

Short communication

# Two new leafless species of *Ficinia* (Cypereae, Cyperaceae) from the Greater Cape Floristic Region of South Africa

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## Abstract

Two new species of *Ficinia* (Cypereae, Cyperaceae) are described from South Africa. *Ficinia* has its centre of diversity in the Greater Cape Floristic Region (GCFR), with c. 90% of the species growing in the Fynbos biome. Recent collections from the arid edge of the Fynbos biome and in the Succulent Karoo biome have revealed two species new to science. Both are perennial plants that lack leaf blades and have sticky leaf sheaths.

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**Keywords:** Cyperaceae; *Ficinia quartzicola*; *Ficinia jardinei*; Greater Cape Floristic Region; South Africa; Taxonomy

## 1. Introduction

*Ficinia* Schrad., a temperate-southern-hemisphere genus in Cyperaceae, comprises 75 species (World Checklist of Monocotyledons, 2011). This monophyletic clade is characterised by a *Ficinia*-type embryo and the presence of a hypogynous disc (gynophore; Goetghebeur, 1998; Vrijdaghs et al., 2005; Muasya et al., 2009; Muasya and de Lange, 2010). The genus has its centre of diversity in the Greater Cape Floristic Region (GCFR; Born et al., 2007), where it most commonly occurs in the Fynbos biome (Archer, 2000). *Ficinia* has rapidly diversified since the mid-Miocene (Besnard et al., 2009). It is potentially ant-dispersed (presence of elaiosome; Bond and Slingsby, 1983) and most species show adaptation to frequent fire (resprouting profusely after fire).

*Ficinia* predominantly occurs in sub-Saharan Africa. Two species grow outside Africa: *F. nodosa* (Rottb.) Goetgh. et al. is nearly circum-Antarctic (Muasya et al., 2000), and *F. spiralis* (A.Rich.) Muasya & de Lange is endemic to New Zealand (Muasya and de Lange, 2010). Within Africa, a number of *Ficinia* species are found outside the Fynbos biome in GCFR areas that

share the winter-rainfall regime, and some also extending into afro-alpine zones in tropical Africa and Madagascar. Recent field studies within the GCFR have yielded two species new to science: one from the arid margins of the Fynbos biome and the other from the Succulent Karoo biome. These two species are described herein.

## 2. Species treatment

*2.1. Ficinia quartzicola* Muasya & N.A.Helme sp. nov. *Ficinia repens* Kunth affinis, sed habitu fasciculato (vs. laxo), basi culmi dura (vs. molli), rhizomate manifesto nullo (vs. rhizomate longo) differt. Type: South Africa, Western Cape Province, Van Rhynsdorp Dist. (3118): SW. Knersvlakte on Moedverloren 208 (–AB), 4 Jul 2011, Helme 7046 (BOL, holo.!, K!, NBG!, PRE!, iso.)

Perennial, forming clumps to 30 cm diameter, base hardened, without obvious rhizome. Culm 50–175 mm tall, 0.6–1.0 mm thick, but c. 1.6 mm thick across the rim of the leaf sheath, glabrous. Leaf sheath 14–19 mm long, glabrous, not papery, wine-red, sticky. Leaf blade absent. Involutral

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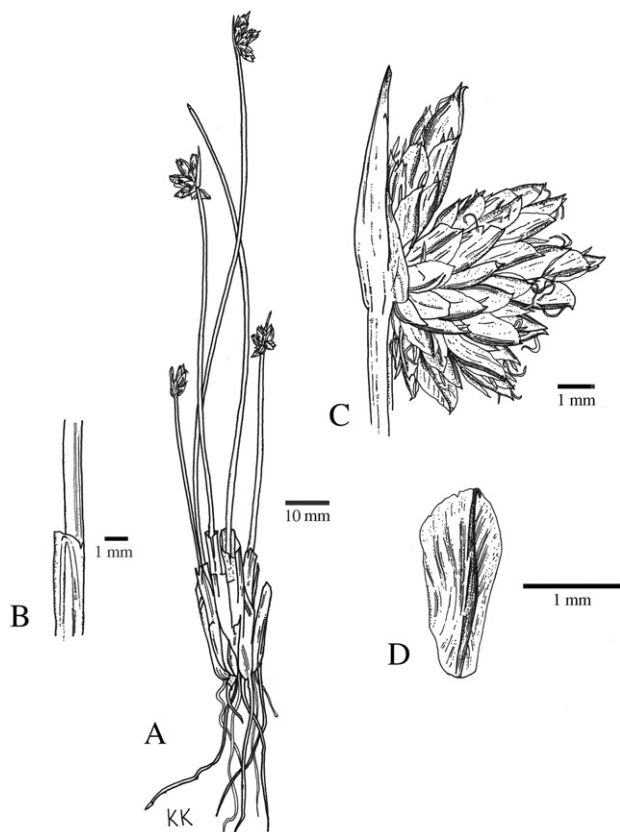


Fig. 1. *Ficinia quartzicola*: (A) habit; (B) leafy culm; (C) inflorescence; (D) glume. All drawn from Helme 4910 by K-L Kilian.

bract 1, stem-like and erect, 4.0–12.0 mm, margin glabrous. Inflorescence capitata, 5.0–9.0 mm diameter, appearing pseudo-lateral due to involucrel bract extending in direction of stem, spikelets 5 to 10. Spikelets 4.5–6.8 × 1.8–2.1 mm, terete, dark brown. Glumes 2.3–2.5 mm long, boat-shaped with a mucro 0.5 mm long; margins entire. Style trifid. Stamens 3, anthers crested. Nutlets 1.5–1.8 × 0.8–0.9 mm, brown, reticulate; hypogynous disc to 0.5 mm long, cupular, 3-lobed (Figs. 1 and 3).

Table 1  
Comparison of leafless *Ficinia* species.

	Habit	Plant height (mm)	Leaf sheath	Leaf blade length (mm)	Glume arrangement	Biome	Habitat
<i>F. distans</i> C.B.Clarke	Clumped to shortly rhizomatous	≤ 500	Not sticky	≤ 5	Distichous	Fynbos	Mountain streams; 50–300 m
<i>F. jardinei</i> Muasya & C.H.Stirt.	Rhizomatous	≤ 700	Sticky	≤ 13	Spiral	Succulent Karoo–Fynbos boundary	Seepages, streams; 1000–1200 m
<i>F. lateralis</i> (Vahl) Kunth	Clumped	≤ 350	Not sticky	0	Spiral	Fynbos	Sand dunes; below 100 m
<i>F. nodosa</i> (Rottb.) Goetgh. et al.	Rhizomatous	≤ 700	Not sticky	0	Spiral	Fynbos, Succulent Karoo and elsewhere	Brackish wetlands; 10–1000 m
<i>F. quartzicola</i> Muasya & N.A.Helme	Clumped	≤ 200	Sticky	0	Spiral	Succulent Karoo	Quartzite plains; 100–300 m
<i>F. quinquangularis</i> Boeck.	Clumped	≤ 350	Not sticky	0	Spiral	Fynbos	Mountain slopes; 600–1200 m
<i>F. repens</i> Kunth	Rhizomatous	≤ 400	Not sticky	0	Spiral	Fynbos (Renosterveld)	Shale flats; below 300 m
<i>F. sylvatica</i> Kunth	Clumped	≤ 900	Not sticky	≤ 5	Spiral	Fynbos	Forest understorey; 100–1100 m

### 2.1.1. Etymology

The specific epithet *quartzicola* refers to the characteristic quartz patch habitat of the species, a unique feature within the genus — no other *Ficinia* species is known to be restricted to quartz patches.

### 2.1.2. Diagnostic characters

*Ficinia quartzicola* has above-ground morphological similarity with *F. repens* Kunth (shape and size of leaf, culm and inflorescence; Table 1, Figs. 1 and 3). In addition to notable ecological and geographic differences, *F. quartzicola* is characterised by its sticky leaf sheath, clumping habit, very hard (almost woody) culm bases and lack of a rhizome.

### 2.1.3. Distribution and habitat

*Ficinia quartzicola* is currently known from only two localities, about 50 km apart, in the Knersvlakte region of the Succulent Karoo biome (Fig. 4). Although similar, and apparently suitable, habitat is present in the intervening areas there are a number of other taxa (e.g. *Babiana stenomera* Schltr. and *Pelargonium quarciticola* Meve & E.M.Marais) that we observed showing the same distribution pattern, and it is thus possible that this is a real pattern rather than an artefact of collecting. The species occurs on gentle east- and south-facing slopes densely covered with white quartz pebbles, over heavily weathered underlying shales.

The Knersvlakte is a renowned centre of succulent and geophyte diversity (Van Wyk and Smith, 2001) and numerous new species continue to be described from the region, especially from the quartz patches that are so characteristic of the area (e.g. Geraniaceae, Meve et al., 2000; Iridaceae, Goldblatt and Manning, 1993; Oxalidaceae, Oberlander et al., 2009; Hyacinthaceae, Snijman and Harrower, 2009; Manning et al., 2011). A number of other undescribed angiosperm species are known to co-occur with the new species, but no other *Ficinia* species are known to occur in the Knersvlakte. The low rainfall (< 100 mm/annum) at the type locality is supplemented by fairly regular

overnight fog (especially from autumn to spring), which moves in from the coast and up the Olifants River valley (N. Helme, pers. obs.), and which may be an important factor allowing for the development or persistence of many localised plant endemics. The highly reflective white quartz is assumed to keep the underlying soil surface notably cooler and moister, and is a relatively stable (erosion-resistant) surface, both factors which have been suggested as reasons for the spectacular levels of plant diversity and endemism in this habitat (Schmiedel, 2002).

#### 2.1.4. Conservation status

This taxon is currently known from two localities in the Knersvlakte, one of which is currently used as grazing for sheep, while the other (Moedverloren) is a formal conservation area managed by CapeNature. Although there are no threats evident at either site, overgrazing could be a potential threat at the Spitsberg locality. Population size at Spitsberg is estimated to be fewer than 100 plants, and at Moedverloren between 200 and 300 plants. Both populations occupy areas of less than 5 ha each, and it is thus very likely that the total area of occupancy is less than 1 km<sup>2</sup>. We therefore assess this taxon as Vulnerable (VU D1; Von Staden et al., 2009).

#### 2.1.5. Additional specimens examined

South Africa. **3118 (Calvinia)**: Van Rhynsdorp District, N Knersvlakte on farm Spitsberg 115 (–AB), 6 Sep 2007, Helme 4910 (BOL, NBG); Moedverloren 208 (–AD), 5 Sep 2007, Helme 4901 (BOL; NBG).

**2.2. *Ficinia jardinei* Muasya & C.H.Stirt. sp. nov. *Ficinia nodosa* (Rottb.) Goetgh. et al. affinis, sed vaginis foliorum viscidis (vs. non viscidis), glumis margine serrato (vs. integro) differt. Type: South Africa, Western Cape Province, Ceres District (3219): Swartruggens, Farm Knolfontein (–DC), dry fynbos, 1000 m, 12 Dec 2010, Muasya & Jardine 5168 (BOL, holo.!: K!, NBG!, PRE!, iso.)**

Perennial, rhizome to 8.0–10.0 mm diameter. Culm 350–765 mm tall, 0.9–1.2 mm thick, but c. 2.0 mm thick across the rim of the leaf sheath, glabrous. Leaf sheath 70–140 mm long, glabrous, not papery, wine-red, sticky. Leaf blade reduced to lobe, 1.0–13.0 mm long, glabrous, canaliculate. Involucral bract 1, leaf-like and erect or deflected to one side, 7.0–9.0 mm long, margin glabrous. Inflorescence globose, 8.0–10.0 mm diameter, each with over 20 spikelets. Spikelets 4.0–5.5 × 2.0–2.5 mm, terete, dark brown. Glumes 2.3–2.6 mm long, boat-shaped with a mucro 0.5 mm long; margins serrated. Style trifid. Stamens 3, anthers crested. Nutlets 1.5–1.7 × 0.9–1.0 mm, dark brown, weakly reticulate; hypogynous disc to 0.5 mm long, cupular, 6 to 9-lobed (Figs. 2 and 3).

#### 2.2.1. Etymology

The specific epithet *jardinei* honours local conservationist and naturalist, Dr Ivor Jardine, whose thorough collection of plants on the Farm Knolfontein (Swartruggens; Jardine and Jardine, 2010) has yielded a number of new species (e.g. Aizoaceae, Klak, 2010; Scrophulariaceae, Manning and Goldblatt,

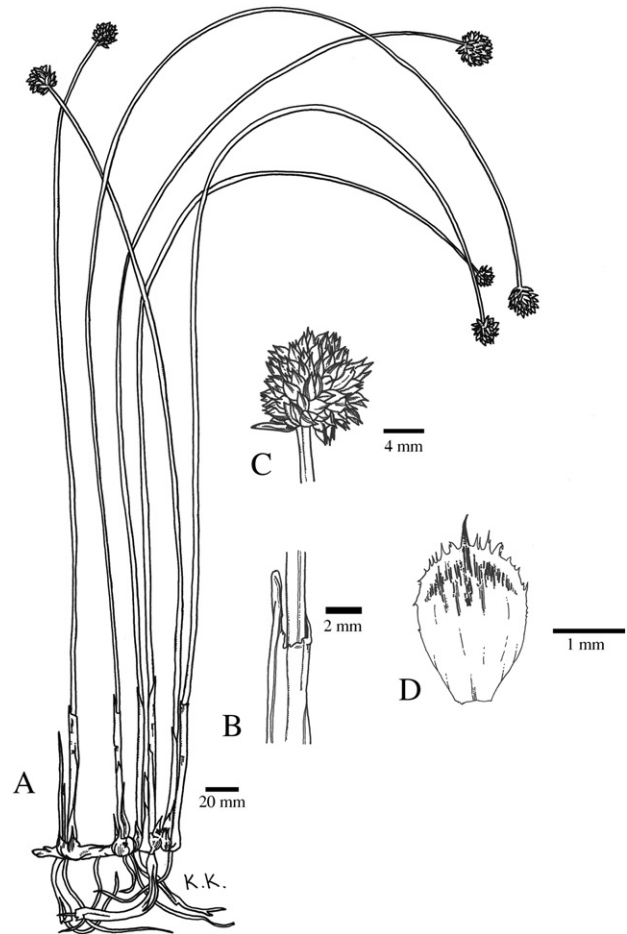


Fig. 2. *Ficinia jardinei*: (A) habit; (B) leafy culm; (C) inflorescence; (D) glume. All drawn from Muasya & Jardine 5168 by K-L Kilian.

2010), and extended the distribution ranges of others (e.g. Apiaceae, Magee et al., 2010; Asteraceae, Ortiz, 2007).

#### 2.2.2. Diagnostic characters

*Ficinia jardinei* is most similar to *F. nodosa*, sharing gross morphological similarities (well-developed rhizome, absent or reduced leaf blades, globose inflorescence; Table 1, Figs. 2 and 3). *F. jardinei* is characterised by its sticky leaf sheaths and glumes with serrate margins.

#### 2.2.3. Distribution and habitat

*Ficinia jardinei* is currently known from seepages and stream banks at 1000–1200 m in the Swartruggens and Witteberg quartzite ranges at the arid edge of the Fynbos biome (Fig. 4). All known localities occur in the transition zone between the Fynbos and Succulent Karoo biomes.

#### 2.2.4. Conservation status

*F. jardinei* is currently known from five small populations. While all populations are in private land used for grazing and conservation areas and there are no known threats, the area of occupancy is small and each population has fewer than 500 plants. We therefore assess this taxon to be Rare (AOO, EOO; Von Staden et al., 2009).



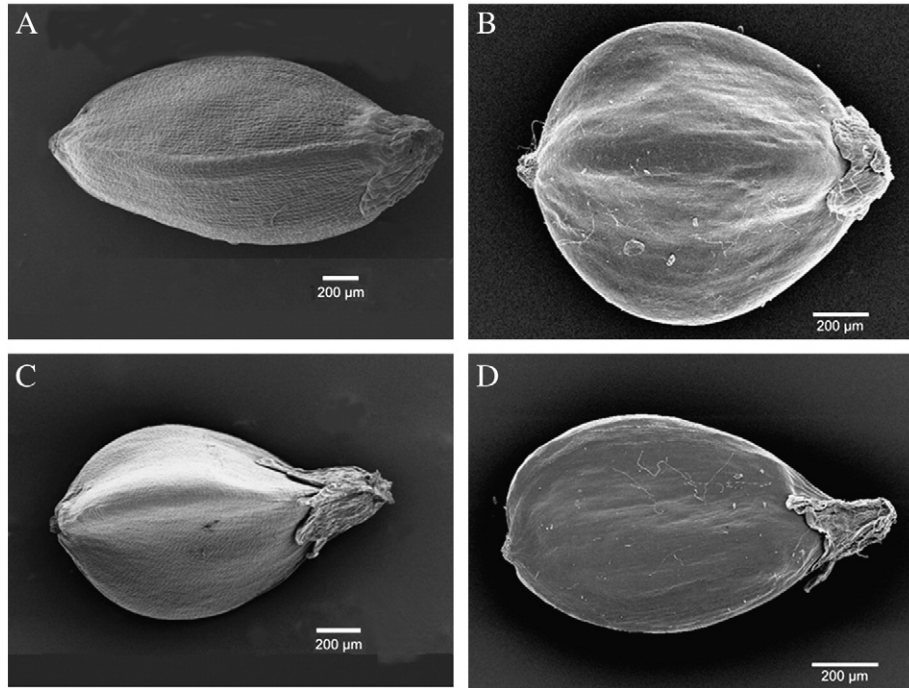


Fig. 3. Scanning electron micrographs of nutlets: (A) *Ficinia quartzicola*; (B) *F. repens*; (C) *F. jardinei*; (D). *F. nodosa*.

2.2.5. Additional specimens examined

South Africa. **3219 (Wuppertal)**: Swartruggens, Farm Knolfontein (–DC), 3 Nov 2010, *Jardine 1462* (BOL); 22 Sep 2010, *Jardine 1413* (BOL); 12 Jan 2009, *Jardine & Jardine 1059* (BOL, NBG); 30 Sep 2009, *Jardine 1169* (BOL); 30 Sep 2009,

*Muasya & Jardine 4592* (BOL2 Oct 2009, *Muasya 4621* (BOL, NBG); Farm Hartneksloof, 12 Apr 2011, *Jardine 1549* (BOL). **3320 (Ladismith)**: Witteberg Private Nature Reserve (–AD), jeep track to Grootdam, 19 Feb 2011, *Muasya, Chimphango & Stirton 5926* (BOL, NBG, PR); Bontberg (–AA),

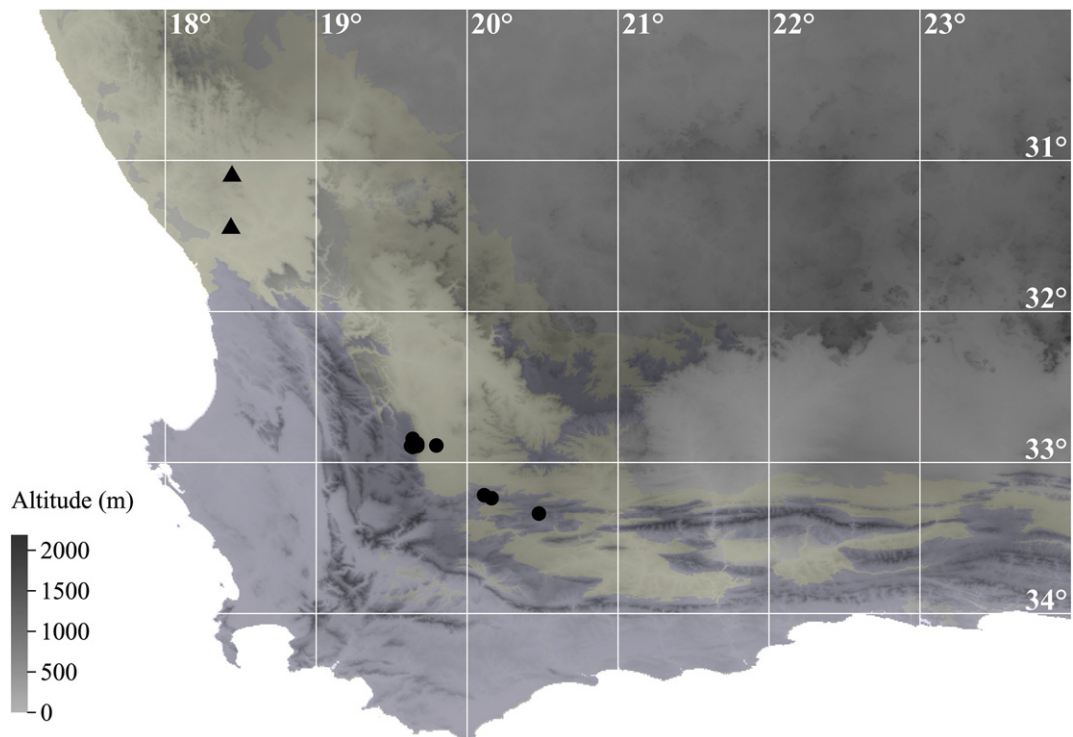


Fig. 4. Distribution of *Ficinia quartzicola* (triangles) and *F. jardinei* (circles). Map plotted with the R package raster (R Development Core Team, 2011; Hijmans and Van Etten, 2011) using data from Worldclim (Hijmans et al., 2005) shows Fybos (purple) and Succulent Karoo (gold) biomes.

Pienaarskloof, 7 Sep 2011, *Muasya & Stirton 6042* (BOL); Bierkraal Se Rante (–AA), 8 Sep 2011, *Muasya & Stirton 6063* (BOL).

### 3. Evolution of leaflessness and sticky leaf sheaths in *Ficinia*

The presence of well-developed leaf blades is a common feature in Cyperaceae and in the majority of *Ficinia* species. Leaflessness is noted in only eight species (Table 1), which occur over a wide range of altitudes (0–1200 m) and habitats, including sand dunes and open habitats (*F. lateralis* (Vahl) Kunth), renosterveld shales (*F. repens*), mountain fynbos (*F. quinquangularis* Boeck.), margins of wetlands (*F. nodosa*) and forest undergrowth (*F. sylvatica* Kunth). These taxa do not form a clade (Muasya et al., unpublished data), and leaflessness appears to have evolved independently in a variety of habitats.

In the GCFR, sticky leaves are common among carnivorous plants such as Droseraceae, and in various other groups, such as *Erica*. However, among the Cyperaceae, sticky leaf sheaths are only encountered in the leafless taxa described above and in certain leafy taxa (e.g. *Ficinia rigida* Levyns, *Tetraria compar* (L.) T. Lestib.). Sticky inflorescences also occur in *F. polystachya* Levyns. Sticky-leaved species occur at a variety of altitudes (1–1000 m) and habitats (shale and sandstone; wetland and well-drained soils). The evolutionary significance of sticky leaves and reduced leaf blades is subject to further investigation.

#### 3.1. Key to the leafless *Ficinia* species

1. Rhizome well developed, with successive culms borne at equal distance and perpendicular to rhizome; glumes spirally arranged.....2
- 1\*. Rhizome poorly developed, with successive culms clumped; glumes spirally or distichously arranged.....4
2. Plants to 500 mm tall; inflorescence capitate heads, with up to 10 spikelets.....*F. repens*
- 2\*. Plants over 700 mm tall; inflorescence globose heads, with over 20 spikelets.....3
3. Leaf sheaths sticky; leaf blade a lobe to 13 mm long; glume margins serrated.....*F. jardinei*
- 3\*. Leaf sheaths not sticky; leaf blade absent; glumes margins entire .....*F. nodosa*
- 4 Plants growing in mountain streams; glumes distichously arranged .....*F. distans*
- 4\*. Plants growing elsewhere; glumes spirally arranged.....5
5. Plants over 500 mm tall; inflorescence with 2 or 3 spikelets; growing in forests .....*F. sylvatica*
- 5\*. Plants under 500 mm tall; inflorescence with 5 or more spikelets; growing in the open .....6
- 6 Plants growing on mountain slopes above 400 m; stems 5-angled; glumes apex acute .....*F. quinquangularis*
- 6\*. Plants growing on flats and dunes below 300 m; stems terete; glumes apex obtuse .....7
7. Leaf sheaths sticky; restricted to quartz patches in Knersvlakte .....*F. quartzicola*

7\*. Leaf sheaths not sticky; widespread on coastal dunes below 200 m .....*F. lateralis*

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