

## A NEW SPECIES OF *MICRAIRA* (POACEAE: MICRAIREAE) FROM NORTHERN WESTERN AUSTRALIA.

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### ABSTRACT

*Micraira* is an unusual genus of "resurrection" grasses endemic to Australia. During fieldwork in northern Western Australia in 1993, vegetative material of a suspected undescribed species of *Micraira* was collected. Examination of flowering material, gathered from plants grown in cultivation, confirmed that this was indeed a new species, which is here described and illustrated as *Micraira lazaridis* n.sp. A key to the spicate species of *Micraira* is provided, and the new species is compared with the other spicate taxa, using both gross morphological and leaf anatomical characters.

KEYWORDS: Poaceae, *Micraira*, new species, identification key, Australia, Western Australia.

### INTRODUCTION

*Micraira* F. Muell. is a genus of typically diminutive, moss-like, mat-forming grasses endemic to Australia. The type species, *M. subulifolia* F. Muell., is restricted to Queensland, whereas the remaining 13 described species (including *M. lazaridis*) are narrow endemics within the monsoon zones of the Northern Territory and Western Australia (Lazarides 1984). Species of *Micraira* are extraordinary in several respects. Perhaps most notable is their ecological behavior as resurrection plants, whereby they rapidly green and flower from a desiccated state upon receiving rainfall (Gaff and Latz 1978). In addition, the genus exhibits spiral phyllotaxy and has an unusual palea structure (Lazarides 1979, 1984). The most common habit adopted by the species of *Micraira* is the mat form in which a dense interlocking mat of stems is formed. On occasion, however, colonies on strongly fire-protected pavements can develop into hummocks up to c. 1 m tall.

During an expedition to Western Australia in 1993, additional vegetative material of a suspected undescribed species of *Micraira* was collected by J. Stewart, J. Wendel and E. Edwards. Flowering material gathered from plants grown in cultivation confirmed that this was indeed a new species, which is here described and illustrated. We deemed it appropriate to name this species in honor of Michael (Mike) Lazarides, who has studied this genus and described the majority of its species. A key to the spicate species of *Micraira* is provided, and the new species is compared with other spicate taxa.

### MATERIALS AND METHODS

Leaf anatomical studies were conducted in addition to routine examinations and comparisons of gross morphology. Leaf sections from herbarium specimens were softened with Pohl's solution (Pohl 1965), hand-sectioned, and mounted in lactophenol/aniline blue solution (Sass 1958).

## SYSTEMATICS

*Micraira* F. Muell

Key to the spicate species of *Micraira* (adapted from Lazarides 1984)

1. a Spike shorter than and obscured by the upper leaves ..... 2
- b Spike prominently exerted above the upper leaves ..... 3
2. a Leaf blades 5-6 mm long; glume apex entire, scaberulous ..... *M. inserta*
- b Leaf blades 1.8-3.7 mm long; glume apex emarginate, ciliate. *M. lazaridis* sp. nov.
3. a Glumes terminating a flattened spine c. 0.5 mm long; leaf sheath abruptly narrowed at junction with blade *M. compacta*
- b Glumes muticous; sheath of similar width to blade at their junction ..... 4
4. a Peduncle glabrous, glandular; florest c. 1/2 as long as glumes; glumes oblong, obtuse, glabrous, 1-3 nerved ..... *M. spiciforma*
- b Peduncle pilose to hirsute, eglandular; florest c. 1/3 as long as glumes; glumes ovate, sub-acute, pilose, 1-nerved ..... *M. subspicata*

*Micraira lazaridis*

L. G. Clark, Wendel & Craven, sp. nov.

(Figs 1-3, Plate 1)

Culmi aërii ramosi. Folia numerosa in verticillis condensatis disposita; laminae 1.8-3.7 mm longae, 0.3-0.4 mm latae, trinervatae. Inflorescentia spicata eglandulata foliis superata. Spiculae 1-1.4 mm longae. Glumae ovatae emarginatae ciliatae flosculis longiores.

TYPUS: Australia: Australian Capital Territory: cultivated in greenhouse at Canberra, ACT, 7 September 1993, *Craven 9344* (holotype: CANB; isotypes: A, BRI, DNA, ISC, K, L, MEL, NSW, PERTH). (Provenance: Western Australia, sandstone pavement adjacent to crossing of King Edward River on road to Mitchell Plateau. Voucher: *Stewart, Wendel and Edwards 9253*).

Other specimens examined. AUSTRALIA: Western Australia: Mitchell Plateau, lat. 14°50' S, long. 125°38'E, 26 February 1980, *Dunlop 5312* (CANB); King Edward River at Mitchell Plateau road crossing (Amax Crossing), lat. c. 14°53'S, long. 126°12'E, 2 June 1971, *Byrnes 2196* (BRI, DNA), 29 February 1980, *Dunlop*

*5363* (CANB), 1 March 1980, *Dunlop 5415* (CANB), 26 May 1993, *Stewart, Wendel and Edwards 9253* (CANB, PERTH). Australian Capital Territory: cultivated in greenhouse at Canberra, 13 February 1987, *Craven 8444* (CANB) (Provenance: Western Australia, Mitchell Plateau road crossing of King Edward River, leg. Craven, July 1984); *ditto*, 11 August 1993, *Craven 9343* (CANB, ISC) (Provenance: Western Australia, sandstone pavement adjacent to crossing of King Edward River on road to Mitchell Plateau, *Stewart, Wendel and Edwards 9253*). UNITED STATES: Iowa: Story Co.: Ames, campus of Iowa State University, cultivated in R. W. Pohl Conservatory, 18 July 1992, *Clark 1157* (ISC) (Provenance and voucher details as for *Craven 9343*).

Description. Mat-forming perennial with prop roots 3-8 cm long. Culms 0.5-0.9 mm wide (with sheaths), 0.4-0.6 mm wide (without sheaths), dark brown and smooth (below sheaths); aerial culms 3-11 cm tall, extensively branched; internodes 1-1.5 mm long, completely covered by the imbricate, persistent leaf sheaths. Leaves numerous in tightly condensed, terminal whorls; sheaths 0.8-1.0 (-1.5) mm long, as wide as blade at their junction, 3-nerved, the midnerve well developed and cartilaginous, the lateral nerves thin, the internerve areas green to hyaline, the margins as broad as the strip bounded by the nerves, membranous to hyaline, widening downwards, enclosing the internode at the base; blades 1.8-3.7 mm long, 0.3-0.4 mm wide, 2-3 times as long as the sheath, subobtusate, 3-nerved, green when young, adaxially flat, sparsely pilose between the nerves, the midnerve as wide as the margins, whitish, abaxially keeled, pilose between the nerves, the nerves scabrous, the midnerve prominent, whitish, twice as wide as the margins, the margins cartilaginous, whitish, scabrous; auricles absent; ligule a line of cilia ca. 0.2 mm long. Inflorescence a spike of sessile or subsessile spikelets, 1.6-2.0 mm long, usually 5-6 spikelets per spike, completely overtopped and hidden by the whorl of leaves, subtended by a single, keeled bract ca. 1.5 mm long; peduncle eglandular, virtually absent; only pedicel of terminal spikelet developed, this 0.2 mm long. Spikelets 1-1.4 mm long, usually 2-flowered, both florets apparently bisexual, laterally compressed; glumes 1-1.4 mm long, equal, longer than the florets, membranous, ovate, obtuse, emarginate, upper margins ciliate, 1- or 3-nerved, the midnerve slightly wider than the somewhat



**Plate 1.** *Micraira lazaridis* n. sp. **A**, plant prior to commencement of irrigation; **B**, Plant seven days after commencement of irrigation; **C**, Close-up of inflorescence, whorl is 7 mm in diameter. (Material of Stewart *et al.* 9253 in cultivation. Photo credits: **A**, J. Faulkner; **B**, G. Brown; **C**, S. Craig.)



obscure lateral nerves and somewhat keeled, the internerve areas green to hyaline, the margins broad, hyaline; *lemmas* 0.35-0.5 mm long, membranous; *paleas* 0.3-0.5 mm long, membranous. *Stamens* 2; anthers 0.9-1.1 mm long, reddish-purple before anthesis, becoming yellow at anthesis, exserted above the leaf whorl. *Stigmas* 2, exserted before the anthers. *Caryopsis* 0.4 mm long, broadly ellipsoid.

**Distribution and ecology.** Western Australia: the Mitchell Plateau area in the Kimberley region (Fig. 1).

Recorded as occurring in shallow sand on sandstone pavement. The flowering period in nature is unknown.

**Remarks.** *Micraira lazaridis* is characterized by its relatively tall, profusely branched aerial culms; extremely condensed whorls of leaves; three-nerved leaf blades 1.8-3.7 mm long abaxially with a prominent, keeled midnerve; highly reduced spicate inflorescence not exserted above the upper leaves; and emarginate, apically ciliate glumes that are longer than the florets (Table 1). With respect to the leaves and inflorescences, this species appears to be among the most reduced within the genus, although it has larger and more profusely

branched aerial culms than some of the other species (Figs 2-3, Plate 1).

It is noted on the label for *Craven 9343* that "foliage became green two days after watering commenced, and first flowers appeared five days later." Plants grown at Iowa State University also greened and flowered from a desiccated state within several days of initial watering. The translucent stigmas exserted first, and withered by the time the stamens shed their pollen. These observations suggest that the species is protogynous.

Renvoize (1986) examined transverse leaf anatomy and leaf epidermal micromorphology of two species, *M. subulifolia* and *M. subspicata* Lazarides. He concluded that the leaf anatomy sufficiently resembled that of the Arundineae to warrant the inclusion of the Micraireae in the same subfamily, the Arundinoideae. A starch test confirmed the presence of the  $C_3$  photosynthetic pathway. We examined the transverse leaf anatomy of *M. lazaridis* and three other species with spicate inflorescences for which material was available. Renvoize (1986) noted that the primary (or central) bundle was scarcely larger than the other bundles, and this holds true in the four species in our survey (Figure 3). He also

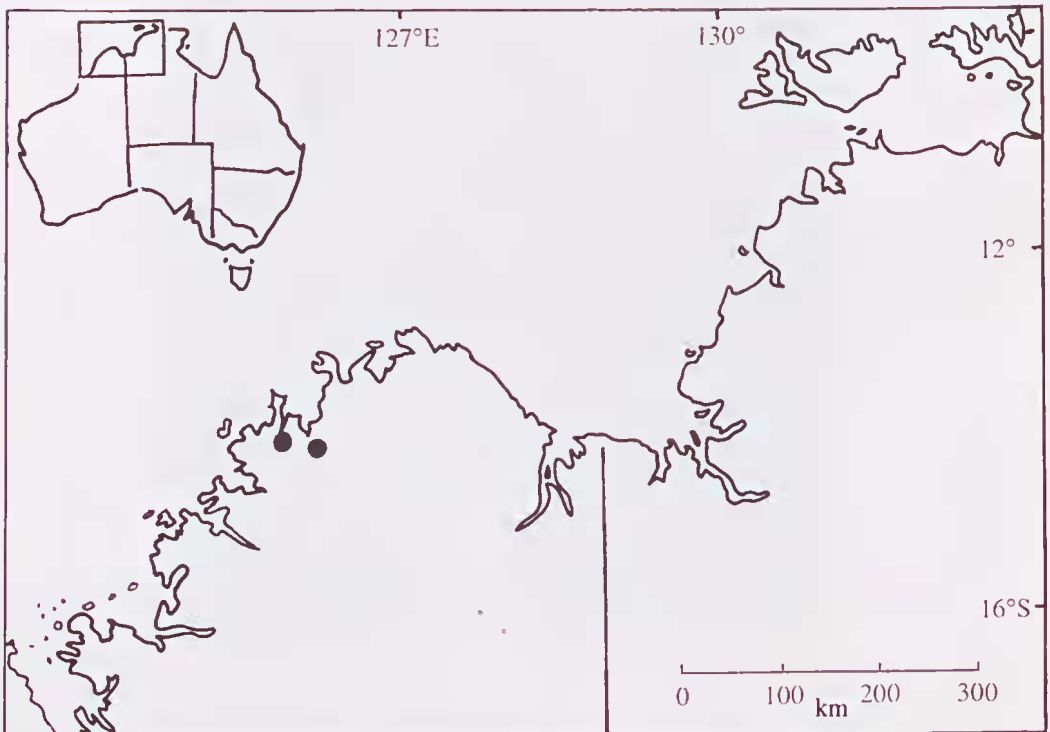


Fig. 1. Distribution of indigenous populations of *Micraira lazaridis* n.sp.

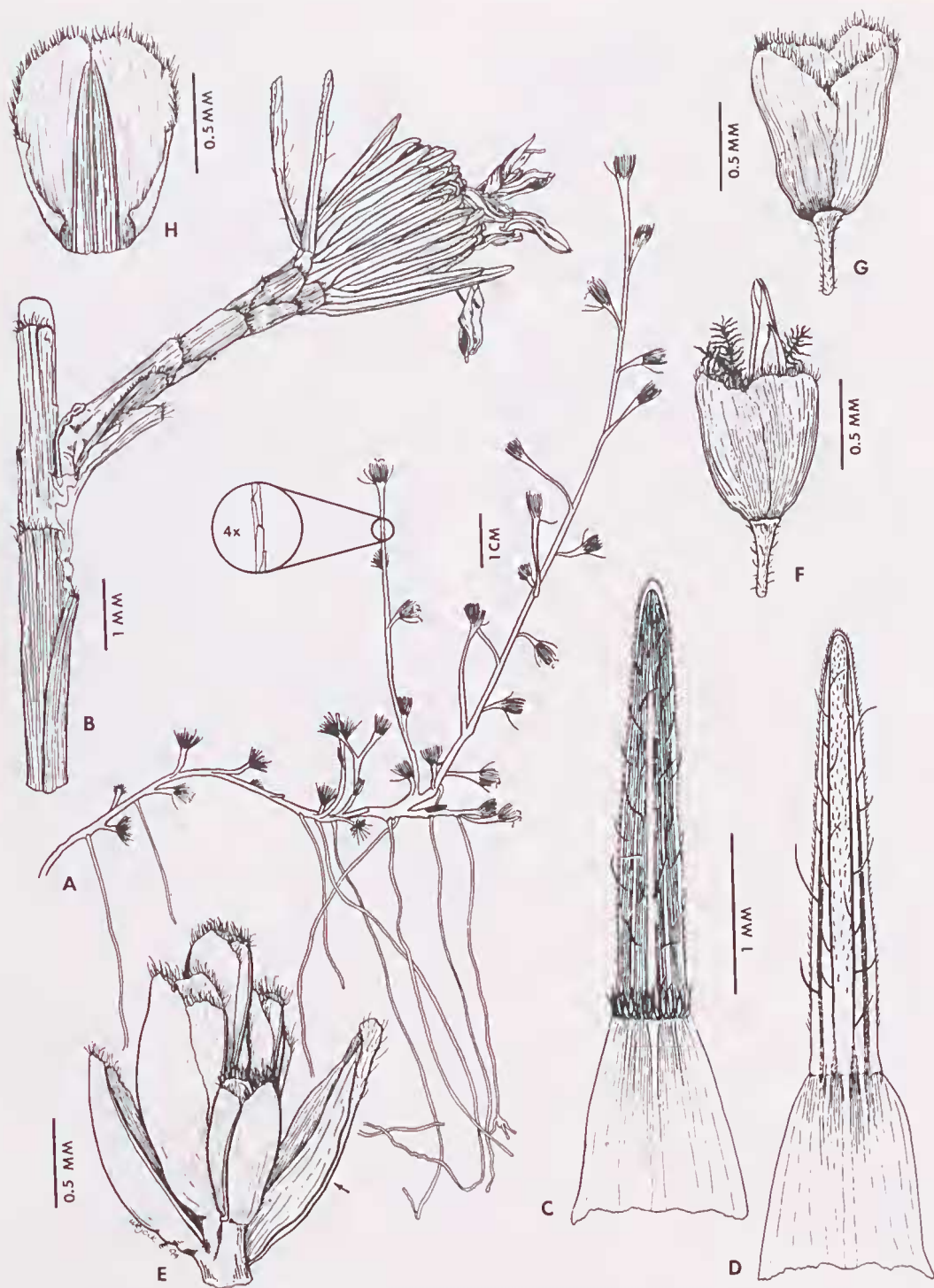


Fig. 2. *Micraira lazaridis* n.sp. A, habit; B, branch with leaf cluster and exserted stamens; C, leaf, adaxial view; D, leaf, abaxial view; E, Inflorescence with subtending bract (arrow); F, spikelet with exserted stigmas and young stamens; G, spikelet; H, glume, adaxial view. (A, based on material of *Stewart et al.* 9253 in cultivation; B-H, based on *Clark 1157*. Del. J. Wojcik.)

noted the presence of a broad sclerenchyma girder below the bundles linking them to the abaxial epidermis, and that girders above the bundles could be absent, or, if present, could be smaller than the lower girders. We observed this in *M. compacta* Lazarides, *M. spiciforma* Lazarides, and *M. inserta* Lazarides (Figure 3A, C-D). In *M. lazaridis*, however, there are no girders in direct contact with the bundles, although sclerenchyma is present (Figure 3B).

The four species shown here are easily distinguished by their transverse leaf anatomy. Three of them, *M. lazaridis*, *M. inserta*, and *M. spiciforma*, have densely packed chlorenchyma with no obvious intercellular spaces (Figure 3B-D). The fourth species, *M. compacta*, shares the densely packed chlorenchyma but has well developed spaces on both sides of each bundle that are reminiscent of fusoid cells in bamboos (Figure 3A). The presence of a palisade-like arrangement in the chlorenchyma adjacent to the adaxial epidermis was noted in *M. compacta*, *M. lazaridis*, and *M. inserta*. *Micraira lazaridis* is distinguished by its narrow blades with the prominent keel, and the lack of any connection between sclerenchyma bands and vascular bundles. *Micraira inserta* has a massive sclerenchyma girder abaxial to the central bundle, but none of the other bundles have associated girders; this species also apparently lacks

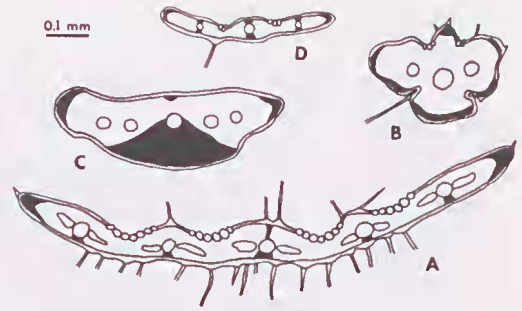


Fig. 3. Transverse leaf anatomy in four spicate species of *Micraira*; A, *M. compacta* (Craven 8337); B, *M. lazaridis* n. sp. (Clark 1157); C, *M. inserta* (Dunlop 4427); D, *M. spiciforma* (Dunlop 5298). Solid black = sclerenchyma.

obvious bulliform cells (Figure 3C). We suggest that any future revision of *Micraira* include a study of leaf anatomy, as this is likely to be informative in circumscribing species and assessing relationships.

Without additional material and further study, it is not possible to accurately infer relationships among the species of *Micraira*. Based on similarities in leaf anatomy and the shared, reduced, non-exserted spikes, however, *M. lazaridis* appears to be closest to *M. inserta*. The phylogenetic relationship of *Micraira* to other grasses is problematical. *Micraira* is classified in its own tribe, the Micraireae, which is placed in the Arundoideae (Clayton and Renvoize 1986;

Table 1. Comparison of the spicate species of *Micraira*.

Character	<i>M. inserta</i>	<i>M. lazaridis</i>	<i>M. compacta</i>	<i>M. spiciforma</i>	<i>M. subspicata</i>
Blade persistence	deciduous	deciduous	persistent	± persistent	persistent
Blade length in mm	5-6	1.8-3.7	4-8	4-5	6-9
Sheath length in mm	2-3	0.8-1.5	3-4	2-3	3-4
Ligule	ciliolate 0.3-0.5 mm	ciliolate c. 0.2 mm	ciliolate c. 0.2 mm	tubercular- thickened ridge, glabrous or sparsely puberulous	membranous or tubercular, pube- rulous or glabrous
Inflorescence length in mm	3-4	1.6-2	4-5	3-4	3-4
Inflorescence exertion at maturity	not exerted	not exerted	well exerted	well exerted	shortly exerted
Presence of glands in spike	eglandular	eglandular	eglandular	glandular	eglandular
Glume apex	entire, scaberulous	emarginate, ciliate	emarginate, scaberulous	entire or minutely emarginate, mucous, minutely scaberulous	entire, mucous

Watson and Dallwitz 1992) or segregated into its own subfamily, the Micrairoideae (Lazarides 1979). Clayton and Renvoize (1986, p.184) speculate that *Micraira* is a "derivative of Arundineae adapted to a specialized habitat." In this respect, we note that in a cladistic analysis of the grass family based on DNA sequence data from the chloroplast gene *ndhF*, *M. lazaridis* consistently appears as sister to a robust clade containing the four representatives of the Chloridoideae included in the survey (Clark *et al.* in prep.). Further study is required, but it is likely that *Micraira* is not closely related to the Arundineae.

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