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ORIGINAL ARTICLE

Acrodictys (Hyphomycetes) and related genera from China

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Abstract Taxonomic studies on *Acrodictys* and related genera in China has yielded 13 taxa including a new species, *Acrodictys porosiseptata* sp. nov., characterized by indeterminate conidiophores with successive lageniform proliferations and muriform conidia usually with 4–5 parallel transverse septa, several longitudinal or oblique septa, and the presence of conspicuous septal pores. *Acrodictys atroapicula*, *A. irregularis*, *A. micheliae*, *Pseudoacrodictys deightonii*, and *Rhexoacrodictys fuliginosa* are newly recorded for China. Descriptions and illustrations of all taxa are provided, and similarities or differences with morphologically close taxa are discussed.

Keywords Anamorphic ascomycota · Dictyosporous fungi · Taxonomy

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Introduction

Acrodictys M.B. Ellis was originally erected by Ellis (1961) with *A. bambusicola* as the type species, and was mainly characterized by percurrently proliferating conidiophores and muriform conidia. Subsequently, more than 30 species have been referred to the genus. A broad generic circumscription of *Acrodictys* was accepted for nearly 40 years until recent generic segregations started in 2001 (Baker et al. 2001, 2002a, b; Baker and Morgan-Jones 2003).

Acrodictyella W.A. Baker & Partridge, typified by *A. obovata*, was considered the first genus to accommodate those species similar to *Acrodictys* but characterized by producing hyaline, muriform conidia which secede well before maturation and only becoming pigmented sometime after their release (Baker et al. 2001). Baker et al. (2002a, b) and Baker and Morgan-Jones (2003) refined the generic concept of *Acrodictys* in a stricter sense as 'conidiophore commonly indeterminate and successive terminal percurrent proliferations lageniform to doliiform, conidia muriform, usually with vertical-longitudinal septa in the middle cells and several parallel-transversal septa'. They established three other genera i.e. *Rhexoacrodictys*, *Junewangia* and *Pseudoacrodictys* to accommodate *Acrodictys* species, based on conidial morphology, conidiogenesis and conidial secession. As a result, three species were retained in the refined *Acrodictys* sensu stricto. Another five species were placed in *Junewangia*, which is characterized by successive percurrent proliferating conidiophores, narrowly cuneate conidiogenous cells and conidia seceding schizolytically. Four taxa were assigned to *Rhexoacrodictys,* characterized by rhexolytic disarticulation and detachment of conidia, and seven species were transferred to *Pseudoacrodictys* with large, somewhat irregularly shaped, numerous-celled conidia. Several questionable *Acrodictys*

sensu lato species still required reassignment, such as *Acrodictys elaeidis* J.M. Yen & Sulmont (Ellis 1976), *A. kamatii* Narendra & V.G. Rao (Narendra and Rao 1973), *A. malabarica* Subram. & Bhat (Subramanian and Bhat 1987), *A. queenslandica* Matsush. (Matsushima 1989), *A. septosporioides* Matsush. (Matsushima 1983), *A. stilboidea* J. Mena & Mercado (Mercado Sierra and Mena Portales 1986) and *A. triarmatus* Whitton, McKenzie & K.D. Hyde (Whitton et al. 2000). Zhao et al. (2009b) erected a genus, *Ramoacrodictys*, to accommodate *Acrodictys malabarica*, on the basis of an examination of the literature and a specimen collected on *Bambusa* sp. from Hainan, China. *Ramoacrodictys* is mainly characterized by erect, macronematous, multi-branched conidiophores, monoblastic conidiogenous cells and production of gangliar conidia (Zhao et al. 2009b).

In recent years, more species of *Acrodictys* and related genera have been described following Ellis or Baker et al. criteria, including *Acrodictys liputii* L. Cai, K.Q. Zhang, McKenzie, W.H. Ho & K.D. Hyde (Cai et al. 2002), *Pseudoacrodictys dimorphospora* Somrith. & E.B.G. Jones (Somrithipol and Jones 2003), *Acrodictys caribensis* (Mercado) Mercado (Mercado Sierra et al. 2005), *A. elliptica* and *A. lignicola* Manohar., N.K. Rao, D.K. Agarwal & Kunwar (Manoharachary et al. 2006), *A. micheliae* Kodsueb & McKenzie (Kodsueb et al. 2006), *A. irregularis* R.F. Castañeda, Gusmão & Guarro (Castañeda et al. 2007) and *A. oblonga* G.Z. Zhao (Zhao et al. 2009a).

Materials and methods

Decaying woody litter was collected in the field. Samples were separately placed into plastic or paper bags, taken to the laboratory, and stored in a refrigerator at 4°C before microscopic study, or incubated in moist containers (plastic bags or boxes) at room temperature to induce sporulation. Humidity was maintained by adding moistened paper towels. The incubated samples were examined microscopically for the presence of microfungi after 4–5 days and periodically for up to 1 month. Cultures of fungi were obtained by single spore isolation. Herbarium specimens and living cultures were deposited in HSAUP (Herbarium of Shandong Agricultural University: Plant Pathology) and HMAS (Herbarium of Mycology, Chinese Academy of Sciences).

Results

Acrodictys and related genera are rarely known from China. During surveys of dematiaceous dictyosporous hyphomycetes for the *Flora Fungorum Sinicorum* from 1999 to 2009, more than 100 *Acrodictys*-related specimens were collected and examined. Following Baker et al.'s (2001, 2002a, b, 2003) rearrangement, 13 species are recorded and presented in this paper, including 7 *Acrodictys* species, 1 *Junewangia* species, 2 *Pseudoacrodictys* species, 1 *Ramoacrodictys* and 2 *Rhexoacrodictys* species. Among them, *Acrodictys porosiseptata* is referred to a new species, characterized by indeterminate conidiophores with successive lageniform proliferations and muriform conidia usually with 4–5 parallel transverse septa, several longitudinal or oblique septa, and the presence of conspicuous septal pores. *Acrodictys atroapicula*, *A. irregularis*, *A. micheliae*, *Pseudoacrodictys deightonii*, and *Rhexoacrodictys fuliginosa* are newly recorded for China. All taxa are found on the saprobic substrates, such as dead wood, stems of bamboo, decaying branches *etc*. Their diagnostic features are summarized in Table 1. Another two species previously reported from China are documented.

Taxonomy

Acrodictys atroapicula C.J.K. Wang & B. Sutton, Mycologia 74: 492, 1982. Figure 1

Colonies effuse, hairy, scattered, blackish brown. Mycelium partly superficial, partly immersed, composed of branched, septate, subhyaline to pale brown, smooth, hyphae. Conidiophores macronematous, mononematous, single or in groups of two or three, erect or ascending, straight or flexuous, smooth, thick-walled, septate, 30–95 μm long, dark brown at the base, 5.5 μm wide, paler and narrower toward the apex, 2.5–3.5 μm wide, indeterminate, with 1–4 successive, percurrent proliferations. Conidiogenous cells integrated, terminal, monoblastic, pale brown, cylindrical, lageniform to doliiform. Conidial secession schizolytic. Conidia holoblastic, solitary, dry, acrogenous, obovoid to pyriform, muriform, usually with 5 transverse septa and a few longitudinal and oblique septa, constricted at the septa, mid to pale brown in the lower half, dark blackish brown in the upper portion, smooth, 17–27×11-15 μm, truncate at base, 2.5–3.5 μm wide, detached conidia sometimes with part of the conidiogenous cell attached.

Specimens examined On rotten wood, Caiqi, Shennongjia, Hubei Province, 17 September 2003, G.Z. Zhao, HMAS 90413 (= $ZGZII_{03}077$); on rotten wood, Gubai Town, Linzhi, Tibet, altitude 2,900 m, 23 July 2004, G.Z. Zhao, HMAS 98906 (=$ZGZII_{04}052$).

Notes Acrodictys atroapicula resembles *A. elaeidicola* M.B. Ellis (1961), but can be distinguished by several features. In *A. atroapicula*, the conidiophore may bear up to three percurrent proliferations, whereas in *A. elaeidicola* there may be up to ten or more successive conidiogenous

Table 1 Synopsis of *Acrodictys* and related genera from China

Species	Conidiophores (μm)	Conidiogenous cells	Conidia			
			Shape	Size(μm)	Septa	Secession
Acrodictys atroapicula	30–95×5.5	1–4 percurrent proliferations, lageniform	Obovoid to pyriform	17–27×11–15	5 transverse and a few longitudinal and oblique	Schizolytic, usually with upper conidiogenous cells
Acrodictys bambusicola	Up to 130×5–6.5	1–3 percurrent proliferations, lageniform	Pyriform	20–30×13–16	4 transverse and a few longitudinal	Schizolytic
Acrodictys irregularis	Up to 85×4.5–6	1 or more percurrent proliferations, obclavate to lageniform	Polymorphic, irregularly contorted, complanate to subglobose	12–22×8–16	Irregular	Schizolytic, with upper conidiogenous cells
Acrodictys micheliae	Up to 88×4.5–6	Determinate or sometimes percurrent, cylindrical	Cylindric-ovoid	65–78×17–22	9–14 transverse and a few longitudinal	Rhexolytic
Acrodictys oblonga	Up to 100×5.5	Percurrent proliferations, lageniform	Ovate, ellipsoidal to oblong	27–32×12–16	5 transverse and a few longitudinal	Schizolytic
Acrodictys papillatum	Up to 50×2.5–5.5	1–6 percurrent proliferations, cylindrical or cuneiform	Broadly ellipsoidal to oblong	16–20×12–15	3 transverse and several longitudinal	Schizolytic
Acrodictys porosiseptata	100–210×4–5.5	1 or more percurrent proliferations, lageniform to cylindrical	Broadly clavate to pyriform	25–30×13.5–16.5	4–5 transverse and 3 perpendicular longitudinal	Schizolytic, with upper conidiogenous cells
Junewangia globulosa	70–130×4–7	1 or more percurrent proliferations, lageniform to oblong	Subglobose to globose	18–22 (diam.)	2 transverse and several longitudinal	Schizolytic
Pseudoacrodictys appendiculata	10–30×4–5	Determinate, lageniform to doliiform	Turbinate to pyriform, with appendages	33.5–50×25.5–35	Irregularly transverse and longitudinal	Schizolytic
Pseudoacrodictys deightonii	40–120×9–13	1 or more percurrent proliferations, lageniform to cylindrical	Irregularly turbinate to broadly pyriform, variable in shape, sometimes lobed	30–61×25–55	Numerous transverse and longitudinal	Schizolytic
Ramoacrodictys malabarica	Up to 210×7.5, branched	Determinate	Obovoid, pyriform to turbinate	17–22×12.5–15.5	3 transverse and a few longitudinal	Schizolytic
Rhexoacrodictys erecta	20–70×4–6	1 or more percurrent proliferations, cylindrical	Obovoid	20–30×16–23	Numerous irregularly transverse, longitudinal and oblique	Rhexolytic
Rhexoacrodictys fuliginosa	Up to 85×4–6	1 or more percurrent proliferations, cylindrical, obclavate to lageniform	Obovoid	20–26×9–14	3 transverse and several longitudinal	Rhexolytic

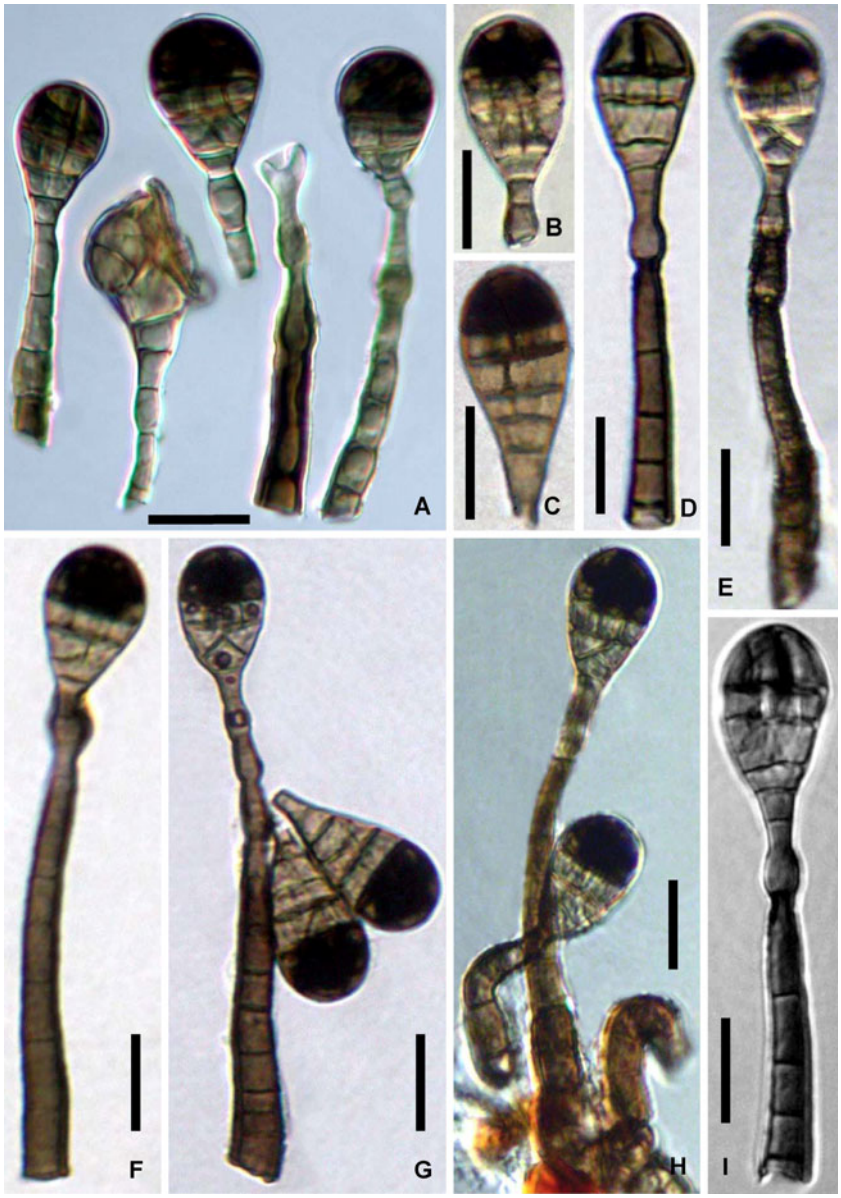

Fig. 1 *Acrodictys atroapicula*. Conidiophores, conidiogenous cells and conidia, **a** from HMAS 98906; **b–i** from HMAS 90413. *Bars* 10 μm

cells formed (Baker et al. 2002a). The conidia of *A. atroapicula* are obovoid to pyriform, with the upper half dark blackish brown in color and in contrast to turbinate or pyriform conidia with fewer transverse, constricted septa in the latter species. The conidiophores of *A. atroapicula* are shorter than those of *A. elaeidicola* and have a thicker base (Wang and Sutton 1982).

Acrodictys bambusicola M.B. Ellis, Mycol. Pap. 79: 6, 1961. Figure 2

Conidiophores up to 130 μm long, dark brown at the base, 5–6.5 μm wide, narrower and paler toward the apex, 2–3 μm wide, indeterminate, with 1–3 successive, percurrent proliferations. Conidiogenous cells integrated, terminal, monoblastic, pale brown, cylindrical, lageniform to doliiform. Conidial secession schizolytic. Conidia broadly clavate, obovoid to pyriform, muriform, usually with 4 transverse septa and a few longitudinal septa, slightly constricted at the septa, brown to dark brown, smooth, 20–30×13–16 μm; basal cell obconical, pale brown, truncate at base, 2–3 μm wide.

Specimen examined On dead branches of bamboo, Diaoluoshan, Hainan Province, 12 December 2003, G.Z. Zhao, HMAS 90364 (= $ZGZII_{03}183$-1).

Notes A. bambusicola is the type species of *Acrodictys sensu lato* Ellis (1961), and is known only on bamboo. Matsushima (1980) reported this species on a culm of *Phyllostachys* sp. from Taiwan without description.

Fig. 2 *Acrodictys bambusicola*. **a** Conidia; **b**–**c** conidiophores, conidiogenous cells and conidia. *Bars* 10 μm

Acrodictys irregularis R.F. Castañeda, Gusmão & Guarro, Mycotaxon 102: 92, 2007. Figure 3

Conidiophores occasionally branched, up to 85 μm long, dark blackish brown at the base, 4.5–6 μm wide, narrower and paler toward the apex, 2–3 μm wide, indeterminate, with one or more successive, percurrent proliferations. Conidiogenous cells integrated, terminal, monoblastic, pale brown, obclavate to lageniform. Conidial secession schizolytic. Conidia polymorphic, irregularly contorted, complanate to subglobose, muriform, dark blackish brown, smooth, 12–22×8–16 μm, sometimes septa strongly constricted forming lobes, with swollen and protruding peripheral cells; basal cell protruding, obconical, subhyaline to pale brown, truncate, 3–6.5×2.5–5 μm, usually with the upper part of conidiophore when detached.

Specimens examined On decaying culms of bamboo, Hangzhou, Zhejiang Province, 12 August 2002, G. Z. Zhao, HSAUP020985 (=ZGZII$_{02}$185).

Notes Acrodictys irregularis can be easily recognized by its macronematous conidiophores, lageniform proliferating conidiogenous cells, and irregularly contorted, subglobose, muriform conidia. The current specimen with occasionally branched conidiophores is slightly different from those originally described by Castañeda et al. (2007). There is no mention of branched conidiophores in Castañeda et al.'s description and illustration.

Acrodictys micheliae R. Kodsueb & McKenzie, in Kodsueb *et al*., Cryptogamie, Mycologie 27: 112, 2006. Figure 4

Conidiophores unbranched, brown at the base, pale brown toward the apex, up to 88 μm long, 4.5–6 μm wide. Conidiogenous cells integrated, monoblastic, terminal, sometimes percurrent, cylindrical. Conidial secession rhexolytical. Conidia cylindric-ovoid, brown to dark brown, smooth, 65–78×17–22 μm, muriform, with 9–14 transverse and a few longitudinal septa, often slightly constricted at the septa; basal cell cuneiform, pale brown, truncate at base, 4.5–6 μm wide, usually bearing a small marginal frill when detached. Globose secondary spore/cell occasionally observed beside conidia, 7–10 μm in diam.

Fig. 3 *Acrodictys irregularis*. **a**,**b** Colonies from natural substrate; **c**–**f** conidiophores, conidiogenous cells and conidia. *Bars* 10 μm

Specimens examined On decaying branches, Caiqi, Shennongjia, Hubei Province, 17 September 2003, G.Z. Zhao, HMAS 90427 (= $ZGZII_{03}076$-1).

Notes Acrodictys micheliae represents a group of species with cylindric-ovoid or oblong, muriform conidia including *Acrodictys septosporioides* Matsush. (Matsushima 1983) *A. peruamazonensis* Matsush. (Matsushima 1993) and *A. oblonga* G.Z. Zhao (Zhao et al. 2009a). *A. micheliae* differs from *A. septosporioides* by its smaller conidia measuring (33-) 55–65 (−83)×(14.5–) 16.5 (−25.5) μm, while those of *A. septosporioides* are 64–105×24–40 μm (Matsushima 1983; Kodsueb et al. 2006). It also differs from *A. peruamazonensis* and *A. oblonga* by its longer conidia, which are 28–36×17–21 μm in *A. peruamazonensis* and 27–32×12–16 μm in *A. oblonga* (Matsushima 1983, 1993; Kodsueb et al. 2006; Zhao et al. 2009a).

Baker et al. (2002a) considered *A. septosporioides* and *A. peruamazonensis* better placed in *Junewangia* based on their conidiophores morphology and conidiogenesis. Castañeda et al. (2007) concluded that *Acrodictys micheliae* was most closely related to the genus *Junewangia* by lacking doliiform or lageniform proliferations. In our opinion, *A. peruamazonensis* is better kept in *Acrodictys* due to the presence of lageniform to doliiform proliferating conidiogenous cells, while *A. septosporioides* should be placed in *Junewangia* based on its atypical proliferating conidiophores and narrowly cuneate conidiogenous cells (Matsushima 1983, 1993; Zhao et al. 2009a). *Acrodictys micheliae*, based on the specimen currently studied, is probably better placed in *Rhexoacrodictys* due to its atypical proliferating conidiophores and rhexolytically seceding conidia usually with a small marginal frill.

Although the Chinese collection is assigned to *Acrodictys micheliae*, there are some slight differences compared with

Fig. 4 *Acrodictys micheliae*. **a**–**e** Cylindric-ovoid conidia; **f** acylindric-ovoid conidium with a globose secondary spore; **g** conidiophore, conidiogenous cells and conidium with a globose secondary spore. *Bars* 10 μm

the original descriptionof Kodsueb et al. (2006). The Chinese fungus produce slightly larger conidia (65–78×17–22 μm), sometimes with globose secondary spore/cells, and seceding conidia usually have a small marginal frill. The conidia described by Kodsueb et al. (2006) average 60.7×18.3 μm and there is no mention of conidial seccession and secondary spore/cells. The Chinese collection was originally considered under *Xenosporium* Penz. & Sacc. (Ellis 1971), and it is comparable to *Xenosporium africanum* Piroz., *X. boivinii* S. Hughes, *X. intermedium* Vittal and *X. ovatum* G.Z. Zhao, Xing Z. Liu & W.P. Wu in having muriform conidia and globose secondary spore, but the conidia are more or less curved in the *Xenosporium* species (Zhao et al. 2006, 2007).

Acrodictys oblonga G.Z. Zhao, Nova Hedwigia 88: 218, 2009.

Description and illustration See Zhao et al. (2009a).

Specimens examined On rotten petiole of banana, Guanmenshan, Shennongjia, Hubei Province, 16 September 2003, G.Z. Zhao, HMAS 90286.

Notes Acrodictys oblonga is characterized by the presence of percurrently proliferating conidiophores, ellipsoidal to oblong, muriform conidia usually with 5 transverse and a few longitudinal or oblique septa (Zhao et al. 2009a).

Acrodictys papillatum (P.Rag. Rao & D. Rao) G.Z. Zhao, in Zhang *et al*., Flora Fungorum Sinicorum 31: 21, 2009. Figures 5 and 6

Berkleasmium papillatum P. Rag. Rao & D. Rao, Mycopathologia 22: 311, 1964.

Conidiophores up to 50 μm long, brown to dark brown, 2.5–5 μm wide, slightly swollen at the base, indeterminate, with up to 6 successive, sometimes swollen percurrent proliferations. Conidiogenous cells integrated, terminal, monoblastic, pale brown, cylindrical or cuneiform. Conidial secession schizolytic. Conidia broadly ellipsoid to oblong, muriform, usually with 3 transverse and several longitudinal septa, slightly constricted at the septa, pale brown, thin-walled, smooth, 16–20×12–15 μm; basal cell protrudes, cylindrical, subhyaline to pale brown, truncate, 2–4 μm wide.

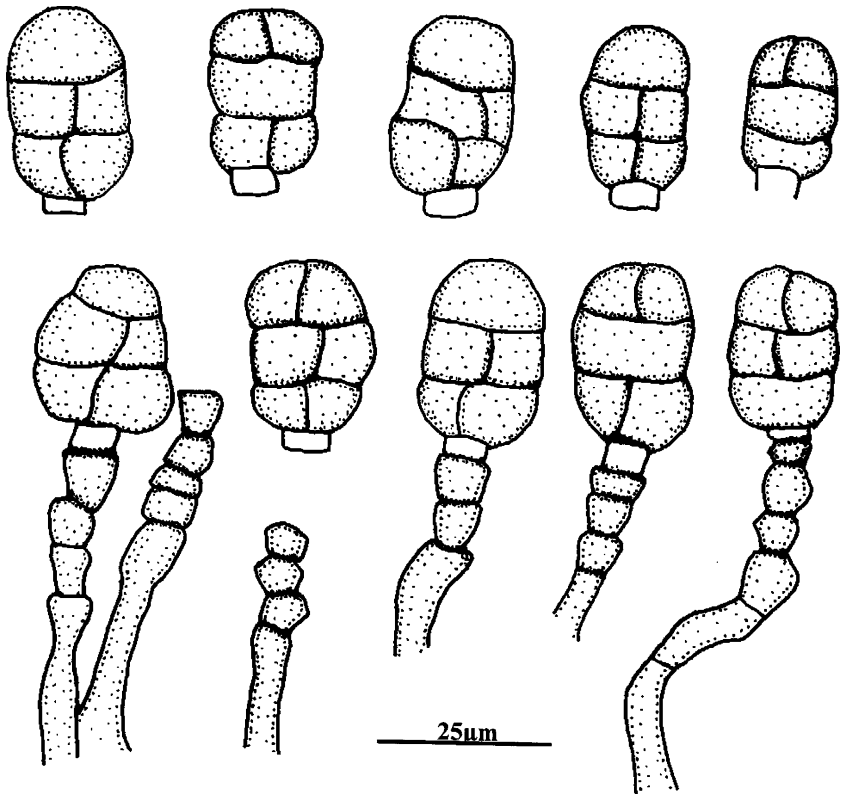

Fig. 5 *Acrodictys papillatum*. Conidiophores, conidiogenous cells and conidia from $HSAUP_{01}0458$

Specimens examined On dead branch, Xuzhou, Jiangxu Province, 7 August 2002, G. Z. Zhao, $HSAUP_{02}1030$-1 (=$ZGZII_{02}230$-1); on decorticated dead branches, Taishan, Shandong Province, $HSAUP_{01}0458$, $HSAUP_{01}0478$.

Notes This species was originally assigned to *Berkleasmium* Zobel and recently transferred to *Acrodictys* by Zhang et al. (2009) due to the presence of short but distinct conidiophores, percurrently proliferating conidiogenous cells and muriform conidia (Rao and Rao 1963; Zhang et al. 2009).

The conidia of *Acrodictys papillatum* are morphologically similar to *Acrodictys fimicola* M.B. Ellis & Gaunnell (Ellis 1961), *Junewangia globulosa* (Tóth) W.A. Baker & Morgan-Jones (Ellis 1965; Baker et al. 2002a) and *J. lamma* (Whitton, McKenzie & K.D. Hyde) W.A. Baker & Morgan-Jones (Baker et al. 2002a). However, *A. fimicola* has darker conidia with irregular septation and without protruding basal cells. *J. globulosa* has larger subglobose conidia measuring 22–27×17–23 μm, while *J. lamma* produces globose, crucially septate conidia (Whitton et al. 2000; Baker et al. 2002a).

Acrodictys porosiseptata G.Z. Zhao, sp. nov. Figure 7

Etymology L. *porosiseptata*, referring to the conidia with pored septa.

Coloniae effusae, pilosae, brunneae vel fuscae. Mycelium partim superficiale et partim immersum, ex hyphis ramosis, septatis, subhyalinis vel pallide brunneis, laevibus, reticulatis compositum. Conidiophora macronemata, mononemata, singularia vel 2 vel 3 disposita, recta vel flexuosa, laevia, septata, usque ad 100–210 μm longa, basim versus atro brunnea, 4–5.5 μm lata, apicem versus pallidiora, 2–3 μm lata, indeterminata, plerumque ad proliferationes percurrentes successivas. Cellulae conidiogenae in conidiophoris incorporatae, terminales, monoblasticae, pallide brunneae, lageniformes vel obclavatae. Conidiorum secessio schizolytica. Conidia holoblastica, solitaria, sicca, acrogena, brunnea vel atro-brunnea, lata clavata vel pyriformia, muriformia, plerumque 4–5 transverse septata et 3 aliquot longitudinaliter et oblique septata, brunnea vel atrobrunnea, laevia, 25–30×13.5–16.5 μm; cellula basali obconica vel cuneiformi, pallide brunnea, protuberantes, 2–3 μm lata, ad basin truncata.

Colonies effuse, hairy, scattered, blackish brown. Mycelium partly superficial, partly immersed, composed of branched, septate, subhyaline to pale brown, smooth, hyphae. Conidiophores macronematous, mononematous, single or in groups of two or three, erect or ascending, straight or slightly flexuous, smooth, thick-walled, septate, 100–210 μm long, dark blackish brown at the base, 4–5.5 μm wide, narrower and paler toward the apex, 2–3 μm wide, indeterminate, with one or more successive, terminal, percurrent proliferations. Conidiogenous cells integrated, terminal, monoblastic,

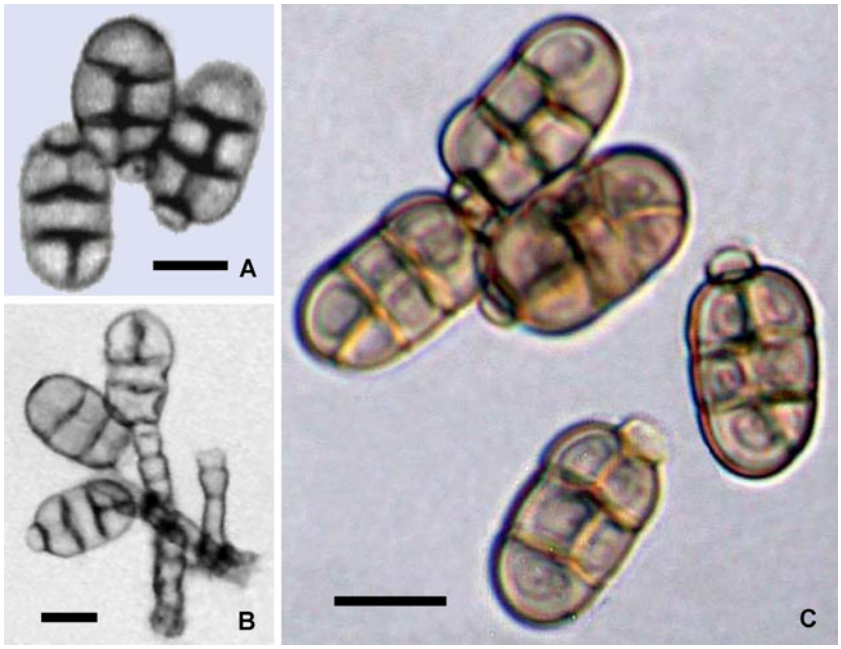

Fig. 6 *Acrodictys papillatum*. **a**,**b** Conidiophores, conidiogenous cells and conidia from $HSAUP_{01}0458$; **c** conidia from HSAUP021030-1. *Bars* 10 μm

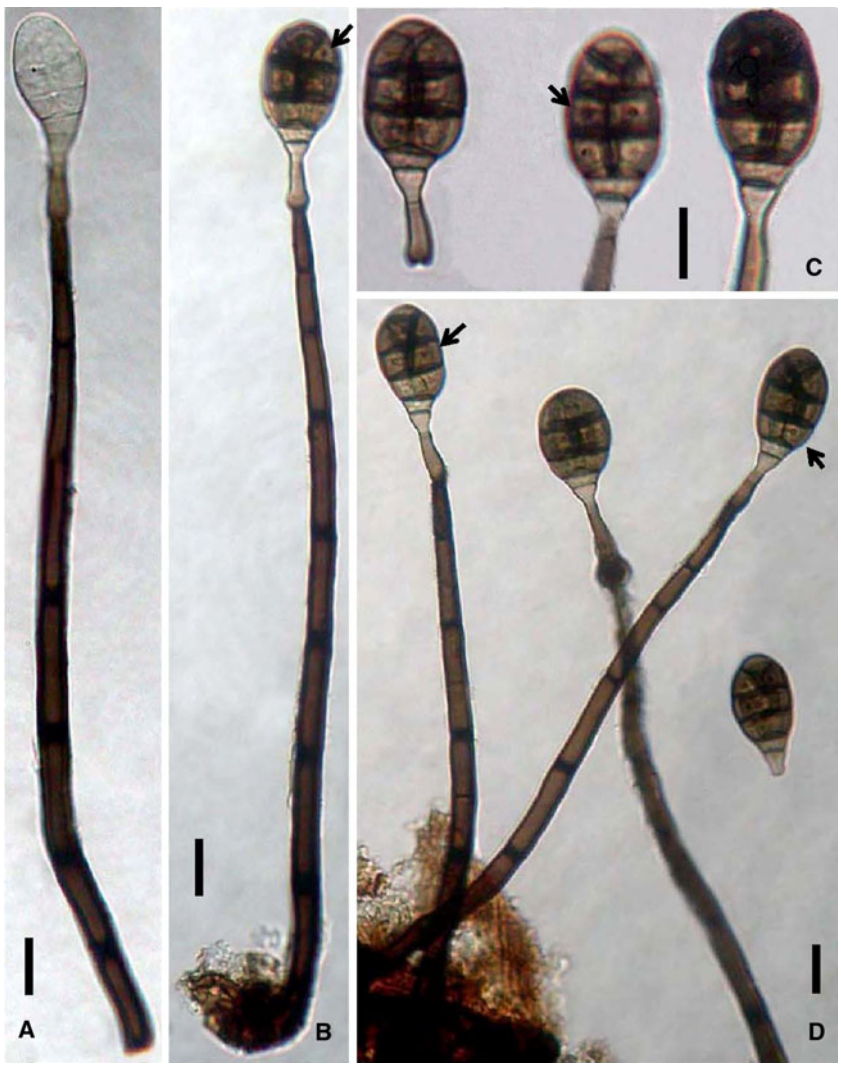

Fig. 7 *Acrodictys porosiseptata*. **a**–**d** Conidiophores, conidiogenous cells and conidia from holotype; **a** conidiophores and immature conidium; **c** detached conidia with the upper portion of the conidiophores attached. *Arrows* indicate the conidia with pored septa. *Bars* 10 μm

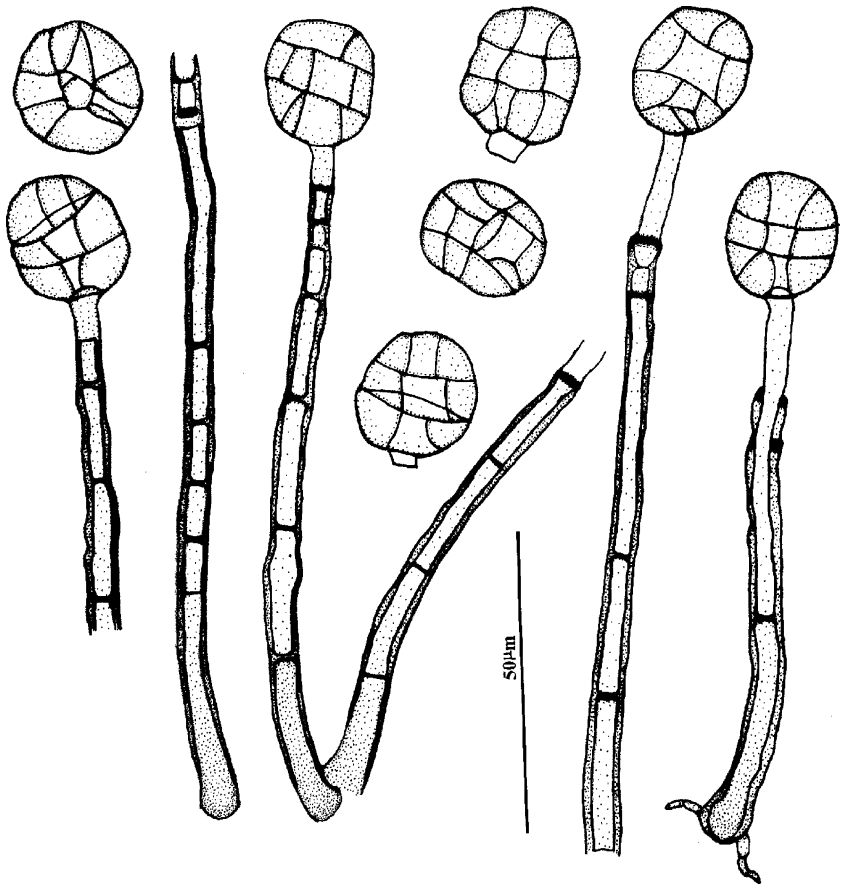

Fig. 8 *Junewangia globulosa*. Conidiophores, conidiogenous cells and conidia from $HSAUP_{99}2154$

pale brown, lageniform to obclavate. Conidial secession schizolytic. Conidia holoblastic, solitary, dry, acrogenous, broadly clavate, pyriform, muriform, usually with 4–5 transverse septa and 3 perpendicular longitudinal and oblique septa, with conspicuous pores in the septa, brown to dark brown, smooth, 25–30×13.5–16.5 μm; basal cell persistent, protruding, obconical or cuneiform, pale brown, truncate, 2–3 μm wide. Detached conidia usually with the upper portion of the conidiophore attached.

Specimen examined On dead stem of *Bambusa* sp., Wuzhishan, Hainan Province, 15 December 2003, G.Z. Zhao, HMAS 90275 (= $ZGZII_{03}103$-1), holotype.

Notes This species resemble *A. liputii* L. Cai, K.Q. Zhang, McKenzie, W.H. Ho & K.D. Hyde (2002). Both species produce subglobose or pyriform muriform conidia with the presence of conspicuous septal pores. However, *A. liputii* has conidia mostly with 2–3 parallel transverse septa and 2 perpendicular longitudinal septa, 18.5–22.5×13.5–17.5 μm in size, while the conidia of *A. porosiseptata* have 4–5

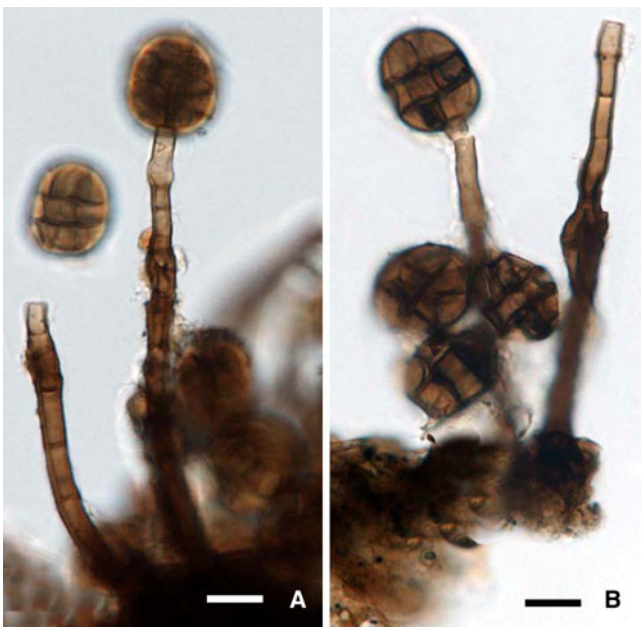

Fig. 9 *Junewangia globulosa*. **a**,**b** Conidiophores, conidiogenous cells and conidia from HMAS 98766. *Bars* 10 μm

transverse and 3 longitudinal septa, and measure 25–30× 13.5–16.5 μm.

Acrodictys porosiseptata is also morphologically comparable to *A. balladynae* (Hansf.) M.B. Ellis, *A. elaeidicola* M.B. Ellis (Ellis 1961) and *A. similes* Hol.-Jech. (Holubová-Jechová and Mercado Sierra 1984). It can be distinguished from *A. balladynae* by its longer conidiophores with swollen proliferations and longer conidia with conspicuous septal pores (Ellis 1961); it has fewer conidiophore proliferations than *A. elaeidicola* and has more conspicuous conidial septal pores than either *A. elaeidicola* or *A. similis* (Holubová-Jechová and Mercado Sierra 1984).

Junewangia globulosa (Tóth) W.A. Baker & Morgan-Jones, Mycotaxon 81: 308, 2002. Figures 8 and 9

Monodictys globulosa Tóth, Ann. Hist.-nat. Mus. Hung. 54: 183, 1962.

Acrodictys globulosa (Tóth) M.B. Ellis, Mycol. Pap. 103: 34, 1965.

Conidiophores 70–130 μm long, brown to dark brown, 4–7 μm wide, slightly swollen at the base, indeterminate, with one or more successive, percurrent proliferations, which are sometimes swollen. Conidiogenous cells integrated, terminal, monoblastic, pale brown, cylindrical,

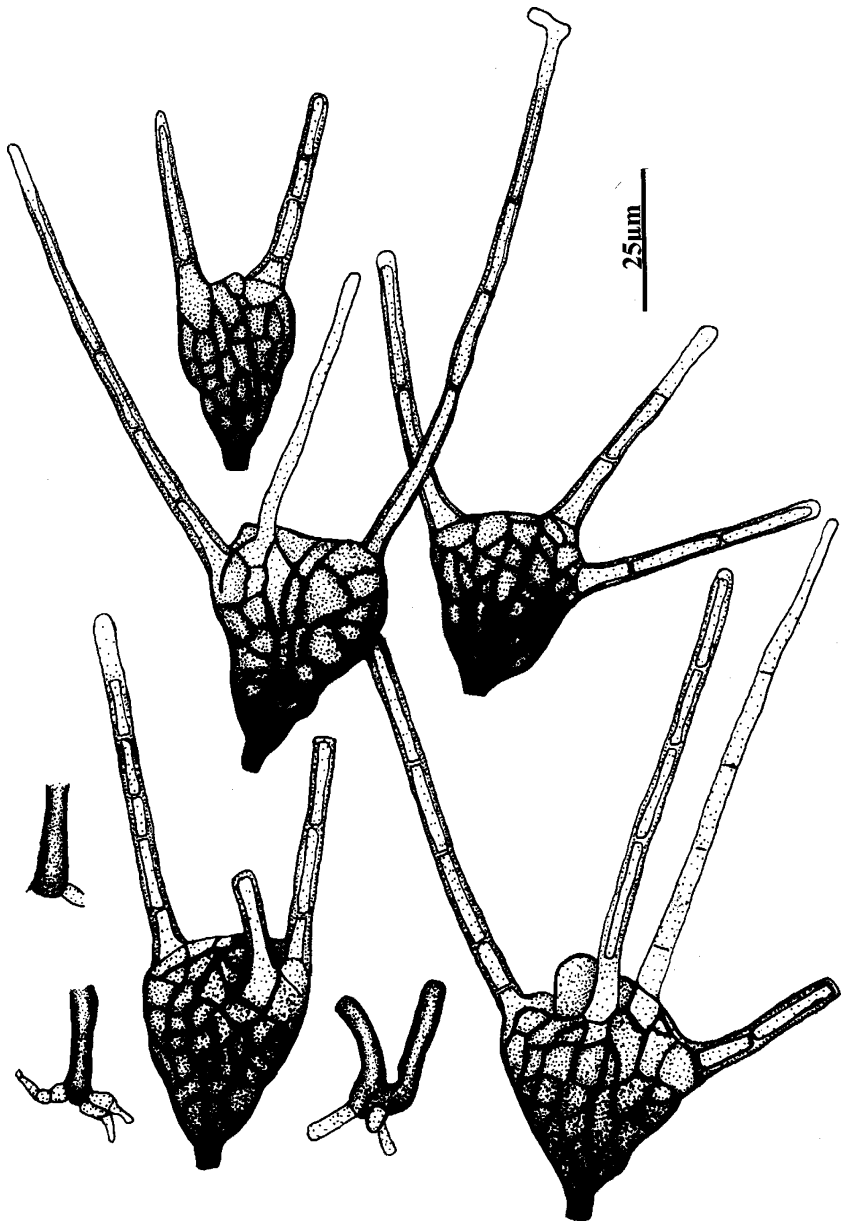

Fig. 10 *Pseudoacrodictys appendiculata*. Conidiophores, conidiogenous cells and conidia

lageniform to oblong. Conidial secession schizolytic. Conidia subglobose to globose, muriform, usually with 2 transverse and several longitudinal or oblique septa, pale brown, thin-walled, smooth, 18–22 μm in diam; basal cell protruding, cylindrical, subhyaline to pale brown, truncate, 5–7 μm wide.

Specimens examined On barks of *Syzygium samarangense* (Bl.) Merr. & Perry, Nanning, Guangxi Province, $HSAUP_{99}2154$; on rotten wood, Qianshan, Liaoning Province, 22 September 2004, G.Z. Zhao, HMAS 98766 (=$ZGZII_{04}150$); on rotten wood, Taian, Shandong Province, $HSAUP_{01}0473$, $HSAUP_{01}0453$, $HSAUP_{01}0478$.

Notes Matsushima (1980) recorded this species on leaves of *Daemonorops margrite* and *Semecarpus gigantiflora* from Taiwan.

This species was transferred into *Junewangia* from *Acrodictys* by its elongating successive percurrent proliferations of conidiophores and seceding schizolytically conidia (Baker et al. 2002a). *J. globulosa* is easily recognized by its globose, pale brown, muriform conidia with usually two transverse septa. It shows some similarities with *Acrodictys papillatum* (P.Rag. Rao & D. Rao) G.Z. Zhao and *Rhexoacrodictys fimicola*, but can be distinguished from *A. papillatum* by its globose conidia and from *R. fimicola* by the presence of subhyaline conidia. The conidia of *A. papillatum* are oval or oblong and conidiophores have more percurrent proliferations. Conidia of *R. fimicola* are oval, mid brown to blackish brown and usually lack a protruding basal cell (Rao and Rao 1963; Ellis 1965; Baker et al. 2002a, b; Baker and Morgan-Jones 2003).

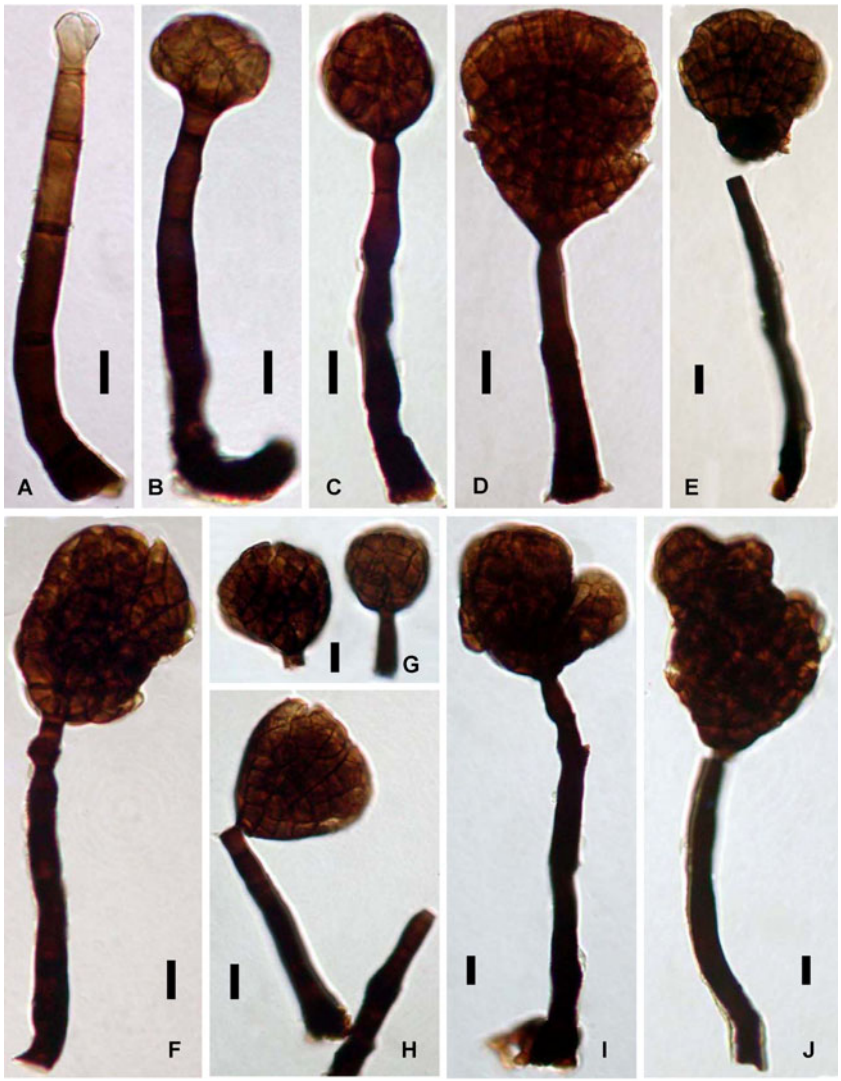

Fig. 11 *Pseudoacrodictys deightonii*. **a**–**j** Conidiophores, conidiogenous cells and conidia; **a** young conidium. *Bars* 10 μm

Except for slightly longer conidiophores (70–130 μm) in specimen HSAUP$_{99}$2154, the Chinese collections fit well with the description of 30–70 μm by Ellis (1965).

Pseudoacrodictys appendiculata (M.B. Ellis) W.A. Baker & Morgan-Jones, Mycotaxon 85: 374, 2002. Figure 10

Acrodictys appendiculata M.B. Ellis, Mycol. Pap. 103: 33, 1965.

Conidiophores macronematous, single or in groups of two or three, short, erect or ascending, straight or flexuous, smooth, thick-walled, aseptate, dark brown to blackish brown, determinate, 10–30×4–5 μm. Conidiogenous cells integrated, terminal, monoblastic, pale brown, cylindrical, lageniform to doliiform. Conidial secession schizolytic. Conidia turbinate to pyriform, muriform, brown to dark brown, smooth, 33.5–50×25.5–35 μm, with 2–4 pale brown appendages, up to 105 μm long, 4–4.5 μm wide; basal cell protruding, blackish brown, cylindrical or cuneiform, truncate at base, 4–5 μm wide.

Specimen examined On dead culm of *Phragmites communis* Trin., Huangshan, Anhui Province, 10 September 2002, G.Z. Zhao, HSAUP$_{02}$0956 (=ZGZII$_{02}$156).

Notes Ellis (1965) reported this species on dead culms of *Oxytenanthera abyssinica* from Sierra Leone. Baker and Morgan-Jones (2003) examined the type specimen

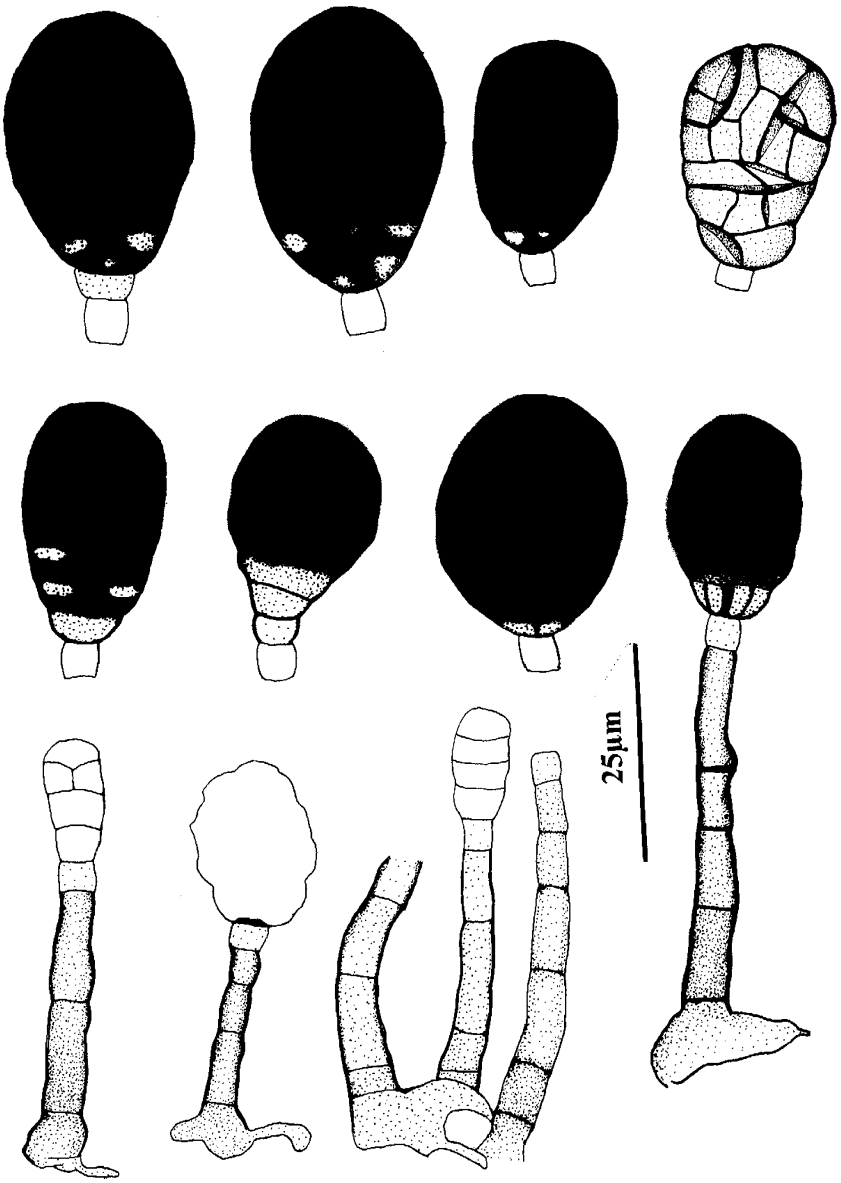

Fig. 12 *Rhexoacrodictys erecta*. Conidiophores, conidiogenous cells and conidia

(IMI74761b) of the species and transferred it into *Pseudoacrodictys* by production of large, somewhat irregularly shaped, dark-colored, numerous-celled conidia.

Pseudoacrodictys appendiculata is very similar to *Piricauda cochinensis* (Subram.) M.B. Ellis (Ellis 1976) in having muriform, pyriform conidia with setiform appendages. *Piricauda cochinensis* can be distinguished from *P. appendiculata*, which either lacks, or has micronematous conidiophores, has inflated conidiogenous cells, and monotretic conidia with distinctly verruculose wall at base and lacking a protruding basal cell.

P. appendiculata also resemble two other species, *P. corniculata* (R.F. Castañeda) W.A. Baker & Morgan-Jones and *P. eickeri* (Morgan-Jones) W.A. Baker & Morgan-Jones (Baker and Morgan-Jones 2003) that have appendaged conidia. However, *P. appendiculata* has non-proliferating conidiophores, whereas *P. corniculata* and *P. eickeri* have successive percurrently proliferating conidiophores and subglobose conidia, with clustered distally aseptate appendages, which are shorter (8–20 μm) than those of *P. appendiculata*. *P. eickeri* conidia bear hypha-like appendages laterally or distally (Baker and Morgan-Jones 2003).

The Chinese collection fits well with the original description of *P. appendiculata* (Ellis 1965) except for the longer appendages (up to 105 μm vs 6–32 μm).

Pseudoacrodictys deightonii (M.B. Ellis) W.A. Baker & Morgan-Jones, Mycotaxon 85: 380, 2003. Figure 11

Acrodictys deightonii M.B. Ellis, Mycol. Pap. 79: 17, 1961.

Conidiophores 40–120 μm long, dark blackish brown at the base, 9–13 μm wide, narrower and brown towards the apex, 4–5.5 μm wide, indeterminate, with one or more successive, percurrent proliferations. Conidiogenous cells integrated, terminal, monoblastic, brown, lageniform to cylindrical. Conidial secession schizolytic. Conidia irregularly turbinate to broadly pyriform, sometimes variable in shape, sometimes lobed, with swollen and protruding peripheral cells, muriform, with numerous transverse and longitudinal septa, brown to dark brown, smooth, 30–61×

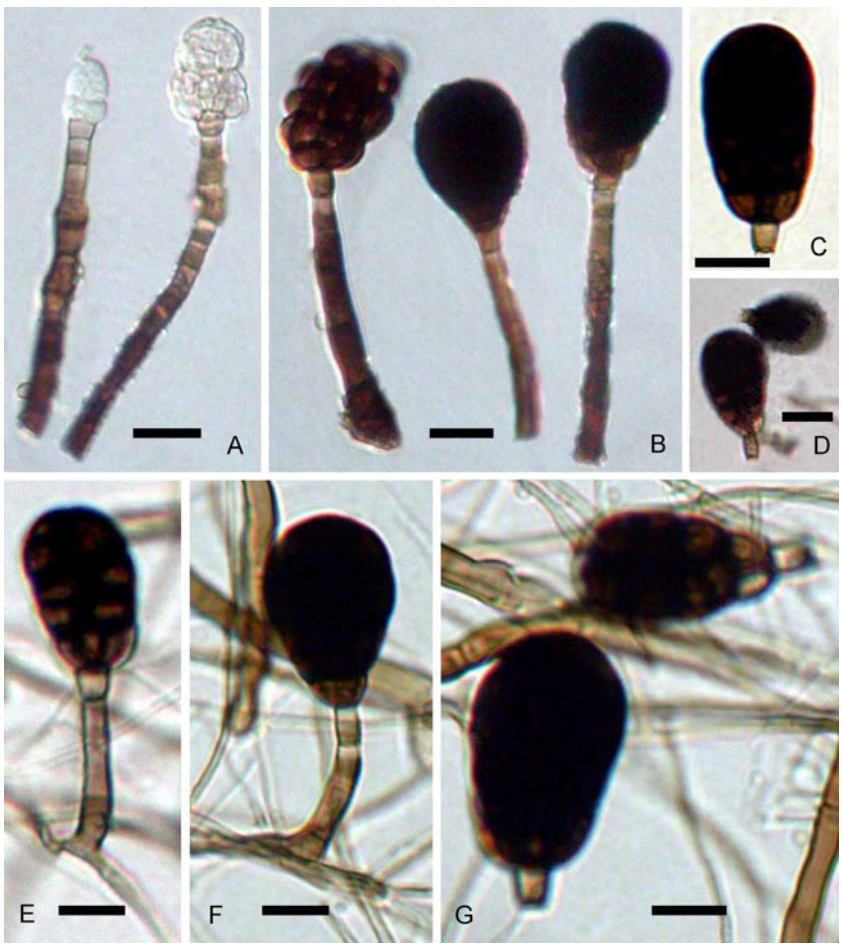

Fig. 13 *Rhexoacrodictys erecta*. Hyphae, conidiophores, conidiogenous cells and conidia; **a** young conidia; **a**,**b** from HMAS90327; **c**–**g** from HMAS90424. *Bars* 10 μm.

25–55 μm, basal cell protruding, cylindrical or cuneiform, dark brown, truncate, 4–5.5 μm wide.

Specimens examined On decaying branches, Tongbiguan, Gaoligongshan, Yunnan Province, 18 October 2003, G.Z. Zhao, HMAS 90312 (=ZGZII$_{03}$130–2).

Notes Ellis (1961) reported the species on dead branches, of *Cassia fruticosa*, *Gardenia nitida* and *Rauwolfia vomitoria* from Sierra Leone.

Pseudoacrodictys deightonii is close to *P. dennisii* (M.B. Ellis) W.A. Baker and Morgan-Jones (2003) in having large conidia with numerous septa, but differs in its irregularly turbinate to pyriform or lobed conidia usually with swollen and protruding peripheral cells. Conidia of *P. dennisii* are obovoid to pyriform, with the notably cylindrical shape and denser pigmentation of the basal cell (Baker and Morgan-Jones 2003).

Ramoacrodictys malabarica (Subram. & Bhat) G. Z. Zhao, Sydowia 61: 355, 2009.

Acrodictys malabarica Subram. & Bhat, Kavaka 15: 41, 1987.

Bhatia malabarica (Subram. & Bhat) W.A. Barker & Morgan-Jones, Mycotaxon 110: 93, 2009.

Description and illustration See Zhao et al. (2009b).

Specimens examined On dead branches of bamboo, Diaoluoshan, Hainan Province, 12 December. 2003, G.Z. Zhao, HMAS 90364 (=ZGZII$_{03}$183-2).

Notes The multi-branched conidiophores, non-proliferating conidiogenous cells and production of gangliar conidia (Subramanian and Bhat 1987), excludes this species from *Acrodictys*. A genus, *Ramoacrodictys*, was introduced to

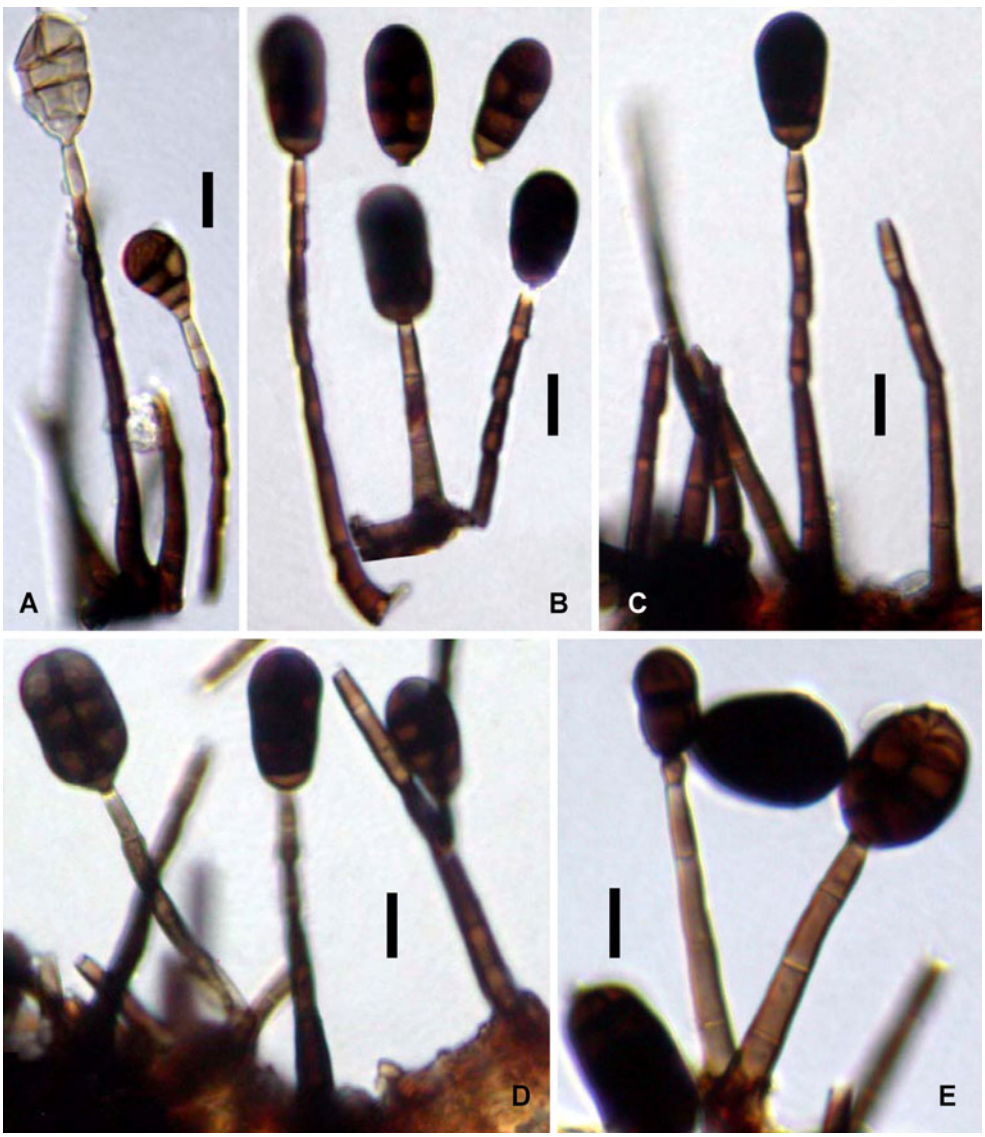

Fig. 14 *Rhexoacrodictys fuliginosa*. **a**–**e** Conidiophores, conidiogenous cells and conidia. *Bars* 10 μm

accommodate the species by Zhao et al. (2009b). While Gams et al. (2009) erected another genus, *Bhatia*, to accommodate this species, herein, it is referred to a synonym.

Rhexoacrodictys erecta (Ellis & Everh.) W.A. Baker & Morgan-Jones, in Baker, Partridge & Morgan-Jones, Mycotaxon 82: 99, 2002. Figures 12 and 13

Acrodictys erecta (Ellis & Everh.) M.B. Ellis, Mycol. Pap. 79: 12, 1961.

Conidiophores 20–70 μm long, dark blackish brown at the base, 4–6 μm wide, narrower and paler towards the apex, 2.5–4.5 μm wide, indeterminate, with one or more successive, percurrent proliferations. Conidiogenous cells integrated, terminal, monoblastic, pale brown, cylindrical. Conidial secession rhexolytic. Conidia obovoid, muriform, with numerous irregularly transverse, longitudinal and oblique septa, constricted at the septa, mature conidia shining black in the upper 3/4, pale brown in the lower 1/4, smooth, 20–30×16–23 μm; basal cell protrudes, truncate or with a marginal frill when detachment, cylindrical, subhyaline to pale brown, 3–5 μm wide.

Specimens examined On dead bark of palm tree, Tropical Botanical Garden of Danzhou, Hainan Province, 19 December 2003, G.Z. Zhao, HMAS 90327(= $ZGZII_{03}$145-5); on decaying stalk of *Sorghum bicolor* (L.) Moench, Taian Shandong Province, $HSAUP_{01}$0462(=$ZGZII_{01}$012); on decaying branches, Taishan, Shandong, $HSAUP_{01}$0502(=$ZGZII_{01}$052); on rotten stalk of *Zea mays* L., Mile, Yunnan Province, $HSAUP_{02}$0041 (=ZW_{02}0041); on rotten stems of bamboo, Gaoligongshan Yunnan Province, 19 October. 2003, G.Z. Zhao, HMAS 90424 (=$ZGZII_{03}$089).

Notes Ellis (1961) reported this species on *Arundo donax* in Venezuela and on *Zea mays* in USA. Baker et al. (2002b) examined several type specimens under some synonyms of this species and built *Rhexoacrodictys*, with *R. erecta* as the type species, on the basis of conidial morphology and detachment process.

R. erecta represents a group of species within the genus with percurrently proliferating conidiophores and muriform conidia that secede rhexolytically. *R.erecta* is most similar to *R. fuliginosa* Sutton in having black, opaque, muriform conidia, but the latter species has smaller (21–26×12–16 μm) conidia with regularly transverse septa (Ellis 1961; Sutton 1969).

R. erecta was previously recorded from China in forest soil of Taishan, Shandong (Liu 2004) and on *Bambusa multiplex* from Taiwan (Matsushima 1987).

Rhexoacrodictys fuliginosa (B. Sutton) W.A. Baker & Morgan-Jones, in Baker, Partridge & Morgan-Jones, Mycotaxon 82: 106, 2002. Figure 14

Acrodictys fuliginosa B. Sutton, Can. J. Bot. 47: 853, 1969.

Conidiophores up to 85 μm long, dark blackish brown at the base, 4–6 μm wide, becoming narrower and paler towards the apex, 2–3.5 μm wide, indeterminate, with one or more successive, terminal, percurrent proliferations. Conidiogenous cells integrated, terminal, monoblastic, brown, cylindrical, obclavate to lageniform. Conidial secession rhexolytic. Conidia obovoid, muriform, usually with 3 transverse and several longitudinal septa, dark blackish brown, smooth, mature conidia dark brown to shining black, often obscured by thickened, darkly pigmented septa, 20–26×9–14 μm; basal cell protrudes, cylindrical, pale brown to brown, 2–3.5 μm wide.

Specimens examined On rotten wood, Wulingshan, Hebei Province, 17 May 2004, G.Z. Zhao, HMAS 98872 (=$ZGZII_{04}$020).

Notes This taxon was transferred to *Rhexoacrodictys* by Baker et al. (2002b) after examination of the type specimen from decaying bark of *Populus tremuloides* from Canada. Proliferations of conidiophores in *R. fuliginosa* are varied from different specimens. In the original description (Sutton 1969) conidiophores proliferation was not mentioned, however, Baker et al. (2002b) described it as indeterminate with 1–3 percurrent proliferations. The Chinese collection bears 1–5 successive proliferations and cylindrical, lageniform to doliiform inflated conidiogenous cells.

R. fuliginosa differs from *R. erecta* by its narrower conidia (9–14 μm vs 16–23 μm) with regularly parallel 2–3 transverse septa.

Other species reported from China

The following species have been reported from China, but no specimens have been examined by us.

Junewangia lamma (Whitton, McKenzie & K.D. Hyde) W.A. Baker & Morgan-Jones, Mycotaxon 81: 310, 2002.

Acrodictys lamma Whitton, McKenzie & K.D. Hyde, Fungal Diversity 4: 163, 2000.

Whitton et al. (2000) recorded this species from Lamma Island, Hong Kong, on decaying leaves of *Pandanus tectorius*.

Pseudoacrodictys dennisii (M.B. Ellis) W.A. Baker & Morgan-Jones, Mycotaxon 85: 385, 2003.

Acrodictys dennisii M.B. Ellis, Mycol. Pap. 79: 15, 1961.

This species was reported by Chen (1997) from Xishuangbanna, Yunnan on dead branches of *Brucea javanica* and *Micromelum integerrimum*.

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