

Some new Helotiales on ferns from South Africa

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Unfortunately Ain Raitviir died on September 17th, 2006. He was one of the best experts on Helotiales, especially on the family Hyaloscyphaceae. He prepared the descriptions of the new taxa and wrote a nearly complete draft which has been used for the final version of this article. Five new species of small discomycetes, *Crocicreas blechni*, *Lachnum capense*, *Niptera capensis*, *Phaeoscypha pteridicola*, *Urceolella todeae*, and one new variety, *Incrupila aspidii* var. *pteridicola*, are described. All of them were collected on dead fronds of ferns in South Africa.

Key words: Microfungi on ferns, ascomycetes, Helotiales, new taxa, South African mycobiota

Microfungi on ferns are mainly described from the northern temperate zone (Böhler 1974, Dennis 1978, Holm & Holm 1978, 1979, Ellis & Ellis 1985). Much less is known about tropical and subtropical areas (Samuels & Rogerson 1990, Lodge *et al.* 1995), and no publication has been found dealing with ascomycetes fruiting on dead, dying or living parts of ferns in South Africa.

During a floristic excursion of the Institute of Systematic Botany, University of Zürich, in the year 2002, J. S. had the opportunity to collect dead fronds of different fern species bearing microfungi, mainly discomycetes. The material was re-examined in Zurich but could not be identified. It was therefore sent to A. R., one of the few experts on small discomycetes. The biodiversity of microfungi in South Africa is very likely to contain a large number of still undescribed species (Crous *et al.* 2006a), and many of the currently known species are parasites of cultivated plants (Crous *et al.* 2006b), or more or less host-specific fungi on Proteaceae and Restionaceae (Lee & Crous 2003). But especially the Pezizales and Helotiales of South Africa are still poorly known, and comparably few examples are mentioned in the publication of Doidge (1950). Here we describe and present five new species and one new variety of Helotiales.

Material and Methods

Dry herbarium material was re-soaked in 3 % aqueous solution of KOH. Melzer's reagent (MLZ), Lugol's solution (IKI), Congo Red (CR), and Cotton Blue (CB) were used for histochemical reactions. Concerning the iodine reactions of the apical apparatus of asci, it should be noted here that we refer only to reactions in MLZ in the descriptions given below, not to reactions in IKI (but compare, e.g., Baral 1987). The mounts were examined by a Nikon Labophot-2 microscope equipped with a drawing tube. The size of microscopic structures was measured in 3 % KOH, using a 100x oil immersion objective lens unless otherwise stated.

Taxonomy

***Niptera capensis* Raitv. & Schneller sp. nov.** (Dermateaceae) – Fig. 1.

Apothecia dispersa vel gregaria, superficialia, sessilia, 0.5–1.5 mm in diametro, patellato-cupulata vel patellata, sicca brunnea usque ad nigro-fusca. Excipulum ectale ex textura globulosa compositur, cellulis pallide brunneis, tenuiter vel subcrasse tunicatis. Asci non uncinati, clavati, octospori, $50\text{--}62 \times 8\text{--}9 \mu\text{m}$, poro iodo caerulescenti praediti. Sporae late fusoideae, hyalinae, 2- vel 3-guttulatae, aseptatae vel raro uniseptatae, $8\text{--}14 \times 2.5\text{--}3.5 \mu\text{m}$. Paraphyses filiformes, ramosae, apicibus capitatis usque ad $5 \mu\text{m}$ latis, interdum crasse tunicatis et granulatis, contento luteo-fusco.

In frondibus emortuis *Todeae barbarae* crescit. – Holotypus: South Africa, Cederberg, 29 Sep 2002, coll. J. Schneller, no. SA02-1 (in herbario Z).

Apothecia superficial, scattered to gregarious, sessile. Disc 0.5–1.5 mm, plane to slightly concave, with broad, rounded margin, medium brown to blackish brown when dry. Receptacle broadly sessile, shallow cupulate or saucer-shaped, concolorous with the hymenium, smooth. Ectal excipulum composed of brownish textura globulosa, cells with thin to slightly thickened walls, 5–8 μm in diameter. Brown amorphous encrusting matter abundant in intercellular spaces of the outer layers of the excipulum and on the surface of the outermost cells. At the margin the excipulum is formed of 1–3 rows of prismatic cells with broadly clavate terminal cells. Asci arising from simple septa, clavate, 8-spored, $50\text{--}62 \times 8\text{--}9 \mu\text{m}$, apical pore deep blue in MLZ. Ascospores broadly fusoid, aseptate, becoming 1-septate at maturity, hyaline, containing two or three big lipid globules, $8\text{--}14 \times 2.5\text{--}3.5 \mu\text{m}$. Paraphyses filiform, often branched, more rarely simple, apically swollen up to $5 \mu\text{m}$, apical cells often containing yellowish brown, homogeneous matter, sometimes with thick, granulate walls.

Etymology. – Named after the Cape Province of South Africa.

Host plant. – On dead fronds of *Todea barbarae*.

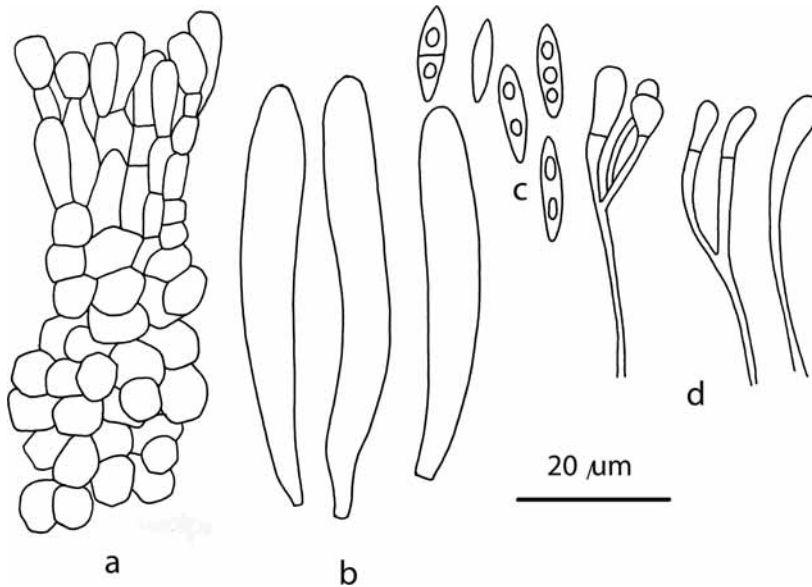


Fig. 1. *Niptera capensis*. **a.** Ectal excipulum with margin of the fruit body. **b.** Asci. **c.** Spores with oil drops, without septum, rarely with one septum. **d.** Paraphyses, apically more or less swollen, simple or forked.

Distribution. – Known only from the type locality in South Africa.

Material examined. – South Africa, Cederberg, 29 Sep 2002, coll J. Schneller, no. SA02-1, Holotype (Z).

***Crocicreas blechni* Raitv. & Schneller sp. nov.** (Helotiaceae) – Fig. 2.

Apothecia dispersa vel gregaria, superficialia, sessilia, 1–3 mm in diametro, patellato-cupulata, albida. Excipulum ectale ex textura oblita compositur, hyphae hyalinae, tenuiter vel crasse gelatinosotunicatae. Asci non uncinati, clavati, octospori, $45\text{--}52 \times 4.5\text{--}5.5 \mu\text{m}$, poro iodo caerulescenti praediti. Sporae fusioideae, hyalinae, biguttulatae, aseptatae, $8\text{--}12 \times 2\text{--}2.5 \mu\text{m}$. Paraphyses filiformes, $1 \mu\text{m}$ latae.

Allophylariae campanuliformi similis, apotheciis majoribus et ascis brevioribus differt. In frondibus emortuis *Blechni punctulati* crescit. – **Holotypus:** South Africa, Brains Kloof, 29 Sep 2002, coll. J. Schneller, no. SA02-4 (in herbario Z).

Apothecia superficial, scattered to gregarious, sessile on a narrow base. Disc 1–3 mm, concave, with distinct margin, whitish when dry. Receptacle shallow-cupulate, concolorous with the hymenium, smooth. Ectal excipulum composed of hyaline textura oblita, hyphae $3\text{--}5 \mu\text{m}$ wide, with thin to thick gelatinized walls, $5\text{--}8 \mu\text{m}$ in diameter. Asci arising from simple septa, clavate, 8-spored, $45\text{--}52 \times 4.5\text{--}5.5 \mu\text{m}$, apical pore deep blue in MLZ. Ascospores fusoid, aseptate, hyaline, containing two prominent lipid globules, $8\text{--}12 \times 2\text{--}2.5 \mu\text{m}$. Paraphyses filiform, simple, $1 \mu\text{m}$ wide.

Etymology. – Named after the host genus, *Blechnum*.

Host plant. – On dead fronds of *Blechnum punctulatum*.

Distribution. – Known only from the type locality in South Africa.

Material examined. – SOUTH AFRICA, Brains Kloof, 29 Sep 2002, coll. J. Schneller, no. SA02-4, Holotype (Z).

Notes: This species is similar to *Allophylaria campanuliformis* (Fuckel) Svrček, but differs by larger sessile apothecia and distinctly shorter asci. The genus *Allophylaria* (P. Karst.) P. Karst. differs only slightly from *Crocicreas* Fr. (e.g., Triebel & Baral 1996), therefore we prefer to describe this species as a *Crocicreas*.

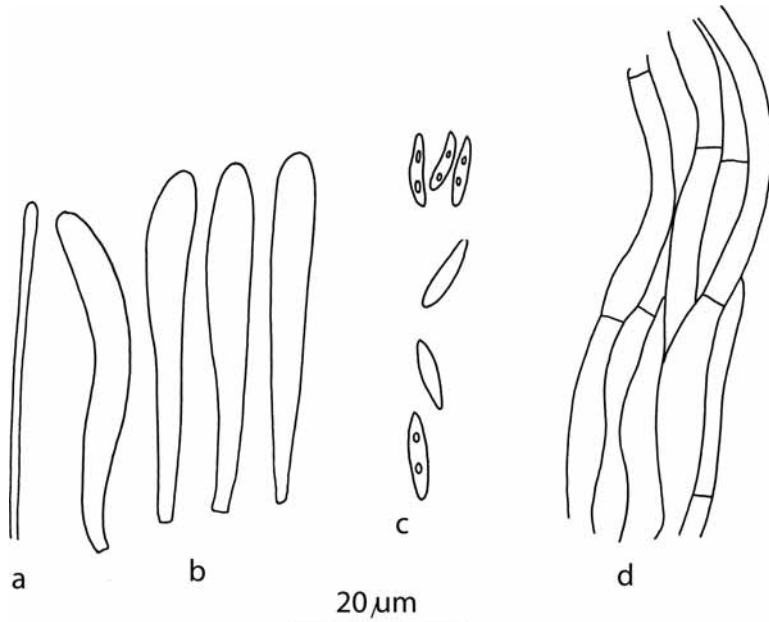


Fig. 2. *Crocicreas blechni*. **a.** Paraphyse. **b.** Asci. **c.** Spores with somewhat variable size. **d.** Structure of ectal excipulum (textura oblita).

***Incrupila aspidii* (Lib.) Raitv. var. *pteridicola* Raitv. & Schneller var. nov.** (Hyaloscyphaceae) – Fig. 3.

Ab *Incrupila aspidii* var. *aspidii* recedit pilis brevioribus agglutinatisque et excipulo pallide brunneo. Ad frondes emortuas *Pteridii aquilini* crescit. – Holotypus: South Africa, Brains Kloof, 29 Sep 2002, coll. J. Schneller, no. SA02-4 (in herbario Z).

Apothecia superficial, scattered, short stipitate. Disc 0.15–0.2 mm, concave to shallow-concave, whitish when fresh, and dry. Receptacle cup-shaped to shallow cup-shaped, whitish, covered with white hairs, particularly at the margin. Ectal excipulum composed of

hyaline to pale grayish brown *textura prismatica*, cells thin-walled, $5\text{--}14 \times 4\text{--}6 \mu\text{m}$. Hairs cylindrical, apically obtusely rounded, thin-walled, uniseptate, $20\text{--}30 \times 2.5\text{--}3 \mu\text{m}$, lower cell smooth, upper cell covered by a continuous crust of small crystals. Individual hairs strongly agglutinated when dry. Asci arising from simple septa, cylindrical-clavate, $20\text{--}30 \times 4\text{--}5 \mu\text{m}$, apical pore deep blue in MLZ. Ascospores clavate, aseptate, hyaline, without inclusions, $5\text{--}6 \times 1.2\text{--}1.5 \mu\text{m}$. Paraphyses filiform, simple, not exceeding the asci, $1 \mu\text{m}$ wide.

Etymology. – Named after the host genus, *Pteridium*.

Host plant. – On dead fronds of *Pteridium aquilinum*.

Distribution. – Known only from the type locality in South Africa.

Material examined. – SOUTH AFRICA, Brains Kloof, 29 Sep 2002, coll. J. Schneller, no. SA02-4, Holotype (Z).

This South African collection differs from typical European *Incrupila aspidii* (found on *Polystichum* sp.) by considerably shorter, more narrow hairs, which are strongly agglutinated when dry, quite similar to the hairs of *I. crystallophora* (Nograsedk & Matzer) Raitv., a species growing on dead leaves of *Dryas* (Nograsedk & Matzer 1991, Raitviir 2004). The ectal excipulum of the new variety is pale grayish brown, in contrast to the completely hyaline excipulum of typical *I. aspidii*.

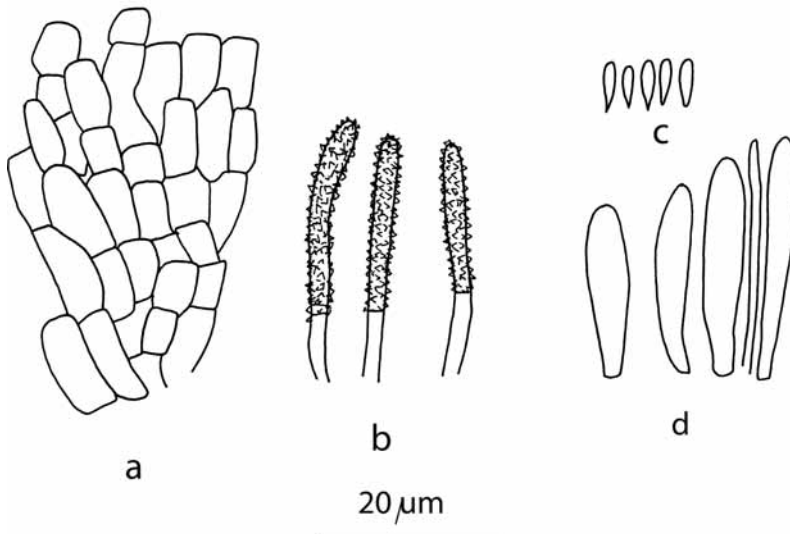


Fig. 3. *Incrupila aspidii* var. *pteridicola*. **a.** Ectal excipulum, cell structure. **b.** Hairs, upper part incrustated with small crystals. **c.** Spores, illustrating the variance in size. **d.** Asci and paraphyses.

***Lachnum capense* Raitv. & Schneller sp. nov.** (Hyaloscyphaceae) – Fig. 4.

Apothecia sparsa, substipitata vel breviter stipitata, cupulata, 0.3–1 mm in diametro, disco concavo vel profunde concavo, albido, in statu sicco brunneo-aurantiaco. Receptaculum albidum, pilis albis obtectum. Excipulum ectale ex textura prismatica compositur, cellulis hyalinis tenuiter tunicatis. Pili cylindracei, hyalini, in statu sicco pallide brunnei, uniseptati, tenuiter tunicati, verrucosi, $30\text{--}60 \times 2.5\text{--}4 \mu\text{m}$, apicibus rotundatis. Asci non uncinati, cylindracei vel cylindraceo-clavati, octospori, $30\text{--}45 \times 3\text{--}4 \mu\text{m}$, poro iodo caerulescenti praediti. Sporae clavatae, hyalinae, aseptatae, eguttulatae, $5\text{--}6.5 \times 1.6 \mu\text{m}$. Paraphyses lanceolatae, hyalinoguttulatae, ascos usque ad $15 \mu\text{m}$ superantes, $3\text{--}4 \mu\text{m}$ latae.

Species pteridicola apotheciis substipitatis et sporis clavatis minutis distincta. In frondibus emortuis *Pteridii aquilini* crescit. – Holotypus: South Africa, Cape Town, Kirstenbosch Botanical Garden, 5 Oct 2002, coll. J. Schneller, no. SA02-2 (in herbario Z).

Apothecia superficial, scattered, substipitate to short stipitate. Disc 0.3–1 mm, concave to deeply concave, whitish when fresh, brownish orange when dry. Receptacle cupulate, whitish when fresh, dirty whitish when dry, externally covered with white hairs, particularly at the margin. Ectal excipulum composed of textura prismatica, cells hyaline, thin-walled, $8.5\text{--}15 \times 4\text{--}8.5 \mu\text{m}$. Hairs cylindrical, apically obtusely rounded, hyaline to pale brownish when dry, thin-walled, coarsely warted, 1-septate, $30\text{--}60 \times 2.5\text{--}4 \mu\text{m}$. Asci arising from simple septa, cylindrical to cylindric-clavate, 8-spored, 30–

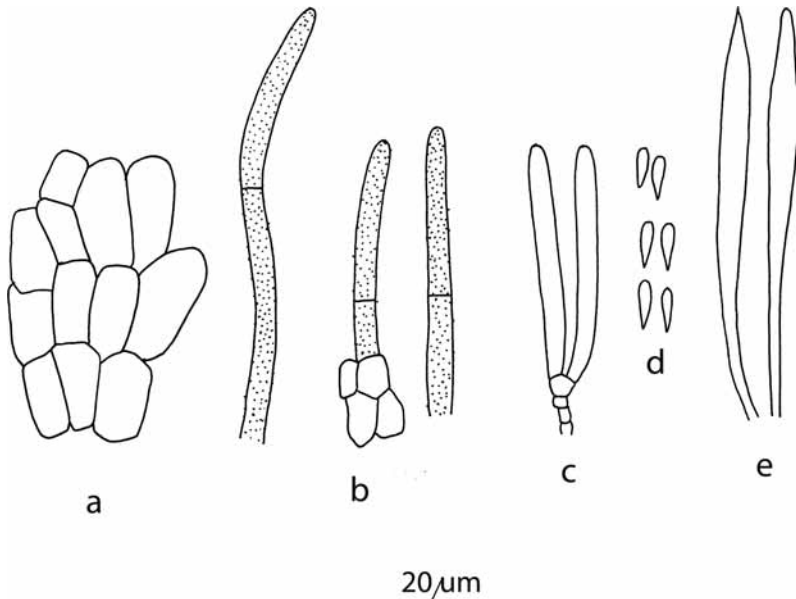


Fig. 4. *Lachnum capense*. a. Ectal excipulum. b. Hairs with coarsely warted cell-wall. c. Asci. d. Spores. e. Lanceolate paraphyses.

45 × 3–4 µm, pore medium blue in MLZ. Ascospores clavate, hyaline, aseptate, without inclusions, 5–6.5 × 1.6 µm. Paraphyses lanceolate, filled with colourless guttules, exceeding the asci by 15 µm, 3–4 µm wide.

Etymology. – Named after the Cape Province of South Africa.

Host plant. – On dead fronds of *Pteridium aquilinum*.

Distribution. – Known only from the type locality in South Africa.

Material examined. – SOUTH AFRICA, Cape Town, Kirstenbosch Botanical Garden, 5 Oct 2002, coll. J. Schneller, no. SA02-2, Holotype (Z).

***Phaeoscypha pteridicola* Raitv. & Schneller sp. nov.** (Hyaloscypha-ceae) – Fig. 5.

Apothecia sparsa, breviter stipitata, cupulata, sicca usque ad subglobosa, 0.15 mm in diametro, disco concavo vel profunde concavo, albido. Receptaculum atro-fuscum, pilis brunneis obtectum. Excipulum ectale ex textura prismatica compositur, cellulis hyalinis vel pallide brunneis subcrasse tunicatis. Pili cylindracei, angustati, hyalini, aseptati, subcrasse fuscotunicati, 45–55 × 2–3 µm, apicibus 1.5–2 µm latis. Asci uncinati, cylindraceo-clavati, octospori, 35–45 × 5.5–6.5 µm, poro iodo caerulescenti praediti. Sporae clavatae, hyalinae, aseptatae, eguttulatae, 8–13.5 × 1.8–2.2 µm. Paraphyses filiformes, ascos non superantes, 1–1.5 µm latae.

A *Phaeoscypha cladii* differt ascis et sporis minoribus, anamorphosi absentibus et substrato. In frondibus emortuis *Pteridii aquilini* crescit. – Holotypus: South Africa, Cape Town, Kirstenbosch Botanical Garden, 5 Oct 2002, coll. J. Schneller, no. SA02-3 (in herbario Z).

Apothecia superficial, scattered, shortly stipitate. Disc 0.15 mm, concave to deeply concave when dry, whitish. Receptacle cupulate to spherical and almost closed when dry, dark brown, externally covered with brown hairs, particularly at the margin. Ectal excipulum composed of textura prismatica, cells hyaline to pale brownish, with slightly, sometimes irregularly thickened walls, 6–12 × 5–7 µm. Hairs cylindrical, slightly tapering, apically obtusely rounded to subacute, smooth, with dark brown firm walls, 0–2-septate with short basal and long apical cell, 45–55 × 2–3 µm, tapering to 1.5–2 µm towards the apex. Asci arising from croziers, cylindrical-clavate, 8-spored, 35–45 × 5.5–6.5 µm, pores deep blue in MLZ. Ascospores clavate, hyaline, aseptate, without inclusions, 8–13.5 × 1.8–2.2 µm. Paraphyses filiform, not exceeding the asci, 1–1.5 µm wide.

Etymology. – Named after the host genus, *Pteridium*.

Host plant. – On dead fronds of *Pteridium aquilinum*.

Distribution. – Known only from the type locality in South Africa.

Material examined. – SOUTH AFRICA, Cape Town, Kirstenbosch Botanical Garden, 5 Oct 2002, coll. J. Schneller, no. SA02-3, Holotype (Z).

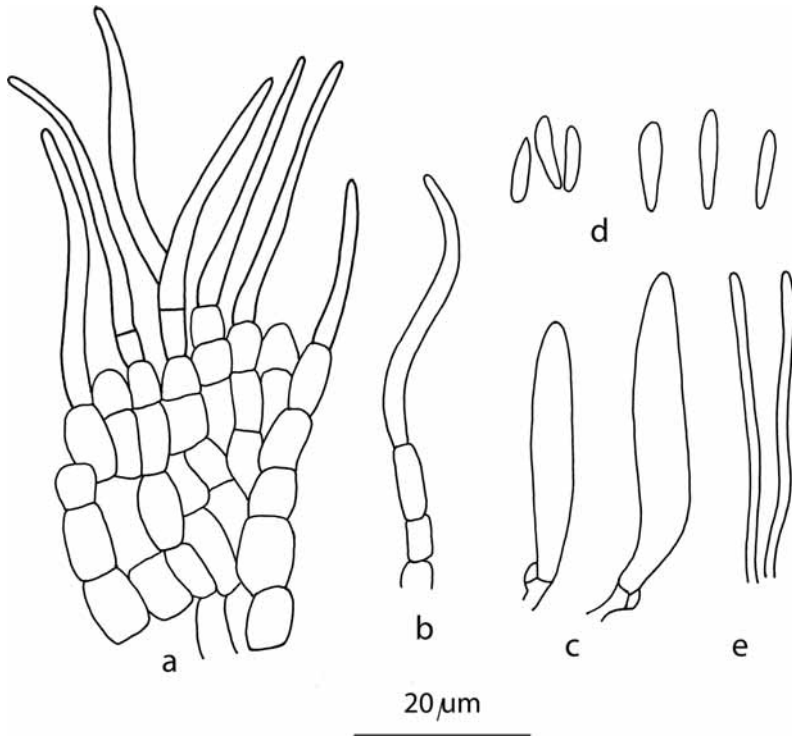


Fig. 5. *Phaeoscypha pteridicola*. **a.** Excipulum cells and margin of the excipulum. **b.** Hair and adjacent excipulum cells. **c.** Asci. **d.** Spores illustrating some variance in size. **e.** Paraphyses.

***Urceolella todeae* Raitv. & Schneller sp. nov.** (Hyaloscyphaceae) – Fig. 6.

Apothecia sparsa, sessilia, cupulata vel applanato-cupulata, 0.25–0.4 mm in diametro, disco applanato-concavo, albido. Receptaculum albidum, pilis albis obtectum. Excipulum ectale ex textura angularis-prismatica compositum, cellulis hyalinis tenuiter tunicatis, MLZ –, CR +. Pili conici vel cylindraneo-conici, hyalini, aseptati, crasse vitreotunicati, MLZ –, CR –, 10–15 × 2.5–4 µm, apicibus 1.5 µm latis. Asci uncinati, cylindraneo-clavati, octospori, 30–40 × 3–5 µm, poro iodo pallide caerulescenti praediti. Sporae anguste clavatae, hyalinae, aseptatae, eguttulatae, 6–8 × 1.2–1.5 µm. Paraphyses filiformes, ascos non superantes, 1–1.2 µm latae.

Urceolellae pani similis, sed differt sporis minoribus anguste clavatis eguttulatis et ascis pilisque minoribus. In frondibus emortuis *Todeae barbarae* crescit. – Holotypus: South Africa, Cape Town, Kirstenbosch Botanical Garden, 5 Oct 2002, coll. J. Schneller, no. SA02-6 (in herbario Z).

Apothecia superficial, scattered, substipitate. Disc 0.25–0.4 mm, concave to shallow-concave, whitish. Receptacle cupulate to shallow-cupulate, whitish, externally minutely downy, particularly at the margin. Ectal excipulum composed of textura angularis-prisma-

tica, cells hyaline, thin-walled, remaining hyaline in MLZ, staining deep red in CR, $4-12 \times 4-8.5 \mu\text{m}$. Hairs cylindrical-conical to lageniform, $10-15 \times 2.5-4 \mu\text{m}$, apically tapering to $1.5 \mu\text{m}$, hyaline, with thin-walled lower part and solid glassy upper part losing glassiness in 3 % KOH, at the margin intermixed with loosely attached hyaline crystalline matter, remaining hyaline in CR and MLZ. Asci arising from croziers, sometimes with bifurcate base, cylindrical-clavate, 8-spored, $30-40 \times 3-5 \mu\text{m}$, pore faintly blue in MLZ. Ascospores narrowly clavate, hyaline, aseptate, without inclusions, $6-8 \times 1.2-1.5 \mu\text{m}$. Paraphyses filiform, not exceeding the asci, $1-1.2 \mu\text{m}$ wide.

Etymology. – Named after the host genus, *Todea*.

Host plant. – On dead fronds of *Todea barbara*.

Distribution. – Known only from the type locality in South Africa.

Material examined. – SOUTH AFRICA, Cape Town, Kirstenbosch Botanical Garden, 5 Oct 2002, coll. J. Schneller, no. SA02-6, Holotype (Z).

This species is related to *Urceolella pani* (Velen.) Huhtinen, which is described from *Dryopteris filix-mas*, but differs in several characters. The spores of the new species are distinctly shorter, more slender, without lipid guttules and aseptate. The asci are somewhat shorter and much more slender; the hairs are shorter and their apex is obtuse, not acute.

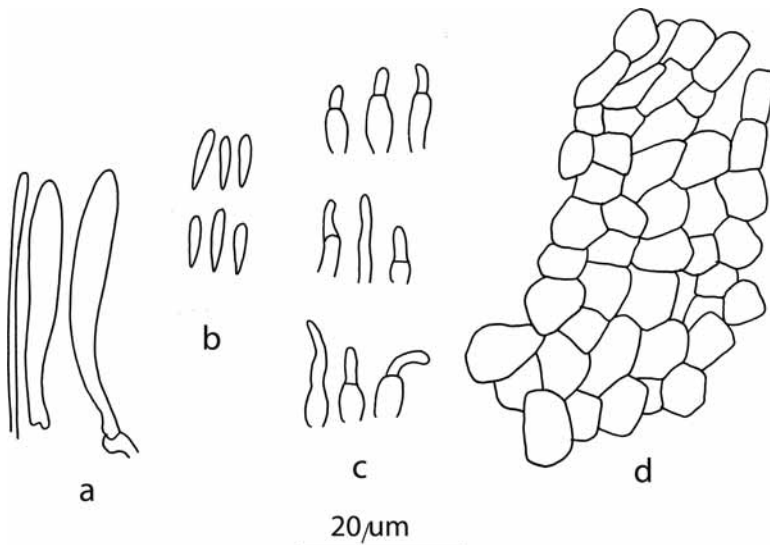


Fig. 6. *Urceolella todae*. **a.** Asci and paraphyses. **b.** Spores showing some variance in size. **c.** Hairs with thin walled lower part and solid upper part, glassy. **d.** Ectal excipulum with margin.

Discussion and Outlook

The microfungi living on *Todea barbara* and *Blechnum punctulatum* might have evolved parallel to their host plants, and perhaps they are also specially adapted to the type of natural South African vegetation where their host plants occur. But it is also interesting to see that the ubiquitous and relatively well-studied *Pteridium aquilinum* is colonized by fungi which have not been found in the northern hemisphere. However, we must keep in mind that small fungal spores such as from ascomycetes can be dispersed over enormous distances, and that their distribution patterns are quite different from those of flowering plants.

As mentioned in the introduction, there are only few species of Helotiales described for South Africa. Considering the unique biogeographic history of the South African Flora (e.g., Linder 2003), its connection with the Gondwana flora, and its extraordinary number of species, we may assume that a wealth of microfungi growing on remains of ferns, lycopods and flowering plants is still awaiting discovery and description.

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References

- Baral H. O. (1996) Lugol's solution/IKI versus Melzer's reagent: Hemiamyloidity, a universal feature of the ascus wall. *Mycotaxon* **29**: 199–218.
- Böhler H. C. (1974) Taxonomical studies in some Norwegian Helotiales (Ascomycetes) on fern remains. *Norwegian Journal of Botany* **21**: 79–100.
- Crous P. W., Rong I. H., Wood A., Lee S., Glen H., Botha W., Slippers B., de Beer W. Z., Wingfield M. J., Hawksworth D. L. (2006a) How many species of fungi are there at the tip of Africa? *Studies in Mycology* **55**: 13–33.
- Crous P. W., Wingfield M. J., Slippers B., Rong I. H., Samson R.A. (2006b) 100 years of fungal biodiversity in southern Africa. *Studies in Mycology* **55**: 1–305.
- Dennis R. W. G. (1978) *British Ascomycetes*. J. Cramer, Vaduz.
- Doidge E. M. (1950) The South African fungi and lichens to the end of 1945. *Bothalia* **5**: 1–1094.
- Ellis M. B., Ellis J. P. (1985) *Microfungi on land plants*. Croom Helm, London & Sydney.
- Hawksworth D. L. (1998) The consequences of plant extinctions for their dependent biotas: an overlooked aspect of conservation science. In: *Rare, threatened, and endangered floras of Asia and the Pacific Rim* (eds. Peng C. I., Lowry P. P.). Institute of Botany, Academia Sinica, Taipei.

- Holm L., Holm K. (1978) Some pteridicolous Ascomycetes. *Botaniska Notiser* **131**: 97–114
- Holm L., Holm K. (1979) Swedish pteridicolous Mycosphaerellae. *Botaniska Notiser* **132**: 211–219.
- Lee S., Crous P. W. (2003) Taxonomy and biodiversity of hysteriaceous ascomycetes in fynbos. *South African Journal of Botany* **69**: 480–488.
- Linder H. P. (2003) The radiation of the Cape flora, southern Africa. *Biological Review* **78**: 597–638.
- Lodge D. J., Chapela I., Samuels G., Uecker F. A., Desjardin D., Horak E., Miller O. K. Jr., Hennebert G. L., Decock C. A., Ammirati J., Burdsall H. H. Jr., Kirk P. M., Minter D. W., Halling R., Laesste T., Mueller G., Huhndorf S., Oberwinkler F., Pegler D. N., Spooner B., Petersen R. H., Rogers J. D., Ryvarden L., Watling R., Turnbull E., Whalley A. J. S. (1995) A survey of patterns of diversity in non-lichenized fungi. *Mitteilungen der Eidgenössischen Forschungsanstalt Wald Schnee Landschaft* **70**: 157–173.
- Nogrask A., Matzer M. (1991) Nicht-pyrenokarpe Ascomyceten auf Gefäßpflanzen der Polsterseggenrasen I. Arten auf *Dryas octopetala*. *Nova Hedwigia* **53**: 445–475.
- Raitviir A. (2004) Revised synopsis of the Hyaloscyphaceae. *Scripta Mycologica* **20**: 1–177.
- Samuels G. J., Rogerson C.T. (1990) Some ascomycetes (fungi) occurring on tropical ferns. *Brittonia* **42**: 105–115.
- Triebel D., Baral H. O. (1996) Notes on the ascus types in *Crocicreas* (Leotiales, Ascomycetes) with a characterization of selected taxa. *Sendtnera* **3**: 199–218.

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