

# New species and reports of rust fungi (Basidiomycota, Uredinales) of South America

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**Abstract** Four new species of rust fungi (Basidiomycota, Uredinales) are proposed: *Edythea soratensis* on *Berberis phyllacantha* (Berberidaceae), *Prospodium bicristatum* on *Mansoa* sp. (Bignoniaceae), *Uromyces cearensis* on *Ipomoea* sp. (Convolvulaceae) and *Uredo cavernula* on *Ribes weberbaueri* (Grossulariaceae). *U. cavernula* most probably belongs to the genus *Goplana*. *Phakopsora phyllanthi* and *Phakopsora vernoniae* are newly reported for Brazil and the New World. The uredinial stage of the latter is the same as *Uredo toroiana*, known so far from Hispaniola in the Caribbean. The parasitic mycelium of *Esalque holwayi* was studied. It is strictly intracellular but comprises well-defined haustoria and intracellular hyphae.

## Taxonomical novelties

*Edythea soratensis* Ritschel

*Prospodium bicristatum* R. Berndt and F. Freire

*Uredo cavernula* R. Berndt and R.S. Peterson

*Uromyces cearensis* R. Berndt and F. Freire

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## Introduction

Rust specimens collected recently in Brazil and Peru and a herbarium specimen originating from Bolivia were found to represent species that are new to science. The present paper aims to contribute to the knowledge of the rust mycobiota of these countries by a detailed description and illustrations of the new species.

## Materials and methods

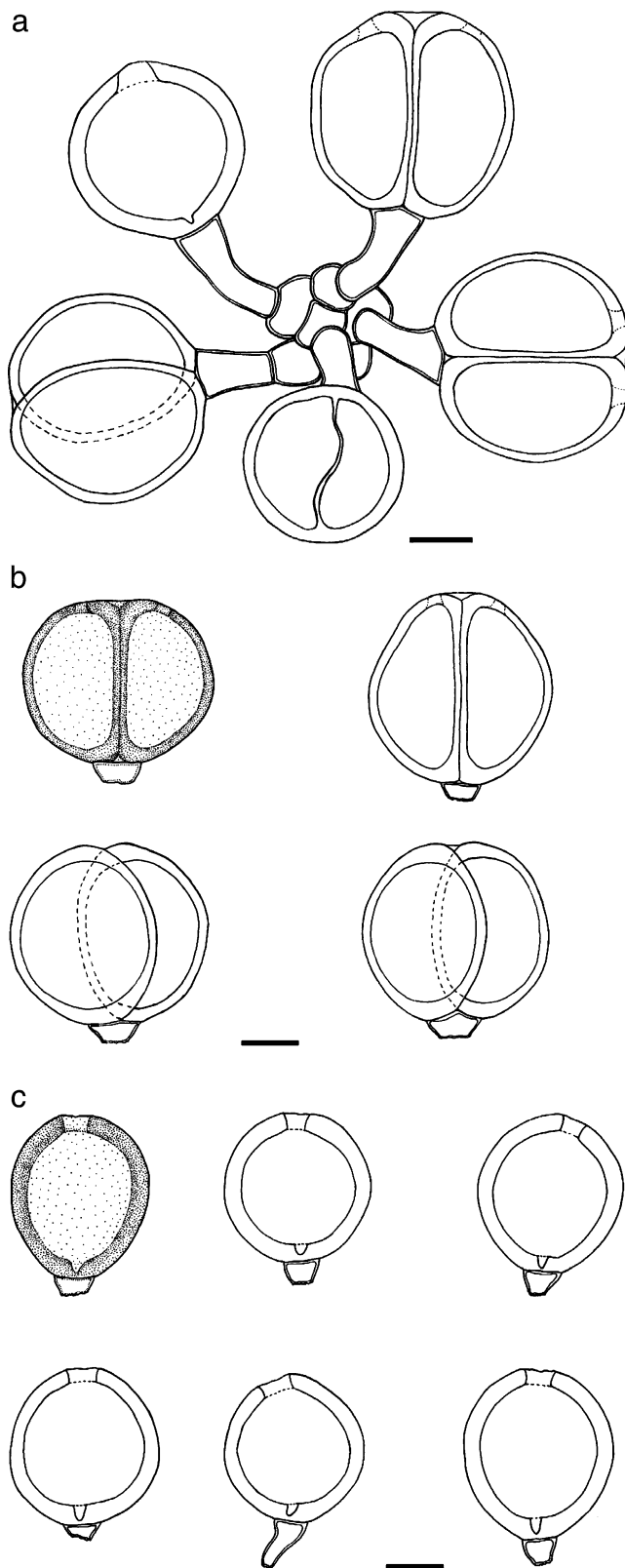
Spores and hand sections of herbarium material were mounted in lactophenol and gently heated to boiling. The preparations were examined with C. Zeiss “Axioskop” or “Axiophot” light microscopes, and photographs were taken with a C. Zeiss MC-80 camera on Kodak Ektachrome 64 Professional slide film. All micrographs were taken using DIC optics. At least 30 spores of each spore stage were measured and the arithmetic mean (“mean”) calculated.

## Results

*Edythea soratensis* Ritschel sp. nov.

Etymology: named after the place of collection, the town Sorata in Bolivia (Fig. 1a–c).

Fungus parasiticus hospitem non vel paullum commutat. Telia abaxialia, ca. 60–120  $\mu\text{m}$  diam., pallide aurantiaca ad ochracea in herbario sicco, laxe dispersa vel in gregibus 0.6–1 mm diam.; teliosporae subglobosae ad late ellipsoideae, verticaliter septatae, basaliter et apicaliter complanatae, non vel paullum constrictae ad septum, (27)29–37 (39)  $\times$  (29)32–35(39)  $\mu\text{m}$  (medium 32.5  $\times$  34  $\mu\text{m}$ ), pariete pallide flavobrunneo, levi, ca. 1–2  $\mu\text{m}$  crasso, propter



**Fig. 1** *Edythea soratensis*. **a** View upon telium from above. **b** Two-celled teliospores. **c** One-celled mesospores. Scale bars = 10  $\mu\text{m}$

septum usque ad 3  $\mu\text{m}$  crasso, poris germinationis obscuris, apicaliter ad subapicaliter sitis, pedicellis tenue tunicatis, hyalinis, 10–20  $\mu\text{m}$  longis et 7–10  $\mu\text{m}$  latis, frequenter infra hilum frangentibus; mesosporae unicellulatae, subglobose ad ellipsoideae, (22)25–28(30)  $\times$  (25)27–29 (30)  $\mu\text{m}$  (medium 26.5  $\times$  28.5  $\mu\text{m}$ ), pariete pallide flavo-brunneo, levi, aequaliter ca. 3  $\mu\text{m}$  crasso, poris germinationis conspicuis, apicaliter ad subapicaliter sitis, pedicellis ut in teliosporis. Urediniosporae absunt.

In foliis *Berberidis phyllacanthae* Rusby (Berberidaceae).

Host not visibly or hardly affected by parasite. Telia abaxial, ca. 60–120  $\mu\text{m}$  diameter, pale orange to ochraceous in dried herbarium specimen, loosely scattered or in groups of 0.6–1 mm diameter; teliospores subglobose to broadly ellipsoid, vertically septate, basally and apically flattened, not or only slightly constricted at the septum, (27)29–37(39)  $\times$  (29)32–35(39)  $\mu\text{m}$  (mean 32.5  $\times$  34  $\mu\text{m}$ ), wall pale yellowish brown, smooth, ca. 1–2  $\mu\text{m}$  thick, thickened near the septum up to 3  $\mu\text{m}$ ; germ pores obscure, situated apically to subapically; pedicels thin walled, hyaline, 10–20  $\mu\text{m}$  long and 7–10  $\mu\text{m}$  wide, usually breaking off near the hilum; mesospores one-celled, subglobose to elliptic, (22)25–28(30)  $\times$  (25)27–29 (30)  $\mu\text{m}$  (mean 26.5  $\times$  28.5  $\mu\text{m}$ ), wall pale yellowish brown, smooth, evenly ca. 3  $\mu\text{m}$  thick; germ pores conspicuous, apical to subapical, pedicels as in the teliospores. Urediniospores not observed.

On leaves of *Berberis phyllacantha* Rusby (Berberidaceae).

Holotype (PUR 68851): Bolivia, Sorata, on *B. phyllacantha*, 27 Apr. 1920, leg. E.W.D. and M.M. Holway (Plants of South America no. 579, collected by E.W.D. and M.M. Holway), det. H.S. Jackson.

*E. soratensis* is based on a specimen from Sorata, Bolivia, determined as *Edythea quitensis* (Lagerh.) Jacks. and Holw. by Jackson (1931a). The specimen differs from the type of *E. quitensis* by the size of the teliospores as well as by the occurrence of one-celled mesospores. *E. quitensis*, first described as *Uropyxis quitensis* by Arthur (1918), is based on material from Quito, Ecuador, collected by G. Lagerheim in 1891. In the original description, the urediniospores are described to measure 19–23  $\times$  23–24  $\mu\text{m}$  and the teliospores to be 20–23  $\mu\text{m}$  wide and 21–26  $\mu\text{m}$  long. According to our investigation of the type material, the urediniospores measure 22.5–27  $\times$  22.5–25  $\mu\text{m}$  (mean 24.5  $\times$  23  $\mu\text{m}$ ) and the teliospores 22.5–27  $\times$  25–30  $\mu\text{m}$  (mean 25.0  $\times$  27.0  $\mu\text{m}$ ). The teliospores of the specimen from Sorata are distinctly larger (mean 32.5  $\times$  34  $\mu\text{m}$ ) and differ also from those of two other species of *Edythea*, *Edythea berberidis* and *Edythea tenella* H.S. Jacks. and Holw., in size and shape. Mesospores have hitherto not been observed in members of the genus *Edythea*. Therefore, the new species *E. soratensis* is described. The type collection of *E. soratensis* also contains

aecidial aecia. It is doubtful, however, that they belong to *E. soratensis*, as they are not associated to the telia.

#### Material investigated

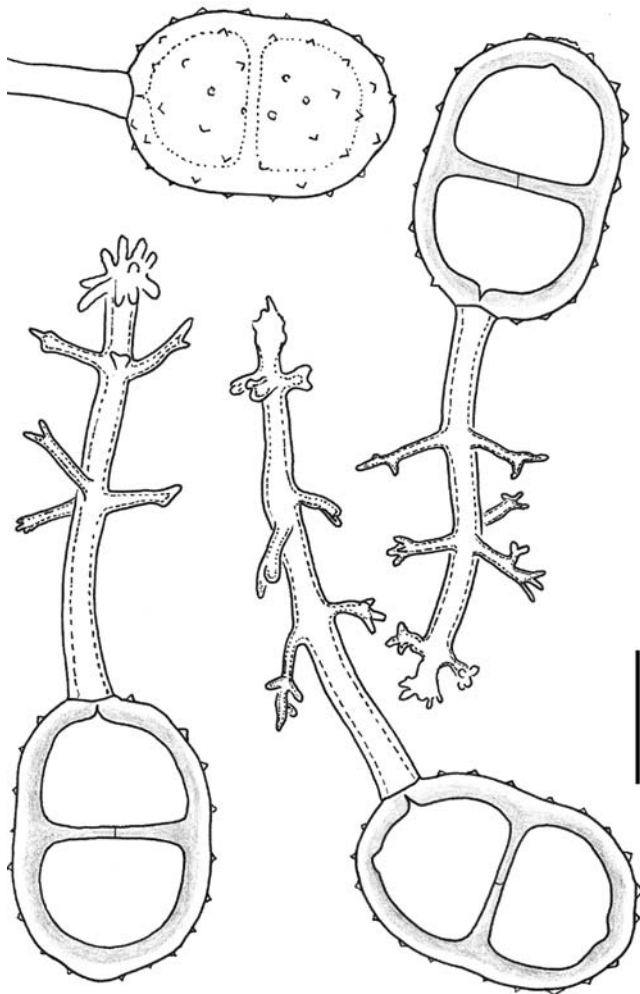
*E. quitensis*, Ecuador, Quito, on *Berberis* sp., Apr. 1891, leg. G. Lagerheim (PUR 68850, holotype). *E. quitensis*, Ecuador, Quito, on *Berberis* sp., 18 Aug. 1920, leg. E.W.D. and M.M. Holway, det. H.S. Jackson (PUR 68852; Reliquiae Holwayanae 228, Plants of South America no. 918). *E. quitensis*, Ecuador, Cuenca, on *Berberis* sp., 10 Sep. 1920, leg. E.W.D. and M.M. Holway, det. H.S. Jackson (PUR 68853; Plants of South America no. 980). *E. quitensis*, Ecuador, Provincia Quito, in monte Pichincha, on *Berberis schwerini* C.K. Schneid., 17 Sep. 1937, leg. et det. H. Sydow (PUR N 3389; Sydow, Fungi exotici exsiccati no. 1097). *E. quitensis*, Bolivia, Cochabamba, 3,500 m altitude, on *Berberis boliviana* Rusby, June 1946, leg. M. Cardenas (PUR 78800). *E. quitensis*, Ecuador, ca. 13 km from Piñas, on the Piñas-Loja road, on the border of

El Oro and Loja Provinces, elevation ca. 7,000 ft, on *Berberis* sp., 30 July 1975, leg. K.P. Dumont, S.E. Carpenter, P. Buriticá (PUR 86592, 86593). *E. berberidis*, Ecuador, Tahatanga, on *Berberis glaucescens* St. Hil., Sep. 1891, leg. G. Lagerheim (PUR 68849, holotype). *E. tenella*, Bolivia, Sorata, on *Berberis divaricata* Rusby, 22 Apr. 1920, leg. E.W.D. and M.M. Holway, det. H.S. Jackson (PUR 68854, Plants of South America no. 564, holotype).

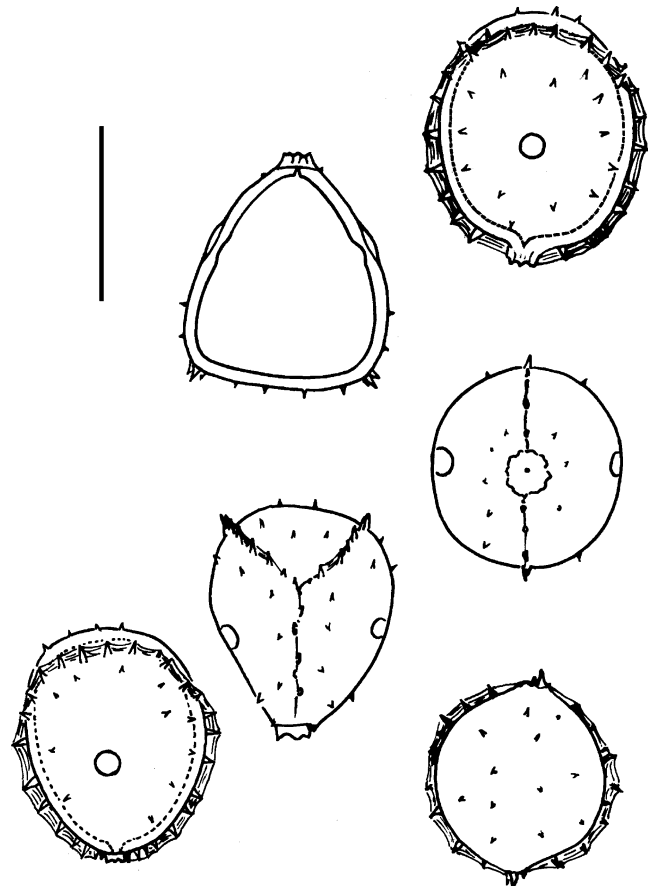
*Prospodium bicristatum* R. Berndt and F. Freire, sp. nov.

**Etymology:** named after the two ridges of interconnected spines crowning the urediniospore apex (Figs. 2, 3 and 4a–d).

Spermogonia et aecia ignota. Uredinia foliicola, abaxialia, parva, cyathiformia, paraphysibus peripheralibus circumdata; paraphyses anguste cylindricae vel conicae ad aciculares, ca.  $30\text{--}45 \times 5\text{--}9 \mu\text{m}$ , rectae vel irregulariter deformatae, stramineae, crasse tunicatae, subacutae; urediniosporae asymmetricae, obovoideae vel late ellipsoideae aspectu frontali (versus porum germinationis), rotundato-triangularis aspectu laterali,  $24\text{--}29 \times 23.5\text{--}28 \mu\text{m}$  (medium  $27.0 \times 25.9 \mu\text{m}$ ), pariete brunneo, ca.  $1.5 \mu\text{m}$  crasso, sparse potius delicateque echinulato praeter tonsuras duas in poris



**Fig. 2** *Prospodium bicristatum*. Teliospores with appendaged pedicels. Scale bar = 20  $\mu\text{m}$



**Fig. 3** *Prospodium bicristatum*. Urediniospores. Scale bar = 20  $\mu\text{m}$

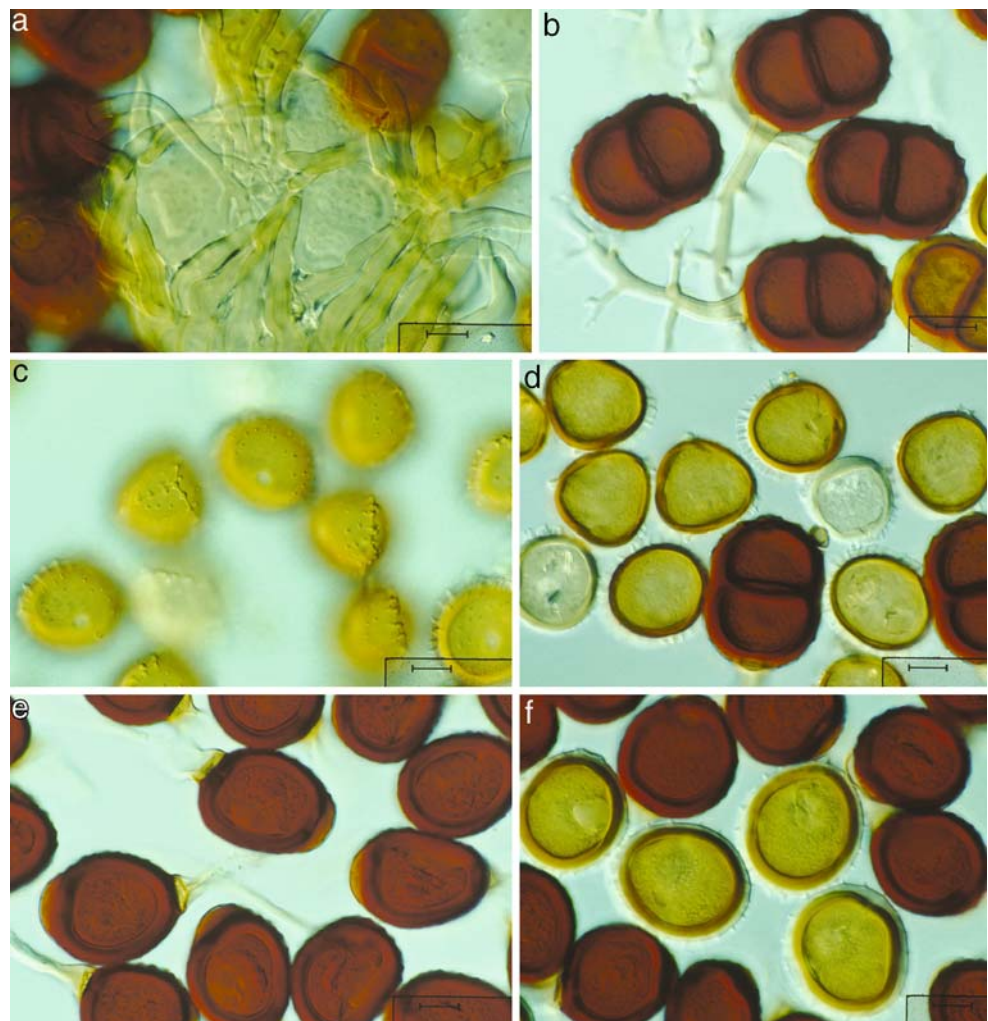
germinationis et cristam spinibus coniunctis, delicatis, usque ad 3  $\mu\text{m}$  longis, quam ab hilo ad hilum evolutum est et post bifurcationem apicem bifariam cingit, poris germinationis duobus, plusminusve aequatorialibus et oppositis, inconspicue papillatis. Telia urediniis similia; teliosporae bicellulares, late ellipsoideae, utrinque rotundatae, ad septum non vel aegre constrictae, 38–42 $\times$ 28–32  $\mu\text{m}$  (medium 39.9 $\times$ 30.0  $\mu\text{m}$ ), pariete castaneo, ca. 4  $\mu\text{m}$  crasso, bistrato (indistincte in sporis maturis), strato interiori brunneo, exteriorem, quod dilutius est, aequanti, sparse et aequaliter verrucoso verrucis acutis, late conicis (inter se ca. 5–7  $\mu\text{m}$  distantibus), poris germinationis indistinctis, verosimiliter (sub)apicalibus et hilum juxta, pedicellis basaliter vel leniter oblique, rariter laterale insertis, subhyalinis, moderate crasse tunicatis, 2–3 verticillis appendicis, apicaliter sparse ramificatis, praeditis.

In foliis *Mansoae* sp. (Bignoniaceae).

Spermogonia and aecia unknown. Uredinia abaxial on leaves, distinctly basket-like, shortly stalked, surrounded by peripheral paraphyses; paraphyses narrowly cylindrical to conical or needle-shaped, ca. 30–45 $\times$ 5–9  $\mu\text{m}$ , straight or

slightly bent, straw-coloured, thick-walled, subacute; urediniospores asymmetrical: obovoid to broadly ellipsoid in view parallel to the axis between germ pores, rounded-triangular when the direction of the view is perpendicular to the axis between the pores, 24–29 $\times$ 23.5–28  $\mu\text{m}$  (mean 27.0 $\times$ 25.9  $\mu\text{m}$ ); spore wall yellowish brown, ca. 1.5  $\mu\text{m}$  thick, sparsely and rather finely echinulate, except for two large smooth areas around the germ pores and two opposite ridges of interconnected bigger spines that originate at the hilum and branch in the distal part of the spore to garland the spore apex; spines of the ridges rather delicate but up to 3  $\mu\text{m}$  long, connected by a translucent membrane that appears to be finely layered; germ pores two, more or less equatorial and opposite, with inconspicuous subhyaline papillae. Telia like the uredinia; teliospores bi-cellular, broadly ellipsoid, rounded at both ends, not or only slightly constricted at the septum, 38–42 $\times$ 28–32  $\mu\text{m}$  (mean 39.9 $\times$ 30.0  $\mu\text{m}$ ); spore wall chestnut brown, ca. 4  $\mu\text{m}$  thick, two-layered (layering indistinct in mature spores), with equally thick layers, the outer one being lighter brown than the inner one, sparsely and evenly verrucose by flatly conical

**Fig. 4** a–d *Prosopidium bicristatum*. **a** Basket-like telium with peripheral thick-walled paraphyses. **b** Teliospores. **c** Urediniospores with spines and crests. **d** Urediniospores in optical section. Scale bars = 10  $\mu\text{m}$ . **e, f** *Uromyces cearensis*. **e** Teliospores. **f** Urediniospores among teliospores. Scale bars = 10  $\mu\text{m}$



but pointed warts (points of warts ca. 5–7  $\mu\text{m}$  apart); germ pores indistinct but most probably (sub)apical and close to the hilum; pedicels attached basally or slightly laterally on proximal spore cell, rarely shifted sideways by up to 90°, subhyaline and slightly thick-walled, adorned with two to three well-developed whorls of appendages that stick out more or less rectangularly and branch sparsely in their distal part.

On leaves of *Mansoa* sp. (Bignoniaceae).

Holotype (UB): Brazil, Ceará State, Marco City (03°06' 44"S, 40°05'31"W), on *Mansoa* sp., 3 Dec. 2004, leg. F. Freire (isotype HeRB 8536, located in Z + ZT).

*P. bicristatum* is different from the other known rust fungus parasitizing *Mansoa*, *Prospodium laevigatum* Hennen and Sotão, which has strongly constricted smooth teliospores. It also differs from other described *Prospodium* spp. especially by the characteristically ornamented urediniospores that do not show a distinctly two-layered wall.

*Uromyces cearensis* R. Berndt and F. Freire, sp. nov.

Etymology: after the Brazilian state of Ceará where the fungus was collected (Figs. 4e,f, 5 and 6).

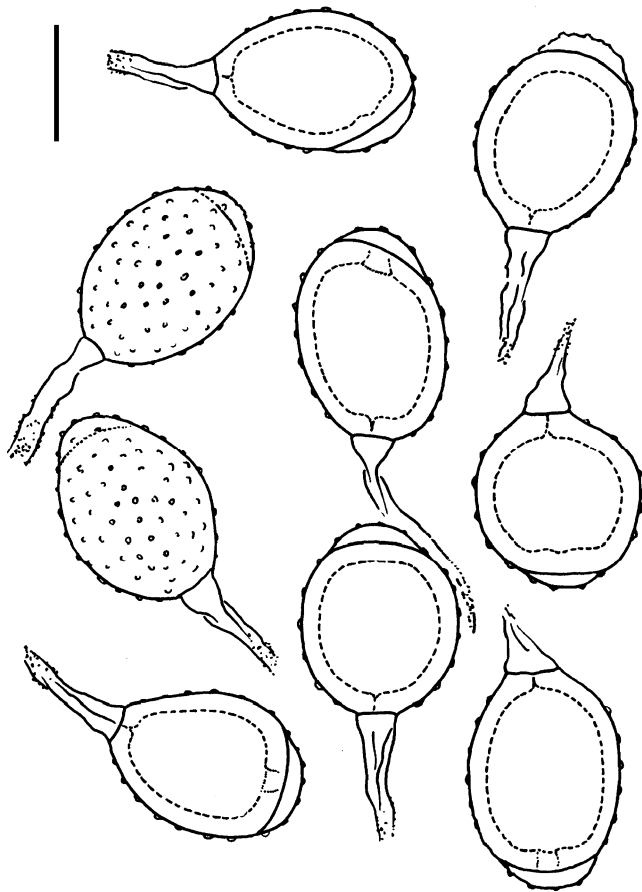


Fig. 5 Teliospores of *Uromyces cearensis*. Scale bar = 20  $\mu\text{m}$

Spermogonia et aecia ignota. Uredinia absentia, sed copia urediniosporarum saturate ferruginea supra telios adest; urediniosporae obovoideae, late ellipsoideae, 33.5–40 $\times$ 28–34  $\mu\text{m}$  (medium 36.9 $\times$ 30.8  $\mu\text{m}$ ), pariete ca. 3.5–4.5  $\mu\text{m}$  crasso, bistrato, strato exteriori subhyalino, strato interiori crassiori aureoque, sparse et aequaliter echinulato spinis potius grossis, inter se ca. 3.5–6  $\mu\text{m}$  distantibus, poris germinationis 3–4, plusminusve aequatorialibus et aequidistantibus, epapillatis. Telia in foliis amphigena sparsa, gregibus densis vel solutis, minuta ad parva (0.2–0.8 mm diam.), atra, celeriter exposita, pulverulenta; teliosporae ovoideae, late ellipsoideae vel subglobosae, 30.5–38.5 $\times$ 26.5–32  $\mu\text{m}$  (medium 34.4 $\times$ 28.8  $\mu\text{m}$ ), pariete ca. 3.5–4  $\mu\text{m}$  crasso, apicaliter usque ad 6.5–8  $\mu\text{m}$ , obscure badio, aequaliter potius sparseque verrucoso verrucis humile conicis, poro germinationis apicali vel subapicali, cum papilla lata, dilutiore brunnea, nonnunquam infirme evoluta, pedicellis subhyalinis, juxta hilum dilute brunneis, collabentibus, sporis brevibus vel aequantibus, levibus, proximaliter granulosis.

In foliis tomentosae *Ipomoeae* sp. indeterminatae (Convolvulaceae).

Spermogonia and aecia unknown. Uredinia lacking, but urediniospores present on several telia, deeply ferruginous; urediniospores obovoid or broadly ellipsoid, 33.5–40 $\times$ 28–34  $\mu\text{m}$  (mean 36.9 $\times$ 30.8  $\mu\text{m}$ ), wall about 3.5–4.5  $\mu\text{m}$  thick, two-layered with an outer subhyaline layer and a thicker, golden inner layer, sparsely and evenly echinulate with rather coarse spines (spines ca. 3.5–6  $\mu\text{m}$  apart); three to

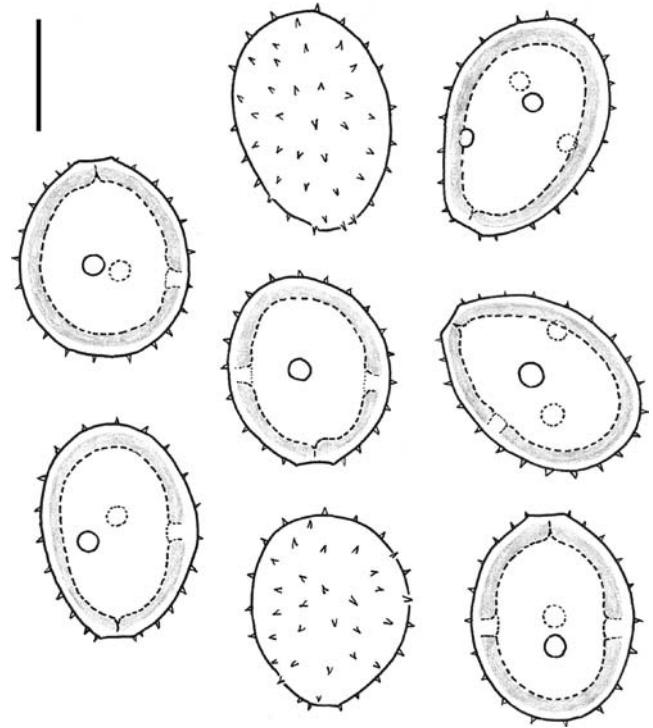


Fig. 6 Urediniospores of *Uromyces cearensis*. Scale bar = 20  $\mu\text{m}$

four germ pores, more or less equatorial and equidistant, without papillae but outer wall layer slightly thickened at pores. Telia amphigenous on leaves, scattered in loose or dense groups; individual sori tiny to small, 0.2–0.8 mm diameter, sooty black, early naked and pulverulent; teliospores ovoid, broadly ellipsoid to subglobose,  $30.5\text{--}38.5 \times 26.5\text{--}32 \mu\text{m}$  (mean  $34.4 \times 28.8 \mu\text{m}$ ); spore wall about  $3.5\text{--}4 \mu\text{m}$  thick, apically thickening to  $6.5\text{--}8 \mu\text{m}$ , dark chestnut brown, evenly and rather sparsely verrucose with flat conical warts; germ pore apical or subapical, covered by a broad, lighter brown papilla that may not always be clearly differentiated; pedicels collapsing, short (up to as long as spores), generally smooth but proximally granular, subhyaline except for a light brown ring proximal to the hilum.

On an undetermined species of *Ipomoea* (Convolvulaceae) with tomentose leaves.

Holotype (UB): Brazil, Ceará State, Monsenhor Tabosa City ( $04^{\circ}46'74''\text{S}$ ,  $40^{\circ}07'71''\text{W}$ ), on *Ipomoea* sp., 10 Sep. 2004, leg. F. Freire (isotype HeRB 8529, located in Z + ZT).

The Convolvulaceae are hosts for a considerable number of *Uromyces* species (Monoson and Schlessler 1980). None of their New World representatives combine the characters observed in *U. cearensis*. The most similar species appears to be *Uromyces greenstockii* Doidge from South Africa but it has smaller teliospores with subhyaline, hemispherical papillae. Uredinia are unknown in *U. greenstockii*.

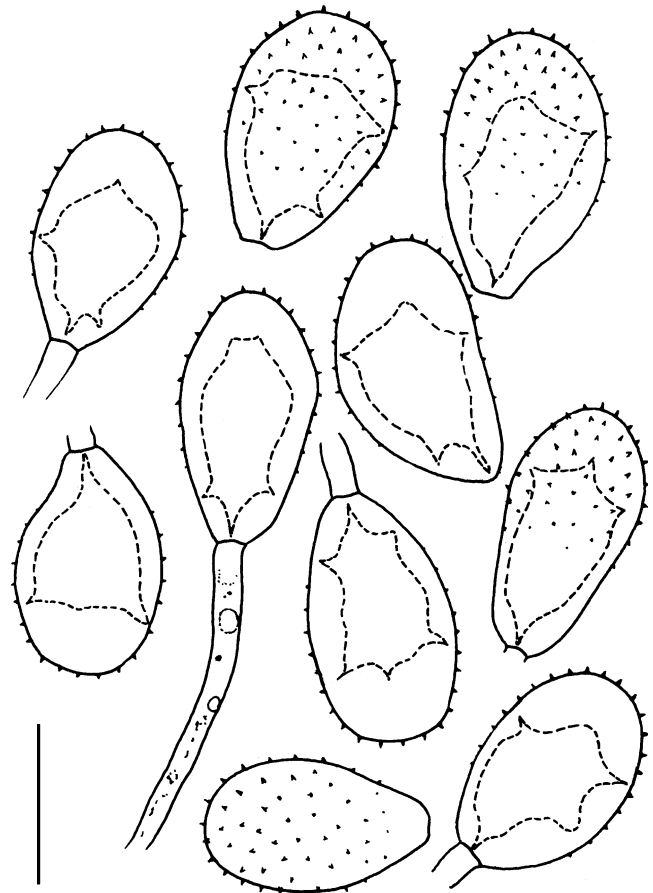
*Uredo cavernula* R. Berndt and R.S. Peterson sp. nov.

**Etymology:** describing the shape of the lumen of the urediniospores (Fig. 7).

Uredinia in pagina abaxiali foliorum sparsa, maculis stramineis usque ad remisse purpureo-luteolis insidentia, rotundata et pulvinata, ca. 0.4–0.7 mm diam., in herbario sicco ochroleuca vel cerina; urediniosporae obovoideae,  $(24)27\text{--}33(35) \times 20\text{--}25 \mu\text{m}$  (medium  $30.6 \times 22.2 \mu\text{m}$ ), pariete subhyalini ad hyalini, apicaliter 6–10  $\mu\text{m}$  crasso, lateraliter irregulariter  $(2)3\text{--}5 \mu\text{m}$  crasso, foveolis profundis sparsis (poris germinationis?) praedito, echinulato spinis moderate delicatis, inter se ca. 2–3.5  $\mu\text{m}$  distantibus, hilum versus decrescentibus, uno tertiis parte levi, spora delicate pedicellatae pedicellis fragilibus hyalinis.

In foliis *Ribis weberbaueri* Jancz. (Grossulariaceae).

Uredinia scattered abaxially on leaves, on straw-coloured to faint purplish-yellow leaf spots, rounded, pulvinate, ca. 0.4–0.7 mm diameter; in herbarium specimen cream-coloured to apricot; urediniospores obovoid,  $(24)27\text{--}33(35) \times 20\text{--}25 \mu\text{m}$  (mean  $30.6 \times 22.2 \mu\text{m}$ ); spore wall subhyaline to hyaline, apically thickened to 6–10  $\mu\text{m}$ , laterally irregularly  $(2)3\text{--}5 \mu\text{m}$  thick, with several scattered deep pits (germ pores?), echinulate by moderately delicate spines ca. 2–3.5  $\mu\text{m}$  apart, echinulation fading towards hilum and more or less lacking in proximal third of spore



**Fig. 7** *Uredo cavernula*. Urediniospores. Scale bar = 20  $\mu\text{m}$

surface, delicately stalked by hyaline, slender pedicels that tend to break off close to the hilum.

On leaves of *R. weberbaueri* Jancz. (Grossulariaceae).

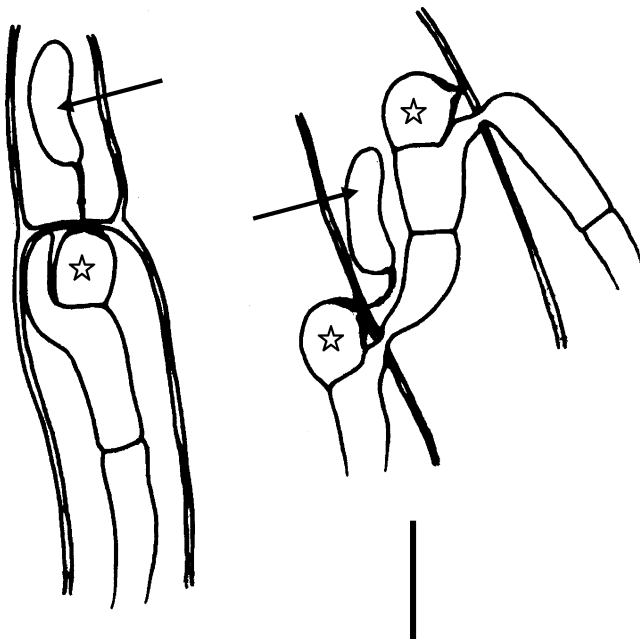
Holotype (Z + ZT): Peru, Depto. La Libertad, Prov. Santiago de Chuco, road from Santiago de Chuco to Huamachuco ( $7^{\circ}58.435'\text{S}$ ,  $78^{\circ}12.906'\text{W}$ ), altitude 4,110 m, 19 Apr. 2004, leg. M. Weigend and Ch. Schwarzer.

*U. cavernula* is very similar to the uredinial stage of *Goplana ribis-andicolae* R. Berndt (Berndt 1999). It differs from that species by thicker-walled spores whose proximal third is smooth. We are convinced that *U. cavernula* will prove to belong to *Goplana* once the telial stage will have been discovered.

*Esalque holwayi* (H.S. Jacks.) Hennen, Figueiredo and de Carvalho

*Syn. Triactella holwayi* H.S. Jacks.

Teliospores of *E. holwayi* are very similar to those of *Triphragmium*. Although aware of this fact, Jackson (1931b) assigned his new species to the genus *Triactella* mainly because of the leguminous host. *Triactella* was later shown to be a synonym of *Hapalophragmium*. As *T.*



**Fig. 8** *Esalque holwayi*. Host cells with parasitic mycelium consisting of intracellular hyphae that form haustorial mother cells (stars) and haustoria (arrows). Scale bar = 10  $\mu$ m

*holwayi* is different from *Hapalophragmium*, Hennen et al. (2000) transferred it to a new genus, *Esalque*. However, like Jackson, they did not find morphological characters that would have shown convincingly that *E. holwayi* was different from *Triphragmium*.

While studying a uredinial specimen of *E. holwayi* from Brazil, we noticed that the parasitic mycelium of the rust was entirely intracellular and comprised “ordinary” septate hyphae, haustorial mother cells (HMC) and stalked haustoria (Fig. 8). Where the septate hyphae entered an adjacent host cell, they did not only breach the host cell wall but formed HMC adjacent to the penetration site as well. These gave rise to delicate, more or less cylindrical or allantoid haustoria in the neighbouring host cell. The nuclei

remained within the HMC and did not migrate into the haustorial bodies.

Similar mycelia with intracellular HMC are widespread in Raveneliaceae (Berndt 1997) and are known for a single member of Phakopsoraceae, *Physopella zae* (Mains) Cummins and Ramachar [= *Phakopsora zae* (Mains) Buriticá] (Heath and Bonde 1988). The type of parasitic mycelium therefore supports the assumption of Jackson (1931b) and Hennen et al. (2000) that *Esalque* belongs to Raveneliaceae.

Brazil, State of Ceará, Guaramiranga City, on *Caesalpinia* cf. *ferrea* Mart., 6 Jan. 2005, leg. F. Freire, det. R. Berndt (HeRB 8541, located at Z + ZT).

#### *Phakopsora phyllanthi* Dietel in the Neotropics

A recent collection of *Phakopsora* on *Phyllanthus* from Brazil was determined as *P. phyllanthi*, a species, to our knowledge, not hitherto reported to occur in the New World. The species can be easily distinguished from the other New World Phakopsoras on *Phyllanthus* by its paraphysate uredinia of the “*Malupa*”-type (Buriticá 1999). A specimen collected in Venezuela on *Phyllanthus* sp. and another one from Ecuador on *Phyllanthus stipulatus* (Ruf.) G. Webster (H. Bauch, personal communication) could also be assigned to this species. *P. phyllanthi* may therefore have a wide distribution in tropical America.

#### Material investigated

Brazil, Ceará State, Fortaleza City, on *Phyllanthus acidus* Skeels. (Euphorbiaceae), 10 Jan. 2006, leg. F. Freire, det. R. Berndt (HeRB 8581, at Z + ZT). Venezuela, Miranda State, at Mamporal near Laguna de Tacarigua, on *Phyllanthus* sp., 13 Dec. 1993, leg. et det. R. Berndt (HeRB A-113, at Z + ZT).

**Table 1** Comparison of *Phakopsora vernoniae* with *Uredo toroiana*

|  | Urediniospores  | Paraphyses  |
|--|---|---|
| <i>Phakopsora vernoniae</i> , after original description | Globose, elongate or obovate, 20–29 $\times$ 15–20 $\mu$ m, spore wall 1–1.5 $\mu$ m thick, echinulate, pores obscure   | Peripheral, inwardly curved, 30–40 $\mu$ m long, at the apex capitate-thickened to 10–15 $\mu$ m broad, wall hyaline to yellowish-brown, 1.5 $\mu$ m thick, apically to 3 $\mu$ m |
| <i>P. vernoniae</i> , Brazilian specimen (HeRB 8521)     | Obovoid, ellipsoid to broadly ellipsoid or subclavate, 19–29.5 $\times$ 16.5–20 $\mu$ m (mean 23.9 $\times$ 17.8 $\mu$ m), spore wall ca. 1 $\mu$ m thick, subhyaline to ochraceous, moderately densely and finely echinulate (ca. 1.5–2.2 $\mu$ m between spines), pores obscure   | Peripheral, cylindrical to subclavate, 1–2 septate, more or less inwardly curved, with a slightly thickened (1.5–2.5 $\mu$ m) ochraceous to golden wall                           |
| <i>Uredo toroiana</i> (PUR 47272)                        | Obovoid or broadly ellipsoid, 22.5–30.5 $\times$ 16.5–20 $\mu$ m (mean 25.4 $\times$ 18.2 $\mu$ m; 22–30 $\times$ 19–26 $\mu$ m according to Kern), spore wall ca. 1.5 $\mu$ m thick, moderately densely echinulate with slender and sharp ca. 1 $\mu$ m long spines, pores obscure | Peripheral, subclavate, 1–2 septate, mostly inwardly bent, with golden to ochraceous, 2.5–3 $\mu$ m thick wall  |

*Phakopsora vernoniae* Jørstad in Brazil

*Syn. Uredo toroiana* Kern

A rust fungus collected in Brazil on *Vernonia* sp. (Asteraceae) revealed paraphysate uredinia together with very few telia of *Phakopsora*. The fungus fits the description of *P. vernoniae* Jørstad in all characters and is thus assigned to the latter species (Gjærum 1986; Jørstad 1956). *P. vernoniae* has not been known in the New World so far. According to the description, *U. toroiana* from Santo Domingo (Hispaniola) is similar to the uredinial stage of *P. vernoniae*, although it is described to have broader urediniospores (Kern 1928). We investigated *U. toroiana* and were unable to find essential differences to the uredinial stage of *P. vernoniae*. Thus, *U. toroiana* is regarded as a synonym of the latter. The minor differences observed between *P. vernoniae* from Brazil and *U. toroiana* (the latter with slightly bigger urediniospores, slightly thicker spore wall and slightly coarser echinulation) are believed to lie within the variation of the species (Table 1).

#### Material investigated

*P. vernoniae*, Brazil, Ceará State, Monsenhor Tabosa City, on *Vernonia* sp., 10 Sep. 2004, leg. F. Freire, det. R. Berndt (HeRB 8521, at Z + ZT). *U. toroiana*, Dominican Republic, Prov. Espaillat, Valle del Cibao, Moca, Estación Nacional Agronómica, 1930, leg. Ciferri and Ekman. Ciferri, Mycoflora Domingensis Exsiccata no. 193 (PUR 47272).

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