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New records of smut fungi. 6

Cvetomir M. Denchev* & Teodor T. Denchev

Institute of Biodiversity and Ecosystem Research, Bulgarian Academy of Sciences, 2 Gagarin St., 1113 Sofia, Bulgaria

* Correspondence to: *cmdenchev@yahoo.co.uk*

Abstract — Five species of smut fungi, *Leucocintractia scleriae, Sporisorium caledonicum, Sporisorium paspali-thunbergii, Sporisorium ugandense,* and *Ustanciosporium scleriicola,* are recorded for the first time from the Democratic Republic of the Congo. *Cyperus distans* is a new host of *Cintractia limitata* in Africa. For *Entorrhiza casparyana* var. *tenuis* on *Juncus tenuis,* a new combination and status, *E. tenuis,* are proposed.

Key words — taxonomy, *Ustilaginomycetes*

Introduction

Vánky et al. (2011) published a checklist containing 427 species in 47 genera of smut fungi in Africa and adjacent islands. We add a further five species to the smut fungi known from the Democratic Republic of the Congo and report *Cyperus distans* as a new host of *Cintractia limitata* in Africa. A new combination and status, at the species level, are proposed for *Entorrhiza casparyana* var. *tenuis* on *Juncus tenuis*.

Material & methods

Dried specimens from the mycological collection of the National Botanical Garden of Belgium (BR) were examined under light (LM) and scanning electron (SEM) microscopes. For LM observations, spores were mounted in lactophenol solution on glass slides, gently heated to boiling point to rehydrate the spores, and then cooled. Spore measurements are given in the form: min–max [mean ± 1 standard deviation]. For SEM, spores were attached to specimen holders by double-sided adhesive tape and coated with gold with an ion sputter. The surface structure of spores was observed at 10 kV and photographed with a JEOL JSM-5510 scanning electron microscope.

The distribution of the smut fungi in Africa is given in accordance with Vánky et al. (2011) while the general distribution is after Vánky (2011).

New records for the Democratic Republic of the Congo

Leucocintractia scleriae (DC.) M. Piepenbr., Begerow & Oberw., Mycologia 91: 497, 1999. Figs 1–2

Sori around all the peduncles of an inflorescence with rudimentary spikelets, more or less cylindrical, often curved, 5–25 × 2–3 mm wide, when young covered by a thick peridium, later becoming exposed; spore mass of the mature sori dark reddish brown, agglutinated, powdery on the surface. Spores slightly flattened, in plane view orbicular, suborbicular or broadly elliptical, in plane view 13–16.5 × 11.5–15.5 (14.8 ± 0.7 × 13.4 ± 0.9) µm (n = 50), in side view 9.5–12 µm wide, reddish brown; wall 0.9–1.5 µm thick, in LM with connected warts, forming rows, irregular and incomplete reticulum-like ornaments, or parallel ridges (especially, in side view); in SEM with well developed ornamentation: in plane view of coarse, irregular, connected warts, forming short or long rows, or fusing into irregular meshes, in side view of connected warts forming irregular meshes (the interspaces often with single or connected warts) or uneven, more or less parallel ridges, often connected by lower, transverse rows.

Specimen examined — On *Rhynchospora corymbosa* (L.) Britton: **DEMOCRATIC REPUBLIC OF THE CONGO, Orientale Province,** Garamba National Park, near Bagbele, 03°40′ N, 29°00′ E, 24 April 1950, leg. A. Noirfalise, no. 199 (BR 49871,13).

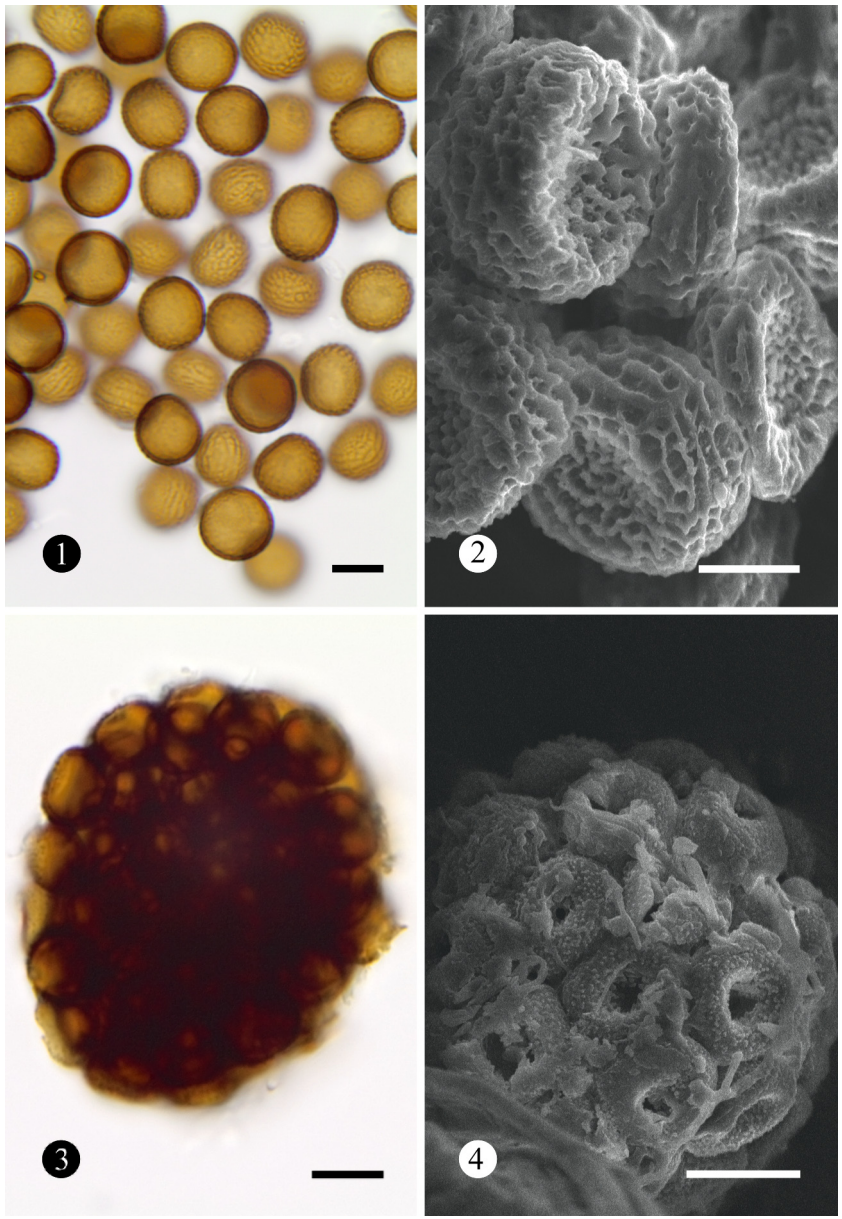
Distribution — On *Rhynchospora* spp. (*Cyperaceae*), distributed in the tropics. In Africa known on *R. corymbosa* and *R. spectabilis* from Cameroon, Guinea, Namibia, Sierra Leone, South Africa, and Tanzania.

Sporisorium caledonicum (Pat.) Vánky, Mycotaxon 40: 165, 1991. Figs 3–4

Sori destroying the whole inflorescence, when young covered by a greyish brown peridium, which ruptures irregularly exposing a dark reddish brown mass of permanent spore balls and several filiform columellae. Spore balls irregular, broadly ellipsoidal, ellipsoidal or ovoid, 35–85 × 25–50 µm, dark reddish brown, often opaque, composed of tens, rather firmly united spores. Sterile cells absent. Spores dimorphic. Outer spores subglobose, broadly ellipsoidal or slightly irregular, 9.5–13 × 7.5–11.5 (11.4 ± 0.9 × 9.5 ± 1.0) µm (n = 50), medium to dark reddish brown; wall 0.7–1.5 µm thick, in LM punctate to finely verruculose, spore profile slightly affected, in SEM punctate to finely verruculose.

Specimen examined — On *Heteropogon contortus* (L.) P. Beauv. ex Roem. & Schult.: **DEMOCRATIC REPUBLIC OF THE CONGO, Kinshasa Province,** Boma, 05°51′ S, 13°03′ E, 1921, leg. Claessens in Vanderyst, sine num. (BR 49827,66).

Distribution — On *Heteropogon* spp. (*Poaceae*), Africa, South Asia, Australia, Papua New Guinea, North & South America. In Africa known on *H. contortus* from Ethiopia, South Africa, Zambia, and Zimbabwe.



Figs 1–2. ***Leucocintractia scleriae*** on *Rhynchospora corymbosa* (BR 49871,13). Spores in LM and SEM. Figs 3–4. ***Sporisorium caledonicum*** on *Heteropogon contortus* (BR 49827,66). Spore ball in LM and SEM. Scale bars: 1, 3, 4 = 10 µm, 2 = 5 µm.

Sporisorium paspali-thunbergii (Henn.) Vánky, Publications from the Herbarium *Ustilaginales* Vánky 3: 9, 1986. Figs 5–6

Sori destroying the whole inflorescence, up to 10 cm long, 1–2.5 mm wide, partly hidden by the leaf sheath, when young covered by a thick, greyish brown peridium which ruptures irregularly exposing a powdery, dark reddish brown mass of spore balls and spores, and a long, filiform, central columella; the columella sometimes with short, lateral branches. Spore balls broadly ellipsoidal, globose, ovoid or irregular, 35–70 × 30–55 µm, dark reddish brown, composed of eight to tens spores, separating easily. Sterile cells absent. Spores irregular to subpolygonal, broadly ellipsoidal or subglobose, sometimes elongated, 11–17 × 9–13.5 (13.9 ± 1.3 × 11.6 ± 1.2) µm (n = 50), medium reddish brown; wall uneven, thicker at the angles, 0.7–2.0 µm thick, in LM punctate to verruculose on the free surface of the spores, and smooth on the contact surface, spore profile not affected, in SEM finely echinulate or verruculose.

Specimen examined — On *Paspalum* sp.: **DEMOCRATIC REPUBLIC OF THE CONGO, Orientale Province,** Kisangani, 00°31′ N, 25°11′ E, 19 January 1931, leg. R.L. Steyaert, no. 330 (BR 49888,30).

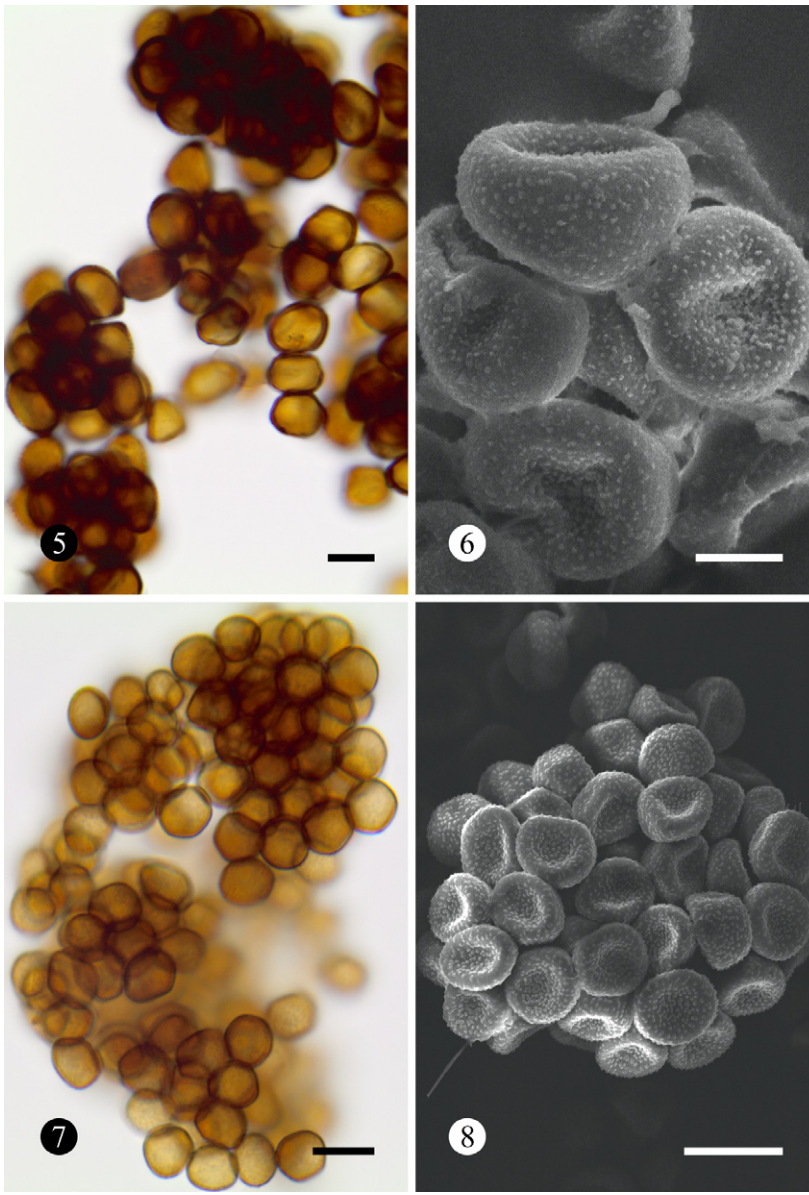
Distribution — On *Paspalum* spp. (*Poaceae*), Africa, South and East Asia, Philippines, Australia, and Hawaii. In Africa known on *P. scrobiculatum* from Ethiopia, Malawi, South Africa, and Uganda.

Sporisorium ugandense (Henn.) Vánky, Mycotaxon 91: 250, 2005. Figs 7–8

Sori destroying the distal part of sterile shoots, 4–6 cm long, 0.5–2 mm wide, partly hidden by the leaf sheath, covered by a greyish peridium which later ruptures, exposing powdery, dark brown mass of loose spore balls and spores, and numerous filiform columellae. Spore balls globose, broadly ellipsoidal, ovoid or slightly irregular, 30–65 × 25–55 µm, medium reddish brown, composed of fifteen to tens spores, separating easily. Sterile cells absent. Spores subglobose, broadly ellipsoidal, ellipsoidal, ovoid or slightly irregular, 7.5–12 × 7–9.5 (9.4 ± 0.8 × 8.1 ± 0.4) µm (n = 50), light reddish brown; wall 0.3–0.5 µm thick, in LM punctate to verruculose, spore profile not affected, in SEM verruculose.

Specimen examined — On *Digitaria abyssinica* (A. Rich.) Stapf: **DEMOCRATIC REPUBLIC OF THE CONGO,** Tshirumbi, 02°19′ S, 28°47′ E, August 1945, leg. F.L. Hendrickx, no. 2882 (as *D. scalarum* (Schweinf.) Chiov., BR 49849,88).

Distribution — On *Digitaria* spp. (*Poaceae*), Africa and Australia. In Africa known on *D. abyssinica* from Ethiopia, Kenya, and Uganda.



Figs 5–6. ***Sporisorium paspali-thunbergii*** on *Paspalum* sp. (BR 49888,30). Spore balls and spores in LM and SEM. Figs 7–8. ***Sporisorium ugandense*** on *Digitaria abyssinica* (BR 49849,88). Spore balls and spores in LM and SEM. Scale bars: 5, 7 = 10 µm, 6, 8 = 5 µm.

Ustanciosporium scleriicola (Cant.) M. Piepenbr., Nova Hedwigia 70: 352, 2000. Figs 9–10

Sori in all flowers of the spikelets; spore mass of the mature sori black, powdery. Spores single, flattened, in plane view orbicular, suborbicular, broadly elliptical or slightly irregular, in plane view 16.5–23 × 14.5–20.5 (18.9 ± 1.7 × 17.3 ± 1.4) µm (n = 50), in side view 9.5–13 µm wide, medium to dark reddish brown, no hyaline appendages; wall 1.0–1.9 µm thick, in LM foveolate-reticulate, the ornamentation slightly affecting the spore profile, in SEM foveolate or with reticulate pattern of low muri and irregular, polygonal meshes.

Specimen examined — On *Scleria melanomphala* Kunth: **DEMOCRATIC REPUBLIC OF THE CONGO,** Katomia, Marungu, 07°20′ S, 29°40′ E, 28 April 1939, leg. Van den Brande, no. 120 (as *Ustilago* sp., BR 49895,37).

Distribution — On *Scleria melanomphala, S. lagoensis* Boeckeler, *Scleria* sp. (*Cyperaceae*), Africa; known from Cameroon, Central African Republic, and Ethiopia.

A new host of *Cintractia limitata* in Africa

Cintractia limitata G.P. Clinton, Proc. Boston Soc. Nat. Hist. 31: 399, 1904. Figs 11–12

Sori in individual flowers or groups of flowers; spore mass of the mature sori dark reddish brown, powdery. Spores flattened, in plane view orbicular, suborbicular or broadly elliptical, sometimes slightly irregular, in plane view 9.5–13.5 × 7.5–12.5 (11.8 ± 1.0 × 10.5 ± 0.9) µm (n = 50), in side view 6.5–8.5 µm wide, light to medium reddish brown, wall 0.6–1.0 µm thick; in LM smooth, in SEM densely punctate of very low warts (often forming small groups or short rows).

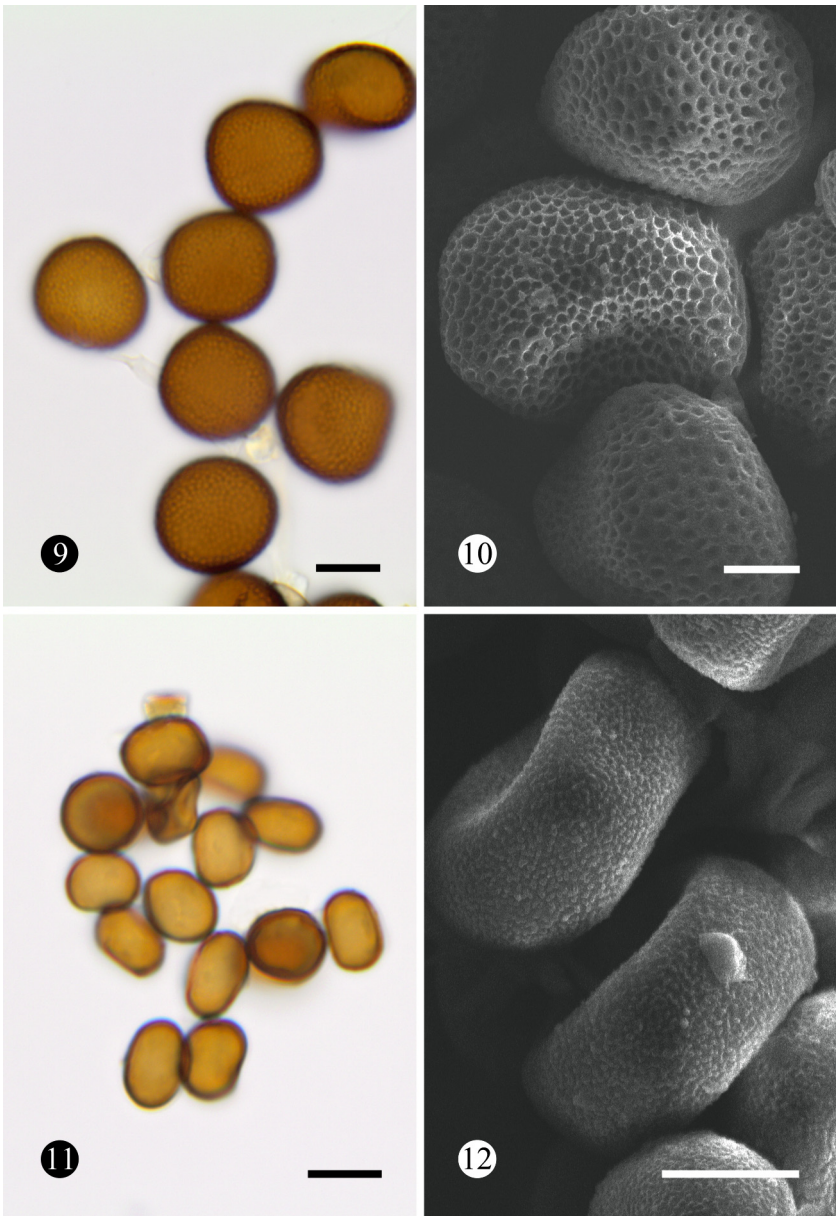
Specimen examined — On *Cyperus distans* L.f.: **DEMOCRATIC REPUBLIC OF THE CONGO,** Equateur Province, Koli Koli, 00°05′ S, 18°12′ E, July 1930, leg. P. Staner, no. 213 (BR 49875,17).

Distribution — On *Cyperus, Kyllinga,* and *Mariscus* spp. (*Cyperaceae*), tropics and subtropics. In Africa known from Cameroon, Congo, Ethiopia, Gabon, Ghana, Guinea, Ivory Coast, Malawi, Nigeria, Reunion, Sierra Leone, South Africa, Sudan, Tanzania, Togo, Uganda, Zambia, and Zimbabwe. *Cyperus distans* is reported here as a new host of *Cintractia limitata* in Africa.

New combination and status of *Entorrhiza casparyana* var. *tenuis*

Entorrhiza casparyana (Magnus) Lagerh. var. *casparyana* attacks 17 species of *Juncus* (not including *J. tenuis*), and is distributed in Europe, North America, Africa, Australia, and New Zealand (Vánky & McKenzie 2002, Denchev & Minter 2008, Vánky & Shivas 2008, Denchev et al. 2011, Vánky et al. 2011).

Denchev et al. (2007) described a new variety of *Entorrhiza casparyana,* var. *tenuis,* restricted to one host, *Juncus tenuis,* and recorded only from South Korea, Austria, Romania, and Costa Rica (Vánky 1985, Piepenbring 2003,



Figs 9–10. ***Ustanciosporium scleriicola*** on *Scleria melanomphala* (BR 49895,37). Spores in LM and SEM. Figs 11–12. ***Cintractia limitata*** on *Cyperus distans* (BR 49875,17). Spores in LM and SEM. Scale bars: 9, 11 = 10 µm, 10, 12 = 5 µm.

Denchev 2004 [all as *E. casparyana*]; Denchev et al. 2007). It differs from var. *casparyana* especially by the shorter sori and spores. The sori of var. *casparyana* are up to 15 mm in length, whereas those of var. *tenuis* are only up to 5 mm long. The spores of var. *casparyana* are (12–)13.5–23(–32) µm long (including the ornamentations) while those of var. *tenuis* are 11.5–20(–21.5) µm long.

We suggest that *Entorrhiza casparyana* var. *tenuis* is morphologically distinct from *E. casparyana* var. *casparyana* and should be recognized at the species level.

Entorrhiza tenuis (Denchev & H.D. Shin) Denchev, Vánky & T. Denchev, **comb. et stat. nov.**

MycoBank MB 564487

≡ *Entorrhiza casparyana* var. *tenuis* Denchev & H.D. Shin, *Mycotaxon* 100: 74, 2007.

Type collections: on *Juncus tenuis* Willd., **KOREA, Gangwon Prov.,** near Hoengseong, 37°31′24.82″ N, 128°17′27.98″ E, 7 September 2006, C.M. Denchev (holotype, SOMF 26 206); 37°31′24.84″ N, 128°17′28.11″ E, 7 September 2006, C.M. Denchev (paratype, SOMF 26 207).

Illustrations: Denchev 2004: 50 (Figs 1–2, as *E. casparyana*), Denchev et al. 2007: 75 (Figs 1–2, as *E. casparyana* var. *tenuis*).

Comments — Four *Entorrhiza* species are known on *Juncus: E. aschersoniana* (Magnus) Lagerh. (Europe, Central America, New Zealand), *E. caricicola* Ferd. & Winge (Europe, New Zealand), *E. casparyana,* and *E. casparyanella* Vánky (New Zealand). *Entorrhiza tenuis* differs from *E. casparyanella* in having tuberculate or verrucose spore ornamentation with coarse tubercules or warts, whereas *E. casparyanella* spores have a smooth or undulate outer wall layer (cfr Vánky 1998: 342–343). Spore shape primarily distinguishes *E. aschersoniana* and *E. caricicola* from *E. tenuis,* with the mainly broadly ellipsoidal, ellipsoidal or ovoid (occasionally subglobose) spores with a length/width ratio >1.06 of the first two species contrasting with the globose or subglobose spores of *E. tenuis* (length/width ratio 1.04–1.05).

Key to *Entorrhiza* species on *Juncus*

1	Spores mainly broadly ellipsoidal, ellipsoidal or ovoid, occasionally subglobose, length/width ratio >1.06	**2**
1*	Spores globose or subglobose, length/width ratio ≤1.05	**3**
2	Spore wall rugulose-undulate or smooth	***E. caricicola***
2*	Spore wall verrucose	***E. aschersoniana***
3	Outer wall layer smooth or undulate; spores 10–17 µm long	***E. casparyanella***
3*	Outer wall layer coarsely tuberculate or verrucose, occasionally smooth	**4**
4	Spores (12–)13.5–23(–32) µm long, sori up to 15 mm long	***E. casparyana***
4*	Spores 11.5–20(–21.5) µm long, sori 1.2–5 mm long	***E. tenuis***

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