodite florets usually at least 2; glumes awned or awnless; basal lemma 2-3 lobed *Plectrachne*

On morphological features, the relationships of *Symplectrodia* are clearly with *Plectrachne* Henr. and *Triodia* R. Br., the complexity of its spikelet structure possibly indicating it to be a specialized derivative of *Plectrachne*. During development, the spikelet undergoes major changes, which dramatically alter its appearance. In the immature state, all the florets are condensed almost wholly within the glumes. With maturity the spikelet, or more specifically the rhachilla, elongates to at least 3 times its length. Consequently, the infertile florets become widely separated from each other and from the hermaphrodite floret and glumes. Ultimately, the infertile florets disarticulate individually and the fertile floret falls with its callus, while the glumes remain attached to the pedicel. The complexity in structure seems difficult to justify in terms of seed dispersal or any other function, considering that all the florets affected

by these changes are sterile, and better dispersal might be achieved by the aristulate fertile floret remaining attached to the cluster of 3-awned sterile florets.

The two species in the genus are extremely homogenous in morphology, the only variable feature being density of indumentum on the foliage. However, plants of the species differ outstandingly in habit and dimensions.

Key to the species of *Symplectrodia*

1. Plants robust, rhizomatous, 1.8-3 m high; basal sheaths reddish-brown, often covered in woolly hairs; blades 60-90 cm long; panicles 44-54 cm long; basal lemma mostly hairy, with an awn <3 mm long *S. lanosa*
1. Plants slender, not rhizomatous, 0.75-1.05 m high; basal sheaths not coloured, if hairy then not woolly; blades 7-15 cm long; panicles 7-17 cm long; basal lemma mostly glabrous, with an awn 5-8 mm long *S. gracilis*

Symplectrodia lanosa Lazarides, sp. nov. (Figure 7)

Gramen perenne rhizomatosum robustissimum <3 m altum; vaginae foliorum basalium maxime coloratae rubiginosae, saepe pilis densis lanatis omnino vestitae; laminae 60-90 cm longae; panicula 44-54 cm longa; lemma basale pilis densis pro parte maxima vestitum.

Typus: Northern Territory: Darwin & Gulf District: *Dunlop* 4874, 2.vi.78, Mt Gilruth area, 12° 58'S, 133° 10'E (holo: NT; iso: BRI, CANB, DNA, K, NSW).

Robust tussocky rhizomatous *perennial* forming extensive clumps; tussocks 61-135 cm high; flowering culms 1.8-3 m high. *Culms* branched near base or simple; nodes pubescent or bearded, the hairs extending to the sheaths. *Leaf sheaths* highly coloured reddish-brown in the lower part, sometimes entirely covered in dense woolly hairs which extend along the blades, often ciliate on margins, often 1.5-2 cm wide, much wider than blade at their junction. *Blades* 60-90 cm long, usually glabrous, scabrous on upper surface, smooth on the lower one, often glaucous. *Ligule* 0.8-1 mm long. *Panicle* 44-54 x 5 cm, sometimes rather dense; primary branches <15 cm long, spikelet-bearing to base, rarely the lower ones sparsely divided; pedicels <1 cm long. *Glumes* 10-13 mm long, often aristulate, smooth in the lower part or scaberulous, faintly 3-5-nerved (laterals often close together), the lower usually 1-2 mm shorter than upper. *Basal lemma* 12-13 mm long (including callus and awn), ciliate on margins and hirsute about the midnerve in the lower 1/2-2/3, glabrous and scaberulous above and along the lateral nerves; callus c. 2 mm long; awn <3 mm long. *Palea* c. 9.5 mm long, glabrous, smooth. *Lodicules* 1.2-1.5 mm long. *Anthers* c. 4.8 mm long, reddish. *Caryopsis* c. 4 x 0.8 mm, embryo c. 1 mm and hilum c. 0.5 mm long. *Rhachilla*: basal internode c. 5 mm long, adnate to palea for c. 4 mm. *First empty lemma* 5-6 mm long (excluding lobes); lobes narrowly acuminate, sometimes sparsely ciliate on the margins, mid-lobe awn-like; awns 6-7 mm (median) and 3-4 mm (laterals) long. *Upper empty lemmas* similar to first or reduced to the awns.

Surprisingly, the extremely dense cover of woolly hairs on the basal foliage, which is a striking feature of some plants, is completely absent in others of the species. However, the unusually robust, rhizomatous, clump-forming habit, high colouring, great dimensions of leaves and panicles, and hirsute lemma of the fertile florets are consistent distinguishing characters.

The species occurs on the western margins of the Arnhem Land Plateau in rugged, sandstone habitats such as steep rocky slopes and massive outcrops.

Paratypes

Northern Territory: Darwin & Gulf District: *Dunlop* 5478, 23.iv.80, Mt. Brockman, 12°48'S, 132°55'E (BRI, CANB, DNA, NSW). *Dunlop* 6597, 23.ii.84, 12°55'S, 133°02'E (BRI, CANB, DNA, MEL, NSW). *Lazarides* 7757, 17.ii.73, c. 26 miles E of Oenpelli Mission, 133°26'E, 12°20'S (CANB, DNA, K). *Telford* 8029, 23.iv.80, 6.5 km SSW of Mt Brockman, 12°48'S, 132°56'E (CANB, CBG). *Lazarides* 7655, 18.vii.72, East Alligator River, 12°47'S, 133°21'E (BRI, DNA, K, L, NSW, US). *Lazarides* 9134, 2.vi.80, 19.5 km SE of Jabiru East, 12°49'S, 132°59'E (CANB). *Craven* 6614 & *Craven* 6616, 30.iii.81, c. 25 km NE of Jabiru, 12°29'S, 132°57'E (CANB). *Latz* 7677, 10.vi.78, Radon Creek, Brockman Range, 12 km S of Jabiru (BRI, CANB, DNA, K, NSW, NT, PERTH).

***Symplectrodia gracilis* Lazarides, sp. nov.**

Symplectrodiae lanosae affinis, sed habitu gracili non-rhizomatoso, panicula et laminis multo brevioribus, lemmate flosculi fertilis pro parte maxima glabro longius aristato, lodiculis et antheris parvioribus differt.

Typus : Northern Territory: Darwin & Gulf District: *Lazarides* 7919, 28.ii.73, c. 7.5 miles SE of Mt Gilruth, 133°09'E, 13°07'S (holo: CANB; iso: BRI, DNA, K, L, US).

Slender tussock-forming *perennial*; tussocks c. 30 cm high, neatly compact; flowering culms 0.75-1.05 m high. *Culms* branched near base, with c. 3 pubescent nodes. *Leaves* varying from hirsute to almost glabrous. *Leaf sheaths* ciliate on at least the outer margin. *Blades* 7-15 cm long, often ciliate on margins upwards from the ligule, scabrous on the upper surface; ligule 0.5-1 mm long. *Panicle* 7-17 x 1-3 cm (excluding awns); branches <3.5 cm long; pedicels <1.2 cm long. *Glumes* scaberulous or partly smooth; lower 10-12 mm long (including awn of c. 2 mm), faintly 1-3-nerved; upper 12.5-15 mm long (including awn of 1-3 mm), faintly 3-5-nerved, rarely with a few scattered hairs. *Basal lemma* 10-12 mm long (including callus), ciliate to almost glabrous on margins, glabrous on surface or sometimes sparsely hairy along midnerve near the base, awned; awn 5-8 mm long, scaberulous; callus 1.8-2.5 mm long. *Palea* c. 8 mm long, narrowly lanceolate-oblong, ciliolate or scaberulous at apex. *Lodicules* 0.8-1 mm long. *Anthers* c. 3.5 mm long. *Caryopsis* 4-4.5 x 1 mm, pallid; embryo 1.3-1.5 mm long. *Rhachilla*: basal internode 5-5.5 mm long, free in the upper 1 mm; second internode c. 0.5 mm long (in immature spikelets), elongating to c. 15 mm with maturity; third internode c. 17 mm long at maturity. *Empty lemmas* usually 4-5, the first 4-6 mm long (body), sparsely ciliate on margins of lobes near sinus, median awn 8-9 mm long, laterals 5-6 mm long; the second lemma 3-5 mm long, sparsely ciliate on margins, median awn 12-13 mm long, laterals 9-10 mm long; third lemma similar to second but smaller, the remainder reduced to awns.

Plants of the species can be greyish from a dense cover of hairs on leaves, (cf. *Lazarides* 7943), or vary from sparsely hairy to glabrous, as in the other specimens cited. The species is distinguished from *Symplectrodia lanosa* by its slender habit, smaller dimensions, and mostly glabrous longer awned lemma of the fertile floret.

The species is known only from a small area on the sandstone plateau of Arnhem Land.

Paratypes

Northern Territory: Darwin & Gulf District: *Lazarides* 7943, 28.ii.73, c. 2.5 miles SW of Mt Gilruth, 133°02'E, 13°03'S (CANB, DNA, K, US). *Dunlop* 4410, 22.ii.77, Mt Gilruth, Deaf Adder Gorge, 13°04'S, 133°05'E (CANB, DNA, NT). *Lazarides* 8003, 4.iii.73, c. 11 miles SW of Mt Gilruth, 132°56'E, 13°04'S (BRI, CANB, DNA, NSW, PERTH).

Plectrachne Henr. (Eragrostideae)

Originally monotypic, *Plectrachne* was enlarged considerably by Hubbard (1939, 1941) and with the present additions, the genus comprises 16 Australian endemic taxa. As might be expected, variations in morphology have become evident with the increased content. In particular, the new species in this paper differ in the structure of lobes and awns on glumes and lemmas, from all other species in the genus except *P. bynoei* C. E. Hubb. New features of generic significance are incorporated in the following summary of diagnostic characters of the genus.

Plectrachne Henr., Viertelj. Naturf. Gesell. Zurich. 74: 132 (1929). *Type species*: *P. schinzii* Henr.

Tussock-forming, resinous or non-resinous *perennials*; culms few-noded, usually glabrous, branched from the lower nodes or simple; leaf sheaths shorter than culm internodes, abruptly narrowed at junction with blade; blades soon tightly conduplicate, terete, thickened, pungent; ligule ciliate. *Panicle* racemose and usually elongated or contracted. *Spikelets* few-flowered, lower 1-4 florets hermaphrodite, the remainder neuter and usually reduced to awns. *Glumes* persistent, equal to somewhat unequal, lanceolate, entire or emarginate, awnless or 1-3-awned, usually glabrous, subequal or longer (rarely much shorter) than spikelet (excluding awns). *Lemmas* 2-3-lobed, 1-3-awned, variously hairy; awns (when 3) subequal or laterals shorter than median; callus small, bearded or with glabrous tip. *Paleas* 2-keeled, truncate or obtuse, entire or notched, muticous, glabrous or hairy between keels. *Ovary* glabrous; stigmas plumose. *Lodicules* cuneate, truncate, glabrous. *Rhachilla* glabrous, disarticulating between the fertile florets and above glumes, continuous between the sterile florets. *Caryopsis* scarcely compressed, broader upwards, obtuse; embryo prominent.

Key to new and allied species in *Plectrachne*

1. Glumes 3-awned, pilose *P. aristiglumis*
1. Glumes awnless or sometimes 1-awned, usually glabrous.
 2. Lemmas 1-awned.
 3. Spikelet c. 8 mm long (excluding awns), with 6-7 florets exerted above glumes; palea hairy between keels in lower 1/3-1/2 *P. contorta*
 3. Spikelet c. 5 mm long (excluding awns), with usually 4 florets enclosed within glumes; palea glabrous between keels *P. uniaristata*
 2. Lemmas 3-awned or rarely (in *P. bynoei*) the lowest one 1-awned and the remainder 3-awned.
 4. Palea coriaceous in lower 1/2-4/5, hyaline above.
 5. Glumes 6-6.5 mm long; lemmas not demarcated between lobes and body; spikelet with one hermaphrodite floret *P. mollis*
 5. Glumes 8-20 mm long; lemma with a transverse joint at base of lobes, which finally disarticulate from the body; spikelet with 2-4 hermaphrodite florets *P. pungens*, *P. schinzii*
 4. Palea entirely coriaceous or membranous.
 6. Spikelet 4-8.5 mm long (excluding awns); lemmas membranous; lateral awns on lemma of basal floret absent or distinctly shorter than the median; spikelets approximate on numerous racemose branches *P. bynoei*
 6. Spikelet usually 10-25 mm long (excluding awns); lemmas coriaceous or firmly membranous; lateral awns subequal to median; spikelets irregularly arranged in contracted panicles *Remaining species*

Plectrachne aristiglumis Lazarides, sp. nov. (Figures 3a, b, 4a)

Gramen perenne non-resinaceum; culmi sparsim pilosi vel glabri; vaginae foliorum hirsutae vel in parte infera pilosae; laminae prope ligulam pilosae; spicula flosculis 7-8; flosculi arcte imbricati, supra corpus glumarum exserti, sursum aristis reducti, glumae bilobatae, lobis et sinu inaequaliter triaristatae, pilosae vel glabrae; lemmata bilobata, lobis et sinu inaequaliter triaristata, in parte $1/3$ infera pilis argenteis in seriebus longitudinalibus barbata, pilosa vel secus margines superos ciliata; palea corpore lemmatis leviter longior, ad basim barbata.

Typus: Northern Territory: Darwin & Gulf District: *Dunlop* 3371 (DNA 6558), 25.ii.73, Magela Creek, $12^{\circ}40'S$, $133^{\circ}03'E$ (holo: CANB; iso: BRI, DNA, K, NT, PERTH).

Tufted or tussock-forming, non-resinous *perennial* c. 60 cm high. *Culms* 3-4-noded, densely scaberulous, sparsely pilose or glabrous. *Leaf sheaths* hirsute to pilose in the lower part. *Blades* <25 cm long, slender, often flexuose, scabrid-hispid on the upper surface, scaberulous on lower, pilose near ligule; ligule c. 0.8 mm long. *Panicle* 11.5-13 x 3-4 cm (including awns), loose, sparse; primary branches <3 cm long, sparsely divided; pedicels <1.5 mm (laterals) and <14 mm (terminals) long; divisions acutely triquetrous, scabrous-hispid. *Spikelets* 11-13 x 2-3.3 mm (excluding awns), 7-8-flowered, laterally compressed; florets closely imbricate, reduced upwards to the awns, exserted above the body of glumes; awns straight or recurved or twisted. *Glumes* 7-8 mm long (excluding awns), membranous to cartilaginous, scaberulous, faintly 3-nerved, 2-lobed, (especially the upper) pilose or glabrous on surface, ciliate-pilose on the upper margins and sparsely so on the lobe margins, unequally 3-awned from lobes and sinus; awns on lower glume 6-7 mm (median) and 2-3 mm (laterals) long, on upper glume 8-9 mm (median) and 3-4 mm (laterals) long. *Lemmas* c. 6 mm long (excluding awns), cartilaginous, scaberulous, 2-lobed, unequally 3-awned from lobes and sinus, bearded in the lower $1/3$ with silvery-white hairs in longitudinal series, pilose-ciliate on the upper margins (including lobe margins); awns c. 12 mm (median) and c. 7 mm (laterals) long; callus c. 0.3 mm long, with glabrous blunt tip. *Paleas* c. 5 mm long, slightly longer than body of lemma, membranous, oblong, subacute, bearded at base; keels acute, scaberulous; flaps broad, with hyaline edges. Awns on upper lemmas similar to the lower ones or slightly longer. *Caryopsis* not seen.

The species is known from only one locality on the escarpment of the Arnhem Land plateau of the Northern Territory.

Characteristic features, some of which are unique within the genus, include the 2-lobed unequally 3-awned glumes and lemmas, hairy leaf sheaths, glumes and lemmas, many-flowered spikelet with exserted florets, and mostly glabrous palea.

Paratype

Northern Territory: Darwin & Gulf District: *Dunlop* 3372 (details as for holotype).

Plectrachne contorta Lazarides, sp. nov. (Figures 3c, d, 4b, c)

Gramen perenne non-resinaceum; folia saepe pilis simplicibus et tuberculis portatis pilosa; spicula flosculis 6-7; flosculi exserti supra glumas; glumae pilosae vel praecipue in marginibus superis ciliatae vel glabrae, uniaristatae; gluma infera integra; gluma supera bilobata sinu aristata; lemmata profunde bilobata, sinu uniaristata, secus margines superos ciliata, in parte $1/3$ infera hirsuta; arista valde curva vel contorta; palea longitudine corpore lemmatis, inter carinas in parte $1/3$ - $1/2$ infera, carinis ciliatis vel scaberulis.

Typus: Northern Territory: Darwin & Gulf District: *Lazarides* 7924, 28.ii.73, c. 7.5 miles SE of Mt Gilruth, $13^{\circ}07'S$, $133^{\circ}09'E$ (holo: CANB; iso: BRI, DNA, K, L, PERTH, US).

Non-resinous *perennial* 0.70-1.05 m high; vegetative tussocks c. 15 cm high; flowering culms 0.90-1.05 m high. *Culms* 2-3-noded, terete, scaberulous or becoming smooth. *Leaf sheaths* glabrous or hairy with simple and tubercle-based hairs, ciliate on margins, bearded or pilose at mouth. Blades <15 cm long, rigid, straight, pilose especially near ligule or glabrous, scabrous or papillose; ligule 0.8-1 mm long. *Panicle* 14-21 x c. 3 cm, loose; axis and divisions acutely triquetrous, densely scabrous-hispid to pilose; primary branches < 6 cm long. *Spikelets* c. 8 mm long (excluding awns), 6-7-flowered, florets exserted above glumes. *Glumes* firmly membranous, acuminate, faintly 3-nerved, obtusely keeled, scaberulous, awned from keel, glabrous or pilose-ciliate especially on the upper margins; lower 5-8 mm long, entire, with a straight stiff scaberulous awn 2-5 mm long; upper 5-6 mm long, with 2 acuminate apical lobes and a similar awn 3.5-4.5 mm long from sinus. *Lemmas* c. 5.2 mm long (including callus and lobes), firmly membranous, deeply 2-lobed and awned from sinus, densely scaberulous, obscurely nerved, ciliate on the upper margins, hirsute in the lower third; awn 8-12 mm long, strongly curved or contorted, scaberulous; lobes acuminate; callus minute, with glabrous obtuse tip. *Palea* as long as body of lemma or somewhat shorter, thinly membranous, narrowly lanceolate, entire, hirsute between keels in lower 1/3-1/2; keels ciliate upwards or scaberulous from near base. *Lodicules* c. 0.8 mm long, firm. *Caryopsis* not seen. *Rhachilla* stout; internodes c. 1 mm long, with acutely oblique articulation.

The species is known from two relatively close localities on the Arnhem Land plateau of the Northern Territory, where plants were common on sandstone shelves and outcrops.

Distinctive features of the species include the 1-awned, 2-lobed lemma and glumes, exserted florets, relatively short palea, and contorted awns of the lemma. From *Plectrachne uniaristata*, the only other species in the genus with exclusively 1-awned lemmas, *P. contorta* differs markedly in spikelet morphology.

Paratype

Northern Territory: Darwin & Gulf District: *Dunlop* 4340, 21.ii.77, Deaf Adder Gorge, 13° 02' S, 132° 57' E (BRI, CANB, DNA, NT).

***Plectrachne mollis* Lazarides, sp. nov. (Figure 2a, b)**

Gramen perenne gracile non-resinaceum; culmi ad nodos inferos ramosi; panícula contracta; spicula parva, flosculo hermaphrodito et sursum flosculis neuteris setis reductis plerumque tres; lemma obscure nervatum, trilobatum, triaristatum, continuum inter lobos et corpus; lobi plani, triangulares; lobus medianus trinervis; lobi laterales binerves; aristae leviter inaequales; palea coriacea autem in parte 1/5 supera membranaceae vel hyalina, inter carinas sparsim pubescens; carinae excurrentes minutis mucronibus.

Typus: Western Australia: Northern Province: *Kenneally* 8656, 7.xii.82, 19 km N of Mitchell Plateau mining camp on track to Port Warrender, 14° 42' S, 125° 47' E (holo: CANB; iso: PERTH).

Slender non-resinous *perennial* 60-75(-90) cm high, forming compact leafy tussocks. *Culms* 2-3 noded, branched at the lower nodes, terete, glabrous, smooth, purple-black when young. *Leaves* filiform, glabrous; sheaths loose, pilose at mouth; blades thickened, terete, soon conduplicate, finely pungent, densely scabrous on upper surface, sparsely scabrid on edges; ligule c. 0.2 mm long; collar sometimes ciliolate. *Panicle* 9-14 x 1-1.5 cm, contracted, rather dense; primary branches < 2.8 cm long, few, naked in the lower part; pedicels 0.8 mm (laterals) and 2.8-4 mm (terminals) long. *Spikelet* with one hermaphrodite floret and usually 3 neuter florets above, the latter reduced to slender stiff scabrous bristles 3-7 mm long and clustered at apex of rhachilla; rhachilla internode 1-1.5 mm long, slender, compressed,

glabrous, smooth. *Glumes* membranous, lanceolate, acuminate, entire, muticous, glabrous, scaberulous upwards, 3-nerved, longer than spikelet (excluding awns), lower 6-7.5 mm and upper 4.6-6.5 mm long. *Lemma* coriaceous to indurated, 3-lobed, 3-awned; body (including callus) 1.8-2 mm long, entirely or partly pubescent, indistinctly nerved, sometimes (usually in mature spikelets) with a transverse thickened ridge at base of lobes on the inner surface, but no articulation; lobes flat, c. 0.5 mm wide at base, attenuate with awns, triangular, mid-lobe 3-nerved and the lateral lobes 2-nerved; awns 6-9 (median) and 5-6.5 (laterals) mm long (including lobes); callus c. 0.3 mm long; lodicules 0.4-0.5 mm long. *Palea* 2.2-2.5 mm long, slightly longer than body of lemma, narrowly oblong and truncate, notched or entire, coriaceous in the lower 4/5 and abruptly membranous to hyaline above, sparsely pubescent between keels; keels smooth and obtuse in the lower coriaceous part of palea, acute and scaberulous above, excurrent as minute mucros; flaps narrow, with hyaline edges. *Anthers* 2.3-2.8 mm long, purple. *Caryopsis* not seen.

The species is known from the Mitchell Plateau in the north Kimberleys of Western Australia, usually associated with damp habitats and laterite.

Plectrachne mollis has the two-textured palea of *P. pungens* (R. Br.) C. E. Hubb. and *P. schinzii* Henr., but is otherwise quite dissimilar, having a slender, compact habit, smaller spikelet with only one hermaphrodite floret, and no articulation between lobes and body of its lemma. A noteworthy feature of similarity in the 3 species is the presence of a transverse calloused ridge on the inner surface of the lemma at the base of the lobes. The feature, which appears to develop with maturity of the spikelet, is recorded for *P. pungens* by Hubbard (1939), who referred plants possessing the character to var. *callosum*.

By nature of their slender habit, especially the filiform scarcely pungent leaves, plants of *P. mollis* are soft in aspect in comparison with the tough, xerophytic facies of many "spinifex" species.

Paratypes

Western Australia: Northern Province: *Kenneally* 7954, 25.i.82, weather station, 29 km N of mining camp, Mitchell Plateau, 14° 34'10"S, 125° 48'10"E (CANB, PERTH). *Beard* 8380, 23.ii.79, Mitchell River Falls, Mitchell Plateau, 14° 49'S, 125° 40'E (CANB, PERTH). *Fryxell & Craven* 4042, 10.v.83, Mitchell Plateau, 29 km N of mining camp, 14° 35'S, 125° 47'E (CANB). *Fryxell & Craven* 4047, 11.v.83, Mitchell Plateau, 20 km SE of mining camp, 14° 56'S, 125° 58'E (CANB).

The following specimens are sterile, but almost certainly belong to *P. mollis*:-

Western Australia: Northern Province: *Kenneally* 4785, 13.vi.76, Airport swamp, Mitchell Plateau, 125° 48'E, 14° 47'S (CANB, PERTH). *Kenneally* s.n., 15.v.78, ibid (CANB, PERTH).

***Plectrachne uniaristata* Lazarides, sp. nov. (Figure 2c, d)**

Gramen perenne non-resinaceum; spicula quadriflora; glumae bilobatae, uniaristatae; flosculi similes, sursum gradatim parviores, glumis inclusi; lemmata bilobata, uniaristata, indimidio infero margines et costam ciliata; arista acute curva vel recurva; palea quam corpore lemmatis leviter longior, glabra, carinis anguste alatis.

Typus : Northern Territory: Darwin & Gulf District: *Lazarides* 7764, 17.ii.73, c. 28 miles SE of Oenpelli Mission, 133° 25'E, 12° 29'S (holo: CANB; iso: BRI, DNA, K, L, PERTH, US).

Erect non-resinous *perennial*; vegetative tussocks 30-45 cm high; flowering culms 0.90-1.20 cm high. *Culms* c. 4-noded, terete, branched near base, minutely scaberulous. *Leaves*

densely scaberulous, glabrous. *Sheaths* with rounded auricles minutely ciliolate on the edges. Blades <40 cm long, filiform, finely pungent, scabrous on the upper surface; ligule c. 1 mm long. *Panicle* $<30 \times <5$ cm, loose; axis and divisions strongly ribbed and scabrous; primary branches <11 cm long, naked in the lower 5-8 mm; pedicels 3 mm (laterals) and 15 mm (terminals) long. *Spikelets* c. 5 mm long (excluding awns), narrow, 4-flowered, florets (excluding awns) enclosed by glumes. *Glumes* 5-6 mm long (including awn), membranous to cartilaginous, obscurely 3-5-nerved, with 2 apical muticous acuminate lobes c. 0.5 mm long and aristulate from sinus; lower densely scaberulous, the awn 0.6-0.8 mm long; upper scaberulous upwards, awn c. 1.5 mm long. *Lowest lemma* 5-5.5 mm long (including callus and lobes), ciliate in the lower $\frac{1}{2}$ on margins and midnerve, minutely scaberulous towards apex, with 2 apical acuminate muticous lobes c. 1 mm long and awned from sinus; awn c. 13 mm long, flattened in the lower part, scaberulous, sharply curved or recurved; callus c. 0.3 mm long, with glabrous subobtuse tip and oblique articulation. *Palea* slightly longer than body of lemma, membranous, linear-oblong, glabrous, with entire scaberulous apex; keels scaberulous, narrowly winged in the lower part. *Anthers* c. 1.8 mm long. *Caryopsis* not seen. *Rhachilla* compressed, smooth, slender, internodes c. 1 mm long. *Upper florets* similar to the lowest, gradually smaller upwards.

Only the type collection known of the species.

Unlike any other species in the genus except *Plectrachne contorta*, all the lemmas in the spikelet are 1-awned. On comparison with *P. contorta*, there are marked differences in the morphology and indumentum of the spikelets, and in the habit of their plants.

Plectrachne bynoei C. E. Hubb., Kew Bull. Misc. Inf. no.3, 30 (1941); Gardner, Fl. W. Aust. 1 (1): 83 (1952); Lazarides, J. Roy. Soc. W. Aust. 44 (3): 81 (1961). *Type*: Western Australia: Northern Province: North-west coast, *Bynoe* s.n. (holo: K, fragment in PERTH).

Viscid aromatic *perennial*; vegetative tussocks 30-45 cm high, 15-90 cm wide, forming clumps 1.5-1.8(-2.5) m wide; flowering culms 0.90-1.65 m high. *Culms* terete or slightly compressed, c. 4-noded, smooth or minutely scaberulous, branched near base. *Leaves* resinous especially on sheaths and lower part of blades. *Sheaths* ciliate on the outer margin with straight or crimped woolly hairs, bearded at mouth with stiff silvery hairs <7 mm long. *Blades* <45 cm long, scabrous-mealy on the upper surface, sparsely scabrid-prickly along edges, hairy near ligule or glabrous, flexuose, usually flattened and glaucous when young, soon tightly conduplicate and shiny-green; ligule c. 1 mm long; collar glabrous or partly ciliate. *Panicle* usually 30-51 \times 4-5 cm, loose to rather dense, the spikelets biseriate, second and contiguous to approximate on numerous simple solitary branches (racemes) <11 cm long; axis and divisions densely scabrous, purplish when young; axis ribbed, grooved, more or less pubescent in axils; branches and pedicels acutely triquetrous; pedicels 0.9-2 mm long. *Spikelets* 4-8 mm long (excluding awns), loosely 4-6-flowered, usually the lower 2 florets hermaphrodite and the remainder neuter and reduced. *Glumes* membranous, acuminate, entire or notched, cuspidulate to aristulate (<1.4 mm long), scaberulous or smooth; lower 4.4-9.5 mm long, 1-nerved; upper 3.3-7 mm long, 3-nerved with the laterals often faint. *Rhachilla* compressed, scaberulous on edges or smooth, c. 0.2 mm long between lower and upper glumes, c. 0.3 mm long between upper glume and callus; internodes between the fertile florets 0.8-1.5 mm long, slender, with cupular oblique articulation. *Lowest lemma* 1.6-2.3 mm long (body and callus), membranous, 3-lobed, 1-awned or unequally 3-awned, faintly 3-5-nerved (laterals submarginal), sparsely and irregularly hairy in the lower $\frac{1}{2}$ - $\frac{3}{4}$, scaberulous above; median lobe and awn 4.5-7 mm long; lateral lobes awnless and 1.2-1.5 mm long, or awned and 2.5-3.8 mm long; awns flattened, scabrous along edges, purplish when young. *Callus* 0.1-0.2 mm long, oblique, bearded with glabrous obtuse tip. *Palea* 2.4-3 mm long, membranous, narrowly oblong, truncate or obtuse, notched, sparsely hairy

between keels in c, the lower $\frac{1}{2}$, scaberulous on keels upwards, flaps with hyaline margins. *Lodicules* 0.2-0.3 mm long, membranous. *Anthers* 1-1.7 mm long, often purplish. *Caryopsis* c. 1.5 mm long, oblanceolate, obtuse, acuminate at base, slightly compressed dorsally, somewhat flattened on the hilar face, brown; embryo c. 0.6 mm long, basal, obovate. *Second lemma* always 3-awned, otherwise similar to the lowest one, the median lobe and awn 5-6 mm long, the lateral lobes and awns 3.8-4.8 mm long. *Upper lemmas* reduced usually to the awns. (Figure 4d-h).

The above description, derived from the material cited, emends the original one based entirely on the holotype, which I consider to be an ecotypic variant. In its original sense, *Plectrachne bynoei* is characterized by the absence of lateral awns on the basal lemma (unlike the 3-awned condition of the remaining lemmas in the spikelet) and by the large glumes of the spikelet relative to the florets. This combination of features represents the exceptional state in the morphological variation in evidence. In the material studied, plants with considerably smaller spikelets and with the lemmas all 3-awned clearly predominate over those resembling the holotype or intermediate in the range of variation.

The species is the dominant grass over extensive areas of rugged mountain ranges of outcropping sandstone and quartz in the Kimberleys, Western Australia, and adjacent parts of the Northern Territory. In the field the large, spreading clumps with their numerous, tall flowering culms and curling highly resinous, shining green leaves present a striking feature in habit.

Specimens examined. WESTERN AUSTRALIA: Northern Province: *Beauglehole* 51894, 2.vi.76, King Edward River, Mitchell Plateau road, c. 200 km W of Wyndham (CANB). *Burbidge* 5137, 14.iv.56, Martin's Gap, E of Ord River (CANB). *Dunlop* 5240, 22.ii.80, Mitchell River, 14° 50'S, 125° 42'E (BRI, CANB, DNA, NSW, NT, PERTH). *Dunlop* 5558, 23.ii.80, Mitchell Falls, Mitchell River, 14° 50'S, 125° 42'E (BRI, CANB, DNA, PERTH). *Hopkins* BA0051 & BA0086, and *Kenneally* 8284, 11.vi.82, Sunday Island, Buccaneer Archipelago, 16° 25'S, 123° 11'E (PERTH). *Hopkins* BA0113, Long Island, Buccaneer Archipelago, 16° 34'S, 123° 22'E (PERTH). *Hopkins* BA0406, 23.vi.82, Irvine Island, Buccaneer Archipelago, 16° 05'S, 123° 32'E (PERTH). *Kenneally* 6753, 20.v.78, SE of Amax campsite on Theda Station road, 14° 56'S, 125° 57'E (CANB, PERTH). *Kenneally* 6805, 22.v.78, Mitchell Plateau, 14° 49'S, 125° 46'E (CANB, PERTH). *Kenneally* 7021, 5.ii.79, Mitchell Plateau, 14° 47'S, 125° 48'E (CANB, PERTH). *Kenneally* 7655, 24.vi.82, Deep Water Point, Dampier Peninsula, 16° 40'S, 123° 05'E (CANB, PERTH). *Kenneally* 7790 & 7791, 19.i.82, approx. 30 km NW of Mitchell River Mine, 14° 35'S, 125° 43'30"E (CANB, PERTH). *Kenneally* 7899, 22.i.82, Mitchell River Falls, 14° 49'20"S, 125° 41'40"E (CANB, PERTH). *Kenneally* 8012 & 8012B, 28.i.82, Kelly's Knob, 1 km N of Kununurra, 15° 46'S, 128° 30'E (PERTH). *Kenneally* 8323, 14.vi.82, Lachlan Island, Buccaneer Archipelago, 16° 38'S, 123° 29'E (PERTH). *Kenneally* 8412, 20.vi.82, Hidden Island, Buccaneer Archipelago, 16° 15'S, 123° 29'E (PERTH). *Kenneally* 8426, 21.vi.82, & 8449, 22.vi.82, Gibbings Island, Buccaneer Archipelago, 16° 09'S, 123° 31'E (PERTH). *Langfield* 206, 14.ii.56, Deception Ranges (CANB, PERTH). *Lazarides* 2945, 10.vii.52, Thompson's Springs, 42 mi SE of Kimberley Research Station (BRI, CANB, K, PERTH). *Lazarides* 6595A, 6.x.59, 6 mi S of Oobagooma Station (CANB). *Lazarides* 6716, 3.iii.63, Carr Boyd Range, 40 mi SE of Kununurra (BRI, CANB, K, L, MEL, NSW, PERTH, US). *Lazarides* 6722, *ibid* (CANB, K, NSW, PERTH). *Lazarides* 6725, *ibid* (AD, B, CANB, K, MEL, P). *Lazarides* 8516, 12.iii.78, Carr Boyd Range, 20 km ENE of Dunham River homestead (CANB). *Pen* 11, 27.vi.82, Sir Frederick Island, Buccaneer Archipelago, 16° 07'S, 123° 24'E (PERTH). *Petheram* 570, 18.iii.80, 1 km S of Dunham River bridge, Kununurra, 16° 09'S, 128° 22'E (CANB, NT, PERTH). *Roberts* s.n., 1.ii.61, Ord River (PERTH).

NORTHERN TERRITORY: Victoria River District: *Dunlop* 5715, 23.iii.81, Keep River National Park, 15° 46'S, 129° 06'E (BRI, CANB, DNA, NT, PERTH). *Dunlop* 5794, 27.ii.81, Wandjina Rock, Keep River National Park, 15° 49'S, 129° 06'E (DNA, MEL, NSW). *King* 92, 23.iv.82, Keep River National Park, 15° 49'S, 129° 03'E (CANB). *King* 151, *ibid*, 15° 47'S, 129° 05'E (CANB). *King* 152, 25.iv.82, *ibid*, 15° 49'S, 129° 04'E (CANB). *Lazarides* 2982, 21.vii.52, 65 mi ENE of Carlton homestead (CANB, NT, PERTH). *Lazarides* 2991, 22.vii.52, 56 mi E of Carlton homestead (BRI, CANB, K, NSW, NT, PERTH, US). *Lazarides* 2996, 22.vii.52, 80 mi SE of Carlton homestead (AD, BRI, CANB, K, MEL, NSW, NT, PERTH, US). *Perry* 2619, 27.vii.49, near Alligator Springs, 70 mi E of Carlton Station (BRI, CANB, K, MEL, NSW, PERTH).

Oxychloris (Chloridoideae, Chlorideae) Lazarides, gen. nov.

Distinguitur spicula 4-6-floribus, flore basali hermaphrodito et ceteris neutris, callo elongato pungenti, et flosculorum steriliu lemmatibus late alatis 5-7-nervibus.

Typus: *Oxychloris scariosa* (F. Muell.) Lazarides (*Chloris scariosa* F. Muell.)

Annual or short-lived perennial; culms compressed or terete, ribbed, usually simple and 5-7-noded; *leaves* often tubercled; blades narrow, flat or convolute, with tubercle-based prickly-like hairs along the thickened margins; ligule a small ciliolate membrane. *Inflorescence* of 3-6 digitate shortly peduncled, appressed or divergent spikes; rhachides triquetrous, scabrous-pilose or (the peduncles) with simple and tubercle-based hairs. *Spikelet* 4-6-flowered, falling as a whole; basal floret hermaphrodite; the remainder neuter, without paleas, clustered on a very short rhachilla, separated from the fertile floret by a thickened elongated internode. *Glumes* unequal, membranous, 1-nerved, keeled, glabrous, the upper 2-lobed, the lower entire. *Fertile floret* smaller than the sterile ones; *lemma* cartilaginous to indurated, with broad scarious or membranous margins, 2-toothed, strongly convex on the back, 3-nerved, with tufts of hairs near apex on the lateral nerves and in the lower part near midnerve, the midnerve ribbed and prolonged into a scabrous awn arising from the back of the apex, and the lateral nerves submarginal. *Palea* as long as its lemma, membranous, acute, notched, muticous, ciliolate on apex and keels otherwise glabrous; keels slightly shorter than the palea itself, narrowly winged upwards. *Callus* elongated, continuous with the rhachilla, pungent, straight or curved, compressed, densely pubescent except for a glabrous tip and a narrow median line on the front and back. *Anthers* 3; *stigmas* plumose, purple, exerted near apex of floret. *Caryopsis* obovate, trigonous, concave on the hilar face, convex on the back; hilum basal, linear or elliptic; embryo $\frac{1}{2}$ - $\frac{3}{4}$ as long as the grain itself. *Sterile florets*: *lemmas* expanded and wing-like, membranous or scarious, 5(-7)-nerved, glabrous, 2-toothed, awned from the back of the apex, gradually smaller upwards.

Species 1, in Australia between 14th and 30th parallels; adventive in Switzerland.

Oxychloris scariosa (F. Muell.) Lazarides, comb. nov. Based on *Chloris scariosa* F. Muell., *Fragm. Phyt. Aust.* 6: 85 (1867); Benth., *Fl. Aust.* 7: 614 (1878); Bailey, *Queensland Fl.* 6: 1896 (1902); Domin, *Biblioth. Bot.* 20 (85): 370 (1915); Ewart & Davies, *Fl. Northern Territory* 45 (1917); Black, *Fl. S. Aust.*, 2nd edit., pt. 1, 132 (1943); Gardner, *Fl. Western Aust.* 1 (1): 220 (1952); Lazarides, *Grasses of Central Aust.* 87 (1970); Lazarides, *Aust. J. Bot.*, *Suppl. Ser.*, no. 5, 22 (1972); Anderson, *Brigham Young Univ. Sc. Bull.*, *Biol. Ser.*, 19 (2): 40 (1974); Black (revis. Jessop), *Fl. S. Aust.* pt. 1, 3rd edit., 204 (1978); Lazarides in Jessop, *Fl. Central Aust.* 465 (1981); Cunningham et al., *Plants of Western N.S. Wales* 75 (1981); Wheeler et al., *Grasses of N.S. Wales* 141 (1982). *Type*: Western Australia: Ereman Province; Sturt's Creek, *Gregory* s.n. (holo: MEL; iso: K).

Chloris ?scariosa P. Beauv., *Ess. Agrost.* 79, 158 (1812), nomen nudum.

"Sect. vel. subgen. (nov.), *Hackelochloris*" Thellung, *Vjschr. naturf. Ges. Zurich* 64: 707 (1919).

Annual or short-lived perennial 15-47 cm high. *Culms* (3-)5-7-noded, glabrous. *Leaves* strongly nerved, often glaucous; sheaths much shorter than culm internodes; blades <16 cm x <3.5 mm, finely acuminate, scabrous or pilose (especially on upper surface) with simple and tubercle-based hairs or tubercled only; ligule c. 0.5 mm long. *Spikes* 1.8-4.5(-6) mm long. *Glumes* scaberulous on nerve or smooth, often purple; lower 3-5 mm long, narrowly elliptic, obtuse; upper 5-8 mm long, oblanceolate or oblanceolate-elliptic, truncate. *Fertile floret: callus* 2.5-3 mm long; *lemma* 3.3-5 mm long, obovate, bearded near apex with white hairs <1.5 mm long, often purple or brown; awn 5.5-8 mm long; *palea elliptic* or obovate, sometimes sparsely scabrous between keels; *caryopsis* 1.3-2 x c. 1 mm, brown; *anthers* 0.8-1 mm long. *Sterile florets: lemmas* usually 3-4 mm long, orbicular-elliptic to broadly elliptic, often yellowish-green when young and brown when mature; awn (3-4)4-7 mm long. *Rhachilla-internode* between fertile and sterile florets 1-1.5 mm long, flattened or grooved along one side, with a basal tuft of hairs otherwise glabrous. (Figure 1a, b).

Distributed in all mainland States except Victoria; predominant in arid and lower rainfall areas of the Northern Territory and Queensland, often in saline soils.

The characteristic features of *Chloris scariosa* are well known and its segregation to generic rank has been considered previously by Clayton (1967), Lazarides (1972) and Anderson (1974). After continued research on generic boundaries within the tribe, I am elevating the taxon on the basis of its elongated, pungent callus, a unique feature within the subfamily Chloridoideae, and its 4-6-flowered, winged spikelet, which more closely resembles the spikelet of *Tetrapogon* Desf. than that of *Chloris* Sw. A species of arid regions and hard soils, these features are seen as evolutionary adaptations to aid germination and dispersal.

Specimens examined. QUEENSLAND: Cook District: *Brass* 1710, ii.27, Gilbert River (CANB, K). *Brass* 1790, 8.ii.31, Forest Home Station (CANB, K). *Domin* s.n., II.1910, Metal Mtns, Chillagoe (PR, ex K). *Lazarides* 4173, 26.ii.54, 4 mi N of Lynd Station (CANB). North Kennedy District: *Lazarides* 7145, 4.iv.65, Lansdown Pasture Research Station, 35 mi S of Townsville (CANB, K). Burke District: *Hubbard & Winders* 7610, 14.ii.31, Chudleigh Park Station, 110 mi N of Hughenden (BRI, CANB, K). *Lazarides* 4248, 3.iv.54, Norman River, near Normanton (AD, BRI, CANB, K, MEL, NSW, NT, PERTH, US). *Purdie* 2180, 24.ix.81, c. 10 km NE of Hughenden, 20° 48'S, 144° 17'E (CANB). *Winders* 7436, 9.ii.31, Mt Isa (BRI, CANB, K). South Kennedy District: *Adams* 1076, 14.vii.64, 6 mi E of Pasha Station (BRI, CANB, K). Pt Curtis District: *Bowman* s.n., Gracemere (BR, K). Warrego District: *Allen* 87, 6.iii.42, "South Glen" E of Cunnamulla (CANB). *Blake* 5464, 23.iv.34, Earlstoun Station, between Quilpie and Windorah (BRI, CANB). *Key & Chinnik* 7230, 2.v.57, 20 mi NNE of Charleville (CANB). *Purdie & Boyland* 167, 25.iii.76, 51 km N of Charleville, 26° 01'S, 146° 27'E (BRI, CANB). *Rutledge* s.n., 2.v.49, Quilpie (BRI, CANB). Gregory North District: *Everist* 3264, 23.xi.47, Ardmore, c. 25 mi W of Dajarra (BRI, CANB). Maranoa District: *S.W.Q.S.* 1337, 10.iii.53, "Deiran" W of Bollon (CANB). District unknown: *Davies* s.n., v.39, Kalimoo, Carmoo (CANB).

NORTHERN TERRITORY: Darwin & Gulf District: *Perry* 1218, 3.vi.48, 60 mi N of Wollongorang Station (BRI, CANB, K, NT). *Perry* 1822, 30.vii.48, on coast 35 mi E of Borroloola (BRI, CANB, K, NT). Barkly Tableland: NT (*Chippendale*) 1068, 10.iii.55, 26 mi S of Elliott (CANB, NT). *Perry* 195, 4.vii.47, 0.5 mi E of Muckety Homestead (CANB, K). *Perry* 551, 24.iv.48, 8 mi N of Tennant Creek township (BRI, CANB, K, NT). Victoria River District: NT (*Chippendale*) 5698, 3.iv.59, 66.9 mi NE of Tanami (CANB, NT, PERTH).

CENTRAL AUSTRALIA: *Burbidge & Gray* 4194, 19.ix.55, E of Undoolya Gap (CANB). *Burbidge & Gray* 4216, 20.ix.55, on Stuart Highway approx. 30 mi N of Alice Springs (CANB). *Carr* 1684 (& *Beaulehole* 45463), 12.vi.74, c. 138 km W of Alice Springs (CANB). *Cleland* 349, 9.viii.31, Burt's Well (K). *Cleland* s.n., 12.viii.32, Mt Liebig (K). *Cleland* s.n., 23.viii.36, Pine Hill Station (K). *Gardner* s.n., i.53, Burt Plain (PERTH). *Gardner* 11636,

13.iii.53, Hamilton Downs (PERTH). *Lazarides* 5280, 13.v.55, 14 mi NNW of Alice Springs (CANB). *Maconochie* 64 (NT 12166), 7.iv.67, on Yuendumu road 23 mi W of Stuart Highway (CANB, NT). *Martin* 14 (NT 11937), ii.66, Mt Denison Station (CANB, NT). *Nelson* 655, 21.iii.63, McGrath Flat, 29 mi N of Alice Spring (CANB, NT). *Nelson* 809, 9.vii.63, ibid (CANB, NT). *Nelson* 904, 15.i.64, ibid (CANB, NT). *Nelson* 1624, 6.ii.68, Burt Plain, 34 mi N of Alice Springs (CANB, NT, PERTH). *Nelson* 1839, 27.i.69, Stuart Highway, 32 mi N of Alice Springs (CANB, NT). *Nelson* 1873, 28.iii.69, McGrath Flat, 29 mi N of Alice Springs (CANB, NT). NT (*Chippendale*) 439, 9.xi.54, 1 mile E of Undoolya Gap (CANB, NT). NT (*Chippendale*) 2941, 18.ix.56, 1.5 mi W of no. 18 bore, Sandover S.R. (CANB, NT). NT (*Chippendale*) 4121, 26.iii.58, 13 mi WNW of Ambalindum (CANB, NT, PERTH). NT (*Chippendale*) 9017, 24.v.62, 31 mi N of Alice Springs (CANB, NT). *Perry* 3368, 10.iii.53, 5 mi S of Yambah Station (BRI, CANB, K, NSW, NT, US). *Pullen* 10.526, 29.iii.77, c. 13 km SSW of Alice Springs, 23° 49'S, 133° 51'E (BRI, CANB, K, PERTH, WIR). *Schomburgk* s.n., Central Australia (W). *Swinbourne* 596 (NT 9795), 16.xi.62, 31 mi N of Alice Springs (CANB, NT). *Winkworth* 225, 29.iv.54, 22 mi W of Bond Springs (CANB). *Winkworth* 808, 8.xi.54, 6 mi NW of Alcoota (CANB).

SOUTH AUSTRALIA: North East: *Gosse* 173, without precise locality (K).

WESTERN AUSTRALIA: Ereman Province: *H.S. King* s.n., 1885, between Gascoyne and Fortescue Rivers (K, PERTH). *O'Flaherty* s.n., Balgo Hills (PERTH). Northern Province: *Gardner* 10176, 10.v.51, Moola Bulla (PERTH).

Arthrargrostis (Paniceae, Panicinae) Lazarides, gen. nov.

Distinguitur praesentia articuli constricti in axillis omnium ramorum et pedicellorum paniculae, flosculo fertili stipitato cum articulo ad basim stipitis, rhachillae internodio producto inter glumam inferam et superam, gluma infera late ovata involventi basim spiculae, gluma supera lemmate infero inaequali ambobus plerumque cuspidatis.

Typus: *A. deschampsoides* (Domin) Lazarides (*Panicum deschampsoides* Domin).

Annual; culms simple or sparsely branched, few-noded; blades linear, flat; ligule a ciliate membrane. *Inflorescence* a contracted loose panicle, the spikelets solitary and long-pedicelled on primary and secondary branches; the spikelets at their base, and the pedicels and branches in their axils, all with a deeply constricted articulation, disarticulating at maturity and leaving only the naked axis; primary panicle branches 1-nate or the lowest group semi-whorled, divided, rather distant on axis; pedicels with a cupuliform apex. *Spikelet* 2-flowered, lower neuter, upper hermaphrodite. *Glumes* unequal, membranous, strongly many-nerved, separated at their points of attachment on rhachilla; lower c. $\frac{1}{2}$ as long as spikelet, enclosing base of spikelet, muticous to aristulate; upper slightly or distinctly shorter than spikelet, long-acuminate, cuspidate to awned. *Lower lemma* determining the shape and size of the spikelet, membranous, strongly many-nerved, long-acuminate, cuspidate to awned, without floret or palea. *Fertile (upper) floret* almost $\frac{1}{2}$ as long as spikelet, indurated or crustaceous, elliptic, muticous, smooth, glossy, borne on a slender stipe, disarticulating with or without its stipe. *Upper lemma* oblong or elliptic, obtuse to subacute, truncate at base, obtusely convex on the back, faintly 5-7-nerved, with incurved margins. *Palea* similar to lemma in length and shape, flattened, faintly 2-nerved (but not 2-keeled), with incurved margins which widen abruptly near the base. *Anthers* 3, c. 1 mm long, exerted terminally. *Stigmas* plumose, purple; styles free. *Lodicules* c. 0.2 mm long, firm, cuneate, with notched apex. *Caryopsis* dorsally compressed, biconvex in profile; embryo c. $\frac{1}{2}$ as long as the grain itself and almost as wide; hilum in basal $\frac{1}{3}$ of grain, circular.

Species 1, Australia.

Arthragrostis deschampsioides (Domin) Lazarides, comb. nov. Based on *Panicum deschampsioides* Domin, Biblioth. Bot. 20(85): 320 (1915). Type: Queensland: North Kennedy District: Domin 1208, II.1910, Castle Hill, Townsville (holo: PR).

Slender flaccid *annual* 17-50 cm high. *Culms* terete or compressed, striate to ribbed or grooved, c. 4-noded, glabrous, smooth. *Leaves* thin, hispid to hirsute with tubercle-based or simple hairs, usually also a few longer stiff hairs 3-4.5 mm long on margins of blade near ligule, with numerous ribbed or prominent nerves. *Sheaths* shorter than culm internodes, loose, especially the upper ones sometimes partly glabrous and smooth. *Blades* < 9 cm x < 2.8 mm, firmly pointed, with thickened white scabrous margins; ligule 0.5-0.8 mm long; collar not demarcated. *Panicle* < 25 x 2-5 cm; axis upwards and all divisions triquetrous or compressed, densely scabrous, filiform; primary branches < 12 cm long; pedicels 8-25 mm long. *Spikelets* 4-5 x 1-1.5 mm. *Lower glume* 2-4 mm long (including awn), ovate, obtuse to subacute, 7-nerved, scabrous especially on nerves and margins and on the inner surface towards apex, attached 0.3-0.4 mm below the upper glume. *Upper glume* 3-6.3 mm long (including awn), with 9-11 ribbed nerves, lanceolate, scabrous on back and in the upper part on the inner surface. *Lower lemma* 3.8-7.5 mm long (including awn), narrowly lanceolate, 9-nerved, glabrous and smooth on back, scaberulous on margins, sparsely hairy in the upper part on the inner surface. *Fertile floret* 1.5-1.7 mm long, striolate, stipe c. 0.3 mm long. *Caryopsis* 1.2-1.4 x 0.7 mm, elliptic to slightly obovate, obtuse, pallid, smooth. (Figure 1e-g).

Apparently restricted in distribution, the species is represented by collections from the North Kennedy and Cook Districts of Queensland.

Panicum deschampsioides is segregated as a new genus on the basis of a number of distinctive morphological features. Its diagnostic character, the absolute disarticulation of the panicle into component divisions, appears to be unique within the Tribe. However, partial disarticulation in the inflorescence does occur in monotypic, Australian endemic genera (*Paractaenum* P. Beauv., *Plagiosetum* Benth., *Pseudochaetochloa* Hitchc., *Uranthoecium* Stapf), and elsewhere in the Paniceae (*Stenotaphrum* Trin., *Pennisetum* L. C. Rich.).

In *Paractaenum*, *Pseudochaetochloa*, *Pennisetum* and *Plagiosetum*, each raceme disarticulates from the common axis of a racemose or spiciform panicle. In each case the raceme, containing one to many spikelets subtended by one to several bristles or bristle-like branchlets, falls as a whole. In *Uranthoecium*, the axis is jointed and breaks up into individual segments containing a short spike of few spikelets. Similarly in *Stenotaphrum*, the thickened axis with imbedded spikelets breaks at joints into segments of individual spikelets or short racemes. Sometimes the inflorescence is shed as a whole. With the exception of this feature, these genera bear little morphological resemblance to *Arthragrostis* and no close relationship.

Supporting generic characters of *Arthragrostis* include the stipitate fertile floret, the distinct rhachilla-internode between lower and upper glumes, the broad enveloping lower glume, and the unequal usually cuspidate upper glume and lower lemma. As well as the articulation at the base of the spikelet, which is a tribal feature, the fertile floret disarticulates above and below its stipe.

The generic significance of a number of these features is discussed by Lazarides & Webster (1984) in segregating a new genus from *Panicum* L. and *Ichnanthus* P. Beauv. Also, to a greater or lesser degree the features characterize genera allied to *Panicum*, such as *Brachiaria* (Trin.) Griseb., *Paspalidium* Stapf, *Ottochloa* Dandy, *Oplismenus* P. Beauv., *Ichnanthus* P. Beauv., and *Echinochloa* P. Beauv., rather than *Panicum* itself.

Surprisingly, Domin (l.c.) makes no reference to the articulated panicle. Also, the upper lemma is described as nerveless or 1-nerved, but five to seven can be observed with high magnification particularly on the inner surface. In conflict with Domin, I have not observed a palea in the lower floret, either in the holotype or in the slightly larger plant on the second sheet in Prague, (viz. Domin 1209), on which Domin comments in the protologue.

Specimens examined. QUEENSLAND: North Kennedy District: *Blake* 8159, 22.iii.35, Castle Hill, Townsville (topotype, BRI, K). *Blake* 11704, 11.vi.36, Charters Towers (BRI, CANB, L). *Blake* 14905, 4.iv.43, near Charters Towers (BRI). *Domin* 1209, details as for holotype (PR 524423). *Lazarides* 4659, 9.vii.54, 20 miles W of Greenvale Station (CANB). Cook District: *Blake* 13491, 28.iii.38, E of Dimbulah, 17° 0', 145° 0' (BRI). *Goodall* 66, 20.iv.61, Mount Spider, 17° 0', 145° 2' (BRI). *Goodall* s.n., 30.iv.61, headwaters of Murphy's Creek, 17° —', 145° —' (BRI). *Lazarides* 4212, 27.ii.54, 43 miles SSW of Mt Garnet township (AD, BRI, CANB, K, MEL, NSW, NT, PERTH, US). *Simon & Clarkson* 3598, 10.iii.80, 4 km from Almaden on Petford road, 17° 22', 144° 42' (BRI, CANB).

Heteropholis (Andropogoneae, Rottboelliinae, Rottboelliastreae) C. E. Hubb. in Hook., Ic. Plant. 6(2) 5th Ser. or 36 Tab. 3548 (1956); Pilger in Engl. & Prantl, Naturl. Pflanzenfam., 2nd. Ed., 14d : 206 (1956); Bor, Grasses of Burma, Ceylon, India and Pakistan 162 (1960); Jacques-Felix, Graminees D'Afrique Tropicale 282 (1962); Clayton, Kew Bull. 35(4): 813 (1981); Clayton & Renvoize in Polhill, Fl. Trop. East Africa, Gramineae (Part 3): 849 (1982); Koning et al., Gard. Bull. Singapore 36(1): 137 (1983). *Type species*: *H. sulcata* (Stapf) C. E. Hubb. (*Peltophorus sulcatus* Stapf).

Perennials or (in Australia) *annual*; culms slender or very stout, branched, few-many-noded; blades linear to lanceolate, flat; ligule membranous. *Inflorescence* of solitary, spiciform, spatheate racemes terminal on culms and branches. *Racemes* slightly compressed, finally exserted from spathe; rhachis jointed, breaking up into thickened segments containing the imbedded sessile spikelet and the fused pedicel of the adjacent pedicelled spikelet, each segment with a cupuliform apex and a basal peg for attachment to the adjacent segments. *Spikelets* secund, awnless, in pairs and dissimilar, one of the pair sessile, the other pedicelled or absent. *Florets* 2, lower staminate or neuter, upper (in the sessile spikelet) hermaphrodite and (in the pedicelled spikelet) staminate or neuter or absent. *Sessile spikelet* dorsally compressed; callus very short, truncate, glabrous, with a thickened rim. *Glumes* dissimilar, as long as spikelet, glabrous, 2-keeled, keels usually winged or thickened near apex. *Lower glume* thickened, coriaceous to indurated, variously sculptured or pitted, slightly convex, obtuse, 7-11-nerved, with inflexed rigid margins. *Upper glume* cymbiform, keeled or rounded on back, chartaceous or crustaceous except for narrow hyaline margins, subacute to obtuse, 3-7-nerved. *Lower lemma* almost as long as glumes, elliptic-oblong, obtuse, thinly membranous to hyaline, 2-nerved near margins; palea as long as lemma or shorter or absent. *Upper lemma* similar to lower in length, shape and texture, 2-3-nerved; palea as long as lemma or shorter, hyaline, 2-nerved or nerveless. *Lodicules* 2, broadly cuneate-oblong, truncate, glabrous. *Stamens* 3; anthers linear-oblong. *Ovary* glabrous; styles free, filiform; stigmas plumose, purple, laterally exserted. *Caryopsis* dorsally compressed, oblong, obtuse; embryo c. 2/3 as long as the grain itself; hilum basal, rotund. *Pedicelled spikelet* as long as the sessile or longer, disarticulating from its pedicel, oblong, glabrous. *Glumes* equal or unequal, coriaceous or herbaceous, smooth. *Lower glume* oblong, strongly asymmetrical with one margin narrow and acutely inflexed; other margin broad slightly concave, keeled, the keel narrowly winged and 5-9-nerved. *Upper glume* cymbiform, with a 3-5-nerved winged keel, or more or less reduced. *Lemmas* and *paleas* similar to those of the sessile spikelet, or absent.

Heteropholis, which is a new record for Australia, also contains *H. sulcata* (Stapf) C. E. Hubb. from East Africa, *H. nigrescens* (Thw.) C. E. Hubb. from Sri Lanka, *H. benoistii* A. Camus from Madagascar, and *H. cochinchinensis* (Lour.) Clayton vars. *cochinchinensis* and *chenii* (Hsu) Sosef & Koning, which are distributed from India and southern China through Southeast Asia to Malesia.

As the key shows, *Heteropholis* appears to be closely allied to *Hackelochloa* Kuntze and *Manisuris* L., but differs from the former by the morphology of both sessile and pedicelled spikelets, and from the latter genus by the mode of disarticulation of the pedicelled spikelet and by the morphology of the lower glume of the sessile spikelet. However, in *Heteropholis* the pedicelled spikelet is sometimes reduced or absent and, as indicated by Clayton (l.c.) and Koning et al. (l.c.), generic boundaries within the group are not clearly defined.

Key to *Heteropholis* and allied genera

1. Spikelets solitary (by suppression) and sessile or subsessile; pedicelled spikelet (if present) rudimentary or reduced to the pedicel; pedicel fused to internodes of rhachis *Thaumastochloa*, *Ophiuros*, *Eremochloa*
1. Spikelets in pairs with one of the pair sessile and the other pedicelled or sometimes (in *Heteropholis*) absent.
 2. Pedicel of the pedicelled spikelet free of internodes of rhachis *Coelorachis*, *Elionurus*
 2. Pedicel fused to internodes of rhachis.
 3. Spikelets of each pair similar in form and sex; rhachis tough or tardily disarticulating *Hemarthria*
 3. Spikelets (all or mostly all) dissimilar in form and sex; rhachis readily disarticulating at the joints.
 4. Spikelets pseudo-opposite on a cylindrical rhachis; pairs of spikelets in upper part of raceme similar; lower glume of sessile spikelet smooth or roughened by papillae, but not sculptured *Rottboellia*
 4. Spikelets secund on a compressed or flattened rhachis; all pairs of spikelets dissimilar (sometimes the terminal pair similar in *Hackelochloa*); lower glume of sessile spikelet variously sculptured.
 5. Pedicelled spikelet adnate by its base to, and falling with, internode of rhachis; lower glume of sessile spikelet usually with awns or prominent wings; embryo as long as the grain itself *Manisuris*
 5. Pedicelled spikelet (when present) disarticulating at its base and falling free of internode of rhachis; lower glume of sessile spikelet awnless, wingless or with small wings; embryo c. 2/3 as long as the grain itself.
 6. Sessile spikelet globose or subglobose; the lower glume tessellately sculptured, wingless; lower glume of pedicelled spikelet symmetric *Hackelochloa*
 6. Sessile spikelet compressed; the lower glume coarsely rugose or tessellate, with narrow apical wings; lower glume of pedicelled spikelet (when present) asymmetric in form and nervation *Heteropholis*

Heteropholis annua Lazarides, sp. nov. (Figures 1c-d, 7f)

Distinguitur habitu robusto annuo, facie glabra laevi, laminis cordatis amplexicaulibus latissimis tenuibus atroviridibus cum aculeis secus margines, spiculae sessilis gluma supera adnata infera rugosa.

Typus: Western Australia: Northern Province: *Kenneally* 8219, 3.v.1982, Gauging Station, Camp Creek, approx. 12 km SW of mining camp, Mitchell Plateau, 14° 53'10"S, 125° 45'05"E (holo: CANB; iso: BRI, DNA, K, L, PERTH, US).

Robust leafy *annual* <2 m. high, mostly glabrous and smooth on culms and leaves. *Culms* 5-10 mm diam., branched, cylindrical or the lower internodes compressed, many-noded, strongly striate and with a broad longitudinal groove along one side; internodes pithy; nodes glabrous; prop roots from lower nodes common. *Leaves* thinly herbaceous, dark-green, with many (c. 16) ribbed primary nerves and numerous secondary (thinner but prominent) nerves. *Sheaths* <2.5 cm wide (at widest part), loose on the culms, longer than the lower internodes and shorter than the upper ones, with subhyaline glabrous smooth margins. *Blades* <60 x <4.5 cm, lanceolate, flat, acuminate, cordate and amplexicaul, with stout prickles approximate to distant along the thickened margins; the prickles 0.5-0.8 mm long, antrorse, usually translucent, with a thickened base; midnerve ribbed on the lower surface towards the apex and forming a prominent acute wing-like ridge. *Ligule* 1-2 mm long, irregularly dentate, V-shaped; collar glabrous. *Racemes* 1-4 from the upper nodes, 5-7.3 cm long; peduncle widened upwards, strongly striate, glabrous, smooth; rhachis internodes thickened, indurated, strongly nerved. *Sessile spikelet*: *Lower glume* 4.5-5.5 mm long, as long as rhachis-internode and covering concavity containing the spikelet, indurated, obovate, truncate or broadly obtuse, obtuse at base, coarsely rugose especially near margins, somewhat glossy and faintly striolate, 11-nerved on the inner surface, with a deep transverse groove near base, the inflexed margins acute. *Upper glume* adnate to concavity in rhachis-internode except near the base, rounded on the back, broadly oblong or slightly wider upwards, obtuse with a minute subacute thickened mucro, thinly 3-nerved with the lateral nerves submarginal, crustaceous with hyaline flat inturned margins <0.5 mm wide, glabrous on the outer surface except for sparse pubescence on the basal free part, glabrous smooth and shiny on the inner surface. *Lower lemma* broadly elliptic or oblong, obtuse, hyaline, glabrous, smooth, the nerves thin. *Palea* absent. *Upper lemma* slightly shorter and narrower than lower lemma, broadly oblong, obtuse to subacute, glabrous, smooth, thinly or obscurely sub 2-3-nerved. *Palea* slightly shorter than its lemma and much narrower, flat, oblong, obtuse, glabrous, smooth, obscurely nerved in the lower part or nerveless. *Lodicules* c. 0.8 x 1 mm, cuneate, membranous or thinly cartilaginous to thickened, minutely crenate to more or less entire on apical edge. *Anthers* c. 2 mm long. *Caryopsis* c. 3.5 x 2 mm, elliptic-oblong, obtuse at apex and base, plano-convex in profile, thicker upwards, smooth; embryo as wide as the grain itself; hilum 0.8-1 mm long and almost as wide. *Pedicelled spikelet* longer than the sessile. *Lower glume* 7.5-8 mm long (<10 mm in terminal spikelet), lanceolate-oblong, obtuse, thickened and truncate at base, coriaceous to indurated, glabrous, asymmetrically 5- sub 7-nerved (nerves broad and flat), with a thickened keel along one margin. *Upper glume* c. 7 mm long and slightly shorter than lower, membranous to coriaceous with hyaline margins, sparsely ciliate on margins with short stiff hairs otherwise glabrous, asymmetrically nerved, with a prominent winged few-nerved acute keel. *Lower lemma* c. 5 mm long, lanceolate-oblong, obtuse, emarginate, membranous to hyaline, sparsely ciliate on apex and upwards on margins with short stiff hairs otherwise glabrous, smooth, with 2 submarginal nerves or obscurely 2- sub 3-nerved. *Palea* absent. *Floret* neuter. *Upper lemma* as long as the lower, similar in shape and texture, glabrous, 3-nerved. *Palea* c. 3.5 mm long, flat, lanceolate-oblong, acute, membranous to hyaline, nerveless, smooth. *Floret* staminate; anthers c. 3 mm long; filaments filiform, papillose.

At present, the species is known from only the two cited collections, which were growing on alluvial seasonally wet soils among massive sandstone outcrops.

Within *Heteropholis* the Australian species is distinctive by virtue of its stout, annual habit and the adnate upper glume of the sessile spikelet. On comparison with the other three species, it resembles the African *H. sulcata* which, however, is a rhizomatous, narrower-leaved often hirsute perennial with a different surface on the lower glume of the sessile spikelet.

Paratype

Western Australia: Northern Province; *Kenneally* 7128, 9.ii.79, 9 km SW of Amax Campsite, Mitchell Plateau, 14° 55'S, 125° 44'E (PERTH).

***Micraira* F. Muell. (Micrairoideae).**

In a previous publication (Lazarides 1979), *Micraira* was expanded from its monotypic state to a genus of 8 species, and its circumscription was modified to include resulting new morphological data. The new species presented here conform to the revised circumscription.

With the exception of the original *M. subulifolia* F. Muell., which is confined to Queensland, all the species are distributed in a relatively small area of the Northern Territory and Western Australia. Characteristically, plants of the species grow in localized colonies in highly specific habitats. The genus is notable for prominent features such as spiral phyllotaxy, mat-forming habit, and an unusual, 2-keeled and many-nerved or nerveless palea which is usually divided into 2 equal parts. Also, the culms, comprising numerous nodes and extremely short internodes, are completely covered by the leaf sheaths. The inflorescence is sometimes reduced from a simple panicle to a capitate spike. A noteworthy physiological feature, the ability of plants to revive after dehydration (i.e. they are resurrection plants), is described by Gaff & Latz (1978).

On the previous addition of new species, which are homogeneous in many respects, *Micraira subulifolia* became taxonomically isolated in terms of morphology, distribution and ecology. However, one species in this paper, *M. multinervia*, has some features which connect *M. subulifolia* with the group in the western part of the continent.

The following key to all the species in the genus indicates the relationships between the new and existing taxa.

Key to the species of *Micraira*

1. Inflorescence a compact spike, the spikelets sessile or subsessile on axis.
 2. Spike shorter than and obscured by the upper leaves *M. inserta*
 2. Spike prominently exserted above the upper leaves.
 3. Glumes terminating in a flattened spine c. 0.5 mm long; leaf sheath abruptly narrowed at junction with blade *M. compacta*
 3. Glumes muticous; sheath of similar width to blade at their junction.
 4. Peduncle glabrous, glandular; florets c. 1/2 as long as glumes; glumes oblong, obtuse, glabrous, 1-3-nerved *M. spiciforma*
 4. Peduncle pilose to hirsute, eglandular; florets c. 1/3 as long as glumes; glumes ovate, subacute, pilose, 1-nerved *M. subspicata*
1. Inflorescence a contracted panicle, the spikelets pedicelled on few branches.
 5. Leaf blades terminating in a pungent spine 0.5-1.5 mm long.
 6. Lemmas 5-7-nerved; paleas 2-keeled and 4-nerved; leaf blades cartilaginous and hairy at base, minutely scaberulous or smooth on margins *M. multinervia*
 6. Lemmas 1-3-nerved; paleas 2-keeled and nerveless; blades even in texture, glabrous, prickly on margins.
 7. Glumes broadly oblong, truncate, dentate, 1-3-nerved; lemmas oblong, obtuse to truncate, entire or dentate on the apical margins, 1-nerved; panicle shortly exserted, eglandular; leaf sheaths 11-13 nerved *M. pungens*
 7. Glumes ovate-oblong, subacute to obtuse or sometimes truncate, entire or denticulate, 1-nerved; lemmas ovate, obtuse, entire, 1-3-nerved; panicle prominently exserted, glandular on divisions; leaf sheaths 7-9-nerved *M. pungens*

5. Leaf blades muticous or firmly acute, lacking a distinct spine.
 8. Lemmas with 6-9 ribbed nerves; palea 5-7-nerved, 2-keeled, undivided; florets usually longer than glumes; grain shortly beaked; leaf sheaths smooth on margins; culms below the sheaths usually ribbed and pallid *M. subulifolia*
 8. Lemmas with 1-4 ribbed or faint nerves; palea usually 2-nerved, 2-keeled, divided to base between keels into 2 equal parts; florets usually shorter than glumes; grain minutely or not beaked; sheaths usually scaberulous on margins; culms below the sheaths usually smooth and brown.
 9. Glumes (midnerve) prolonged into a terete spine 0.2-0.5 mm long *M. spinifera*
 9. Glumes muticous or mucronulate, lacking a distinct spine.
 10. Plant viscid from glandular tubercles on leaf margins, panicle divisions and glumes; leaf sheaths hairy on surface *M. viscidula*
 10. Plant not viscid, eglandular; leaf sheaths hairy about the mouth or glabrous.
 11. Lemmas strongly 3-nerved; grain smooth; leaf blades 3-nerved *M. dunlopia*
 11. Lemmas 0-4-nerved, often faint when more than one; grain striate or wrinkled; leaf blades 1-nerved or 5-7-nerved.
 12. Leaf blades c. 0.3 mm wide, 1-nerved, flattened in the lower part and convolute-involute upwards; panicle 2-3 x 2-4 cm, usually eglandular; ligular hairs usually 0.5-1.3 mm long; lemmas 1-nerved *M. tenuis*
 12. Leaf blades 0.5-1.5 mm wide, 5-7-nerved, flat or with incurved margins; panicle 10-15 x 7-15 mm, glandular; ligular hairs 0.3-0.5 mm long; lemmas 1-4 nerved *M. adamsii*

***Micraira dunlopia* Lazarides, sp. nov.**

Micrairae tenuis Lazarides affinis sed habitu et lemmate aliter formato trinervato, laminis trinervatis, caryopside laevi nitida, flosculis glumis brevioribus, panicula glandulosa plerumque parvior differt.

Typus: Western Australia: Northern Province: *Telford* 6174, 27.vii.77, Wonjarring Gorge, Carson Escarpment, c. 36 km E of new Theda homestead, 14° 49'S, 126° 49'E (holo: CANB; iso: CBG, PERTH).

Mat-forming *perennial* c. 30 cm long or more and < 5 cm high. *Culms* c. 0.8 mm wide (with sheaths), c. 0.5 mm wide (without sheaths), smooth, dark-brown; internodes c. 1 mm long. *Leaves* herbaceous to coriaceous, bright-green, mostly glabrous. *Leaf sheaths* 3-4 x 1 mm, as wide as blade at their junction or slightly wider, thickened and 3-5-nerved along the centre, subhyaline to scarious and nerveless on margins, which widen downwards and enclose the internode at its base, sparsely bearded at the mouth with stiff tubercle-based hairs 1-1.5 mm long and sometimes ciliate on the upper margins; nerves flattened on the upper surface and ribbed on the lower. *Blades* 6.5-9.5 x c. 0.3 mm, flattened in the lower part and conduplicate upwards, acute to subobtuse, slender but stiff, scaberulous on margins and surfaces or partly smooth on the lower surface, 3-nerved with the nerves flattened and prominent on the upper surface, and obscure or partly prominent on the lower. *Ligule* sparsely pubescent and 0.1-0.2 mm long or puberulous-tuberculate or glabrous; collar sometimes partly ciliate with the hairs of the mouth. *Panicle* 1-1.3 cm long and wide, loose, well-exserted, glabrous, with pit-like or crateriform or pustulate glands on peduncle (sometimes on upper part only), axis, branches and pedicels; peduncle terete, glabrous; axis

grooved or ribbed; branches $< 4.5(-9)$ mm long; pedicels mostly 0-2 mm long; pulvini prominent. *Glumes* c. 1 mm long, equal, thinly membranous with subhyaline margins, ovate or broadly oblong, obtuse to truncate, minutely emarginate or entire, mucronulate, with one thickened nerve, scaberulous on apical edge and upper margins otherwise glabrous and smooth. *Florets* $1\frac{1}{2}$ - $2\frac{2}{3}$ as long as glumes. *Lemmas* 0.3-0.5 mm long, membranous, oblong, obtuse or truncate, minutely 3-toothed or entire, muticous or mucronulate, with 3 ribbed closely spaced nerves (all prominent or the laterals faint). *Paleas* c. as long as lemmas, membranous, glabrous, smooth, divided into 2 narrowly oblong, obtuse to truncate parts, nerveless between keels; keels ribbed, slightly excurrent and mucronulate or not. *Anthems* c. 0.8 mm long, greenish-yellow, terminally exerted. *Caryopsis* 0.2-0.5 mm long, subequal to floret, turgid or slightly compressed dorsally, elliptic to obovate, smooth, shiny, obtuse to subacute at apex and base, minutely rostrate, pale or golden brown; embryo basal, c. $\frac{1}{4}$ as long as the grain itself.

The species is known only from a small area in the Kimberleys, Western Australia, where plants grow in crevices, moist and shady sites on steep slopes in rocky gorges.

Micraira dunlopii closely resembles *M. tenuis* Lazarides, but differs in habit, by its 3-nerved differently shaped lemmas, shorter florets relative to the glumes, shiny smooth grain, 3-nerved blades, and glandular usually smaller panicle.

The species is named after Mr C. R. Dunlop, Conservation Commission of the Northern Territory, Darwin (DNA), whose knowledge, collections and co-operation have been invaluable to research on the flora of northern Australia.

Paratypes

Western Australia: Northern Province: *George* 14072, 9.viii.75, Morgan Falls, Drysdale River National Park, $15^{\circ} 02'S$, $126^{\circ} 40'E$ (CANB, PERTH). *George* 13642, 10.viii.75, Orchid Creek, Carson Escarpment, Drysdale River National Park, $14^{\circ} 49'S$, $126^{\circ} 49'E$ (CANB, PERTH). *Lazarides* 8710, 25.iii.78, near Wonjarring Gorge, Carson Escarpment, 10 km E of Theda homestead (CANB). *Kenneally* 4567, 20.viii.75, Euro Gorge, Drysdale River National Park, $15^{\circ} 03'S$, $126^{\circ} 44'E$ (CANB, PERTH).

***Micraira inserta* Lazarides, sp. nov. (Figure 6a-c)**

Distinguitur inflorescentia spiciformi eglandulata glabra foliis superis brevioribus, glumis truncatis late oblongis muticis paucinerviis flosculis multo longioribus, lemmatibus uninerviis, palea divisa, paginis laminarum incrassatarum dissimilibus.

Typus: Northern Territory: Darwin & Gulf District: *Dunlop* 4427, 22.ii.77, Mt Gilruth, $13^{\circ} 04'S$, $133^{\circ} 05'E$ (holo: CANB; iso: BRI, DNA, K, NT).

Mat-forming *perennial*. *Culms* 0.8-1 mm wide (with sheaths), 0.5-0.8 mm wide (without sheaths), blackish-brown and smooth (below sheaths); internodes 0.5-0.8 mm long. *Leaves* rigid, tightly imbricate, mostly glabrous. *Leaf sheaths* 2-3 mm long, as wide as blade at their junction or slightly wider, thickened in the middle part or herbaceous, few-nerved and membranous to hyaline on the margins which widen downwards and enclose the internode at its base, scaberulous along the edges. *Blades* 5-6 mm long, 0.3-0.5 mm wide, subobtusely, sparsely pilose upwards, with thickened white scaberulous edges; upper surface flat, 3-nerved, even in texture, minutely papillose in longitudinal series, green when young; lower surface mostly indurated, white and nerve-like, smooth and obtusely convex in the lower part, more or less keeled and scaberulous in the upper part, the thickened centre separated from the edges by a linear often green depression. *Ligule* ciliate with hairs 0.3-0.5 mm long. *Inflorescence* a spike of sessile or subsessile spikelets. *Spike* 3-4 x 1 mm, overtopped by the upper leaves, eglandular, subtended by a subhyaline, lanceolate, acuminate, glabrous,

1-nerved floral sheath c. 3 mm long; peduncle c. 1 mm long, glabrous; axis triquetrous, scaberulous on the edges, glabrous; pedicels 0-0.5 mm long, stout, compressed, scaberulous on the edges. *Glumes* c. 1 mm long, equal, distinctly longer than lemmas and paleas, thinly membranous, broadly ovate-oblong, truncate, entire, glabrous, scaberulous on the apical edge and upper margins, 1-nerved or the upper sub 3-nerved, midnerve thickened and keeled. *Lemmas* c. 0.5 mm long, membranous, truncate, dentate, glabrous, smooth, with 1 thickened keeled nerve. *Paleas* slightly longer than lemmas, glabrous, smooth, split to base into 2 equal parts, each part notched by the keel; keels prominent. *Anthers* c. 0.8 mm long, well-exserted above lemmas and paleas, yellow or purple. *Caryopsis* not seen.

Only the type collection is known of the species.

The spiciform inflorescence, a feature shared with *Micraira compacta*, *M. spiciforma* and *M. subspicata* is, in contrast to those species, much shorter than the upper leaves and often scarcely visible among the foliage. Also, there are differences between the four species in the morphology and nervation of glumes and lemmas, structure of blades and ligule, and indumentum of the keels.

***Micraira multinervia* Lazarides, sp. nov. (Figure 6e, f)**

Distinguitur lemmate palea foliisque multinervibus, spina laminarum apicali, marginibus laminarum et vaginarum scaberulis vel laevibus, basi laminarum cartilaginea pilosa, divisibus paniculae glandulosis, flosculis et glumis subaequalibus, palea divisa, glumis late ovatis truncatis vel obtusis, integris vel minute emarginatis, saepe latioribus quam longioribus (complanatis).

Typus: Northern Territory: Darwin & Gulf District: *Dunlop* 5634, 29.i.81, top of Jim Jim Falls, 13° 17'S, 132° 51'E (holo: CANB; iso: DNA).

Vigorous mat-forming *perennial* forming compact clumps 10-15 cm high. *Culms* c. 1.5 mm wide (with sheaths), c. 1 mm wide (without sheaths), smooth and brown below sheaths; internodes 1-2 mm long; prophylla densely ciliate on keels and apex. *Leaves* ciliate on margins near ligule otherwise glabrous or almost so. *Sheaths* 4-5 mm long, narrowed to blade at their junction, scarious with membranous margins, minutely and densely scaberulous along the edges, shiny on the upper surface, many-nerved (nerves 8-9, more or less flattened, prominent on the upper surface); margins nerveless, widened downwards and enclosing the internode at its base. *Blades* pungent with an apical spine 0.8-1 mm long, 9-12.5 mm long (including spine), c. 1.3 mm wide (near base), coriaceous to hardened, rigid, triangular, long-acuminate, involute near apex otherwise flat, 7-9-nerved (nerves thickened, ribbed, scaberulous along their edges), similar on both surfaces though the lower appearing smooth, with thickened, minutely and sparsely scaberulous to smooth margins; the basal part of the blades different to the upper, somewhat cartilaginous, sparsely hairy, ciliate on the edges. *Ligule* c. 0.2 mm long, densely ciliate with white silky hairs. *Panicle* c. 1 x 0.3-1 cm, finally loose, prominently exserted, glabrous, smooth, with crateriform or depressed glands on peduncle (close below panicle), axis and divisions; peduncle and axis striate to ribbed, grooved; branches and pedicels triquetrous or compressed; branches <5 mm and pedicels 0.1-0.8 mm long. *Glumes* 0.5-1 mm long, equal, membranous to scarious, broadly ovate, obtuse to truncate, often wider than long (flattened), entire or minutely notched, mucronulate from the midnerve or muticous, glabrous, smooth, with one thickened nerve or rarely the lower glume 2-nerved. *Florets* as long as glumes or slightly longer. *Lemmas* 0.5-1 mm long, membranous, ovate-oblong, obtuse to truncate, minutely notched or emarginate, glabrous, with 5-7 thickened ribbed nerves. *Paleas* as long as lemmas, similar in texture and indumentum, with 2 thickened ribbed keels and 4 similar or thinner nerves (2 intercarinal and one between each keel and margin), the palea splitting into 2 equal parts when fruit present. *Anthers*

c. 0.8 mm long, purple, well-exserted above florets. *Caryopsis* 0.5-0.6 x 0.3-0.5 mm, elliptic or oblong-elliptic, subacute or obtuse at apex and base, minutely beaked, pale brown, striolate, flattened near the hilum otherwise turgid, embryo obliquely basal.

Though resembling *Micraira pungens* and *M. dentata*, *M. multinervia* is the only species of the 12 in the Northern Territory and Western Australia with a many-nerved lemma and palea. In this feature and in the scaberulous to smooth (not prickly) margins of the blades, it resembles *M. subulifolia*, which is considered to be a disjunct species as mentioned previously. However, *M. multinervia* differs from *M. subulifolia* by the apical spine on its blades, the divided palea and the subequal florets and glumes.

Micraira multinervia is relatively widespread in the Northern Territory on the sandstone plateau of Arnhem Land and adjacent areas, growing in crevices and moist sites on rocky slopes and pavements.

Paratypes

Northern Territory: Darwin & Gulf District: *Martensz & Schodde* AE 592, 25.i.73, 2-3 miles N of El Sharana (c. 1 mile due E of old mine) (CANB). *Lazarides* 9067, 29.v.80, tributary of Deaf Adder Creek, 17.5 km NE of Jim Jim Falls, 13° 08'S, 132° 56'E (holo: CANB).

Though sterile, the following collections are believed to belong to *Micraira multinervia*:- Northern Territory: Darwin & Gulf District; *Gaff* s.n., viii.73, Site 40, Nourlangie Rock area (CANB 249548). *Lazarides* 7609B, 12.vii.72, Query 101, Arnhem Land, 13° 07'S, 133° 09'E (CANB). *Telford* 7970, 22.iv.80, Deaf Adder Creek gorge, 13° 07'S, 132° 56'E (CANB, CBG). *Rankin* 1970, 19.iv.70, Koongarra area, 12° 51'S, 132° 51'E (AD, CANB, DNA). *Rice* 2544, 26.v.78, Koongarra, 12° 51'S, 132° 50'E (CANB).

Micraira spiciforma Lazarides, sp. nov. (Figure 5e-h)

Distinguitur inflorescentia spiciformi exserta, pedunculo glabro glanduloso, glumis exspinosus, glumis et lemmatibus 1-3-nervibus, palea divisa enervi bicarinata carinis laevibus, flosculis glumis duplo brevioribus, foliis pilosis vel hirsutis pilis simplicibus et tuberculis portatis, laminis et vaginis ad juncturam latitudinum similarium, ligula glabra incrassata.

Typus: Western Australia: Northern Province: *Dunlop* 5298, 24.ii.80, Mitchell Plateau, Lat. 14° 50', Long. 125° 42' (holo: CANB; iso: BRI, CANB, DNA, K, MEL, NSW, NT, PERTH).

Mat-forming *perennial* usually 2-5 cm high; prop roots common. *Culms* c. 1 mm wide (with sheaths), c. 0.5 mm wide (without sheaths), brown and smooth below sheaths; internodes c. 0.5 mm long. *Leaves* herbaceous, pilose to hirsute with stiff, simple and tubercle-based hairs on blades (both surfaces) and sometimes on sheath near ligule. *Leaf sheaths* 2-3 mm long, usually glabrous, with 3 ribbed often green nerves, colourless and subhyaline on the margins which widen downwards and enclose the internode, sparsely scaberulous on the edges upwards, attenuate (of similar width) with blade at their junction. *Blades* 4-5 x 0.4-0.5 mm, flat, closely 3-5-nerved between the thickened margins (midnerve thicker than laterals), acute, stiffly hairy and tubercled on both surfaces, tubercled-scabrous-hairy on the edges. *Ligule* a tubercular-thickened ridge, glabrous or sparsely puberulous; collar somewhat thickened (like ligule), glabrous. *Inflorescence* a compact spike of 5-7 subsessile spikelets, 3-4 x c. 1 mm, finally well-exserted; peduncle filiform, glabrous, with a few crateriform, pit-like or depressed glands in the upper part; axis and pedicels triquetrous, smooth, glabrous, eglandular, pedicels c. 0.3 mm long. *Glumes* c. 1 mm long, equal, membranous, oblong, obtuse, entire or minutely emarginate, muticous, minutely scaberulous on apical edges and upper margins, otherwise glabrous and smooth, 1-3-nerved with the laterals often obscure

in the lower or both glumes. *Florets* c. 0.5 mm long and c. $\frac{1}{2}$ as long as the glumes or somewhat less. *Lemmas* subhyaline, narrowly lanceolate, obtuse, minutely emarginate, thinly and closely 1-3-nerved, glabrous, smooth. *Paleas* similar to lemmas in texture and indumentum, 2-keeled (otherwise nerveless), divided into 2 equal narrowly oblong, entire or minutely notched parts; keels smooth. *Anthers* 0.5-0.6 mm long, yellow, well-exserted terminally. *Caryopsis* c. 0.5 mm long and more or less equal to floret, elliptic, obtuse, acute at base, turgid though flattened about the hilum, smooth, glossy, pale brown, minutely rostrate; embryo basal; hilum central.

Micraira spiciforma is known only from the type collection, but is clearly distinct from allied species with a spike, viz. *M. inserta*, *M. compacta* and *M. subspicata*. It is distinguished by the following characters in combination — spineless glumes, glabrous glandular peduncle, pilose to hirsute leaves, more or less glabrous thickened ligule, attenuate sheaths and blades, 1-3-nerved glumes and lemmas, short florets relative to the glumes, and nerveless paleas with smooth keels.

***Micraira viscidula* Lazarides, sp. nov. (Figures 5a-d, 6d)**

Distinguitur praesentia tuberculorum glandulorum alborum vel translucetium in glumis, marginibus foliorum, pedunculo axe ramis pedicellisue paniculae, vaginis foliorum et glumis pilosis, lemmatibus obtuse tridentatis, foliis glumis lemmatibusque trinerviis, flosculis glumis duplo brevioribus vel minoribus.

Typus: Northern Territory: Darwin & Gulf District: *Dunlop* 4975, 11.vii.78, c. 8 km SW of Oenpelli, Lat. 12° 23', Long. 133° 01' (holo: CANB; iso: AD, BRI, DNA, K, MEL, NSW, NT, PERTH).

Mat-forming viscid *perennial* several metres long; prop roots common. *Culms* c. 0.8 mm wide (with sheaths), c. 0.5 mm wide (without sheaths), glabrous, not ribbed, brown, entirely covered by the overlapping leaf sheaths; internodes c. 1 mm long. *Leaves* thinly herbaceous, 5-nerved, with short simple hairs especially on sheaths. *Leaf sheaths* loose, slightly wider than the blades at their junction, with hyaline margins. *Blades* c. 10 x 0.5 mm, longer than sheaths, flat, abruptly acute or subobtuse, hairy on both surfaces, with a prominent row of colourless glandular tubercles along margins; ligule of sparse minute hairs; collar glabrous. *Panicle* c. 1.5 cm long and wide, open, glabrous on the divisions, with glandular often white tubercles or striations on peduncle, axis, branches and pedicels; primary branches <5 mm long; pedicels <3 mm long. *Glumes* 1.3-1.5 mm long, equal or the upper slightly wider than lower, at least twice as long as florets, lanceolate, acuminate, muticous, membranous with thinner margins, sparsely hairy, with glandular tubercles mostly in the upper part and 3 ribbed nerves. *Lemmas* c. 0.5 mm long, membranous with thinner margins, glabrous, smooth, obtusely 3-toothed, with 3 ribbed nerves. *Paleas* c. as long as lemmas and similar in texture and indumentum, strongly keeled, nerveless between keels, divided into 2 equal parts, each part notched by the slightly shorter keel. *Anthers* c. 0.5 mm long. *Caryopsis* c. 0.5 x 0.3 mm, subequal to lemma and palea, elliptic, subacute at apex and base, scarcely compressed, striolate, embryo basal and very small.

The glandular, white or translucent tubercles on leaf margins, panicle divisions and glumes are a unique feature in the genus. Also, leaf sheaths are glabrous in most other species. Other significant characters include the 3-nerved sheaths, blades, glumes and lemmas, the nerveless paleas, and the short florets relative to glumes.

Though all the specimens examined match the holotype in most respects, *Dunlop* 4906 differs in its shorter, blunter glumes and their shorter length relative to the florets.

The species is known at present only from the Oenpelli-Mt Gilruth area of the Northern Territory and plants seem to favour sheltered or partially shady habitats.

Specimens examined. NORTHERN TERRITORY: Darwin & Gulf District: Gaff s.n., 4. vii.73, Arnhem Land, 26 miles N of junction of Oenpelli and Nourlangie Rock roads (CANB). Latz 7842, 13.vi.78, 44 km SE of Oenpelli, 12° 34', 133° 23' (BRI, CANB, NSW, NT). Dunlop 4906, 7.vi.78, Mt Gilruth area, 13° 03', 133° 01' (BRI, CANB, DNA, NT).

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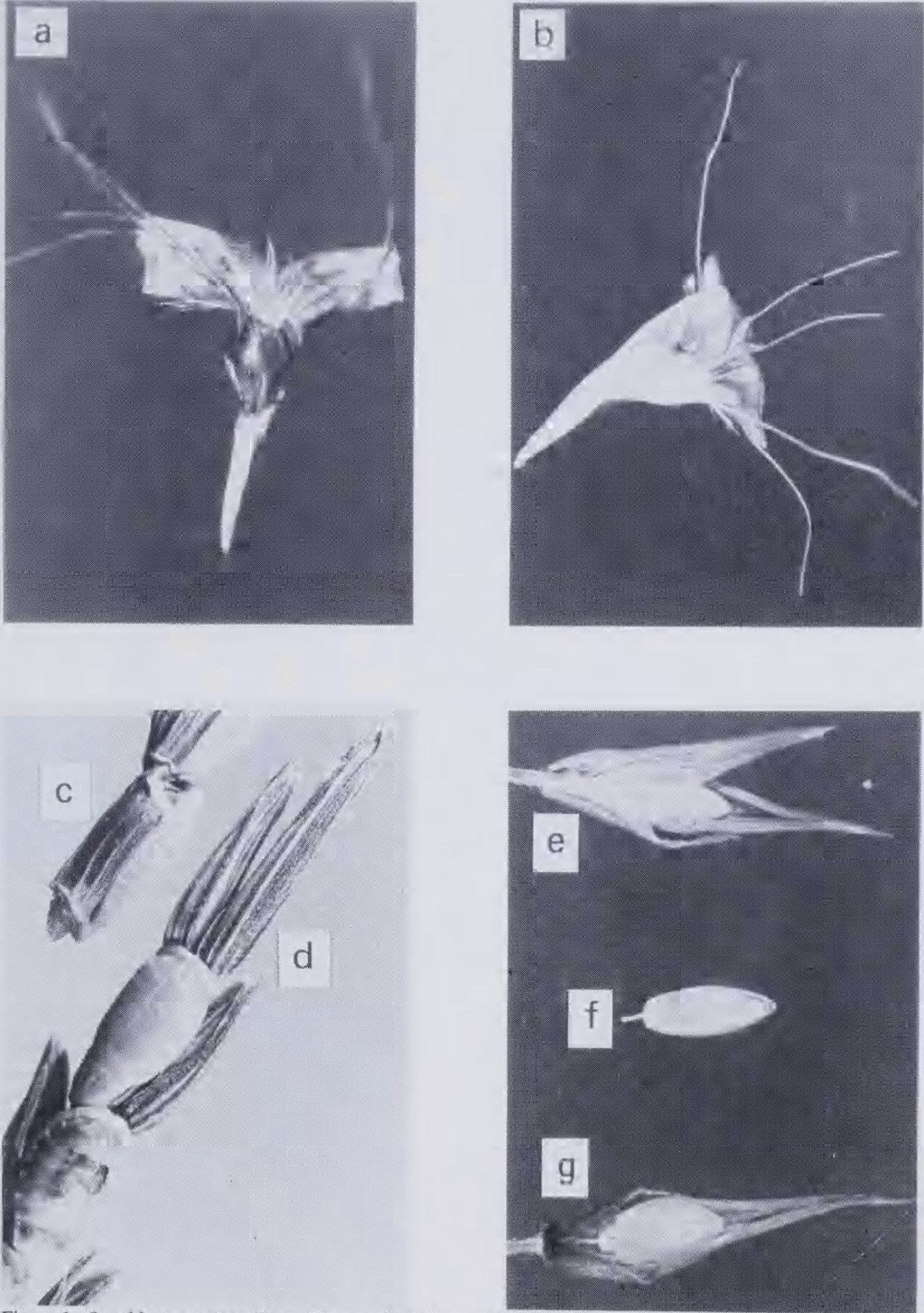


Figure 1. *Oxychloris scariosa* (from Maconochie 64). a — Florets x10. b — Spikelet x10. *Heteropholis annua* (from holotype). c-d — Parts of raceme x8, showing sessile and pedicelled spikelets, terminal pair of spikelets and rachis internode. *Arthragrostis deschampsoides* (from Lazarides 4212). e — Spikelet x13. f — Fertile floret x13. g — Spikelet with upper glume removed x13.

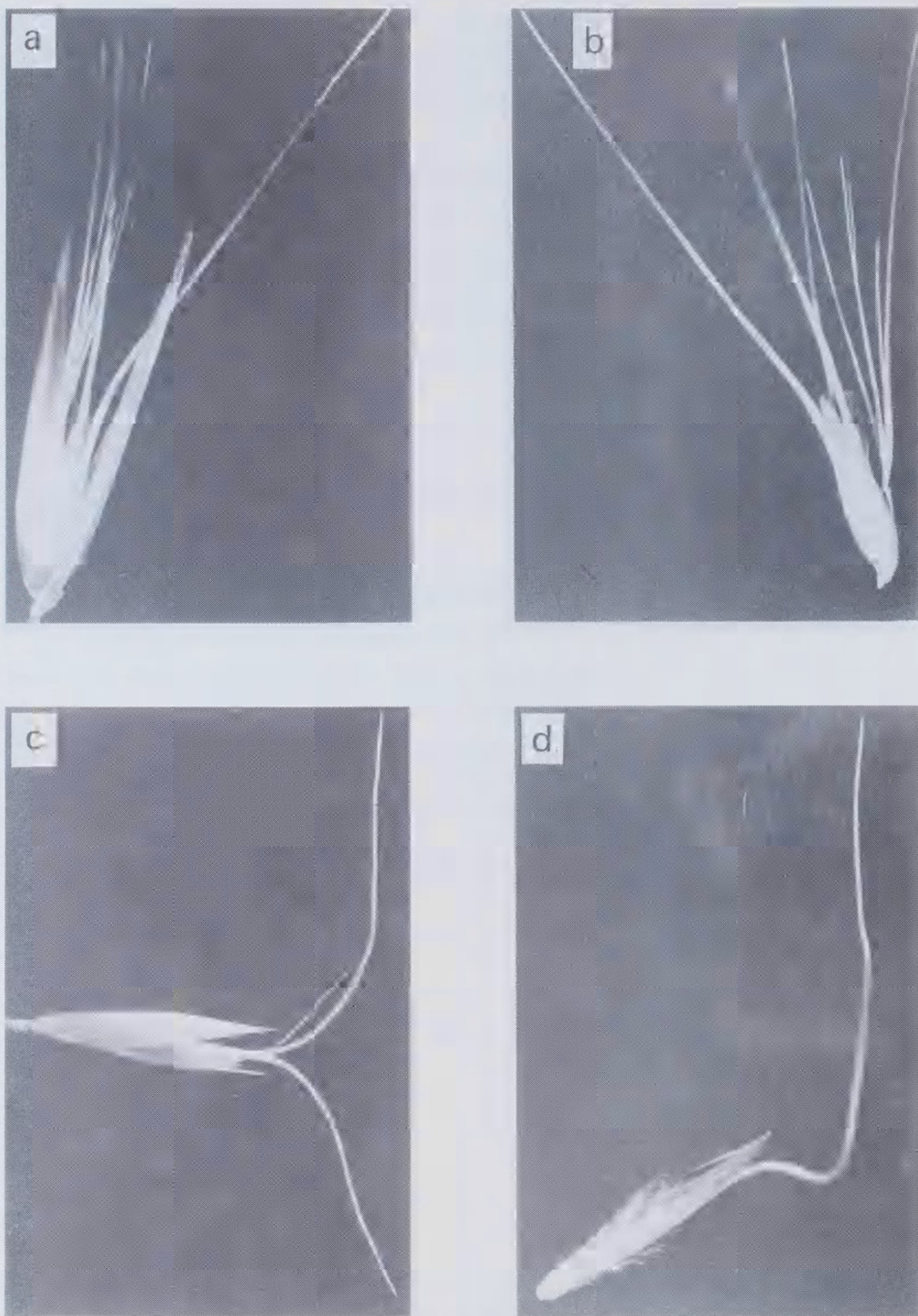


Figure 2. *Plectrachne mollis* (from holotype). a — Spikelet x10. b — Fertile and sterile florets x12. *Plectrachne uniaristata* (from holotype). c — Spikelet x9. d — Floret x10.

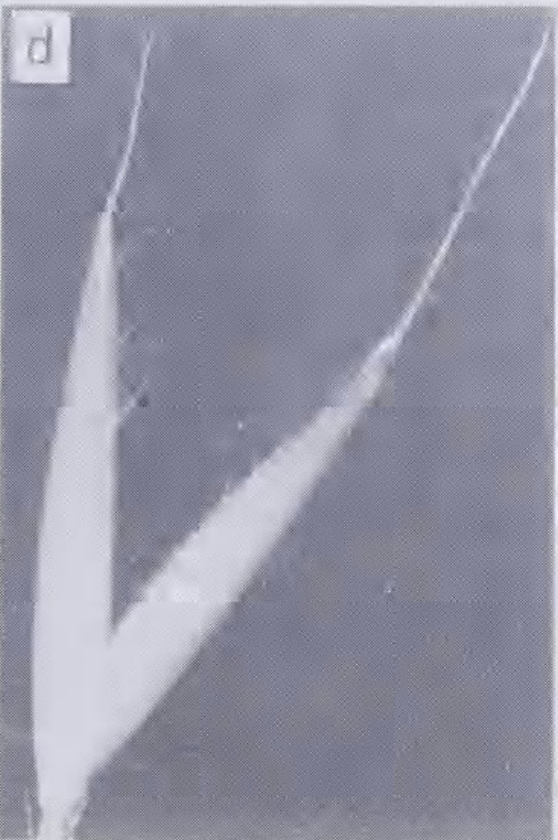


Figure 3. *Plectrachne aristiglumis* (from holotype). a — Spikelet x6. b — Glumes x6. *Plectrachne contorta* (from holotype). c — Spikelet x10. d — Glumes x10.

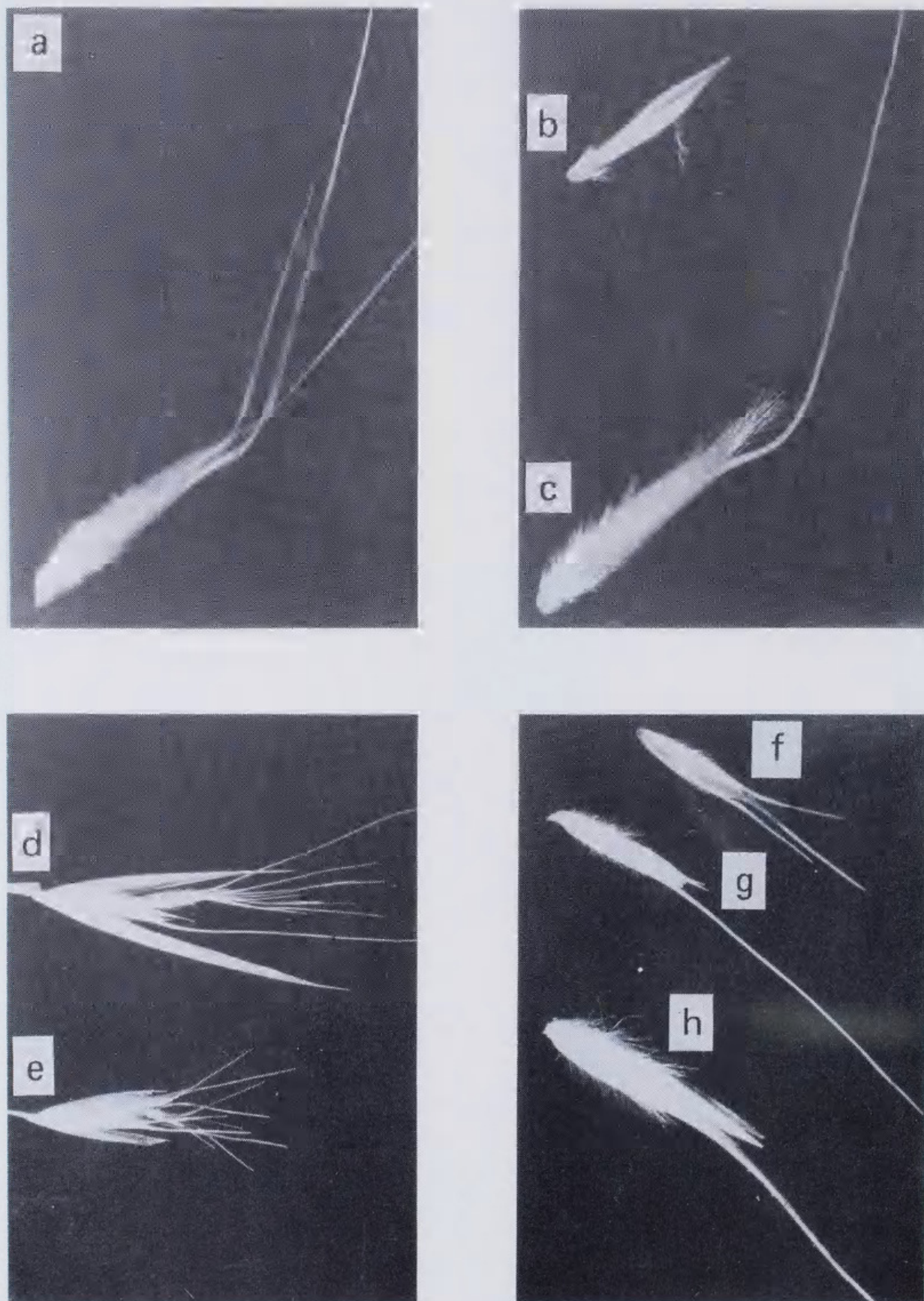


Figure 4. *Plectrachne aristiglumis* (from holotype). a — Floret x7. *Plectrachne contorta* (from holotype). b — Palea x10. c — Floret x10. *Plectrachne bynoei*. d — Spikelet x6 (from holotype). e — Spikelet x6 (from Lazarides 6712). f — Basal (fertile) floret x15 (from Lazarides 6712). g — Basal (fertile) floret x15 (from holotype). h — Basal (fertile) floret x15 (from Beauglehole 51894).

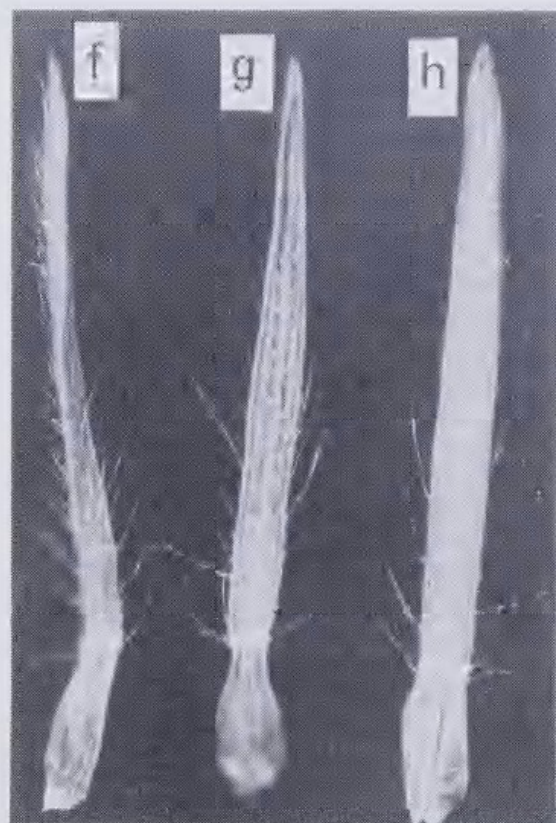
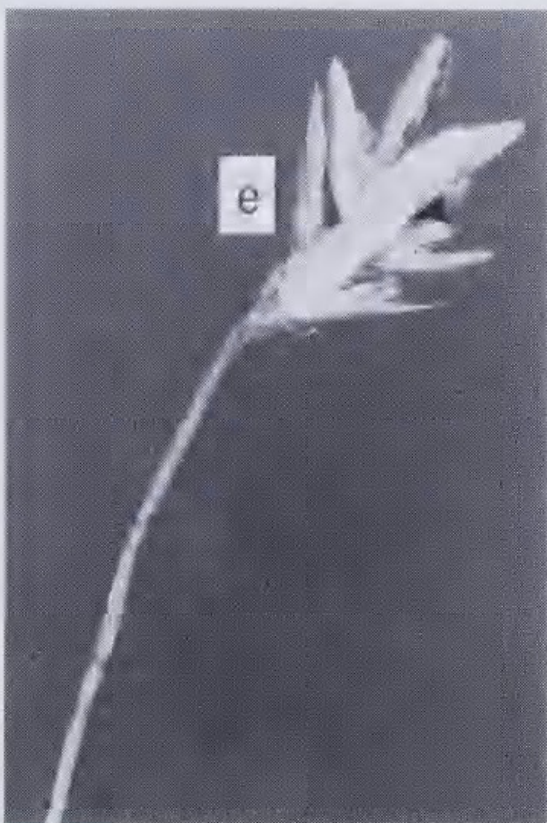
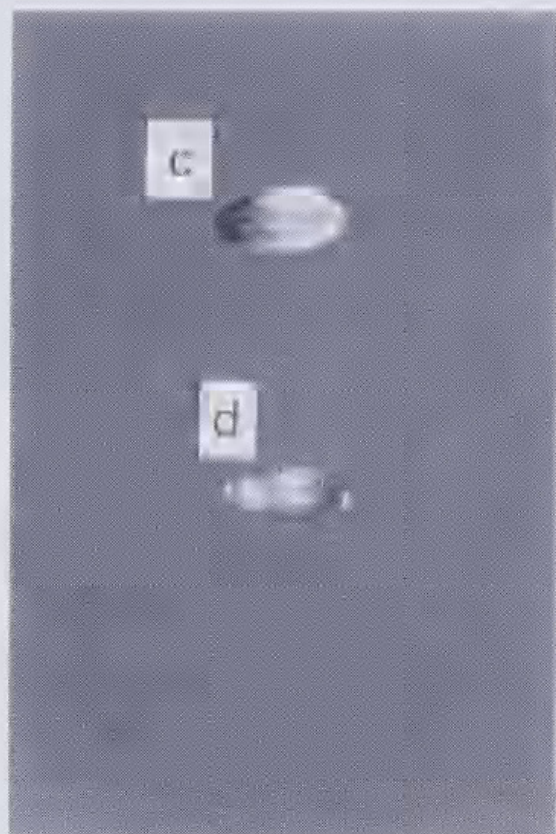
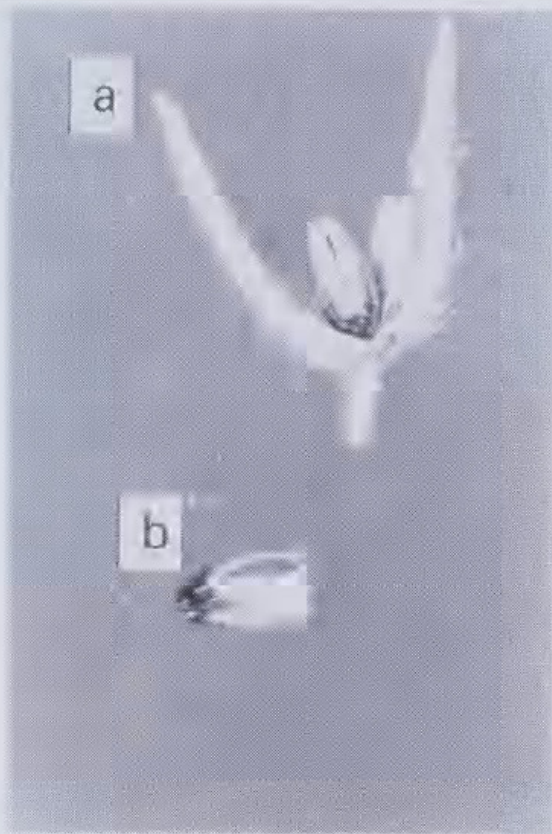


Figure 5. *Micraira viscidula* (from holotype). a — Spikelet x30. b — Floret x30. c — Floret (lemma) x30. d — Caryopsis x30. *Micraira spiciforma* (from holotype). e — Spike and peduncle x25. f-h — Leaves x16.

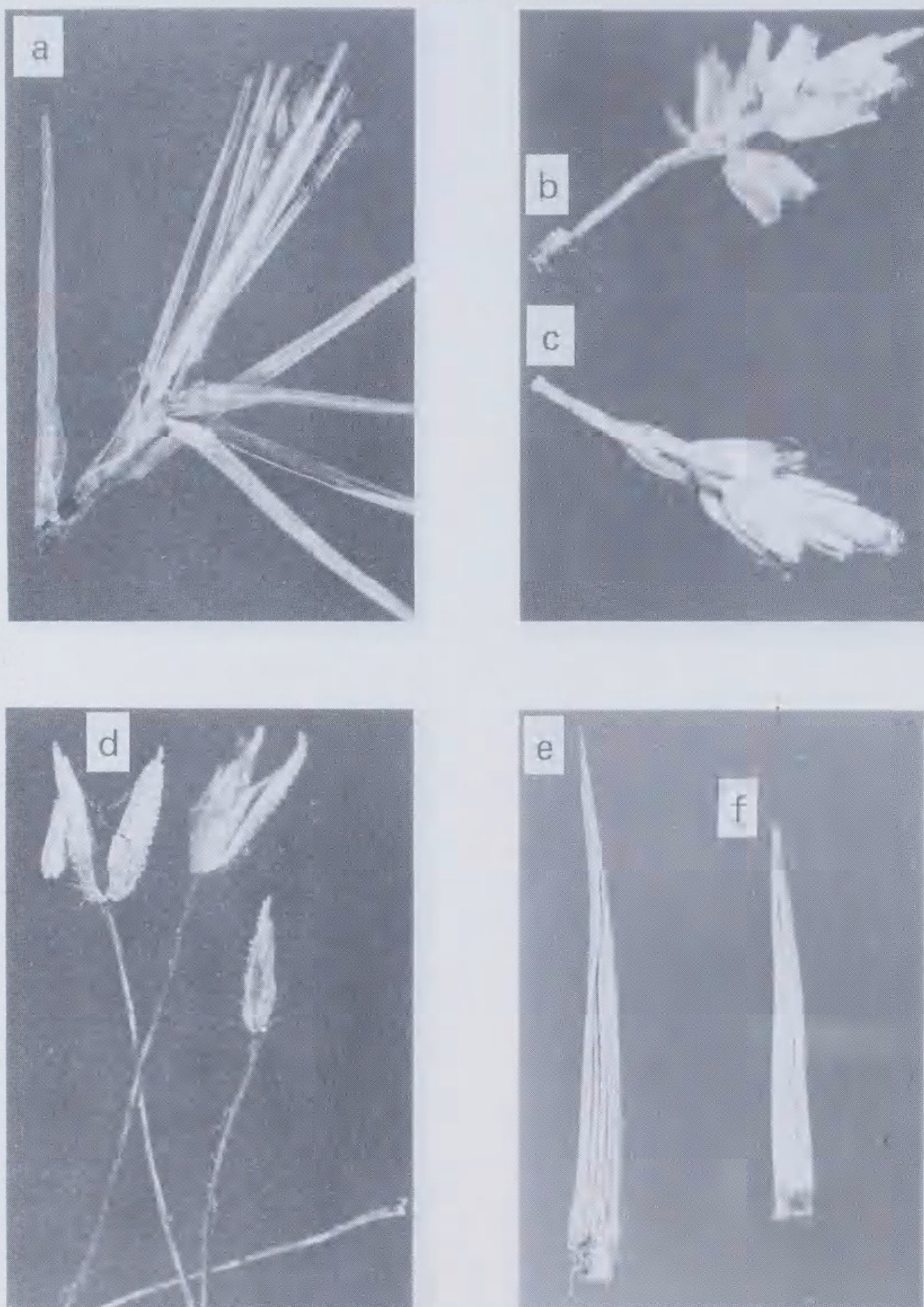


Figure 6. *Micraira inserta* (from holotype). a — Inflorescence and upper leaves x10. b-c — Spikes with leaves removed x15. *Micraira viscidula* (from holotype). d — Glumes and pedicels x20. *Micraira multinervia* (from holotype). e-f — Blades x8.

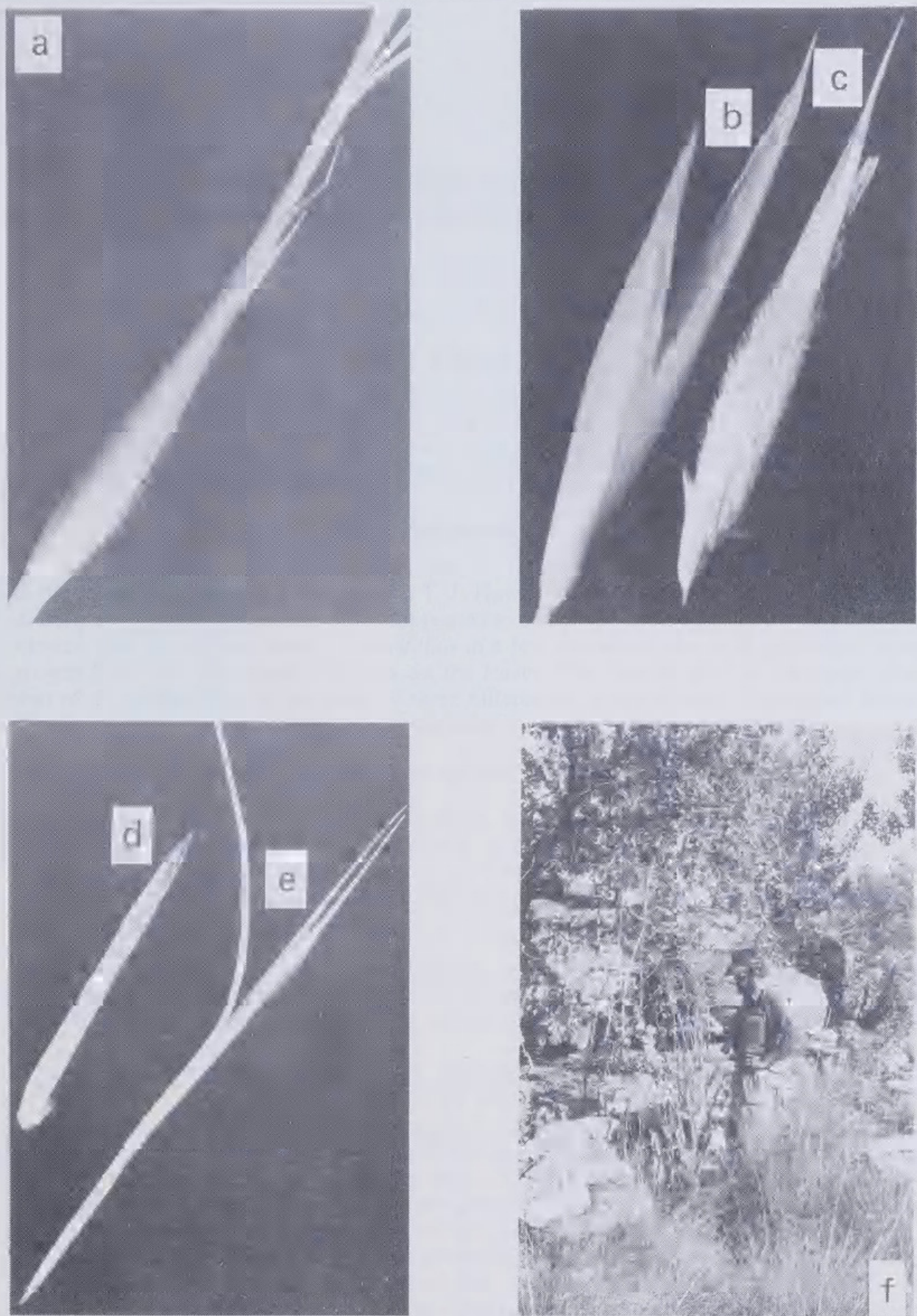


Figure 7. *Symplectrodia lanosa* (from holotype). a — Spikelet (excluding awns) x10. b — Glumes x10. c — Floret x10. d — Palea of fertile floret and rhachilla internode x7. e — First sterile floret and rhachilla internode x7. *Heteropholis annua*. f — field photo by K. F. Kenneally.



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