



Taxonomic revision of *Ustilago*, *Sporisorium* and *Macalpinomyces*

A.R. McTaggart^{1,2,3,5}, R.G. Shivas^{1,2}, A.D.W. Geering^{1,2,5}, K. Vánky⁴, T. Scharaschkin^{1,3}

Key words

smut fungi
systematics
taxonomy
Ustilaginaceae
Ustilaginomycotina

Abstract Morphological characters within the *Ustilago-Sporisorium-Macalpinomyces* complex are defined explicitly. The genera *Sporisorium* and *Anthracoecystis* are emended to reflect morphological synapomorphies. Three new genera, *Langdonia*, *Stollia* and *Triodiomyces* are described based on soral synapomorphies and host classification. The new classification of the *Ustilago-Sporisorium-Macalpinomyces* complex incorporates 142 new taxonomic combinations.

Article info Received: 18 May 2012; Accepted: 9 October 2012; Published: 17 December 2012.

INTRODUCTION

The three genera of smut fungi, *Ustilago*, *Sporisorium* and *Macalpinomyces*, form a complex that has eluded resolution by morphology (Langdon & Fullerton 1975, Vánky 1991, Piepenbring et al. 1998) and molecular phylogenetic analysis (Stoll et al. 2003, 2005). Two suggestions to reconcile the taxonomy of the complex have been proposed. The first was to break up the current taxa into several smaller genera and subgenera, and the second to unify the three genera into a single genus, *Ustilago* (Vánky 2002, Piepenbring 2004). The former solution is dependent on finding morphological synapomorphies that can delimit the genera, and the latter solution dismisses the wide morphological diversity within the group (McTaggart et al. 2012b).

Synapomorphic morphological characters and host plant classification delimited clades in the *Ustilago-Sporisorium-Macalpinomyces* complex (McTaggart et al. 2012a). The current study defines these synapomorphic characters and proposes a new classification for many species currently placed in *Ustilago*, *Sporisorium* and *Macalpinomyces*. This approach preserves the well-known genera *Ustilago*, *Sporisorium* and *Macalpinomyces*, and enables the classification to reflect morphological diversity in the complex.

PHYLOGENY

Phylogenetic analyses resolved eight clades within the *Ustilago-Sporisorium-Macalpinomyces* complex (McTaggart et al. 2012a). Six of the clades had unique morphology or host characters. *Sporisorium* and *Anomalomyces* were accepted genera. Here *Anthracoecystis* is reinstated, and three new

genera, *Langdonia*, *Stollia* and *Triodiomyces* are proposed to accommodate newly resolved clades (Fig. 1).

Definitions of soral characters in the *Ustilago-Sporisorium-Macalpinomyces* complex

The interpretation of soral morphology is inconsistent for many descriptions of smut species. For example, *Sporisorium consanguineum*, *Macalpinomyces spermophorus* and *M. viridans* were described with columellae, but these structures are not homologous with columellae in *Sporisorium* s.str. (McTaggart et al. 2012a). Soral characters need accurate definition to prevent misinterpretation.

Columellae

A columella is defined as a structure formed by both fungal and host material, which proliferates after hyphal-induced growth of the host meristem, and connects the sorus to the host. The columella is invariably the same length or slightly shorter than the length of the sorus. There are two types of true columellae within the complex. Stout columellae are a synapomorphy for *Sporisorium* s.str. (Clade 1), and filiform, flexuous columellae are a synapomorphy for *Anthracoecystis* (Clade 4) (McTaggart et al. 2012a). The non-homologous columella-like structures found in other clades have different origins and do not satisfy the definition of columellae. In particular, care should be taken not to confuse the columella with remnants of the inflorescence, such as in *Ustilago drakensbergiana*.

Sterile cells

Sterile cells are defined as the cells formed from partitioning non-sporogenous hyphae within the sorus. Sterile cells are an apomorphic character of the complex and were present in *Macalpinomyces eriachnes*, *Anomalomyces panici*, and Clades 1, 2, 3, 7 and 8 (McTaggart et al. 2012a). Sterile cells also occur in other groups of smut fungi, including *Tilletia* in the *Exobasidiomycetes*, and are not a valuable character for higher levels of classification. Cells found in the peridium are not formed from partitioning hyphae and are referred to as peridial cells. Peridial cells are generally irregular and in chains, and are only found in taxa with a fungal derived peridium.

Sterile cells formed from non-sporogenous hyphae within the sorus are a useful character for delimitation of genera within

¹ Cooperative Research Centre for National Plant Biosecurity, GPO Box 5012, Bruce, ACT 2617, Australia; corresponding author e-mail: alistair.mctaggart@gmail.com.

² Department of Agriculture, Fisheries and Forestry, Ecosciences Precinct, GPO Box 267, Brisbane, Queensland 4001, Australia.

³ EEBS, Faculty of Science and Technology, Queensland University of Technology, 2 George Street, Brisbane, Queensland 4001, Australia.

⁴ Herbarium Ustilaginales Vánky (HUV), Gabriel-Biel-Str. 5, D-72076 Tübingen, Germany.

⁵ Queensland Alliance for Agriculture and Food Innovation, The University of Queensland, Ecosciences Precinct, GPO Box 267, Brisbane, Queensland 4001, Australia.

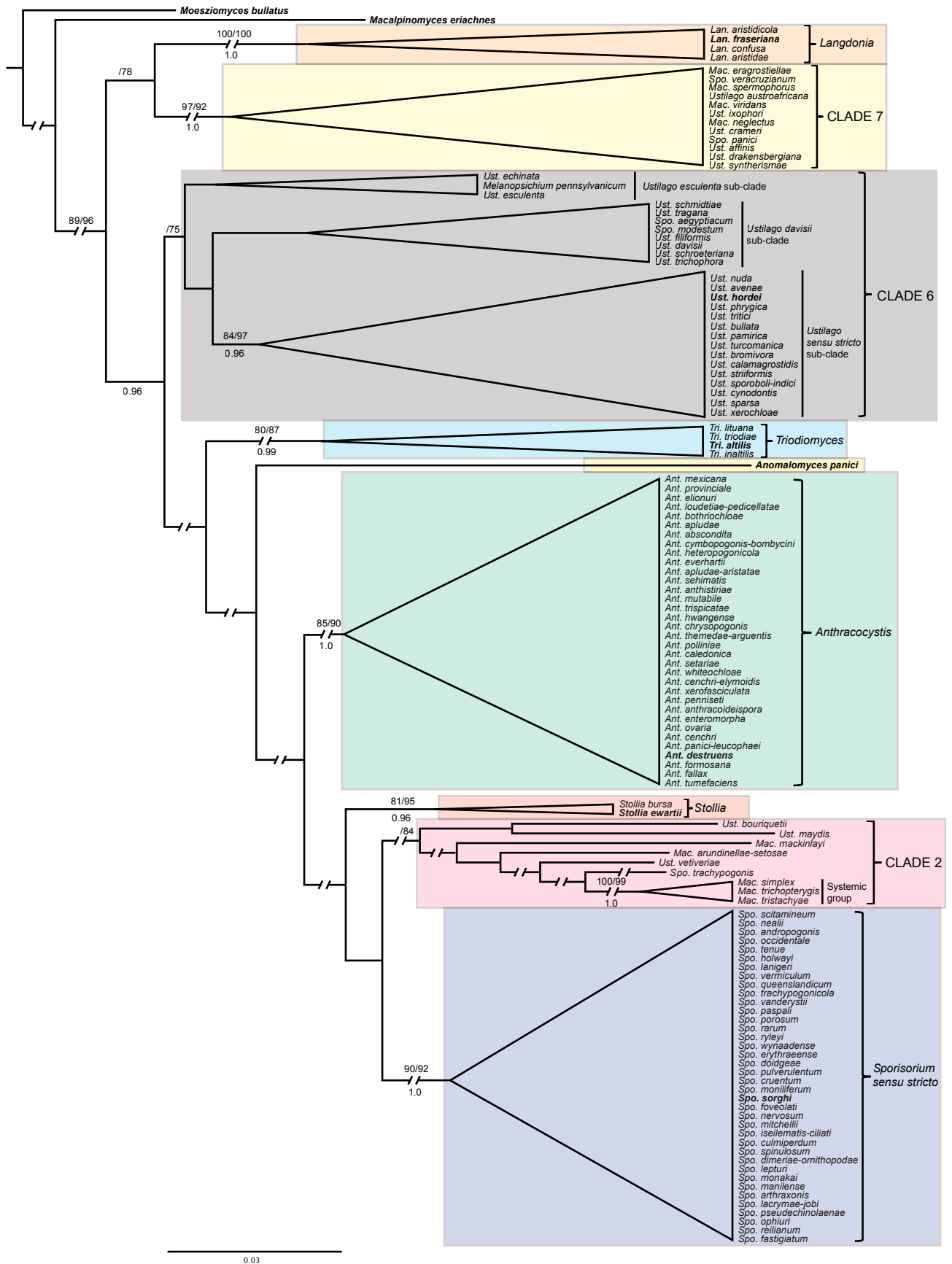


Fig. 1 Phylogram obtained from a phylogenetic analysis by McTaggart et al. (2012a). Maximum likelihood support values (> 70 %) from RAxML 1 000 bootstrap replicates and PhyML aRLT values shown above the nodes. Posterior probabilities (> 0.95) from Bayesian inference shown below the nodes. Resolved genera within the complex are listed on the right hand side. Unresolved clades are numbered according to McTaggart et al. (2012a). Type species of known genera are in **bold**.

the *Ustilago-Sporisorium-Macalpinomyces* complex. Taxa that lack sterile cells occur in two monophyletic groups, namely *Anthracoctystis* and the subgroup, *Ustilago* s.str. (McTaggart et al. 2012a). Absence of sterile cells is an apomorphy for these groups.

Spore balls

Spore balls were considered to be a convergent character within the *Ustilaginomycotina* (Vánky 2001b). However, spore balls produced by coiled sporogenous hyphae are an apomorphic character within *Anthracoctystis*, *Anomalomyces panici* and *Langdonia* (McTaggart et al. 2012a). Although spore balls are homoplasious within the *Ustilaginomycotina*, they can be used for generic delimitation within the complex.

TAXONOMY

SPORISORIUM s.str. (Clade 1)

Sporisorium was originally described as having columellae and sterile cells (Link 1825, Langdon & Fullerton 1978). Many species were described in *Sporisorium* even though they lacked sterile cells, for example *Sporisorium absconditum*, *S. cenchri* and *S. glutinosum*. Spore balls became a *de facto* character that defined *Sporisorium* (Vánky 2002), although spore balls were not mentioned in the type description. McTaggart et al. (2012a) resolved the synapomorphies of *Sporisorium* s.str., which were the presence of a woody columella and sterile cells, and absence of spore balls. It is now possible to define *Sporisorium* in a strict sense, according to the descriptions by Link (1825) and Langdon & Fullerton (1978). Emended or additional characters have been placed in **bold** font.

***Sporisorium* Ehrenb. ex Link, in Link, Linné's Species Plantarum, Ed. 4, 6, 2: 86. 1825 emend. McTaggart & R.G. Shivas**

Type species. Sporisorium sorghi Ehrenb. ex Link, in Willdenow, Willd., Sp. Pl., ed. 4, 6, 2: 86. 1825.

Neotype (design. by Vánky 1990: 275). EGYPT, Cairo, *Sorghum bicolor*, June 1876, G. Schweinfurth, HUV 1672; isoneotypes in Thümen, Mycoth. univ. no. 725 (as '*Ustilago reiliana* f. *Sorghii* *cernui* on *Sorghum cernuum*'). – *Paraneotype*. ROMANIA, Transylvania, near Odorhei (Székelyudvarhely), alt. c. 480 m, *Sorghum bicolor*, 5 Sept. 1963, K. Vánky, HUV 2027; isoparaneotypes in Vánky, Ust. exs. no. 50 (as '*Sphacelotheca sorghi* on *Sorghum vulgare*').

Sori replacing inflorescences or florets. *Peridium* of interwoven hyphae overlain by several layers of host tissue. *Columella* composed of host tissues permeated by inter- and intra-cellular hyphae, **cylindrical, stout or woody, branched or unbranched, peripheral cells thick-walled and vacuolated**. *Hyphae* growing from columella of young sori differentiating as pockets of sporogenous hyphae enclosed by non-sporogenous partitioning hyphae. **Sporogenous hyphae uncoiled**. *Spores* at first somewhat agglutinated, later pulverulent, dark, single, globose to subglobose. *Sterile cells* hyaline, subglobose to globose, in groups or chains, intermixed with the spores, **formed from non-sporogenous partitioning hyphae**. Germination of *Ustilago* type.

New combination for *Sporisorium* s.str.

***Sporisorium porosum* (Langdon) McTaggart & R.G. Shivas, comb. nov. — MycoBank MB801582**

Basionym. Ustilago porosa Langdon, Proc. Linn. Soc. New South Wales 87: 48. 1962.

Specimens examined. AUSTRALIA, Western Australia, Kununurra, Sewerage treatment plant, *Sorghum timorense*, 7 Apr. 2008, A.R. McTaggart, V.L.

Challinor, A.D.W. Geering, M.D.E. & R.G. Shivas, BRIP 51811; Western Australia, Kununurra, Mulligan Lagoon Road, *Sorghum timorense*, 9 Apr. 2008, A.R. McTaggart, V.L. Challinor, A.D.W. Geering, M.D.E. & R.G. Shivas, BRIP 51842a; Northern Territory, NE of Anthony Lagoon, *Sorghum timorense*, 15 Apr. 1947, S.T. Blake, BRIP 7803, holotype.

Sporisorium porosum does not have sterile cells, which are usually present in other species of *Sporisorium*.

ANTHRACOCYSTIS (Clade 4)

Many taxa recovered in Clade 4 of the molecular phylogenetic analysis by McTaggart et al. (2012a) were previously classified as *Sorosporium*. Langdon & Fullerton (1975) described soral differences between *Sorosporium* on hosts in *Caryophyllaceae* and on hosts in *Poaceae*. The name *Sorosporium* was considered a synonym of *Thecaphora* (Vánky 2002) and is not suitable for species in Clade 4 as it applies to smuts on *Caryophyllaceae*. Brefeld (1912) described *Anthracoctystis* to accommodate *Caeoma destruens*, which was recovered in Clade 4. Brefeld (1912) diagnosed *Anthracoctystis* as a distinct genus based on presence of smut galls, and the peculiar formation of its peridium that developed from floral envelopes.

A third name applied to species in Clade 4 was *Lundquistia*, which Vánky (2001a) established for taxa possessing spore balls embedded in the host tissue, and sori that lacked sterile cells, peridia and columellae. Vánky (2001a) initially described *Lundquistia* for one species, *L. fascicularis*, on *Digitaria brownii* in Australia. This species is now synonymous with *Sporisorium panici-leucophaei*. Three years later, Vánky (2004) emended *Lundquistia* to include species that had either permanent or ephemeral spore balls, with or without sterile cells between the spore balls. He included three South American taxa, *L. dieteliana* (syn. *Sporisorium dietelianum*), *L. duranii* (syn. *S. duranii*) and *L. mexicana* (syn. *S. mexicanum*), which possessed combinations of soral characters that were not typical of *Sporisorium*. Vánky (2004) stated that the characters he used to establish *Lundquistia* were "not strong enough to differentiate two genera", but retained *Lundquistia* as a genus.

The first two descriptions of *Lundquistia* by Vánky (2001a, 2004) made some mistaken conclusions about the soral morphology of species included in this genus (2012a). *Lundquistia* was originally described as lacking columellae (Vánky 2001a). However, the combination of fungal and host material in the shredded fascicles of vascular bands described in *Sporisorium panici-leucophaei* are columellae under the definition proposed here. The presence of filiform columellae is a synapomorphy for taxa in Clade 4 (McTaggart et al. 2012a). Vánky (2001a) reported that the spore balls in *Lundquistia* were not formed from coiled sporogenous hyphae, which is a synapomorphic character for taxa in Clade 4. The method of spore ball formation in *S. panici-leucophaei* is not known. For other taxa in Clade 4, spore balls form from coiled sporogenous hyphae, as outlined by Langdon & Fullerton (1975).

Cunnington et al. (2005) demonstrated that the emended *Lundquistia* (Vánky 2004) was polyphyletic. Stoll et al. (2005) first synonymized *Lundquistia* with *Sporisorium* and later Cunnington et al. (2005) confirmed the synonymy. They were unable to find any morphological characters that could separate the two monophyletic groups within *Sporisorium*.

Sporisorium mexicanum and *S. panici-leucophaei*, which were both placed in *Lundquistia* (Vánky 2001a, 2004), belong to Clade 4. Taxa included in Clade 4 represent a genus separate from *Sporisorium*. *Lundquistia* and *Anthracoctystis* are both valid names for these species. *Anthracoctystis* was described in 1912 and takes priority over *Lundquistia*.

Characters that separate *Anthracocystis* from *Sporisorium* are the presence of filiform columellae and spore balls, and the absence of sterile cells (rarely a few cells are observed). The presence of a white, fungal peridium is a useful diagnostic character. *Anthracocystis* is emended to accommodate taxa with these characters. Emended or additional characters have been placed in **bold font**.

Anthracocystis Bref., Unters. Gesamtgeb. Mykol. 15: 53. 1912. *emend.* McTaggart & R.G. Shivas

= *Lundquistia* Vánky, Mycotaxon 77: 371. 2001, *emend.* Vánky, Fung. Diversity 17: 160. Type: *Lundquistia fascicularis* Vánky on *Digitaria brownii*.

Type species. *Anthracocystis destruens* (Schldl.) Bref., Unters. Gesamtgeb. Mykol. 15: 53. 1912.

Neotype (design. by Vánky, Symb. Bot. Upsal. 24, 2: 115. 1985). GERMANY, Bunzlau (Poland, Bolesławiec), *Panicum miliaceum*, J. Kühn, HUV 1895; isoneotypes in Rbh., Herb. Vivum Mycol., ed. 2, no. 400 (as '*Ustilago destruens*').

Sori replacing inflorescences, **all of the racemes or localized in spikelets of an inflorescence**. **Peridium** of vacuolated fungal cells surrounded by a single layer of host cells. **Columella** composed of vascular bundles surrounded by host parenchyma permeated by inter- and intra-cellular hyphae, often separated into several columellae each around a vascular bundle surrounded by parenchyma, filiform, flexuous, flattened. **Sporogenous hyphae** coiled. **Spores** compacted in spore balls, globose to subglobose, often outer spores darker than inner spores. **Sterile cells few or absent**.

New combinations for *Anthracocystis*

Anthracocystis abramoviana (Lavrov) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB519129

Basionym. *Sorosporium abramovianum* Lavrov, Trudy Tomsk. Gosud. Univ. 86: 85. 1934.

≡ *Sporisorium abramovianum* (Lavrov) Karatygin, in Karatygin & Azbukina, Definitorium fungorum URSS, etc.: 72. 1989.

Anthracocystis abscondita (Vánky) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801583

Basionym. *Sporisorium absconditum* Vánky, Mycotaxon 85: 36. 2003.

Specimens examined. AUSTRALIA, Queensland, Mount Garnet, Forty Mile Scrub National Park, *Schizachyrium fragile*, 6 Apr. 1998, C. & K. Vánky, BRIP 43880, isotype; Northern Territory, 26 km S of Tennant Creek, *Schizachyrium fragile*, 26 Apr. 2007, A.R. McTaggart, J.R. Liberato, R.G. Shivas, BRIP 49648.

Anthracocystis anadelphiae (Vienn.-Bourg.) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801584

Basionym. *Sorosporium anadelphiae* Vienn.-Bourg., Bull. Soc. Bot. France 104: 266. 1957 (as '*ananelphiae*').

≡ *Sporisorium anadelphiae* (Vienn.-Bourg.) Vánky, Mycotaxon 85: 58. 2003.

Anthracocystis andropogonis-aciculati (Petch) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801585

Basionym. *Ustilago andropogonis-aciculati* Petch, Ann. Roy. Bot. Gard. (Peradeniya) 4: 303. 1909.

≡ *Sorosporium andropogonis-aciculati* (Petch) Petch, Ann. Roy. Bot. Gard. (Peradeniya) 5: 227. 1912.

≡ *Sporisorium andropogonis-aciculati* (Petch) Vánky, Mycotaxon 18: 328. 1983.

Specimen examined. CHINA, Yunnan, Jinghong, *Chrysopogon aciculatus*, 24 Sept. 1985, T. & K. Vánky, Vánky, Ust. exs. no. 522.

Anthracocystis andropogonis-chinensis (Vánky) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801586

Basionym. *Sporisorium andropogonis-chinensis* Vánky, Mycotaxon 95: 5. 2006.

Anthracocystis andropogonis-eucomi (Vánky) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801587

Basionym. *Sporisorium andropogonis-eucomi* Vánky, Mycotaxon 95: 5. 2006.

Specimen examined. SOUTH AFRICA, Mpumalanga Prov., 9 km NE of Graskop, 1 km along road R534, *Andropogon eucomus*, 22 Jan. 1997, C. & K. Vánky, BRIP 47128, isotype.

Anthracocystis andropogonis-finitimi (Maubl.) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801588

Basionym. *Ustilago andropogonis-finitimi* Maubl., Bull. Soc. Mycol. France 22: 74. 1906.

≡ *Sporisorium andropogonis-finitimi* (Maubl.) Vánky & Mouch., Mycol. Res. 104: 382. 2000.

Specimens examined. ZAMBIA, Southern Province, 22 km NE of Pemba, *Hyparrhenia filipendula*, 12 Apr. 2001, C., T. & K. Vánky, BRIP 39626; Southern Province, 10 km NW of Monze, *Hyparrhenia filipendula*, 15 Apr. 2001, C., T. & K. Vánky, BRIP 39634.

Anthracocystis andropogonis-gabonensis (Vánky) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801749

Basionym. *Sporisorium andropogonis-gabonensis* Vánky, Mycotaxon 95: 7. 2006, nom. nov. for *Sorosporium congoense* L. Ling, Lloydia 16: 186. 1953 (not *Sporisorium congoense* (Syd. & P. Syd.) Vánky).

Anthracocystis andropogonis-pumili (Vánky) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801589

Basionym. *Sporisorium andropogonis-pumili* Vánky, Mycotaxon 95: 7. 2006.

Anthracocystis anthistirieae (Cobb) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801590

Basionym. *Tolyposporium anthistirieae* Cobb, Agric. Gaz. New South Wales 3: 1006. 1892.

≡ *Sorosporium anthistirieae* (Cobb) L. Ling, Mycol. Pap. 11: 9. 1945.

≡ *Sporisorium anthistirieae* (Cobb) Vánky, Acta Mycol. Sin., Suppl. I: 230. 1987.

Specimens examined. AUSTRALIA, Western Australia, between Wyndham and Kununurra, *Themeda triandra*, 13 Apr. 2007, A.R. McTaggart, M.J. Ryley & R.G. Shivas, BRIP 49775. — CHINA, Beijing, Botanical Garden, *Themeda triandra*, 8 Oct. 1985, L. Guo & K. Vánky, Vánky, Ust. exs. no. 579.

Anthracocystis anthracoideispora (Vánky & R.G. Shivas) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801591

Basionym. *Sporisorium anthracoideisporum* Vánky & R.G. Shivas, Mycotaxon 68: 335. 1998.

Specimen examined. PAPUA NEW GUINEA, Western Province, Bensbach River, *Pseudoraphis spinescens*, 13 Apr. 1997, A.A. Mitchell & R.G. Shivas, BRIP 39176, isotype.

Anthracocystis apludae (Mishra) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801592

Basionym. *Sorosporium apludae* Mishra, Mycologia 48: 875. 1956 (not *Sporisorium apludae* (Syd. & P. Syd.) L. Guo, Mycosystema 3: 76. 1990).

≡ *Sporisorium mishrae* Vánky, Mycotaxon 65: 135. 1997, nom. nov.

Specimen examined. INDIA, Karnataka, Belgaum, *Apluda mutica*, 16 June 1995, Sharma, K. Vánky, Vánky, Ust. exs. no. 967.

Anthracoecystis apludae-aristatae (B.V. Patil & Thirum.) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801593

Basionym. *Sorosporium apludae-aristatae* B.V. Patil & Thirum., Sydowia 20: 48. 1968.

≡ *Sporisorium apludae-aristatae* (B.V. Patil & Thirum.) Vánky, Mycotaxon 65: 135. 1997.

Specimen examined. INDIA, Uttar Pradesh, Varanasi, *Apluda mutica*, 7 Oct. 1992, K. Vánky, Vánky, Ust. exs. no. 916.

Anthracoecystis apludae-muticae (A.R. Patil, T.M. Patil & M.S. Patil) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801594

Basionym. *Sorosporium apludae-muticae* A.R. Patil, T.M. Patil & M.S. Patil, J. Mycol. Pl. Pathol. 34: 839. 2004 (not *Sporisorium apludae-muticae* L. Guo, Mycotaxon 72: 390. 1999).

≡ *Sporisorium muticae* Vánky & A.R. Patil, in Vánky, Mycotaxon 99: 47. 2007, nom. nov.

Anthracoecystis azmatii (Mundk.) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801595

Basionym. *Sorosporium azmatii* Mundk., Trans. Brit. Mycol. Soc. 23: 115. 1939.

≡ *Sporisorium azmatii* (Mundk.) Vánky, Fung. Diversity 18: 180. 2005.

Specimen examined. INDIA, Karnataka, Mysore, Bilikere, *Chrysopogon caeruleus*, 19 Sept. 1903, C.A. Barber, BRIP 8052, isotype.

Anthracoecystis berndtii (Vánky) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801596

Basionym. *Sporisorium berndtii* Vánky, Mycotaxon 85: 37. 2003.

Specimen examined. THAILAND, Chiang Mai, Mae Taeng District, Mae Ngad Dam, *Schizachyrium sanguineum*, 19 Dec. 2007, P. Athipunyakom, S. Likhitekaraj, V.L. Challinor, A.R. McTaggart, T.S. Marney, M.D.E. & R.G. Shivas, BRIP 51559.

Anthracoecystis blakeana (Vánky) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801597

Basionym. *Sporisorium blakeanum* Vánky, Mycotaxon 89: 74. 2004.

Specimen examined. AUSTRALIA, Queensland, N of Hughenden, Poison Creek, *Schizachyrium fragile*, 10 Apr. 1935, S.T. Blake, BRIP 7804, holotype.

Anthracoecystis bothriochloae (L. Ling) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801598

Basionym. *Sorosporium bothriochloae* L. Ling, Lloydia 16: 186. 1953.

≡ *Sporisorium bothriochloae* (L. Ling) Vánky, Fung. Diversity 15: 229. 2004.

Specimens examined. AUSTRALIA, Northern Territory, on Stuart Highway, 209 km SE of Katherine, *Dichanthium fecundum*, 14 Mar. 2000, R.G. Shivas, I.T. Riley, C. & K. Vánky, Vánky, Ust. exs. no. 1196; Western Australia, between Wyndham and Kununurra, *Dichanthium sericeum*, 8 Apr. 2008, A.R. McTaggart, V.L. Challinor, A.D.W. Geering, M.D.E. & R.G. Shivas, BRIP 51819.

Anthracoecystis caledonica (Pat.) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801599

Basionym. *Sorosporium caledonicum* Pat., Bull. Soc. Mycol. France 3: 173. 1887.

≡ *Sporisorium caledonicum* (Pat.) Vánky, Mycotaxon 40: 165. 1991.

= *Sporisorium heteropogonis-contorti* Bacc., Ann. Bot. (Rome) 14: 132. 1917.

Specimens examined. AUSTRALIA, Northern Territory, Timber Creek, Policeman's Lookout, *Heteropogon contortus*, 10 Apr. 2008, A.R. McTaggart, V.L. Challinor, A.D.W. Geering, M.D.E. & R.G. Shivas, BRIP 51854. — INDIA, Uttar Pradesh, Tehri, Garwal Himalaya Mt, *Heteropogon contortus*, 17 Sept. 1992, T. & K. Vánky, Vánky, Ust. exs. no. 1053.

Anthracoecystis cenchri (Lagerh.) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801600

Basionym. *Ustilago cenchri* Lagerh., in Patouillard & Lagerheim, Bull. Herb. Boissier 3: 62. 1895.

= *Tolyposporium cenchri* Bref., Unters. Gesamtgeb. Mykol. 12: 156. 1895.

= *Sorosporium cenchri* Henn., Hedwigia 35: 221. 1896.

≡ *Sporisorium cenchri* (Berf.) Zundel, Bothalia 3: 303. 1938.

≡ *Sporisorium cenchri* (Lagerh.) Vánky, Symb. Bot. Upsal. 24: 114. 1985.

= *Sorosporium cenchri* Henn. var. *levis* Vörös & Ubrizsy, Acta Phytopathol. Acad. Sci. Hung. 3: 269. 1968.

= *Sorosporium chardonianum* Zundel, Mycologia 34: 125. 1942.

= *Sorosporium texanum* Zundel, Mycologia 36: 409. 1944.

Specimen examined. MEXICO, 56 km NE of Durango, *Cenchrus pauciflorus*, 18 Nov. 2003, T. & K. Vánky, BRIP 45311: Vánky Ust. exs. no. 1214.

Anthracoecystis cenchri-elymoidis (Vánky & R.G. Shivas) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801601

Basionym. *Sporisorium cenchri-elymoidis* Vánky & R.G. Shivas, Mycotaxon 81: 392. 2002.

Specimens examined. AUSTRALIA, Western Australia, Corneille Island, *Cenchrus elymoides* var. *brevisetosus*, 18 May 1998, A.A. Mitchell, BRIP 26491, holotype; Western Australia, Mitchell Plateau, Surveyor's Pool, *Cenchrus elymoides* var. *brevisetosus*, 12 May 2009, A.R. McTaggart, V.L. Challinor, M.J. Ryley, C.F. Gambley, T. Scharaschkin, M.D.E. & R.G. Shivas, BRIP 52532.

Anthracoecystis chrysopogonicola (A.R. Patil, T.M. Patil & M.S. Patil) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801602

Basionym. *Sporisorium chrysopogonicola* A.R. Patil, T.M. Patil & M.S. Patil, J. Mycol. Pl. Pathol. 34: 779. 2004.

Anthracoecystis chrysopogonis (Vánky) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801603

Basionym. *Sporisorium chrysopogonis* Vánky, Mycotaxon 18: 327. 1983.

Anthracoecystis chrysopogonis-fulvi (A.R. Patil, T.M. Patil & M.S. Patil) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801606

Basionym. *Sorosporium chrysopogonis-fulvi* A.R. Patil, T.M. Patil & M.S. Patil, J. Mycol. Pl. Pathol. 34: 839. 2004 (as '*chrysopogonis-fulviis*').

≡ *Sporisorium chrysopogonis-fulvi* (A.R. Patil, T.M. Patil & M.S. Patil) Vánky & A.R. Patil, Mycotaxon 99: 50. 2007.

Anthracoecystis compacta (Vánky) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801607

Basionym. *Sporisorium compactum* Vánky, Mycotaxon 85: 23. 2003.

Anthracoecystis confusa (Masse) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801608

Basionym. *Ustilago confusa* Masse, in Cooke, Grevillea 20: 65. 1892.

≡ *Sporisorium shivasii* Vánky, Mycotaxon 89: 104. 2004, nom. nov.

= *Sorosporium chamaeraphis* Syd., in Sydow & Petrak, Ann. Mycol. 26: 431. 1928.

≡ *Sporisorium chamaeraphis* (Syd.) Vánky, Mycotaxon 68: 330. 1998.

Specimen examined. AUSTRALIA, Northern Territory, Daly River, Fish Lagoon, *Pseudoraphis spinescens*, 12 Sept. 1996, I.G. Pascoe, BRIP 26795.

Anthracoecystis congensis (Syd. & P. Syd.) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801609

Basionym. *Ustilago congensis* Syd. & P. Syd., in Wildeman, Études sur la flore du Bas- et Moyen-Congo 3: 9. 1909.

≡ *Sphacelotheca congensis* (Syd. & P. Syd.) Wakef., Mycologia 22: 140. 1930.

≡ *Sporisorium congensis* (Syd. & P. Syd.) Vánky, Fung. Diversity 12: 186. 2003.

Specimen examined. UGANDA, Wakiso, Entebbe, Zizka Forest, *Hyparrhenia diplandra*, 15 Feb. 2002, M. Namaganda, T., C. & K. Vánky, Vánky, Ust. exs. no. 1179.

Anthracoystis contorta (Griffiths) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801610

Basionym. *Sorosporium contortum* Griffiths, Bull. Torrey Bot. Club 31: 83. 1904.

≡ *Sporisorium contortum* (Griffiths) Vánky, Mycotaxon 40: 165. 1991.

Anthracoystis crypta (McAlpine) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801612

Basionym. *Ustilago crypta* McAlpine, Proc. Linn. Soc. New South Wales 32: 42. 1897.

≡ *Sorosporium cryptum* (McAlpine) McAlpine, The smuts of Australia: 176. 1910.

≡ *Sporisorium cryptum* (McAlpine) Vánky, Mycotaxon 74: 173. 2000.

= *Sorosporium turneri* McAlpine, The smuts of Australia: 185. 1910.

Specimens examined. AUSTRALIA, Queensland, c. 100 km SW of Mareeba, *Brachiaria holosericea*, 3 Mar. 2000, C. & K. Vánky, Vánky, Ust. exs. no. 1185; Western Australia, Drysdale River, Kalumburu Rd., *Yakirra* sp., 12 May 2009, A.R. McTaggart, V.L. Challinor, M.J. Ryley, C.F. Gambley, T. Scharaschkin, M.D.E. & R.G. Shivas, BRIP 52536.

Anthracoystis cryptica (Cooke & Masee) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801611

Basionym. *Cintractia cryptica* Cooke & Masee, in Cooke, Grevillea 18: 34. 1889.

≡ *Sorosporium crypticum* (Cooke & Masee) L. Ling, Sydowia 3: 131. 1949.

≡ *Sporisorium crypticum* (Cooke & Masee) Vánky & M.S. Patil, Mycotaxon 74: 183. 2000.

Anthracoystis cymbopogonis (Mundk.) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801613

Basionym. *Tolyposporium cymbopogonis* Mundk., Indian J. Agric. Sci. 14: 51. 1944.

≡ *Sorosporium cymbopogonis* (Mundk.) Thirum. & Neerg., Friesia 11: 183. 1978.

≡ *Sporisorium cymbopogonis* (Mundk.) Vánky, Mycotaxon 85: 25. 2003.
= *Tolyposporium christensenii* Ragunath, Mycopathol. Mycol. Appl. 34: 120. 1968.

Specimen examined. INDONESIA, Bali, Lake Batur, c. 2 km SW of Hot Springs, *Cymbopogon flexuosus*, 4 Apr. 1992, C. & K. Vánky, BRIP 39635.

Anthracoystis cymbopogonis-bombycini (R.G. Shivas & Vánky) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801614

Basionym. *Sporisorium cymbopogonis-bombycini* R.G. Shivas & Vánky, Mycol. Balcan. 1: 163. 2004.

Specimens examined. AUSTRALIA, Western Australia, Wyndham, *Cymbopogon bombycinus*, 3 Mar. 1989, R.G. Shivas, BRIP 26809, holotype; Western Australia, Mt Hart Wilderness Lodge, *Cymbopogon bombycinus*, 14 May 2009, A.R. McTaggart, V.L. Challinor, M.J. Ryley, C.F. Gambley, T. Scharaschkin, M.D.E. & R.G. Shivas, BRIP 52511.

Anthracoystis cymbopogonis-distantis (L. Ling) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801615

Basionym. *Sorosporium cymbopogonis-distantis* L. Ling, Farlowia 4: 341. 1953.

≡ *Sporisorium cymbopogonis-distantis* (L. Ling) L. Guo, Mycosystema 17: 1. 1998.

Anthracoystis cynodontis (L. Ling) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801616

Basionym. *Sorosporium cynodontis* L. Ling, Sydowia 3: 131. 1949.

≡ *Sporisorium cynodontis* (L. Ling) R.G. Shivas & Vánky, Fung. Diversity 8: 150. 2001.

Notes — *Anthracoystis cynodontis* is one of five known *Anthracoystis* species that has a chloridoid grass host. The majority of *Anthracoystis* taxa infect andropogonoid grasses.

Anthracoystis decorsei (Har. & Pat.) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801617

Basionym. *Tolyposporium decorsei* Har. & Pat., Bull. Mus. Natl. Hist. Nat. 15: 197. 1909.

≡ *Sorosporium decorsei* (Har. & Pat.) L. Ling, Lloydia 16: 187. 1953.

≡ *Sporisorium decorsei* (Har. & Pat.) Vánky, Mycotaxon 65: 160. 1997.

Anthracoystis dembianensis (Bacc.) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801618

Basionym. *Sorosporium dembianense* Bacc., Ann. Bot. (Rome) 14: 132. 1917.

≡ *Sporisorium dembianense* (Bacc.) Vánky, Fung. Diversity 12: 187. 2003.

Specimens examined. ETHIOPIA, Gojam Region, 24 km NE of Bahar Dahr, *Hyparrhenia hirta*, 23 Oct. 2004, T. & K. Vánky, BRIP 47130. — SOUTH AFRICA, Mpumalanga, 2 km E of Waterfall-Bowen, *Hyparrhenia filipendula*, 20 Dec. 2002, A. Witt, R.G. Shivas & K. Vánky, BRIP 39657. — ZAMBIA, Eastern Province, 230 km NE of Lusaka, *Hyparrhenia filipendula*, 18 Apr. 2001, T., C. & K. Vánky, BRIP 39689. — ZIMBABWE, North Province, Mataberland, Victoria Falls, *Hyparrhenia tamba*, 2 Dec. 1999, C. & K. Vánky, BRIP 39649.

Notes — *Anthracoystis dembianensis* possesses several synapomorphic characters of *Anthracoystis*, namely permanent spore balls, dimorphic spores and absence of sterile cells. The columella is described by Vánky (2003a) as flagelliform, often with a shortly bi- or trifurcate apex. Examination of four specimens of *A. dembianensis* confirmed that the columella is flagelliform. It is woody at the base of the sorus and tapers into a flattened, filiform apex.

Anthracoystis densiflora (L. Ling) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB519163

Basionym. *Sorosporium densiflorum* L. Ling, Lloydia 16: 188. 1953.

≡ *Sporisorium densiflorum* (L. Ling) Vánky, Mycotaxon 85: 27. 2003.

Anthracoystis destruens (Schltld.) Bref. — MycoBank MB431380

Basionym. *Caeoma destruens* Schltld., Fl. Berol. 2: 130. 1824.

≡ *Uredo destruens* (Schltld.) Duby, Bot. Gall. 2: 901, 1830.

≡ *Tilletia destruens* (Schltld.) Lév., Ann. Sci. Nat., Bot., Sér. 3, 8: 372. 1847.

≡ *Ustilago destruens* (Schltld.) Rabenh., Herb. Vivum Mycol., ed. 2, no. 400. 1857.

≡ *Sphacelotheca destruens* (Schltld.) J.A. Stev. & Aar.G. Johnson, Phytopathology 34: 613. 1944.

≡ *Sporisorium destruens* (Schltld.) Vánky, Symb. Bot. Upsal. 24, 2: 115. 1985.

= *Uredo segetum* Pers. ♂ *Uredo panici-miliacei* Pers., Syn. Meth. Fung. 1: 224. 1801.

≡ *Uredo carbo* ♂ *panici-miliacei* (Pers.) DC., Fl. Franç., ed. 3, 6: 76. 1815.

≡ *Erysibe panicorum* β *panici-miliacei* (Pers.) Wallr., Fl. Crypt. Germ. 2: 216. 1833.

≡ *Ustilago panici-miliacei* (Pers.) G. Winter, Rabenh. Krypt.-Fl., ed. 2, 1: 89. 1881.

≡ *Sorosporium panici-miliacei* (Pers.) Takah., Bot. Mag. (Tokyo) 16: 184, 247. 1902.

≡ *Sphacelotheca panici-miliacei* (Pers.) Bubák, Houby Ceské 2: 27. 1912.

= *Sorosporium manchuricum* S. Ito, Trans. Sapporo Nat. Hist. Soc. 14: 93. 1935.

≡ *Sphacelotheca panici-miliacei* (Pers.) Bubák var. *manchurica* (S. Ito) Lavrov, Trudy Tomsk. Gosud. Univ. Kujbyseva, ser. biol. 104: 32, 1948.
 ≡ *Sphacelotheca manchurica* (S. Ito) Y.C. Wang, Acta Bot. Sin. 10: 134, 1962.
 = *Sphacelotheca lioui* W.Y. Yen, Contr. Inst. Bot. Natl. Acad. Peiping 4: 193, 1937.

Specimens examined. AUSTRALIA, Queensland, Dalby, *Panicum miliaceum*, 8 Apr. 1958, T. McKnight, BRIP 8221. – ROMANIA, Dobrogea, delta Danubii, pr. brachium Sf. Gheorghe, *Panicum miliaceum*, 19 Sept. 1982, G.A. Negrean, Vánky, Ust. exs. no. 472.

Notes — There are a few sterile cells reported in *Anthraco-cystis destruens* (Vánky 1994a). These are most likely remnants of non-sporogenous hyphae.

Anthraco-cystis dichanthii (Vánky & N.D. Sharma) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801620

Basionym. *Sporisorium dichanthii* Vánky & N.D. Sharma, Fung. Diversity 15: 230, 2004.

Specimen examined. INDIA, Madhya Pradesh, Jabalpur, 200 km SW of Pachmarhi, *Dichanthium aristatum*, 30 Oct. 1992, R. Sharma, S. Raich, BRIP 51777, HUV 20263, isotype.

Anthraco-cystis duranii (Vánky) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801619

Basionym. *Ustilago duranii* Vánky, Mycotaxon 89: 77, 2004.
 ≡ *Sporisorium duranii* (Vánky) Vánky & Cunningt., in Cunnington, Vánky & Shivas, Mycol. Balcan. 2: 96, 2005.
 ≡ *Lundquistia duranii* (Vánky) Vánky, Fung. Diversity 17: 165, 2004.

Anthraco-cystis ehrenbergii (J.G. Kühn) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801621

Basionym. *Sorosporium ehrenbergii* J.G. Kühn, Mitth. Vereins. Erdk. Halle: 87, 1877.
 ≡ *Tolyposporium ehrenbergii* (J.G. Kühn) Pat., Bull. Soc. Mycol. France 19: 254, 1903.
 ≡ *Sporisorium ehrenbergii* (J.G. Kühn) Vánky, Mycotaxon 38: 270, 1990.
 = *Tolyposporium filliferum* Busse, Arbeiten Biol. Abt. Landw.-Forstw. Kaiserl. Gesundheit. 4: 383, 1905.
 ≡ *Sorosporium filliferum* (Busse) Zundel, Mycologia 22: 148, 1930.
 = *Sorosporium andropogonis-sorghii* S. Ito, Trans. Sapporo Nat. Hist. Soc. 14: 93, 1935.

Anthraco-cystis elionuri (Henn. & Pole-Evans) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801622

Basionym. *Ustilago elionuri* Henn. & Pole-Evans, in Hennings, Bot. Jahrb. Syst. 41: 270, 1908.
 ≡ *Sphacelotheca elionuri* (Henn. & Pole-Evans) Vienn.-Bourg., nom. herb.?
 ≡ *Sporisorium elionuri* (Henn. & Pole-Evans) Vánky, Mycotaxon 73: 155, 1999.
 = *Ustilago elionuri* Speg., Anales Mus. Nac. Buenos Aires, Ser. 3, 12: 288, 1909
 ≡ *Ustilago elionuri-candidi* Speg., in Saccardo & Trotter, in Saccardo, Syll. Fung. 21: 501, 1912, nom. nov. pro *U. elionuri* Speg.
 ≡ *Sphacelotheca elionuri-candidi* (Speg.) Hirschh., Ustil. Fl. Argent.: 119, 1986.

Specimen examined. SOUTH AFRICA, Eastern Cape, Lady Grey, *Elionurus muticus*, 21 July 1996, C. & K. Vánky, Vánky, Ust. exs. no. 1019.

Anthraco-cystis enteromorpha (McAlpine) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801623

Basionym. *Ustilago enteromorpha* McAlpine, Agric. Gaz. New South Wales 7: 154, 1896.
 ≡ *Sorosporium enteromorphum* (McAlpine) McAlpine, The smuts of Australia: 177, 1910.
 ≡ *Sporisorium enteromorphum* (McAlpine) Vánky, Mycotaxon 51: 161, 1994.

Specimens examined. AUSTRALIA, Queensland, Carnarvon National Park, Carnarvon Gorge, *Themeda triandra*, 28 June 2010, R.G. Shivas, BRIP 53624. – SOUTH AFRICA, KwaZulu-Natal, Drakensberg Mountains, *Themeda triandra*, 3 Jan. 1997, K. Vánky, Vánky, Ust. exs. no. 1020.

Notes — Sterile cells formed from non-sporogenous hyphae are usually absent in *Anthraco-cystis*. There are a few sterile cells reported in *A. enteromorpha* (Vánky 1994b), which are most likely remnants of the non-sporogenous hyphae. McAlpine (1910) did not record sterile cells in the type description.

Anthraco-cystis eriochloae (Vánky) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801624

Basionym. *Sporisorium eriochloae* Vánky, Mycotaxon 74: 174, 2000.

Anthraco-cystis eulaliae (L. Ling) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801625

Basionym. *Sorosporium eulaliae* L. Ling, Sydowia 7: 155, 1953.
 ≡ *Sporisorium eulaliae* (L. Ling) Vánky, Mycotaxon 62: 137, 1997.

Specimen examined. AUSTRALIA, Queensland, Pindi Pindi, *Eulalia trispicata*, 21 Aug. 1941, R.F.N. Langdon, BRIP 7929, isotype.

Anthraco-cystis everhartii (Ellis & Galloway) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801626

Basionym. *Sorosporium everhartii* Ellis & Galloway, J. Mycol. 6: 32, 1890.
 ≡ *Tolyposporium everhartii* (Ellis & Galloway) Dietel, in Engler & Prantl, Nat. Pflanzenfam. I, 1: 14, 1897.
 ≡ *Sporisorium everhartii* (Ellis & Galloway) M. Piepenbr., Mycol. Res. 103: 462, 1999.

Anthraco-cystis fallax (R.G. Shivas & Cunningt.) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801627

Basionym. *Sporisorium fallax* R.G. Shivas & Cunningt., Fung. Diversity 16: 149, 2004.

Specimen examined. AUSTRALIA, Northern Territory, 268 km SE of Katherine, *Chrysopogon fallax*, 15 Mar. 2000, R.G. Shivas, I.T. Riley, C. & K. Vánky, BRIP 27687, holotype.

Anthraco-cystis filiformis (Henn.) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801628

Basionym. *Ustilago filiformis* Henn., Bot. Jahrb. Syst. 30: 254, 1901 (not *Ustilago filiformis* (Schränk) Rostr., Festschr. Bot. Foren. 54: 136, 1890).
 ≡ *Sorosporium filiforme* (Henn.) Zundel (as '*filiformis*'), Mycologia 22: 153, 1930.
 ≡ *Sporisorium filiforme* (Henn.) Vánky, Mycotaxon 74: 180, 2000.

Anthraco-cystis formosana (Sawada) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801629

Basionym. *Ustilago formosana* Sawada, J. Formosan Nat. Hist. Soc. 34: 6, 1918 (in Japanese, n.v.); in Tanaka, Mycologia 14: 89, 1922.
 ≡ *Sorosporium formosanum* (Sawada) Sawada, Descriptive catalogue of the Formosan fungi 4: 29, 1928.
 ≡ *Sporisorium formosanum* (Sawada) Vánky, Publ. Herb. Univ. Uppsala 11: 12, 1983.
 = *Ustilago digitariae* Rabenh. forma *panici-repentis* J.G. Kühn, Hedwigia 15: 5, 1876, nom. conf., comp. Vánky 1990: 274.
 = *Sorosporium panici* Beeli, Bull. Jard. Bot. État Bruxelles 8: 7, 1922 (not *Sorosporium panici* E. MacKinnon, J. Proc. Roy. Soc. New S.Wales 45: 201, 1912).
 = *Sorosporium panici* Beeli var. *kinshasaensis* Beeli, Bull. Jard. Bot. État Bruxelles 8: 8, 1922.
 ≡ *Sorosporium kinshasaensis* (Beeli) Zundel, Mycologia 29: 590, 1937.
 ≡ *Sorosporium beelii* Zundel, Bothalia 3: 307, 1938.
 ≡ *Sorosporium beelii* Zundel var. *kinshasaensis* (Beeli) Hendr., Publ. Inst. Natl. Etude Agron. Congo Belge, Ser. Sci. 35: 8, 1948.
 = *Ustilago amadelpa* Syd., P. Syd. & E.J. Butler var. *glabriuscula* Cif., Nuovo Giorn. Bot. Ital. 40: 255, 1933.

- = *Ustilago overeemii* Cif. (as 'overeemī'), Nuovo Giorn. Bot. Ital. 40: 254. 1933.
 ≡ *Sorosporium overeemii* (Cif.) Malençon, Rev. Mycol. (Paris), n.s. 10: 121. 1945.
 ≡ *Sporisorium overeemii* (Cif.) Rifai, Reinwardtia 9: 400. 1980.
 = *Sorosporium punctatum* Malençon & W.Y. Yen, Rev. Mycol. (Paris), n.s. 2: 130. 1937.
 = *Sorosporium trichophorum* (Tul. & C. Tul.) Zundel, Mycologia 31: 583. 1939.

Specimen examined. TAIWAN, Taichung, University campus, *Panicum repens*, 12 July 1988, F. Oberwinkler, Vánky, Ust. exs. no. 688.

Anthracocystis gayana (Vánky & C. Vánky) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801630

Basionym. *Sporisorium gayanum* Vánky & C. Vánky, Mycotaxon 74: 205. 2000.

Specimen examined. ZIMBABWE, North Province, Matabeleland, 12 km north of Lusulu, *Andropogon gayanus*, 16 Mar. 1999, C. & K. Vánky, BRIP 27435, Vánky, Ust. exs. no. 1064, isotype.

Notes — Sterile cells formed from non-sporogenous hyphae are absent in *Anthracocystis*. There are a few sterile cells reported in *A. gayana* (Vánky 2000), which are most likely remnants of the non-sporogenous hyphae.

Anthracocystis glutinosa (Zundel) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801631

Basionym. *Sorosporium glutinosum* Zundel, Mycologia 36: 407. 1944.
 ≡ *Sporisorium glutinosum* (Zundel) Vánky, Mycotaxon 74: 180. 2000.
 = *Tolyposporium andropogonis* Patel & N.B. Kulk., Indian Phytopathol. 4: 65. 1951.
 ≡ *Sorosporium andropogonis* (Patel & N.B. Kulk.) Thirum. & Neerg., Friesia 11: 182. 1978.

Specimen examined. AUSTRALIA, Queensland, Lakeland, 16 km from Lake-land to Cooktown Road, *Heteropogon triticeus*, 24 Mar. 2005, T.S. Marney & R.G. Shivas, BRIP 46153.

Anthracocystis guaranitica (Speg.) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801632

Basionym. *Ustilago guaranitica* Speg., Anales Soc. Ci. Argent. 17: 87. 1884.
 ≡ *Sphacelotheca guaranitica* (Speg.) Zundel, Mycologia 22: 135. 1930.
 ≡ *Sorosporium guaraniticum* (Speg.) L. Ling, Lloydia 16: 190. 1953.
 ≡ *Sporisorium guaraniticum* (Speg.) Vánky, Mycotaxon 35: 155. 1989.

Specimen examined. ECUADOR, Pichincha, Quito, 30 km E of inter pagg. Pifo et Yaruqui, *Schizachyrium condensatum*, 21 Mar. 1993, H. Bauch, C. & K. Vánky, Vánky, Ust. exs. no. 1168.

Anthracocystis heteropogonicola (Mundk. & Thirum.) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801633

Basionym. *Sorosporium heteropogonicola* Mundk. & Thirum., Mycol. Pap. 40: 5. 1951.
 ≡ *Sporisorium heteropogonicola* (Mundk. & Thirum.) Vánky, Mycol. Res. 101: 839. 1997.

Specimens examined. AUSTRALIA, Western Australia, between Wyndham and Kununurra, *Heteropogon contortus*, 8 Apr. 2008, A.R. McTaggart, V.L. Challinor, A.D.W. Geering, M.D.E. & R.G. Shivas, BRIP 51822. — INDIA, Nainital, Utter Pradesh, *Heteropogon contortus*, 7 Sept. 1992, K. Vánky, Vánky, Ust. exs. no. 919.

Notes — Sterile cells formed from non-sporogenous hyphae are usually absent in *Anthracocystis*. There are a few sterile cells reported in *A. heteropogonicola* (Shivas & Vánky 1997), which were most likely remnants of the non-sporogenous hyphae.

Anthracocystis hodsonii (Zundel) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801634

Basionym. *Sorosporium hodsonii* Zundel, Mycologia 22: 152. 1930.
 ≡ *Sporisorium hodsonii* (Zundel) Vánky, Mycotaxon 91: 225. 2005.
 = *Sorosporium harrismithense* Zundel, Mycologia 22: 154. 1930.
 = *Sorosporium flanaganianum* Zundel, Mycologia 22: 155. 1930.
 = *Ustilago versatilis* Syd., Ann. Mycol. 33: 231. 1935.
 ≡ *Sorosporium versatile* (Syd.) Zundel, Bothalia 3: 308. 1938.
 = *Sorosporium afrum* Syd., Ann. Mycol. 33: 232. 1935.

Specimen examined. SOUTH AFRICA, Limpopo, Naboomspruit, 20 km S of Nylsvley Nature Reserve, *Panicum schinzii*, 15 Mar. 1998, C. & K. Vánky, Vánky, Ust. exs. no. 1236.

Notes — Sterile cells formed from non-sporogenous hyphae are usually absent in *Anthracocystis*. Vánky (2005) included sterile cells as sparse or absent in his description of *A. hodsonii*.

Anthracocystis holstii (Henn.) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801635

Basionym. *Sorosporium holstii* Henn., in Engler, Pflanzenw. Ost-Afrikas C: 49. 1895.
 ≡ *Sporisorium holstii* (Henn.) Vánky, Mycotaxon 51: 162. 1994.

Specimen examined. THAILAND, *Themeda triandra*, 20 Dec. 2005, R.G. Shivas, P. Athipunyakom, BRIP 47758.

Anthracocystis horsfallii (Vánky) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801636

Basionym. *Sporisorium horsfallii* Vánky, Mycotaxon 78: 297. 2001.

Anthracocystis hwangensis (Vánky & C. Vánky) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801637

Basionym. *Sporisorium hwangense* Vánky & C. Vánky, Mycotaxon 74: 194. 2000.

Specimen examined. ZIMBABWE, Matabeleland North, Hwange National Park, Main Camp, Sedina Waterhole, *Sporobolus panicoides*, 6 Mar. 1999, C. & K. Vánky, Vánky, Ust. exs. no. 1059, isotype.

Notes — Sterile cells formed from non-sporogenous hyphae are usually absent in *Anthracocystis*. There are a few sterile cells reported in *A. hwangensis* (Vánky 2000), which are most likely remnants of the non-sporogenous hyphae. *Anthracocystis hwangensis* on *Sporobolus* is one of five known *Anthracocystis* species that have a chloridoid grass as host. The majority of *Anthracocystis* taxa infect andropogonoid grasses.

Anthracocystis ischaemiana (A.R. Patil, T.M. Patil & M.S. Patil) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801638

Basionym. *Sporisorium ischaemianum* A.R. Patil, T.M. Patil & M.S. Patil, J. Mycol. Pl. Pathol. 34: 783. 2004.

Anthracocystis ischaemoides (Henn.) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801639

Basionym. *Ustilago ischaemoides* Henn., in Wildeman, Ann. Mus. Congo Belge, Bot., Sér. 5, 2: 86. 1907.
 ≡ *Sorosporium ischaemoides* (Henn.) Zundel, Mycologia 29: 587. 1937.
 ≡ *Sporisorium ischaemoides* (Henn.) Vánky, Fung. Diversity 12: 188. 2003.

= *Sorosporium wildemanianum* Henn., in Wildeman, Ann. Mus. Congo Belge, Bot. Sér. 5, 2: 87. 1907.
 = *Sorosporium austroafricanum* Zundel (as 'austro-africanum'), Mycologia 22: 147. 1930.
 = *Sorosporium hansfordii* Ainsw., Proc. Linn. Soc. London 153: 93. 1941.

Specimen examined. SOUTH AFRICA, Western Cape, Gordon's Bay, 10 km S of Somerset West, *Hyparrhenia anamesa*, 3 Dec. 1996, C. & K. Vánky, Vánky, Ust. exs. no. 1162.

Anthracocestis langdonii (Vánky) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801640

Basionym. *Sporisorium langdonii* Vánky, Mycotaxon 51: 156. 1994.

Specimen examined. AUSTRALIA, Queensland, Dalby, *Themeda avenacea*, 27 May 1941, R.F.N. Langdon, BRIP 7865, holotype.

Notes — Sterile cells formed from non-sporogenous hyphae are usually absent in *Anthracocestis*. There are a few sterile cells reported in *A. langdonii* (Vánky 1994b), which are most likely remnants of the non-sporogenous hyphae.

Anthracocestis leersiae (Mishra) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801641

Basionym. *Sorosporium leersiae* Mishra, Mycologia 48: 876. 1956.

≡ *Sporisorium leersiae-hexandrae* Vánky, Mycotaxon 89: 103. 2004, nom. nov.

= *Sporisorium leersiae* Bag & D.K. Agarwal, Indian Phytopathol. 54: 221. 2001.

Notes — *Leersia* is a member of the grass tribe *Oryzeae* in subfam. *Ehrhartoideae* (Stevens 2001). *Anthracocestis leersiae* is the only known species to occur on a grass in this subfamily.

Anthracocestis leucostachys (Henn.) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801642

Basionym. *Ustilago leucostachys* Henn., in Pазschke, Hedwigia 35: 50. 1896.

≡ *Sphacelotheca leucostachys* (Henn.) Zundel, Mycologia 22: 144. 1930.

≡ *Sporisorium leucostachys* (Henn.) M. Piepenbr., Fl. Neotrop. Monogr. 86: 110. 2003.

Anthracocestis likhitekarajae (R.G. Shivas, Athip. & McTaggart) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801643

Basionym. *Sporisorium likhitekarajae* R.G. Shivas, Athip. & McTaggart, Mycol. Balcan. 5: 103. 2008.

Specimen examined. THAILAND, Nakhon Phanom, 31 km west of Sri Songkram, *Ischaemum* sp., 12 Dec. 2007, P. Athipunyakom, S. Likhitekaraj, V.L. Challinor, T.S. Marney, A.R. McTaggart, M.D.E. & R.G. Shivas, BRIP 51521, holotype.

Anthracocestis livingstoneana (Vánky) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801644

Basionym. *Sporisorium livingstoneanum* Vánky, Mycotaxon 95: 17. 2006.

Specimen examined. ZAMBIA, Southern Province, 10 km N of Livingstone, *Andropogon gayanus*, 14 Apr. 2001, T., C. & K. Vánky, BRIP 47134, isotype.

Anthracocestis lophopogonis (Thirum. & Pavgi) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801645

Basionym. *Sorosporium lophopogonis* Thirum. & Pavgi, Sydowia 20: 23. 1968.

≡ *Sporisorium lophopogonis* (Thirum. & Pavgi) Vánky, Mycotaxon 48: 40. 1993.

Specimen examined. INDIA, Maharashtra, Pune, *Lophopogon tridentatus*, 18 Oct. 1992, K. Vánky, Vánky, Ust. exs. no. 921.

Anthracocestis loudetiae-pedicellatae (Vánky & C. Vánky) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801646

Basionym. *Sporisorium loudetiae-pedicellatae* Vánky & C. Vánky, Mycotaxon 65: 165. 1997.

Anthracocestis loudetiae-superbae (L. Ling) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801647

Basionym. *Sorosporium loudetiae-superbae* L. Ling, Lloydia 16: 190. 1953.

≡ *Sporisorium loudetiae-superbae* (L. Ling) Vánky, Mycotaxon 65: 162. 1997.

Anthracocestis maranguensis (Henn.) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801648

Basionym. *Sorosporium maranguense* Henn. (as '*maranguensis*'), in Engler, Pflanzenw. Ost-Afrikas C: 49. 1895.

≡ *Sporisorium maranguense* (Henn.) Vánky, Fung. Diversity 12: 193. 2003.

Anthracocestis masseeana (Vánky) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801649

Basionym. *Sporisorium masseeanum* Vánky, Australas. Pl. Pathol. 29: 160. 2000.

Anthracocestis megaloprotachnes (Vánky & T. Vánky) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801650

Basionym. *Sporisorium megaloprotachnes* Vánky & T. Vánky, Mycotaxon 81: 389. 2002.

Anthracocestis mexicana (Vánky) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801651

Basionym. *Lundquistia mexicana* Vánky, Fung. Diversity 17: 161. 2004.

≡ *Sporisorium mexicanum* (Vánky) Vánky & Cunningt., Mycol. Balcan. 2: 98. 2005.

Notes — Vánky (2004) described *A. mexicana* with sterile cells mixed within the sorus. Sterile cells derived from partitioning hyphae are an apomorphic character of *Sporisorium*. *Anthracocestis mexicana* was sister to all other taxa in *Anthracocestis*. Whether these are true sterile cells that were lost subsequently in *Anthracocestis* or sterile cells present in spore balls is unknown.

Anthracocestis mixta (Massee) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801652

Basionym. *Tilletia mixta* Massee, Bull. Misc. Inform. Kew 1899: 145. 1899.

≡ *Sorosporium mixtum* (Massee) McAlpine, The smuts of Australia: 178. 1910.

≡ *Sporisorium mixtum* (Massee) Vánky, Mycotaxon 56: 214. 1995.

= *Sorosporium eriochloae* Griffiths, Bull. Torrey Bot. Club 31: 84. 1904.

Anthracocestis mutabilis (Syd.) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801653

Basionym. *Sphacelotheca mutabilis* Syd., Ann. Mycol. 35: 24. 1937.

≡ *Sorosporium mutabile* (Syd.) L. Ling, Lloydia 14: 107. 1951.

≡ *Sporisorium mutabile* (Syd.) Vánky, Mycotaxon 85: 29. 2003.

= *Sorosporium cantonense* Zundel, Mycologia 31: 584. 1939.

≡ *Sporisorium cantonense* (Zundel) L. Guo, Mycosystema 17: 1. 1998.

= *Sorosporium terrareginalense* Zundel, Mycologia 36: 409. 1944.

Specimens examined. AUSTRALIA, Western Australia, Morowa, *Cymbopogon bombycinus*, 26 Sept. 1993, R.J. Cranfield, BRIP 28994; New South Wales, 11 km N of Coonabarabran, *Cymbopogon refractus*, 16 Apr. 2004, M.D.E. & R.G. Shivas, BRIP 44111.

Anthracocestis myosuroidis (Hirschh.) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801654

Basionym. *Sorosporium myosuroidis* Hirschh., Revista Mus. La Plata, n.s., Bot. 3: 343. 1941.

≡ *Sporisorium myosuroidis* (Hirschh.) Vánky, Mycotaxon 81: 396. 2002.

Anthracoystis nardi (Syd. & P. Syd.) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801655

Basionym. *Ustilago nardi* Syd. & P. Syd., in H. & P. Sydow & Butler, Ann. Mycol. 4: 425. 1906.

- ≡ *Sphacelotheca nardi* (Syd. & P. Syd.) Zundel, Mycologia 22: 137. 1930.
- ≡ *Sorosporium nardi* (Syd. & P. Syd.) L. Ling, Sydowia 5: 47. 1951.
- ≡ *Sporisorium nardi* (Syd. & P. Syd.) Vánky, Mycotaxon 85: 30. 2003.

Anthracoystis normanensis (R.G. Shivas & Vánky) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801656

Basionym. *Sporisorium normanense* R.G. Shivas & Vánky (as '*normanensis*'), Fung. Diversity 8: 150. 2001.

Specimen examined. AUSTRALIA, Queensland, Normanton, 18 km SSE of Norman River Bridge, *Cynodon dactylon*, 10 July 1999, R.G. Shivas, M. Gunther, BRIP 25751, holotype.

Notes — Sterile cells formed from non-sporogenous hyphae are usually absent in *Anthracoystis*. There are a few sterile cells reported in *A. normanensis* (Shivas & Vánky 2001), which are most likely remnants of the non-sporogenous hyphae. *Anthracoystis normanensis* on *Cynodon* is one of five known *Anthracoystis* species that has a chloridoid grass species as host. The majority of *Anthracoystis* taxa infect andropogonoid grasses.

Anthracoystis nyalalandica (L. Ling) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801657

- Basionym.* *Sorosporium nyalalandicum* L. Ling, Sydowia 7: 156. 1953.
- ≡ *Sporisorium nyalalandicum* (L. Ling) Vánky, Mycotaxon 91: 226. 2005.

Anthracoystis operculata (Vánky, C. Vánky & R.G. Shivas) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801658

Basionym. *Sporisorium operculatum* Vánky, C. Vánky & R.G. Shivas, Fung. Diversity 7: 154. 2001.

Specimen examined. AUSTRALIA, Queensland, Chillagoe, *Mnesithea formosa*, 4 Mar. 2000, K. & C. Vánky, BRIP 27015, holotype.

Anthracoystis ovaria (Griffiths) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801659

Basionym. *Sorosporium ovarium* Griffiths, Bull. Torrey Bot. Club 34: 209. 1907.

- ≡ *Sporisorium ovarium* (Griffiths) Vánky, Mycotaxon 65: 138. 1997.
- = *Sphacelotheca diplospora* (Ellis & Everh.) Clinton var. *verruculosa* Clinton, N. Amer. Fl. 7: 27. 1906.
- = *Ustilago verecunda* Syd., Ann. Mycol. 33: 231. 1935.
- ≡ *Sorosporium verecundum* (Syd.) Zundel, Bothalia 3: 304. 1938.
- = *Sorosporium brachiariae* J.C.F. Hopkins, Trans. Rhodesia Sci. Assoc. 35: 126. 1938.
- = *Sorosporium brachiariae-ramosae* T.S. Ramakr., Proc. Indian Acad. Sci. 35: 113. 1952.
- = *Ustilago urochloana* Zundel, Mycologia 35: 166. 1943.

Specimen examined. AUSTRALIA, Northern Territory, Alice Springs, 393 km N of Devils Marbles, *Brachiaria piliigera*, 15 Mar. 2000, R.G. Shivas, I.T. Riley, C. & K. Vánky, Vánky, Ust. exs. no. 1184.

Anthracoystis panici-fasciculati (Vánky) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801661

Basionym. *Sporisorium panici-fasciculati* Vánky, Mycotaxon 91: 229. 2005.

Anthracoystis panici-leucophaei (Bref.) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801662

- Basionym.* *Ustilago panici-leucophaei* Bref., Unters. Gesamtgeb. Mykol. 12: 114. 1895.
- ≡ *Sphacelotheca panici-leucophaei* (Bref.) Clinton, N. Amer. Fl. 7: 28. 1906.

≡ *Sporisorium panici-leucophaei* (Bref.) M. Piepenbr., Mycol. Res. 103: 465. 1999.

≡ *Lundquistia panici-leucophaei* (Bref.) Vánky, Fung. Diversity 17: 167. 2004.

= *Ustilago insularis* Henn., in Pazschke, Hedwigia 35: 51. 1896.

= *Ustilago bonariensis* Speg., Anales Mus. Nac. Buenos Aires, Ser. 3, 12: 287. 1909.

≡ *Sphacelotheca bonariensis* (Speg.) Cif., Ann. Mycol. 29: 56. 1931.

≡ *Sorosporium bonariense* (Speg.) Zundel (as '*bonariensis*'), Ustil. World: 54. 1953.

≡ *Sporisorium bonariense* (Speg.) Vánky, nom. herb.

= *Sphacelotheca viegasiana* Zundel, Mycologia 31: 588. 1939.

= *Sorosporium lindmanii* Zundel, Mycologia 35: 173. 1943.

= *Ustilago garcesii* Zundel (as '*garcesi*'), Mycologia 37: 372. 1945.

= *Lundquistia fascicularis* Vánky, Mycotaxon 77: 373. 2001.

≡ *Sporisorium fasciculare* (Vánky) M. Stoll, Begerow & Oberw. (as '*fascicularis*'), Mycol. Res. 109: 354. 2005.

Specimens examined. ARGENTINA, Buenos Aires, 115 km NNW of Buenos Aires, *Panicum elephantipes*, 29 Nov. 1999, K. & C. Vánky, Vánky, Ust. exs. no. 1117 (BRIP 28944). — AUSTRALIA, New South Wales, 11 km N of Coonabarabran, *Digitaria breviglumis*, 16 Apr. 2004, M.D.E. & R.G. Shivas, BRIP 44110.

Anthracoystis panici-petrosi (Syd. & P. Syd) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801663

Basionym. *Ustilago panici-petrosi* Syd. & P. Syd., Ann. Mycol. 14: 73. 1916.

≡ *Sporisorium panici-petrosi* (Syd. & P. Syd.) M. Piepenbr., Fl. Neotrop. Monogr. 86: 122. 2003.

Anthracoystis panicicola (Vánky) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801660

Basionym. *Sporisorium panicicola* Vánky, Mycotaxon 91: 229. 2005.

Specimen examined. REUNION, St Benoit, 14 km SW of Lacus Le Grand Etang, *Panicum coloratum*, 2 Dec. 1994, C. & K. Vánky, Vánky, Ust. exs. no. 1238, isotype.

Notes — Sterile cells formed from non-sporogenous hyphae are usually absent in *Anthracoystis*. There are a few sterile cells reported in *A. panicicola* (Vánky 2005), which are most likely remnants of the non-sporogenous hyphae.

Anthracoystis paraneurachnis (R.G. Shivas & Vánky) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801664

Basionym. *Sporisorium paraneurachnis* R.G. Shivas & Vánky (as '*paraneurachnes*'), Mycol. Res. 101: 836. 1997.

Specimen examined. AUSTRALIA, Western Australia, *Paraneurachne muelleri*, 27 June 1996, A.A. Mitchell, BRIP 26804.

Anthracoystis parodii (Hirschh.) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801665

Basionym. *Ustilago parodii* Hirschh., Darwiniana 3: 404. 1939.

≡ *Sporisorium parodii* (Hirschh.) Vánky, Mycotaxon 85: 59. 2003.

Notes — *Anthracoystis parodii* on *Muhlenbergia* is one of five known *Anthracoystis* species that infect a chloridoid grass. The majority of *Anthracoystis* taxa infect andropogonoid grasses.

Anthracoystis paspali-thunbergii (Henn.) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801666

Basionym. *Ustilago paspali-thunbergii* Henn., Hedwigia 43: 140. 1904.

≡ *Sorosporium paspali-thunbergii* (Henn.) S. Ito, Trans. Sapporo Nat. Hist. Soc. 14: 94. 1935.

≡ *Sporisorium paspali-thunbergii* (Henn.) Vánky, Publ. Herb. Ustilag. Vánky (HUV) 3: 9. 1986.

= *Sorosporium paspali* McAlpine, The smuts of Australia: 180. 1910.

= *Sorosporium paspali* McAlpine var. *verrucosum* Thirum. & Pavgi, Mycopathol. Mycol. Appl. 7: 283. 1956.

Specimen examined. CHINA, Yunnan, Mamushu, *Paspalum scrobiculatum*, 22 Sept. 1985, L. Guo & K. Vánky, Vánky, Ust. exs. no. 526.

Anthracocestis penniseti (Rabenh.) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801667

Basionym. *Ustilago penniseti* Rabenh., Hedwigia 10: 18. 1871.
 ≡ *Sphacelotheca penniseti* (Rabenh.) Reichert, Bot. Jahrb. Syst. 56: 679. 1921.
 = *Sorosporium penniseti* Mundk., Trans. Brit. Mycol. Soc. 23: 116. 1939.
 ≡ *Sporisorium penniseti* (Rabenh.) Ershad, Iran. J. Pl. Pathol. 30: 18. 1994.
 = *Ustilago penniseti* Rabenh. var. *verruculosa* Massenot, Rev. Mycol. (Paris) 34: 217. 1969.
 = *Ustilago pappiana* Bacc., Ann. Bot. (Rome) 4: 272. 1906.
 ≡ *Sorosporium pappianum* (Bacc.) L. Ling, Lloydia 16: 192. 1953.
 = *Sorosporium catharticum* Maire, Trav. Cryptog. Ded. L. Mangin: 359. 1931.
 ≡ *Sporisorium catharticum* (Maire) Vánky, Mycotaxon 35: 155. 1989.
 = *Sphacelotheca panjabensis* Syd., in Sydow & Ahmad, Ann. Mycol. 37: 442. 1939.
 ≡ *Ustilago panjabensis* (Syd.) L. Ling, Sydowia 4: 76. 1950.
 = *Sphacelotheca stewartii* Mundk., Mycologia 36: 290. 1944.

Specimen examined. INDIA, Tamil Nadu, Coimbatore, Institute of Forest Genetics & Tree Breeding, Guest House, *Cenchrus ciliaris*, 4 Jan. 2010, R.G. & M.D.E. Shivas, BRIP 53217.

Anthracocestis penniseticola (Vánky) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801668

Basionym. *Sporisorium penniseticola* Vánky, Mycol. Balcan. 2: 92. 2005.

Specimen examined. ETHIOPIA, Arsi, 11 km south of Asela, *Pennisetum sphacelatum*, 4 Nov. 2004, T. & K. Vánky, BRIP 47137, paratype.

Anthracocestis pennisetina (S. Ahmad) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801669

Basionym. *Sphacelotheca pennisetina* S. Ahmad, Mycol. Pap. 64: 7. 1956.
 ≡ *Sporisorium pennisetinum* (S. Ahmad) Vánky, Mycotaxon 85: 13. 2003.

Notes — Sterile cells formed from non-sporogenous hyphae are usually absent in *Anthracocestis*. There are a few sterile cells reported in *A. pennisetina* (Vánky 2003b), which are most likely remnants of the non-sporogenous hyphae.

Anthracocestis pollinae (Magnus) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801670

Basionym. *Sorosporium pollinae* Magnus (as '*Sorisorium*'), Verh. K. K. Zool.-Bot. Ges. Wien 50: 433. 1900.
 ≡ *Sporisorium pollinae* (Magnus) Vánky, Mycotaxon 18: 331. 1983.

Specimen examined. GREECE, Rhodos, *Andropogon distachyos* L., 14 Apr. 1988, H.W. & I. Scholz, Vánky, Ust. exs. no. 690.

Anthracocestis polytridis (Masse) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801671

Basionym. *Ustilago polytridis* Masse, Bull. Misc. Inform. Kew 1911: 224. 1911.
 ≡ *Sphacelotheca polytridis* (Masse) L. Ling, Sydowia 3: 127. 1949.
 ≡ *Sporisorium polytridis* (Masse) Rifai, Bul. Kebun Raya 7: 28. 1990.
 ≡ *Sporisorium polytridis* (Masse) Vánky (comb. superfl.), Mycotaxon 62: 136. 1997.

Anthracocestis provincialis (Ellis & Galloway) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801672

Basionym. *Sorosporium ellisii* G. Winter var. *provinciale* Ellis & Galloway, J. Mycol. 6: 31. 1890.
 ≡ *Sorosporium provinciale* (Ellis & Galloway) Clinton, J. Mycol. 8: 145. 1902.
 ≡ *Sporisorium provinciale* (Ellis & Galloway) Vánky & Snets., Mycotaxon 38: 271. 1990.

Specimen examined. USA, Iowa, Ledges State Park, Boone Co., *Andropogon gerardi*, 23 June 1989, K.M. Snetselaar, Vánky, Ust. exs. no. 759.

Notes — Sterile cells formed from non-sporogenous hyphae are usually absent in *Anthracocestis*. There are a few sterile cells reported in *A. provincialis* (Vánky 1990), which are most likely remnants of the non-sporogenous hyphae.

Anthracocestis pseudanthistiriae (Syd., P. Syd. & E.J. Butler) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801750

Basionym. *Sorosporium pseudanthistiriae* Syd., P. Syd. & E.J. Butler, Ann. Mycol. 10: 254. 1912.
 ≡ *Sporisorium pseudanthistiriae* (Syd., P. Syd. & E.J. Butler) Vánky, Mycotaxon 62: 145. 1997.
 = *Sorosporium pseudanthistiriae-umbellatae* A.R. Patil, T.M. Patil & M.S. Patil, J. Mycol. Pl. Pathol. 34: 841. 2004.

Specimen examined. INDIA, Maharashtra, Kolhapur, Shivaji University, *Pseudanthistiria hispida*, 16 Nov. 1995, Sharma & K. Vánky, Vánky, Ust. exs. no. 969.

Anthracocestis pseudomarangensis (Zundel) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801673

Basionym. *Sorosporium pseudomarangense* Zundel, Bothalia 3: 309. 1938.
 ≡ *Sporisorium pseudomarangense* (Zundel) Vánky, Mycotaxon 91: 263. 2005.

Notes — Sterile cells formed from non-sporogenous hyphae are usually absent in *Anthracocestis*. There are a few sterile cells reported in *A. pseudomarangensis* (Vánky 2005), which are most likely remnants of the non-sporogenous hyphae.

Anthracocestis pseudoraphis (Vánky) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801674

Basionym. *Sporisorium pseudoraphis* Vánky, Mycotaxon 68: 331. 1998.

Notes — Sterile cells formed from non-sporogenous hyphae are usually absent in *Anthracocestis*. There are a few sterile cells reported in *A. pseudoraphis* (Vánky 1998), which are most likely remnants of the non-sporogenous hyphae.

Anthracocestis rhytachnes (Syd.) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801675

Basionym. *Sphacelotheca rhytachnes* Syd., Ann. Mycol. 37: 201. 1939.
 ≡ *Sporisorium rhytachnes* (Syd.) Vánky, Mycotaxon 74: 171. 2000.

Anthracocestis rubyana (Vánky & N.D. Sharma) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801676

Basionym. *Sporisorium rubyanum* Vánky & N.D. Sharma, Fung. Diversity 15: 234. 2004.

Specimen examined. INDIA, Madhya Pradesh, Jabalpur, 200 km SW of Pachmarhi, *Capillipedium assimile*, 31 Oct. 1992, R. Sharma & S. Raich, BRIP 51782, isoparatype.

Anthracocestis sahariana (Trotter) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801677

Basionym. *Sorosporium saharianum* Trotter, Ann. Mycol. 11: 413. 1913.
 ≡ *Sporisorium saharianum* (Trotter) Karatygin, in Karatygin & Azbukina, Definitorium fungorum URSS, etc.: 78. 1989.

Notes — *Anthracocestis sahariana* on *Sporobolus* is one of five known *Anthracocestis* species that infect a chloridoid grass. The majority of *Anthracocestis* taxa infect andropogonoid grasses.

Anthracoystis scheffleri (Syd. & P. Syd.) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801678

Basionym. *Ustilago scheffleri* Syd. & P. Syd., Bot. Jahrb. Syst. 45: 262. 1911.

≡ *Sporisorium scheffleri* (Syd. & P. Syd.) Vánky, Mycotaxon 91: 232. 2005.

Anthracoystis schizachyrii (Vánky) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801679

Basionym. *Sporisorium schizachyrii* Vánky, Mycotaxon 81: 418. 2002.

Specimen examined. ZAMBIA, Southern Province, Chirundu, 75 km ESE of Kafue, *Schizachyrium exile*, 28 Apr. 2001, K. & C. Vánky, Vánky, Ust. exs. no. 1128.

Anthracoystis scholzii (Vánky) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801680

Basionym. *Sporisorium scholzii* Vánky, Mycotaxon 95: 22. 2006.

Anthracoystis sehimatis (M.S. Patil) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801681

Basionym. *Sorosporium sehimatis* M.S. Patil (as '*sehimae*'), Indian Phytopathol. 45: 181. 1992.

≡ *Sporisorium sehimatis* (M.S. Patil) Vánky (as '*sehimae*'), Mycotaxon 74: 188. 2000.

Specimens examined. AUSTRALIA, Western Australia, between Halls Creek and Kununurra, *Sehima nervosum*, 11 Apr. 2007, A.R. McTaggart, T.S. Marney, S.M. Thompson, M.J. Ryley, A.J., G.F., M.D.E. & R.G. Shivas, BRIP 49671.

Anthracoystis setariae (McAlpine) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801682

Basionym. *Sorosporium setariae* McAlpine, The smuts of Australia: 183. 1910.

≡ *Sporisorium setariae* (McAlpine) Vánky & R.G. Shivas, Fung. Diversity 14: 263. 2003.

Specimens examined. AUSTRALIA, Queensland, c. 32 km south of Cloncurry, *Setaria pumila*, 10 May 1909, G.M. Robinson, BRIP 26796, isotype; Northern Territory, 26.2 km south of Tennant Creek, *Setaria surgens*, 26 Apr. 2007, A.R. McTaggart, R.G. Shivas, J.R. Liberato, BRIP 49637.

Notes — Sterile cells formed from non-sporogenous hyphae are usually absent in *Anthracoystis*. There are a few sterile cells reported in *A. setariae* (Vánky & Shivas 2003), which are most likely remnants of the non-sporogenous hyphae.

Anthracoystis shivasiara (Vánky) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801683

Basionym. *Sporisorium shivasiarum* Vánky, Mycotaxon 106: 145. 2008.

Specimen examined. THAILAND, Chiang Mai, near Mae Ngad Dam, *Eulalia trispicata*, 28 Dec. 2005, P. Athipunyakorn, S. Likhitekaraj, W. Butranu, C. & K. Vánky, A.J., M.D.E. & R.G. Shivas, BRIP 51766, holotype.

Anthracoystis spermoidea (Berk. & Broome) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801684

Basionym. *Ustilago spermoidea* Berk. & Broome, J. Linn. Soc., Bot. 14: 94. 1875.

≡ *Sphacelotheca spermoidea* (Berk. & Broome) Mundk., Trans. Brit. Mycol. Soc. 23: 96. 1939.

≡ *Sorosporium spermoideum* (Berk. & Broome) L. Ling, Sydowia 5: 48. 1951.

≡ *Sorosporium spermoideum* (Berk. & Broome) Zundel, Ustil. World: 74. 1953 (comb. superfl.).

≡ *Sporisorium spermoideum* (Berk. & Broome) Vánky, Mycotaxon 85: 31. 2003.

Specimen examined. INDIA, Tamil Nadu, c. 65 km NW of Madurai, *Cymbopogon martinii*, 28 Jan. 1980, K. Vánky, Vánky, Ust. exs. no. 1245.

Anthracoystis sphacelata (Vánky) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801685

Basionym. *Sporisorium sphacelatum* Vánky, Mycotaxon 85: 13. 2003.

Specimen examined. SOUTH AFRICA, Eastern Cape Province, Lady Gray, Mt Drakensberg, *Pennisetum sphacelatum*, 22 Dec. 1996, C. & K. Vánky, Vánky, Ust. exs. no. 1145.

Anthracoystis stipara (Speg.) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801686

Basionym. *Ustilago stiparum* Speg., Anales Mus. Nac. Buenos Aires, Ser. 3, 12: 288. 1909.

≡ *Sorosporium stiparum* (Speg.) Zundel, Mycologia 43: 269. 1951.

≡ *Sporisorium stiparum* (Speg.) Vánky, Mycotaxon 106: 163. 2008.

Anthracoystis sulcati (M.S. Patil) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801687

Basionym. *Sorosporium sulcati* M.S. Patil, Indian Phytopathol. 45: 181. 1992.

≡ *Sporisorium sulcati* (M.S. Patil) Vánky, Mycotaxon 74: 188. 2000.

Anthracoystis tanganyikeana (Zundel) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801688

Basionym. *Sorosporium tanganyikeanum* Zundel, Mycologia 36: 408. 1944.

≡ *Sporisorium tanganyikeanum* (Zundel) Vánky, Mycotaxon 91: 235. 2005.

Anthracoystis tembuti (Henn. & Pole-Evans) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801689

Basionym. *Sorosporium tembuti* Henn. & Pole-Evans, in Hennings, Bot. Jahrb. Syst. 41: 270. 1908.

≡ *Sporisorium tembuti* (Henn. & Pole-Evans) Vánky, Mycotaxon 99: 63. 2007.

= *Ustilago tumefaciens* Henn., in Engler, Pflanzenw. Ost-Afrikas C: 48. 1895.

≡ *Sorosporium tumefaciens* (Henn.) Zundel, Mycologia 22: 149. 1930 (not *Sorosporium tumefaciens* McAlpine, The smuts of Australia: 184. 1910).

≡ *Sorosporium zundelianum* Cif., Nuovo Giorn. Bot. Ital., n.s., 40: 268. 1933, nom. nov.

≡ *Sporisorium leelingianum* Vánky, Fung. Diversity 12: 190. 2003.

= *Sorosporium healdii* Zundel, Mycologia 22: 147. 1930.

= *Sorosporium proliferatum* Zundel, Mycologia 22: 150. 1930.

= *Sorosporium clintonii* Zundel, Mycologia 22: 153. 1930.

Specimen examined. SOUTH AFRICA, KwaZulu-Natal, Mikes Pass, Cathedral Peak National Park, *Hyparrhenia tamba*, 30 Dec. 1996, K. & C. Vánky, Vánky, Ust. exs. no. 1153.

Anthracoystis thelepogonis (Vánky) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801690

Basionym. *Sporisorium thelepogonis* Vánky, Mycotaxon 62: 130. 1997.

Specimen examined. EAST TIMOR, Maahui, *Thelepogon elegans*, 6 May 2002, M.P. Weinert & A.A. Mitchell, BRIP 51275.

Anthracoystis themedae-arguentis (Vánky) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801691

Basionym. *Sporisorium themedae-arguentis* Vánky, Mycotaxon 51: 154. 1994.

Specimens examined. AUSTRALIA, Northern Territory, Humpty Doo, *Themeda arguens*, 20 Mar. 1967, J.B. Heaton, BRIP 7883, paratype. — INDONESIA, Bali, Denpasar, 20 km south of Mt Alas Kemayuna, *Themeda arguens*, 1 Apr. 1992, Menge, C. & K. Vánky, Vánky, Ust. exs. no. 855, isotype.

Anthracoystis themedae-cymbariae (Vánky) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801692

Basionym. *Sporisorium themedae-cymbariae* Vánky, Mycotaxon 62: 141. 1997.

Specimen examined. INDIA, Karnataka, Mysore, Bandipur, *Themeda cymbaria*, 5 June 1995, Sharma & K. Vánky, Vánky, Ust. exs. no. 973.

Notes — Sterile cells formed from non-sporogenous hyphae are usually absent in *Anthracoystis*. There are a few sterile cells reported in *A. themedae-cymbariae* (Vánky 1997), which are most likely remnants of the non-sporogenous hyphae.

Anthracoystis tothii (Vánky) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801693

Basionym. *Sporisorium tothii* Vánky, Mycotaxon 85: 14. 2003.

Anthracoystis trispicatae (R.G. Shivas, Vánky & Athip.) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801694

Basionym. *Sporisorium trispicatae* R.G. Shivas, Vánky & Athip., Mycol. Balcan. 3: 111. 2006.

Specimen examined. THAILAND, Chiang Mai, Mae Ngad Dam, Mae Taeng District, *Eulalia trispicata*, 28 Dec. 2005, R.G. & M.D.E. Shivas, P. Athipunyakom, W. Butranu, S. Likhitekaraj, C. & K. Vánky, BRIP 47730, isotype.

Anthracoystis tristachyae-hispidae (L. Ling) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801695

Basionym. *Sphacelotheca tristachyae-hispidae* L. Ling, Lloydia 16: 184. 1953.

≡ *Sporisorium tristachyae-hispidae* (L. Ling) Vánky, Mycotaxon 65: 162. 1997.

Specimen examined. SOUTH AFRICA, KwaZulu-Natal, Giants Castle Reserve, Drakensberg Mountains, *Tristachya leucothrix*, 4 Jan. 1997, C. & K. Vánky, Vánky, Ust. exs. no. 1030.

Anthracoystis tristachyae-nodiglumis (Vánky) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801696

Basionym. *Sporisorium tristachyae-nodiglumis* Vánky, Mycotaxon 85: 46. 2003.

Specimen examined. ZAMBIA, Central Province, 169 km ENE of Lusaka, *Tristachya* sp., 17 Apr. 2001, C., T. & K. Vánky, Vánky, Ust. exs. no. 1144, isotype.

Anthracoystis tristachydis (Syd. & P. Syd.) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801697

Basionym. *Sorosporium tristachydis* Syd. & P. Syd., Bot. Jahrb. Syst. 45: 263. 1911.

≡ *Tolyposporium tristachydis* (Syd. & P. Syd.) Zundel, Bothalia 3: 310. 1938.

≡ *Sporisorium tristachydis* (Syd. & P. Syd.) Vánky, Mycotaxon 65: 161. 1997.

Anthracoystis tumefaciens (McAlpine) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801698

Basionym. *Sorosporium tumefaciens* McAlpine, The smuts of Australia: 184. 1910.

≡ *Sporisorium tumefaciens* (McAlpine) Vánky, Mycotaxon 18: 328. 1983.

= *Sphacelotheca raphidis* L. Ling, Sydowia 3: 128. 1949.

= *Sporisorium tumiforme* Vánky & R.G. Shivas, Fung. Diversity 18: 183. 2005.

Specimen examined. AUSTRALIA, Western Australia, Wyndham, 56 km SSE on Great Northern Highway, *Chrysopogon fallax*, 22 Feb. 1996, A.A. Mitchell, C. & K. Vánky, Vánky, Ust. exs. no. 1031.

Notes — Sterile cells formed from non-sporogenous hyphae are usually absent in *Anthracoystis*. There are a few sterile cells present in *A. tumefaciens*, which are remnants of the non-sporogenous hyphae.

Anthracoystis ugandensis (Henn.) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801699

Basionym. *Ustilago ugandensis* Henn., in Engler, Pflanzenw. Ost-Afrikas C: 48. 1895.

≡ *Sporisorium ugandense* (Henn.) Vánky, Mycotaxon 91: 250. 2005.

= *Sphacelotheca dolichosora* Ainsw., Proc. Linn. Soc. London 153: 94. 1941.

≡ *Sporisorium dolichosorum* (Ainsw.) Vánky, Mycotaxon 73: 142. 1999.

Notes — Sterile cells formed from non-sporogenous hyphae are usually absent in *Anthracoystis*. There are a few sterile cells reported in *A. ugandensis* (Vánky 2005), which are most likely remnants of the non-sporogenous hyphae.

Anthracoystis walkeri (Vánky) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801700

Basionym. *Sporisorium walkeri* Vánky, Mycotaxon 51: 158. 1994.

Specimen examined. AUSTRALIA, Queensland, Fernvale, *Themeda triandra*, 15 Nov. 1965, R.F.N. Langdon, BRIP 7876, paratype.

Anthracoystis whiteochloae (Vánky & McKenzie) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801701

Basionym. *Sporisorium whiteochloae* Vánky & McKenzie, in Vánky & Shivas, Fung. Diversity 7: 160. 2001.

Specimens examined. AUSTRALIA, Western Australia, Kununurra, Fish Farm Road, *Whiteochloa cymbiformis*, 26 June 1998, R. Eichner, BRIP 26823, isotype; Northern Territory, Timber Creek, Policeman's Lookout, *Whiteochloa semitonsa*, 10 Apr. 2008, A.R. McTaggart, V.L. Challinor, A.D.W. Geering, M.D.E. & R.G. Shivas, BRIP 51860b.

Anthracoystis xerofasciculata (R.G. Shivas, McTaggart & Vánky) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801702

Basionym. *Sporisorium xerofasciculatum* R.G. Shivas, McTaggart & Vánky, Mycotaxon 101: 353. 2007.

Specimen examined. AUSTRALIA, Western Australia, between Kununurra and Halls Creek, *Xerochloa laniflora*, 11 Apr. 2007, A.R. McTaggart, T.S. Marney, S.M. Thompson, M.J. Ryley, A.J., G.F., M.D.E. & R.G. Shivas, BRIP 49682, holotype.

Anthracoystis zambiana (Vánky) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801703

Basionym. *Sporisorium zambianum* Vánky, Mycotaxon 85: 42. 2003.

STOLLIA (Clade 3)

The new genus *Stollia* is proposed to accommodate smut fungi that occur as localized galls in the ovaries on grasses in the tribe *Andropogoneae*. The sori are enclosed by a peridium of host tissue. The swollen ovaries consist of spores mixed with sterile cells. Columellae and spore balls are absent.

Stollia McTaggart & R.G. Shivas, *gen. nov.* — MycoBank MB801704; Fig. 2

Type species. *Stollia ewartii* (McAlpine) McTaggart & R.G. Shivas.

Holotype. AUSTRALIA, Western Australia, Napier, Broome Bay, *Sorghum stipoideum*, 22 May 1910, A.J. Ewart, MEL 1055129.

Etymology. Named after the German mycologist Matthias Stoll in recognition of his substantial contribution towards resolving the *Ustilago-Sporisorium-Macalpinomyces* complex.

Sori in swollen ovaries of *Andropogoneae*, localized in the inflorescence, globose to obovoid, covered by a thick peridium derived from host tissue, initially green, darker with age, which

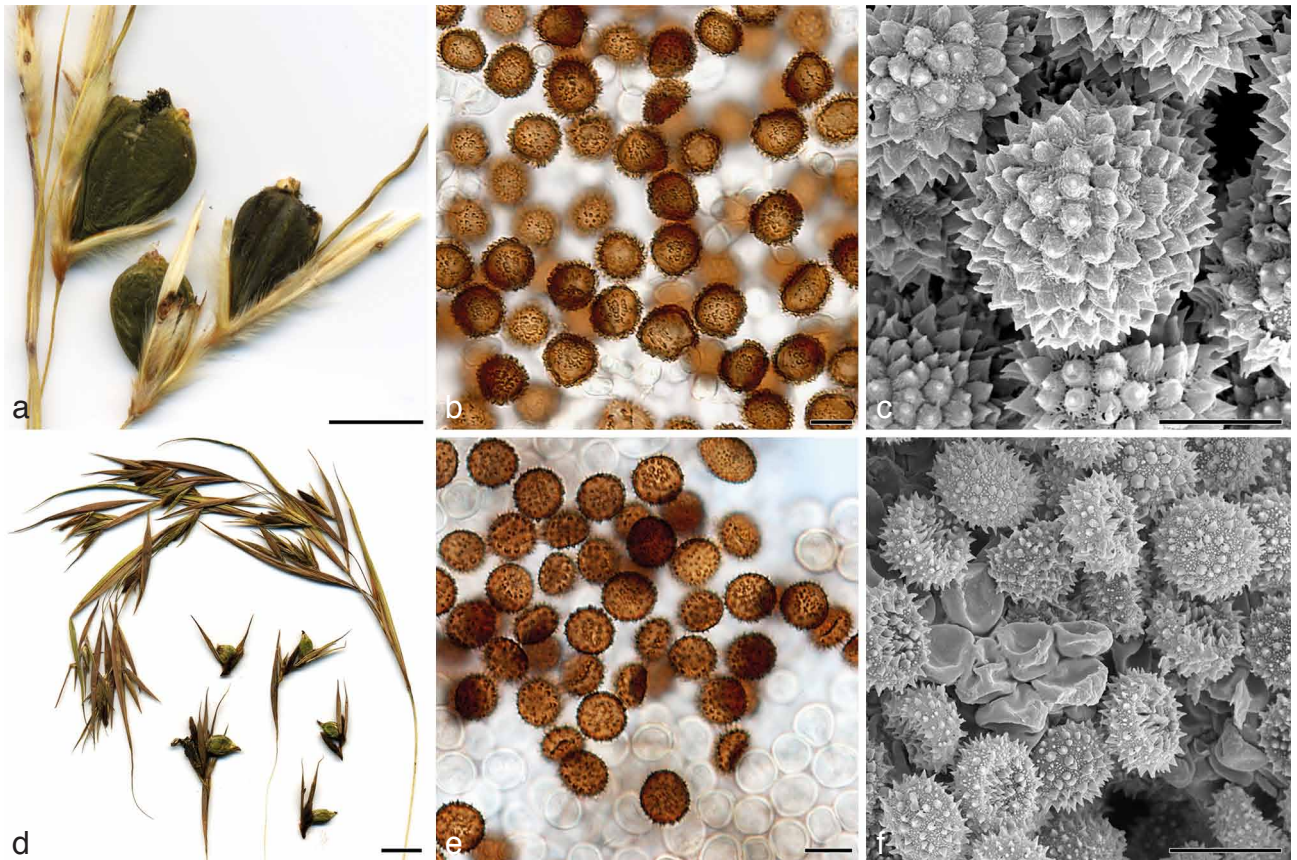


Fig. 2 *Stollia ewartii* and *S. bursa*. a. *S. ewartii* sori; b. *S. ewartii* spores; c. *S. ewartii* spores under SEM; d. *S. bursa* sori; e. *S. bursa* spores; f. *S. bursa* spores under SEM. — Scale bars: a, d = 5 mm; b, c, e, f = 10 μ m.

ruptures at maturity to expose the pulverulent spore mass mixed with sterile cells. Spores single, globose, subglobose to ellipsoidal, often echinulate. Sterile cells in loose irregular groups, globose, hyaline. Columellae and spore balls are lacking.

New combinations for *Stollia*

Stollia bothriochloae (L. Ling) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801705

Basionym. *Ustilago bothriochloae* L. Ling, Mycol. Pap. 11: 4. 1945.
 \equiv *Macalpinomyces bothriochloae* (L. Ling) Vánky, Fung. Diversity 15: 225. 2004.

Specimens examined. BOLIVIA, La Paz, Sud Yungas, between Chulumani and Inquisivi, *Bothriochloa bladonii*, 18 Apr. 2009, R.G. & M.D.E. Shivas, A.R. McTaggart, W.A. Arce, C. & K. Vánky, BRIP 52756. — THAILAND, *Bothriochloa bladonii*, 27 Dec. 2005, R.G. Shivas & P. Athipunyakom, BRIP 47762.

Stollia bursa (Berk.) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801706

Basionym. *Ustilago bursa* Berk., Hooker's J. Bot. Kew Gard. Misc. 6: 206. 1854.
 \equiv *Tolyposporium bursum* (Berk.) McAlpine, The smuts of Australia: 186. 1910.
 \equiv *Sphacelotheca bursa* (Berk.) Mundk. & Thirum., Mycol. Pap. 16: 6. 1946.
 \equiv *Sporisorium bursum* (Berk.) Vánky, Mycotaxon 31: 403. 1988.
 \equiv *Macalpinomyces bursus* (Berk.) Vánky, Mycotaxon 81: 427. 2002.

Specimen examined. THAILAND, Chiang Rai, 42 km east of Chiang Saen, *Themeda villosa*, 16 Dec. 2007, P. Athipunyakom, S. Likhitekaraj, V.L. Challinor, T.S. Marney, A.R. McTaggart, M.D.E. & R.G. Shivas, BRIP 51544.

Stollia ewartii (McAlpine) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801707

Basionym. *Ustilago ewartii* McAlpine (as '*ewartii*'), Proc. Linn. Soc. New South Wales 36: 45. 1912. '1911'.
 \equiv *Macalpinomyces ewartii* (McAlpine) Vánky & R.G. Shivas, Mycotaxon 80: 346. 2001.
 \equiv *Ustilago sorghi-stipoidei* L. Ling, Sydowia 7: 154. 1953.

Specimens examined. AUSTRALIA, Western Australia, between Wyndham and Kununurra, *Sorghum timorense*, 4 Apr. 2008, A.R. McTaggart, V.L. Challinor, A.D.W. Geering, M.D.E. & R.G. Shivas, BRIP 51814; Western Australia, between Wyndham and Kununurra, *Sorghum timorense*, 8 Apr. 2008, A.R. McTaggart, V.L. Challinor, A.D.W. Geering, M.D.E. & R.G. Shivas, BRIP 51818; Northern Territory, Katherine, *Sorghum timorense*, 24 Apr. 1947, S.T. Blake, BRIP 7791, isotype.

Stollia ovariicolopsis (Vánky) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801708

Basionym. *Sporisorium ovariicolopsis* Vánky, Mycotaxon 74: 203. 2000.
 \equiv *Macalpinomyces ovariicolopsis* (Vánky) Vánky, Mycotaxon 81: 427. 2002.

Stollia pseudanthistiriae (A.R. Patil, T.M. Patil & M.S. Patil) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801709

Basionym. *Macalpinomyces pseudanthistiriae* A.R. Patil, T.M. Patil & M.S. Patil, J. Mycol. Pl. Pathol. 34: 839. 2004.

LANGDONIA (Clade 8)

The new genus *Langdonia* is proposed to accommodate the monophyletic group of smut fungi that infect the ovaries of *Aristida*, have coiled sporogenous hyphae and lack columellae.

Langdonia McTaggart & R.G. Shivas, *gen. nov.* — MycoBank MB801710; Fig. 3a–c

Type species. *Langdonia fraseriana* (Syd.) McTaggart & R.G. Shivas.

Holotype. AUSTRALIA, New South Wales, Warialda, *Aristida leptopoda*, Jan. 1932, L.R. Fraser, IMI 44415, HUV 17480.

Etymology. Named after the Australian mycologist Raymond F.N. Langdon who first described the mode of soral development in the *Ustilago-Sporisorium-Macalpinomyces* complex.

Infecting hosts of *Aristida*. Sori in some or all ovaries of a panicle. *Columella* absent. Spores usually compacted into spore balls. Sterile cells formed from non-sporogenous hyphae usually absent.

New combinations for *Langdonia*

Langdonia aristidae (Peck) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801711

Basionym. *Ustilago aristidae* Peck, Bull. Torrey Bot. Club 12: 35. 1885.

= *Sorosporium consanguineum* Ellis & Everh., J. Mycol. 3: 56. 1887.

= *Sporisorium consanguineum* (Ellis & Everh.) Vánky, Mycotaxon 31: 402. 1988, s.l.

= *Sorosporium aristidae* Neger (as '*Sorisporium*'), Ann. Univ. Chile 95: 789. 1896.

= *Sorosporium bornmuelleri* Magnus (as '*Sorisporium*'), Verh. K. K. Zool.-Bot. Ges. Wien 50: 434. 1900.

= *Sorosporium conclatum* L. Ling, Lloydia 14: 106. 1951.

= *Sporisorium arundinellae-nepalensis* Vánky, Mycotaxon 89: 91. 2004 (not *Sporisorium conclatum* (Zundel) M. Piepenbr., Caldasia 24: 109. 2002).

Specimens examined. AUSTRALIA, Western Australia, Kununurra, Ivanhoe Crossing, *Aristida hygrometrica*, 9 Apr. 2008, A.R. McTaggart, V.L. Challinor, A.D.W. Geering, M.D.E. & R.G. Shivas, BRIP 51839; Western Australia, Gingin, Cemetery, *Aristida* sp., 14 Sept. 1999, C. & K. Vánky, BRIP 27723.

Langdonia aristidaria (Durán) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801712

Basionym. *Ustilago aristidarius* Durán, Ustil. Mexico: 222. 1987.

Langdonia aristidicola (Speg.) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801713

Basionym. *Urocystis aristidicola* Speg., Anales Mus. Nac. Buenos Aires, Ser. 3, 12: 294. 1909.

= *Tuburcinia aristidicola* (Speg.) Liro, Ann. Univ. Fenn. Abo., Ser. A, 1: 26. 1922.

= *Sporisorium aristidicola* (Speg.) Vánky, Mycotaxon 78: 305. 2001.

= *Sorosporium consanguineum* Ellis & Everh. var. *bullatum* Pavgi & Thirum., Sydowia 5: 10. 1951.

= *Sorosporium bullatum* (Pavgi & Thirum.) Pavgi & Thirum., Mycopathol. Mycol. Appl. 7: 284. 1956 (not *Sorosporium bullatum* J. Schröter, Jahresber. Schles. Ges. Vaterl. Cult. 49: 6. 1869).

= *Sorosporium penuriasorus* Durán, Ustil. Mexico: 67. 1987.

Specimens examined. AUSTRALIA, Northern Territory, Victoria River, 15 km east of Victoria Highway, *Aristida* sp., 12 Apr. 2008, A.R. McTaggart, V.L. Challinor, A.D.W. Geering, M.D.E. & R.G. Shivas, BRIP 51871; Northern Territory, 72 km NNW of Alice Springs, *Aristida jerichoensis*, 26 Mar. 2000, C. & K. Vánky, Vánky, Ust. exs. no. 1119.

Langdonia clandestina (R.G. Shivas, Vánky & Athip.) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801714

Basionym. *Sporisorium clandestinum* R.G. Shivas, Vánky & Athipunya-kom, Mycol. Balcan. 3: 108. 2006.

Specimens examined. THAILAND, Nakhon Phanom, 31 km west of Sri Songkram, *Aristida balansae*, 12 Dec. 2007, P. Athipunya-kom, S. Likhitekaraj, V.L. Challinor, T.S. Marney, A.R. McTaggart, M.D.E. & R.G. Shivas, BRIP 51520; Kalasin Province, 10 km NW of Na Khu, *Aristida setacea*, 20 Dec. 2005, R.G. Shivas, P. Athipunya-kom, BRIP 47754, isotype.

Langdonia confusa (H.S. Jacks.) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801715

Basionym. *Sorosporium confusum* H.S. Jacks., Bull. Torrey Bot. Club 35: 148. 1908.

= *Sporisorium confusum* (H.S. Jacks.) Vánky, Mycotaxon 78: 306. 2001.

Specimens examined. AUSTRALIA, Northern Territory, 63.4 km north of Alice Springs, *Aristida inaequiglumis*, 23 Apr. 2007, A.R. McTaggart, J.R. Liberato, R.G. Shivas, BRIP 49660; Queensland, 1 km south of Mt Morgan, *Aristida queenslandica*, 24 Mar. 2003, R.G. & M.D.E. Shivas, BRIP 42670. — BOLIVIA, Potosi, Charcas, between Toro Toro and Punata, *Aristida* sp., 22 Apr. 2009, R.G. & M.D.E. Shivas, A.R. McTaggart, W.A. Arce, C. & K. Vánky, BRIP 52755.

Langdonia fraseriana (Syd.) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801716

Basionym. *Sorosporium fraserianum* Syd., Ann. Mycol. 35: 25. 1937.

= *Sporisorium fraserianum* (Syd.) Vánky, Mycotaxon 78: 308. 2001.

Specimen examined. AUSTRALIA, Northern Territory, Alice Springs, near Standley's Gap, *Aristida nitidula*, 22 Apr. 2007, A.R. McTaggart, J.R. Liberato & R.G. Shivas, BRIP 49668.

Langdonia goniospora (Masse) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801717

Basionym. *Ustilago goniospora* Masse, Bull. Misc. Inform. Kew 1899: 183. 1899.

= *Sorosporium goniosporum* (Masse) L. Ling, Lloydia 16: 189. 1953.

= *Sporisorium goniosporum* (Masse) Vánky, Mycotaxon 78: 308. 2001.

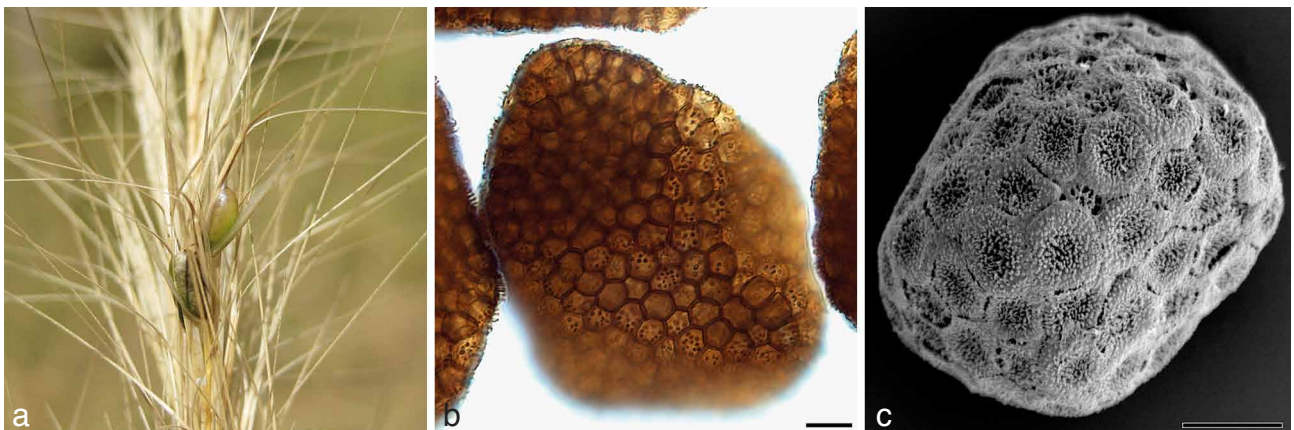


Fig. 3 *Langdonia*. a. *L. aristidicola* sori; b. *L. aristidicola* spores in spore ball; c. *L. aristidicola* spore ball under SEM. — Scale bars: b, c = 10 μ m.

Langdonia inopinata (Vánky) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801718

Basionym. *Sporisorium inopinatum* Vánky, Mycotaxon 81: 384. 2002.

Specimen examined. THAILAND, *Aristida* sp., 20 Dec. 2005, R.G. Shivas & P. Athipunyakom, BRIP 47757. — ZIMBABWE, Matabeleland North, 30 km SE of Bulawayo, *Aristida scabrivalvis*, 2 Mar. 1999, C. & K. Vánky, Vánky, Ust. exs. no. 1108, isotype.

TRIIDIOMYCES (Clade 5)

The new genus *Triodiomyces* is proposed to accommodate the monophyletic group of smut fungi that occur on grasses in the genus *Triodia*.

Triodiomyces McTaggart & R.G. Shivas, *gen. nov.* — MycoBank MB801719

Type species. *Triodiomyces altilis* (Syd.) McTaggart & R.G. Shivas.

Holotype. AUSTRALIA, Northern Territory, between Liddels Hill and Ayers Rock (Uluru), *Triodia* sp., June 1935, J.B. Clealand, BRIP 7884 (lectotype of *Ustilago altilis* design. by Vánky & Shivas, Smut fungi of Australia: 233. 2008).

Etymology. Named after the host genus, *Triodia*.

Infecting hosts of *Triodia*. *Sori* in culms or inflorescence. *Columella*, *spore balls* and *sterile cells* absent.

New combinations for *Triodiomyces*

Triodiomyces altilis (Syd.) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801720

Basionym. *Ustilago altilis* Syd., Ann. Mycol. 35: 23. 1937.

Specimens examined. AUSTRALIA, Northern Territory, between Liddels Hill and Ayers Rock, *Triodia* sp., June 1935, J.B. Clealand, BRIP 7884, lectotype; Barkley Highway, 80 km East of Tennant Creek, *Triodia pungens*, 25 Apr. 2007, A.R. McTaggart, J.R. Liberato & R.G. Shivas, BRIP 49644; Tanami Desert, *Triodia pungens*, 1 July 1980, P.K. Latz, BRIP 14713; Western Australia, Mitchell Plateau, *Triodia* sp., 11 May 2009, A.R. McTaggart, V.L. Challinor, M.J. Ryley, C.F. Gambley, T. Scharaschkin, M.D.E. & R.G. Shivas, BRIP 52543.

Triodiomyces inaltilis (Vánky & A.A. Mitch.) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801721

Basionym. *Ustilago inaltilis* Vánky & A.A. Mitch., Mycotaxon 68: 328. 1998.

Specimen examined. AUSTRALIA, Western Australia, Galvins Gorge, *Triodia longiloba*, 6 June 1996, A.A. Mitchell, BRIP 49123, holotype.

Triodiomyces lituanus (R.G. Shivas, Vánky & Cunningt.) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801722

Basionym. *Ustilago lituana* R.G. Shivas, Vánky & Cunningt., Australas. Pl. Pathol. 35: 363. 2006.

Specimens examined. AUSTRALIA, Western Australia, Cooke Point Port Headland, Foreshore off Dempster St., *Triodia epactia*, 12 Aug. 2005, M.J. Ryley, T.S. Marney & R.G. Shivas, BRIP 46795, holotype; Turnoff to Derby, *Triodia* sp., 9 Apr. 2007, A.R. McTaggart, T.S. Marney, S.M. Thompson, M.J. Ryley, A.J., G.F., M.D.E. & R.G. Shivas, BRIP 49124.

Triodiomyces lunatus (R.G. Shivas, McTaggart & Vánky) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801723

Basionym. *Ustilago lunata* R.G. Shivas, McTaggart & Vánky, Mycotaxon 101: 358. 2007.

Specimens examined. AUSTRALIA, Western Australia, Kennedy Range, *Triodia longiceps*, 16 July 1991, E. Davison, BRIP 49114, isotype.

Triodiomyces triodiae (Vánky) McTaggart & R.G. Shivas, *comb. nov.* — MycoBank MB801724

Basionym. *Ustilago triodiae* Vánky, Mycotaxon 62: 167. 1997.

Specimens examined. AUSTRALIA, Western Australia, turnoff to Derby, *Triodia* sp., 9 Apr. 2007, A.R. McTaggart, T.S. Marney, S.M. Thompson, M.J. Ryley, A.J., G.F., M.D.E. & R.G. Shivas, BRIP 49124; Mitchell Plateau, 11 May 2009, A.R. McTaggart, V.L. Challinor, M.J. Ryley, C.F. Gambley, T. Scharaschkin, M.D.E. & R.G. Shivas, BRIP 52542.

IDENTIFICATION OF GENERA

A key to the genera of the *Ustilago-Sporisorium-Macalpinomyces* complex follows. The genera can be identified based on soral characteristics and host plant.

1. Columella, sterile cells or spore balls present 4
1. Columella, sterile cells and spore balls absent 2
2. On *Poaceae*. 3
2. On *Polygonaceae* *Melanopsichium*
3. On *Triodia* *Triodiomyces*
3. On other genera of grasses. *Ustilago*
4. Columella present 5
4. Columella absent. 6
5. Columella filiform, flattened or flexuous. Spore balls formed from coiled sporogenous hyphae. Sterile cells usually absent *Anthraccocystis*
5. Columella stout, cylindrical or woody. Spore balls usually absent. Sterile cells present *Sporisorium*
6. Sori cylindrical or tubular, derived from host tissue *Macalpinomyces* s.l.
6. Sori globose or ovoid in hypertrophied host ovaries . . . 7
7. Spore balls present and formed from coiled sporogenous hyphae 8
7. Spore balls absent. 9
8. On *Aristida*. *Langdonia*
8. On *Panicum trachyrachis*, sterile cells present *Anomalomyces*
9. On *Eriachne*. *Macalpinomyces* s.str.
9. On grasses in the subfamilies *Paniceae* or *Chloridoideae* 10
10. On grasses in the tribe *Andropogoneae* *Stollia*
10. On grasses in the tribes *Panicoideae* or *Chloridoideae* *Macalpinomyces* s.l.

DISCUSSION

Six of the monophyletic groups within the *Ustilago-Sporisorium-Macalpinomyces* complex are well supported and can be defined by morphology or host classification. The soral synapomorphies present in *Sporisorium* provided a clear, morphological solution to what was the largest component of the *Ustilago-Sporisorium-Macalpinomyces* complex. Relationships among these groups are still ambiguous. Character evolution within the complex cannot be determined confidently while there is doubt about the evolutionary relationships among the clades. For example, because the relationship of *Sporisorium* to *Anthraccocystis* is not fully resolved, it is unknown whether columellae arose once in a shared common ancestor, or whether columellae were derived in two separate clades. The results of our previous studies indicate that the two structural types of columellae arose separately in smut fungi that infect the *Andropogoneae*.

Macalpinomyces remains a polyphyletic group, with taxa distributed over three unrelated clades: i) the monotypic type species

Macalpinomyces eriachnes; ii) Clade 2, which contains smuts with tubular sori that are either localized or entirely replace the host inflorescence; and iii) Clade 7, which form galls on panicoid and chloridoid hosts and have sterile cells. The possible taxonomic outcomes of these clades were discussed by McTaggart et al. (2012a).

Ustilago is also polyphyletic, with taxa distributed in three clades: i) Clade 6, which contains the type species and may be further subdivided into host delimited genera; ii) Clade 2, which contains *Ustilago maydis* and taxa with tubular sori; and iii) Clade 7 with species that do not possess sterile cells or peridia, for example, *U. drakensbergiana*. The resolution of *Ustilago* and *Macalpinomyces* are dependent on each other, and in future phylogenetic analyses, taxa should be chosen from *Stollia*, *Ustilago* s.l., and Clade 2, 6 and 7. It is not necessary to add *Sporisorium* or *Anthracoystis* as these clades are well represented. Data should be obtained from the nuclear rDNA loci ITS and LSU. The addition of more nuclear sequence data is another approach if nuclear rDNA loci do not resolve the relationships.

Acknowledgements We thank Paul M. Kirk (Kew, UK) for his taxonomic advice with *Anthracoystis*. ARM would like to acknowledge the support of the Australian Government's Cooperative Research Centre Program.

REFERENCES

- Brefeld O. 1912. Die Brandpilze und die Brandkrankheiten. V. Untersuchungen aus dem Gesamtgebiete der Mykologie. XV. Commissions-Verlag von Heinrich Schöningh, Münster.
- Cunnington JH, Vánky K, Shivas RG. 2005. *Lundquistia* is a synonym of *Sporisorium* (Ustilaginomycetes). *Mycologia Balcanica* 2: 95–100.
- Langdon RFN. 1962. A study of some smuts of *Sorghum* spp. *Proceedings of the Linnean Society of New South Wales* 87: 45–50.
- Langdon RFN, Fullerton RA. 1975. Sorus ontogeny and sporogenesis in some smut fungi. *Australian Journal of Botany* 23: 915–930.
- Langdon RFN, Fullerton RA. 1978. The genus *Sphacelotheca* (Ustilaginales): criteria for its delimitation and the consequences thereof. *Mycotaxon* 6: 421–456.
- Link HF. 1825. *Cryptogamia. Gymnomyces. Species Plantarum exhibentes Plantas Rite Cognitas ad Genera Relatas*. Linne Ca. 2: 1–128.
- McAlpine D. 1910. The smuts of Australia. Their structure, life history, treatment, and classification. Government Printer, Melbourne.
- McTaggart AR, Shivas RG, Geering ADW, Callaghan B, Vánky K, Scharaschkin T. 2012a. Soral synapomorphies are significant for the systematics of *Sporisorium*. *Persoonia* 29: 63–77.
- McTaggart AR, Shivas RG, Geering ADW, Vánky K, Scharaschkin T. 2012b. A review of the *Ustilago*-*Sporisorium*-*Macalpinomyces* complex. *Persoonia* 29: 55–62.
- Piepenbring M. 2004. Comparative morphology of galls formed by smut fungi and discussion of generic concepts. In: Agerer R, Piepenbring M, Blanz P (eds), *Frontiers in Basidiomycote mycology*: 117–164. IHW-Verlag, Eching, Germany.
- Piepenbring M, Bauer R, Oberwinkler F. 1998. Teliospores of smut fungi – Teliospore connections, appendages, and germ pores studied by electron microscopy; phylogenetic discussion of characteristics of teliospores. *Protoplasma* 204: 202–218.
- Shivas RG, Vánky K. 1997. New smuts (Ustilaginales) on grasses from Western Australia. *Mycological Research* 101: 835–840.
- Shivas RG, Vánky K. 2001. The smut fungi on *Cynodon*, including *Sporisorium normanensis* sp. nov. from Australia. *Fungal Diversity* 8: 149–154.
- Stevens PF. 2001. 'Angiosperm Phylogeny Website. Version 9, June 2008.' Retrieved 18 September 2010, from <http://www.mobot.org/MOBOT/research/APweb/>.
- Stoll M, Begerow D, Oberwinkler F. 2005. Molecular phylogeny of *Ustilago*, *Sporisorium*, and related taxa based on combined analyses of rDNA sequences. *Mycological Research* 109: 342–356.
- Stoll M, Piepenbring M, Begerow D, Oberwinkler F. 2003. Molecular phylogeny of *Ustilago* and *Sporisorium* species (Basidiomycota, Ustilaginales) based on internal transcribed spacer (ITS) sequences. *Canadian Journal of Botany* 81: 976–984.
- Vánky K. 1985. Carpathian Ustilaginales. *Acta Univ. Upsal., Symbolae Botanicae Upsalienses* 24: 1–309.
- Vánky K. 1990. Taxonomical studies on Ustilaginales. VI. *Mycotaxon* 38: 267–278.
- Vánky K. 1991. Spore morphology in the taxonomy of Ustilaginales. *Transactions of the Mycological Society of Japan* 32: 381–400.
- Vánky K. 1994a. European smut fungi. Gustav Fischer Verlag, Stuttgart, Jena, New York.
- Vánky K. 1994b. Taxonomical studies on Ustilaginales. XI. *Mycotaxon* 51: 153–174.
- Vánky K. 1995. Taxonomical studies on Ustilaginales. XIII. *Mycotaxon* 56: 197–216.
- Vánky K. 1997. Taxonomical studies on Ustilaginales. XV. *Mycotaxon* 62: 127–150.
- Vánky K. 1998. New Australasian Ustilaginales. *Mycotaxon* 68: 327–344.
- Vánky K. 2000. Taxonomical studies on Ustilaginales. XX. *Mycotaxon* 74: 161–215.
- Vánky K. 2001a. *Lundquistia*, a new genus of Ustilaginomycetes. *Mycotaxon* 77: 371–374.
- Vánky K. 2001b. The new classification of the smut fungi, exemplified by Australasian taxa. *Australian Systematic Botany* 14: 385–394.
- Vánky K. 2002. Illustrated genera of smut fungi. The American Phytopathological Society, St. Paul, Minnesota, USA
- Vánky K. 2003a. The smut fungi (Ustilaginomycetes) of *Hyparrhenia* (Poaceae). *Fungal Diversity* 12: 179–205.
- Vánky K. 2003b. Taxonomical studies on Ustilaginales. XXIII. *Mycotaxon* 85: 1–65.
- Vánky K. 2004. New smut fungi (Ustilaginomycetes) from Mexico, and the genus *Lundquistia*. *Fungal Diversity* 17: 159–190.
- Vánky K. 2005. Taxonomic studies on Ustilaginomycetes. 25. *Mycotaxon* 91: 217–272.
- Vánky K, Shivas RG. 2003. Further new smut fungi (Ustilaginomycetes) from Australia. *Fungal Diversity* 14: 243–264.