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New records in the lichen family Verrucariaceae (Ascomycota) from Argentina

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Summary: Four interesting lichens belonging to *Catapyrenium*, *Placidium* and *Placopyrenium* genera (*Verrucariaceae*) were collected for the first time in Argentina. *Catapyrenium exaratum* was only reported from Chile and Perú. *Placidium acarosporoides* was previously known from North America, Chile and South Africa. *Placidium pilosellum*, a widespread and common species, but little known in South America. Finally, *Placopyrenium bucekii*, a mediterranean–submediterranean lichen, represents a new record from South America. For these taxa we provide a brief description with emphasis on the ecological aspects and distribution maps.

Keywords: Lichens, *Verrucariaceae*, Argentina, new records.

Resumen: Nuevos registros en la familia de líquenes Verrucariaceae (Ascomycota) de Argentina. En el presente trabajo se dan a conocer cuatro especies liquénicas que constituyen novedades para Argentina. *Catapyrenium exaratum*, previamente recolectada en Chile y Perú. *Placidium acarosporoides*, conocida hasta el momento de Norte América, Chile y Sudáfrica. *Placidium pilosellum*, una especie común y ampliamente distribuida, pero poco conocida en Sudamérica. Finalmente, *Placopyrenium bucekii*, un liquen (sub)–mediterráneo ha sido recolectado por primera vez en Sudamérica. Se añaden, para cada especie, una breve descripción morfo–anatómica y ecológica y un mapa de distribución geográfica.

Palabras clave: Líquenes, *Verrucariaceae*, Argentina, nuevas citas.

Introducción

In this paper we present four new records of pyrenocarpous lichens collected in Argentina during 2005. Three of them are new records from Argentina and the other is collected for the first time in South America. All of them are members of the lichen family *Verrucariaceae*, characterized by perithecial ascomata, bitunicate asci, hamathecium lacking paraphyses (at least at the maturity) but formed by periphyses and pseudoparaphyses (Janex–Favre, 1971), and a positive reaction of the hymenial gel to potassium–iodine (Henssen & Jahns, 1974).

The recently published checklist of Argentinian lichens (Calvelo & Liberatore, 2002) in which 1670 species were recorded, provided a basis for taxonomic work on lichens in the area. This work constitutes an update of the information given by Grassi in 1950 by adding the information contained in posterior reviews as well as in different taxonomical revisions.

Very few works have been published on *Verrucariaceae* in South America. Although some papers have reported new records or described new taxa on different members of the family (e. g.: Räsanen, 1938, 1939; Lamb, 1955, 1958; Osorio & Ferraro, 1975; Scutari *et al.*, 2002; Prieto *et al*., 2007), till the moment there hasn´t been done any treatment about the family. A first approximation was done by Breuss (1993a) who reported 13 species of *Catapyrenium* s.l. from South America, 10 of them from Argentina. Later, the same author, in 1995, presented a preliminary survey of *Catapyrenium* species occurring in the Southern Hemisphere with special emphasis on the distribution patterns. The present study aims at contributing to the knowledge of the ecology and distribution of these rare species in Argentina, although a deeper work is necessary.

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Materials and Methods

The study is based on fresh material collected by the authors and included in MA and BCRU herbaria. Several specimens were requested from other herbaria (ABL and LI) and from personal collection of the authors in order to check the samples. Distributional maps were drawn using a UTM grid (10 x 10 km) projection with Arcview GIS v. 3.1.

Results

Catapyrenium exaratum Breuss, Plant Syst. Evol. 185: 26 (1993)

Illustration : Breuss 1993a, p. 27.

Specimens examined. ***ARGENTINA****: Prov. Salta, P. N. Los Cardones, 3700 m, on calcareous soils, 01/08/2005, G. Aragón & I. Martínez (BCRU).*

Other specimens examined. ***ECUADOR****: Prov. Cotopaxi, P. N. Cotopaxi, along road from Pampa de Limpios to summit of Cotopaxi, 00º38´S, 78º26´W, 4100 m, grass paramo with scattered shrubs, 17/12/1983, R.C. Harris (LI). Typus:* ***PERÚ****: Highland from Cerro de Pasco–Carpish–Tingo Maria, 9/11/1960, F. Mattick (LI).*

Other specimens examined: ***C. cinereum****.* ***SPAIN****: Asturias, Teverga, Puerto de Ventana, Huerto del Diablo, 256962 N, 4772777 E, 1872 m,* on limestone soils in alpine grassland vegetation, *18/05/2006, M. Prieto (MA). Cantabria, P. N. Picos de Europa, Orcados Rojos, 351425 N, 4782493 E, 2350 m,* outcrops of compact sandstones with cuarcites *05/10/2005, G. Aragón, A. García & M. Prieto (MA). Huesca, Cerler, ski resort, slope Tubo de la Cogulla, 790430 N, 4721834 E, 2300 m, on soils in alpine grassland vegetation, 01/04/2006, M. Prieto (MA).*

Thallus of scattered to adjacent squamules, not overlapping, to 6 mm wide, rounded to slightly lobed, totally adpressed to the substrate; upper surface pale, matte, covered by a whitish to gray pruina. Perithecia immersed and frequent. Pycnidia not found. Thallus 200–300 µm thick; upper cortex thin and poorly delimited from the algas layer, with roundish angular small cells (called *cinereum*-type by Breuss, 1990); epinecral layer 25–40 µm thick, cracked into subconical portions thus giving the surface an areolate appearance; algal layer 187–212 µm thick, algal cells 3–12 µm diam.; medulla lacking. Lower cortex well differentiated, 25–40 µm thick, of roundish–angular cells 4–7 µm diam. Rhizohyphae hyaline to brownish, 2.5–4 µm thick, densely interwoven giving an aspect of a rhizine. Perithecia laminally immersed, appearing as black dots on upper surface, subglobose, exciple pale. Ascospores simple, colorless, biseriately arranged, 8 per ascus, 12–20 × 7–9 µm.

The species is similar to *C. cinereum* (Koerber) Pers., from which it differs in having a roughly cracked necral layer, pale exciple and smaller spores. Also it could be confused with *C. squamellum* (Nyl.) Thomson, which has bundles of dark rizohyphae and a differentiated medullary tissue while *C. exaratum* develops faintly brown pigmented rizohyphae and lacks medulla.

This species grows at high altitudes (3700 to 4100 m alt), on calcareous soils together with *Placidium andicola* (Breuss) Breuss.

Catapyrenium exaratum has been previously reported from Ecuador and Perú (Breuss 1993a). This record extends the distribution area of the species in South America confirming the Andean distribution of the species (Fig. 1).

Placidium acarosporoides (Zahlbr.) Breuss, Bull. Cal. Lich. Soc. 7**:** 39 (2000)

Illustration: Thomson 1987, p. 29.

Specimens examined. ***ARGENTINA****: Prov. Salta, Iruya, 3800 m, on limestone soils, 7/08/2005, G. Aragón & I. Martínez (MA).*

*Other specimens examined****: MEXICO****: Baja California, 1 km N of Cataviña, northen Vizcaíno Region of the Sonoran Desert, 29º43´N/114º40´W, 560 m, batholitic granite boulder area, stream with Washingtonia, (ABL).* ***USA****: Arizona: Yuma Co, Palm Canyon, 1000 ft, on rock, 1973, T. H. Nash (LI 297542). Mohave: 20 miles of Kigman, Union Pass, Black mts along Rte 68, 3600 ft, on schist, 1973, T. H. Nash (LI).*

Thallus of convex contiguous squamules, up to 2 mm diam., rounded to slightly lobed; upper surface brown to red–brown, smooth. Thallus 230–600 µm thick; upper cortex 25–60 µm thick, paraplectenchymatous; epinecral layer up to 20 µm thick; algal layer 70–150 µm thick, algal cells 12–15 µm in diam.; medulla prosoplectenchymatous. Lower cortex weakly differentiated, with more densely aggregated cells; rhizohyphae hyaline 3–6 µm thick, confined to the central area, giving an aspect of a peduncle. Perithecia laminally immersed, few per squamule, subglobose, exciple colorless to brown, asci cylindrical to clavate. Ascospores simple, broadly ellipsoidal, colorless, (sub)–biseriately, 8 per ascus,

Fig. 1. Distribution of *Catapyrenium exaratum*. (▲) new records, (●) previous records.

12–17 × 7–11 µm. Pycnidia laminally immersed, *Dermatocarpon* type, conidia oblong to shortly cylindrical.

This is a characteristic species with convex to almost bullate squamules that forms an areolate–appearing thallus.

It has been found growing on calcareous soils in *Festuca* grassland associated with *P. andicola* and *P. squamulosum* var. *argentinum* (Räsänen) Breuss.

Placidium acarosporoides was previously reported from granitic rocks and sandstones from the sea level up to 1890 metres altitude. However, in Argentina this taxon grows on calcareous soils at 3800 metres altitude. This species seems to have a disjunct distribution with occurrences in SW North America (Thomson 1987, 1989), Argentina (this paper), Chile (Breuss 1993a) and South Africa (Breuss 1993b) (Fig. 2).

Placidium pilosellum (Breuss) Breuss, Annln. naturh. Mus. Wien, Ser. B, Bot. Zool. 98(Suppl.): 39 (1996)

Illustration: Breuss 1990, fig. 18.

Specimens examined. ***ARGENTINA:*** *Prov. Jujuy, Iruya, Quebrada de Humahuaca, 4100 m, on limestone soils, 07/08/2005, G. Aragón & I. Martínez (BCRU).*

Other specimens examined ***: MEXICO :*** *Baja California, 10 km. N el Rosario in canon del Rosario, 90 m, coastal scrub community, 05/01/1989, J. M. Egea (LI).*

Thallus of adjacent to overlapping squamules, to 6 mm diam., rounded to lobed, with the margins free from the substrate; upper surface orange brown, tan or dark brown; lower surface usually pale, sometimes brown to black. Perithecia immersed and frequent. Pycnidia marginal. Thallus thin, 250–400 µm thick; upper cortex 40–80 µm thick, paraplectenchymatous; epinecral layer up to 50 µm thick; algal layer 80–140 µm thick; medulla with many spherical cells, with cells of 9–12 µm diam. Lower cortex weakly differentiated, with more densely aggregated cells; rhizohyphae hyaline 4.5–6 µm thick. Perithecia laminally immersed, pyriform, exciple colorless, asci cylindrical. Ascospores simple, ellipsoidal, colorless, uniseriately arranged, 8 per ascus, 12–17 × 5.5–7.5 µm. Pycnidia marginal, *Dermatocarpon* type, conidia 3–4 × 1–1.8 µm.

This species is characterized by its marginal pycnidia (character that separates this species from *P. squamulosum* (Ach.) Breuss) and a medulla with many globular cells. Anatomically, *P. pilosellum* is very similar to *P. andicola*. Although the discrimination is very difficult, *P. pilosellum* has larger spores (12–17 x 5.5–7.5 µm versus 11–14 x 5–6.5 µm) and squamules with free margins meanwhile *P. andicola* has more or less dark rimmed squamules (Breuss 1993a).

We found it growing on limestone soils, dominated by grassland vegetation with *Stipa spp*. and *Festuca spp*. It was found together with *P. squamulosum* var. *argentinum* and *Anthracocarpon andinum* Prieto, Aragón & Breuss.

Placidium pilosellum is a widespread and very common species in Europe (e. g.: Breuss 1990, 1998, Grube et al. 2001, Hafellner & Türk 2001, Llimona & Hladun 2001). It has been also found in Asia (Breuss 1998, Seaward *et al*. 2004), Australia (Breuss 2001), North America (Nash *et al*. 1998), and South America (Feuerer & Sipman 2005). This is the second record

Fig. 2. Distribution of *Placidium acarosporoides*. (▲) new records, (●) previous records.

Fig. 3. Distribution of *Placopyrenium bucekii*. (▲) new records, (●) previous records.

of the species in South America, being previously known from Bolivia.

Placopyrenium bucekii (Nádv. & Servít) Breuss, Stud. Geobot. 7: 182 (1987)

Illustration: Breuss 1993c p. 9; Ménard & Roux 1995.

Specimens examined. ***ARGENTINA****: Prov. Salta, P. N. Los Cardones, 3700 m, on fissures of calcareous rocks, 01/08/2005, G. Aragón & I. Martínez (MA).*

Other specimens examined: P. bucekii var. bucekii. ***TURKEY****: Bursa, 2003, on rock, (ABL).* ***SPAIN:*** *Canary Inslands, Tenerife, Macizo Anaga, slope near Semáforo de San Andrés, 80–150 m., 10/07/1986, O. Breuss (LI). P. bucekii var. triseptatum.* ***TURKEY****: Prov. Izmir, Yamanlardað, southern flank above Yamanlarköy, along the path to Karagöl, 38º32´N/27º09´E, 700 m, 14/04/1992, O. Breuss (LI).*

Thallus epilithic, squamulose–areoled, the squamules are morphologically different according to the position in the thallus, being polygonal the central ones and lobed the most peripherical squamules. All of them are covered by a whitish to grey pruine. Perithecia are immersed in the squamules and are detectable only by their top, forming a black point. Studied material belongs to var. *triseptatum* Breuss. This variety is recognized by its 3–celled spores, whereas the variety type has 1– or 2–celled spores. Spore size is 16–23 x 6–8 µm in var. *triseptatum* (versus 13.5–17 x 5–7 µm in var. type). *Placopyrenium bucekii* has a mediterranean–submediterranean distribution with occurrences in the Canary Islands and Caucasus (Breuss 1987). It has been also cited in Albania (Hafellner & Kashta 2003), Cyprus, Greece and France (Ménard & Roux 1995), Iran (Seaward et al. 2004), Israel (Galun & Mukhtar 1996) and Turkey (Breuss 1993c, John 1996). Previously var. *triseptatum* was only known from Turkey, growing on calcareous soils at 700 m altitude (Breuss 1993c). We have found it in Argentina on fissures of rocks together with *C. exaratum* and *P. andicola.*

The new record extends its distribution range to South America and increases its altitudinal range to more than 3000 m (Fig. 3). So far, this variety might have gone unnoticed and probably it will reach a wider distribution.

Addenda

We include here another species collected in Argentina although they are not new records for the country in order to complete the knowledge about the distributional patterns.

Placidium andicola (Breuss) Breuss, Annln. naturh. Mus. Wien, Ser. B, Bot. Zool. 98(Suppl.): 38 (1996)

Illustration: Breuss 1993a, p. 21.

ARGENTINA*: Prov. Jujuy: Hornaditas, Quebrada de Humahuaca, 3260 m, puna vegetation, 13/02/2007, A.R. Burgaz. Prov. Salta, Iruya, 3800 m, on limestone soils, 7/08/2005, G. Aragón & I. Martínez (MA). P. N. Los Cardones, 3700 m, on calcareous soils, 01/08/2005, G. Aragón & I. Martínez (MA).*

Other specimens examined ***: MEXICO :*** *Baja California, 10 km. N el Rosario in canon del Rosario, 90 m, coastal scrub community, 05/01/1989, J. M. Egea (LI).*

Thallus of dispersed to adjacent squamules, to 4 mm diam., rounded to lobed, with the margins slightly ascending; upper surface brown, black–rimmed; lower surface usually dark brown to black. Perithecia immersed and frequent. Pycnidia marginal. Thallus 260–400 µm thick; upper cortex 35–75 µm thick, paraplectenchymatous; epinecral layer up to 15 µm thick; algal layer 75–120 µm thick, algal cells 3–9 µm in diam.; medulla with many spherical cells. Lower cortex weakly differentiated, with more densely aggregated cells; rhizohyphae hyaline to brown 4.5–6.5 µm thick. Perithecia laminally immersed, exciple colorless, darkening with the age, asci cylindrical. Ascospores simple, ellipsoidal, colorless, uniseriately arranged, 8 per ascus, 10–14 × 5–6.5 µm. Pycnidia marginal, *Dermatocarpon* type, conidia 2.5–4 × 1–1.8 µm.

This is a relatively common species in South America, previously reported from Argentina, Bolivia and Peru (Breuss 1993a). We have found it at high altitude on calcareous soils together with *C. exaratum*, *P. acarosporoides*, *P. squamulosum* var. *argetinum* and *P. bucekii* var. *triseptatum*.

Placidium squamulosum var. argentinum (Räsänen) Breuss, Annln. naturh. Mus. Wien, Ser. B, Bot. Zool. 98(Suppl.): 39 (1996)

Illustration: Breuss 1990 fig. 20.

***ARGENTINA**: Prov. Salta, Salina Grande, on limestone soils, 3310 m, 5/08/2005, G. Aragón & I. Martínez (MA). Prov. Salta, Iruya, on limestone soils, 3800 m, 7/08/2005, G. Aragón & I. Martínez (MA).*

Thallus of adjacent to slightly overlapping squamules, to 7 mm diam., rounded to lobed; upper surface brown; lower surface pale to brown. Perithecia immersed and frequent. Pycnidia laminal. Thallus 200–400 µm thick; upper cortex 30–80 µm thick, paraplectenchymatous; epinecral layer up to 50 µm thick; medulla with many spherical cells, of 9–14 µm diam. Lower cortex weakly differentiated, with more densely aggregated cells; rhizohyphae hyaline 4–5 µm thick. Perithecia laminally immersed, pyriform, exciple colorless, asci cylindrical. Ascospores simple, ellipsoidal, colorless, uniseriately arranged, 8 per ascus, 14–16 × 7–9 µm. Pycnidia laminal, *Dermatocarpon* type, conidia oblong–ellipsoid.

This variety differs from the type one in having broader spores and thinner rizohyphae (spores 12–16 × 5.5–7.5 µm and rizohyphae 4.5–6.5 µm in var. *squamulosum*). It has a very restricted distribution, known from Argentina (Breuss 1993a) and few collections from Central and North America (unpub. Breuss). We have found it in Argentina growing on calcareous soils in *Festuca* grassland associated with *P. andicola* and *P. acarosporoides.*

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