

SOME INTERESTING RECORDS OF LICHENIZED AND LICHENICOLOUS ASCOMYCOTA FROM SOUTH AMERICA

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Abstract. New records of six lichens and one lichenicolous fungus from South America are presented. *Lecanora leuckertiana* (Peru) and *Psilolechia clavulifera* (Bolivia) are recorded for the first time from South America. *Chrysothrix xanthina*, *Nectriopsis parmeliae* (on *Candelariella* sp. as a new host), *Psilolechia lucida* and *Trapeliopsis granulosa* are new to Bolivia, and *Piccolia ochrophora* to Argentina. *Chrysothrix* and *Psilolechia* are new genera to the lichen biota of Bolivia.

Key words: Argentina, biodiversity, biogeography, Bolivia, neotropics, Peru

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INTRODUCTION

The tropics are supposed to host the biologically richest land ecosystems in the world. In terms of lichen diversity, however, they seem to be so far the least-explored regions, as many new species are still being described every year (e.g., Aptroot 1997; Aptroot *et al.* 1997; Kalb 2001; Lücking & Matzer 2001; Sipman & Aptroot 2001). The number of undescribed taxa may be enormous (Sipman & Aptroot 2001), but knowledge of the distribution of currently known lichens and lichenicolous fungi is also limited, even in well-studied groups such as foliicolous lichens (e.g., Lücking 1992). In this paper we present the first records of *Lecanora leuckertiana* and *Psilolechia clavulifera* from South America. Five species are reported for the first time from Bolivia or Argentina.

MATERIAL AND METHODS

The specimens were collected mainly by the first author in Bolivia and Peru (2004 and 2006) during collecting expeditions undertaken by the W. Szafer Institute of Botany, Polish Academy of Sciences, Kraków. They are deposited at GPN, KRAM-L, LPB and UGDA. One

specimen was borrowed from the University of Helsinki herbarium (H). Thin-layer chromatography (TLC) was used to identify secondary metabolites (Orange *et al.* 2001). For identification of pulvinic acid derivatives, extracts from thalli of *Candelariella vitellina* (Hoffm.) Müll. Arg. (calycin), *Chaenotheca chrysocephala* (Ach.) Th. Fr. (vulpinic acid), *Rhizocarpon geographicum* (L.) DC. (rhizocarpic acid) and *Vulpicida pinastri* (Scop.) J.-E. Mattsson & M. J. Lai (pinastric acid) were used for comparison.

In the text the asterisk (*) indicates a lichenicolous fungus.

LIST OF SPECIES

Chrysothrix xanthina (Vain.) Kalb

Bibl. Lichenol. **78**: 144. 2001. – *Lepraria xanthina* Vain.

The species is characterized by a citrine-yellow, rather thick thallus composed of small granules (20–50 µm diam.), which produces pinastric acid as the major metabolite (Kalb 2001). Our samples also contained pulvinic acid dilactone and unidentified terpenoids in small to trace amounts. The species is widely distributed in tropical and

subtropical areas (Kalb 2001). In the Bolivian localities, *Ch. xanthina* was found on siliceous rock in a cleared area within high Andean cloud forest and on tree bark in a lowland flooded savannah. The first of these sites, situated at 3480 m altitude, is probably the world's highest locality of the species.

GENERAL DISTRIBUTION. Asia: Malaysia (Kalb 2001). Africa: Canary Islands, Madagascar, Kenya, Angola (Kalb 2001); Rwanda (Killmann & Fischer 2005). Australoecania: Australia (Kalb 2001). North America: U.S.A., Mexico (Kalb 2001). South America: Brazil, Paraguay, Venezuela (Kalb 2001); Ecuador (Kalb 2001; Nöske & Sipman 2004).

This is the first record of the species and the genus from Bolivia.

SPECIMENS EXAMINED. BOLIVIA: DEPT. BENI, Prov. Ballivian, near Reyes village, 14°18'10"S/67°18'49"W, alt. 192 m, flooded savannah, on tree bark, 29 Nov. 2004, *A. Flakus* 3683 (KRAM-L, LPB, UGDA), 5 Dec. 2004, *A. Flakus* 4356 (KRAM-L, UGDA); DEPT. SANTA CRUZ, Prov. Caballero, East Cordillera, Siberia village, 17°49'38"S/64°44'14"W, alt. 3480 m, open area, on sandstone, 15 Dec. 2004, *A. Flakus* 4882 (KRAM-L, LPB); DEPT. COCHABAMBA, Prov. Chapare, East Cordillera, near Incachaca village, 17°14'13"S/65°49'02"W, alt. 2294 m, anthropogenic glade in high Andean Yungas cloud forest, on siliceous rock, 10 June 2006, *A. Flakus* 8140 & 8141 (KRAM-L, LPB).

Lecanora leuckertiana Zedda

Nova Hedwigia 71(1–2): 108–109. 2000.

Our specimen has the typical morphology and chemistry (usnic acid and zeorin) of the species (Zedda 2000). Its thallus is obscurely lobate, leprous and usually white-rimmed, and composed of a greyish-green layer of rather loose soredia and consoredia embedded in a white, compact medulla with brownish prothallus. The species has a wide ecological spectrum, and has been found on the bark of, for example, *Acer*, *Quercus*, *Olea* and palm trees (Zedda 2000; Lackovičová & Pišút 2004), soil (Zedda 2000), shaded schistose and calcareous rocks (Sérusiaux *et al.* 2003). The Peruvian specimen grew on siliceous rock in an open habitat on south-exposed slopes in the high

Andean semidesert range of the Cañon del Colca canyon. So far, *L. leuckertiana* has been known from a maximum altitude of 940–950 m (Zedda 2000; Lackovičová & Pišút 2004), therefore the record presented here is the highest for the species (2774 m).

GENERAL DISTRIBUTION. Europe: Italy, Greece, Spain, Majorca (Zedda 2000); the Netherlands (Sparrius *et al.* 2002); Belgium, (Sérusiaux *et al.* 2003); Slovakia (Lackovičová & Pišút 2004). Africa: Morocco (Zedda 2000). Records from the Czech Republic (Bayerová & Kukwa 2004) and Poland (Czarnota 2002) belong to another taxon (Kukwa 2006).

This is the first record of the species for South America.

SPECIMEN EXAMINED. PERU: DEPT. AREQUIPA, Prov. Caylloma, below Tapay village, Cañon del Colca canyon, 15°35'07"S/71°56'37"W, alt. 2774 m, high mountain vegetation of semidesert inter-Andean valleys, on siliceous rock, 6 July 2006, *A. Flakus* 9666 (KRAM-L, LPB).

**Nectriopsis parmeliae* (Berk. & M. A. Curtis) M. S. Cole & D. Hawksw.

Mycotaxon 77: 321. 2001. – *Nectria parmeliae* (Berk. & M. A. Curtis) D. Hawksw. – *Diplodina parmeliae* Berk. & M. A. Curtis

This lichenicolous fungus is characterized by the following set of features: pinkish orange perithecia developing on a colorless, loose network of hyphae, with 1–3-septate ascospores of two different types in one ascus: macroascospores (34–60 × 12–23 μm) and microascospores (8–17 × 3–7 μm) (Hawksworth 1981; Clauzade *et al.* 1989; Zhurbenko & Alstrup 2004). Our specimen agreed in almost all respects with the descriptions, but only 1-septate spores were found. The fact that specimens collected in North Carolina, U.S.A. (on *Physcia millegrana* and *Punctelia rudecta*, 2005, Kukwa 4712 & 4713) also had only 1-septate spores suggests that the spore septation is not constant. So far the species has been reported only from foliose or fruticose lichens (Hawksworth 1981; Clauzade *et al.* 1989; Zhurbenko & Alstrup 2004). Here it is

reported for the first time from a crustose lichen, a sterile, sorediate *Candelariella* sp.

GENERAL DISTRIBUTION. Europe: Germany (Triebel & Scholz 2001). North America: U.S.A. (Cole & Hawksworth 2001; Esslinger 2006). South America: Brazil (Clauzade *et al.* 1989).

The species is here reported for the first time from Bolivia.

SPECIMENS EXAMINED. BOLIVIA: DEPT. COCHABAMBA, Prov. Chapare, East Cordillera, near Incachaca village, 17°14'13"S/65°49'02"W, alt. 2294 m, anthropogenic glade in high Andean Yungas cloud forest, on thallus of *Candelariella* sp. growing on hard lignum of moribund coniferous tree trunk, 10 June 2006, *A. Flakus* 8142/1 (KRAM-L, LPB).

***Piccolia ochrophora* (Nyl.) Hafellner**

Symb. Bot. Ups. **34**(1): 91. 2004. – *Lecidea ochrophora* Nyl. – *Biatorella ochrophora* (Nyl.) Arnold – *Strangospora ochrophora* (Nyl.) R. Anderson

The species is characterized by convex apothecia with orange-brown pruina, multispored asci and nonseptate, rounded ascospores 2.5–4.0 µm in diam. (Hafellner 2004). For a long time *P. ochrophora* has been known only from the Northern Hemisphere, mainly in temperate areas, but recently it was recorded from Chile (Hafellner 2004).

GENERAL DISTRIBUTION. Europe: Austria, Belgium, Czech Republic, Finland, France, Germany, Greece, British Isles, Italy, Luxembourg, Netherlands, Norway, Poland, Portugal, Russia, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine (Hafellner 2004). Africa: Morocco, Madeira, Canary Islands (Hafellner 2004). North America: U.S.A., Mexico (Hafellner 2004). South America: Chile (Hafellner 2004).

In this paper the species is recorded for the first time from Argentina. This is the second record of the species in the Southern Hemisphere. It is probably more frequent in the area because it is inconspicuous and easily overlooked.

SPECIMENS EXAMINED. ARGENTINA: GOBERNACIÓN DEL NEUQUÉN, Lago Quillén, by the eastern bend of the lake, on shore plateau on S shore, *Not-*

hofagus obliqua forest, on bark, 28 Dec. 1937, *A. Kalela* 180c (associated with *Lepraria* sp., H).

***Psilolechia clavulifera* (Nyl.) Coppins**

Bull. Brit. Mus. (Nat. Hist.), Bot. **11**(2): 201. 1983. – *Lecidea clavulifera* Nyl. – *Biatora clavulifera* (Nyl.) Arnold – *Micarea clavulifera* (Nyl.) Coppins & P. James – *Lecidea adirondackii* H. Magn.

Psilolechia clavulifera is characterized by an almost mealy, leprose thallus, small, immarginate, convex apothecia, the absence of an anamorphic state, stout, multiseptate paraphyses and dacryoid ascospores produced in *Psora*-type asci (see Coppins & Purvis 1987; Coppins 1988; Ekman *et al.* 2004). According to Coppins (1983) and Coppins and Purvis (1987), *P. clavulifera* is usually found on consolidated soil, siliceous rocks and roots in dry recesses or the root systems of uprooted trees. In the Bolivian locality it was growing on shaded clayey soil within high Andean cloud forest at an altitude of 2582 m. This seems to be the highest elevation recorded for the species.

GENERAL DISTRIBUTION. Europe: Austria (Hafellner & Türk 2001); Belgium, Luxembourg (Diederich *et al.* 2006); Czech Republic (Palice 1999; Vondrák *et al.* 2006); Denmark (Søchting & Alstrup 2002); Estonia (Jüriado *et al.* 2000); France (Bricaud *et al.* 1993); Germany (Scholz 2000; Printzen *et al.* 2002); British Isles (Coppins 1983); Iceland (Kristinsson & Heidmarsson 2006); Lithuania (Motiejūnaitė 1999); the Netherlands (Aptroot *et al.* 2004: rare); Sweden, Norway, Finland (Santesson *et al.* 2004); Poland (Fałtynowicz 2003; Czarnota unpubl. data: common in mountains); Slovakia (Coppins 1983; Pišút *et al.* 1998); Spain (Azuaga & Gomez-Bolea 1996). Australoecania: Australia, New Zealand, Tasmania (Coppins & Purvis 1987). North America: U.S.A. (Harris 2004; Esslinger 2006).

This is the first record of the species for South America.

SPECIMEN EXAMINED. BOLIVIA: DEPT. SANTA CRUZ, Prov. Caballero, East Cordillera, Siberia region near La Palma village, 17°49'12"S/64°40'28"W, alt. 2582 m, on clayey soil, high Andean Yungas cloud forest, 13 Dec. 2004, *A. Flakus* 4770 (GPN, KRAM-L, LPB).

Psilolechia lucida (Ach.) M. Choisy

Bull. Mens. Soc. Linn. Lyon **18**: 142. 1949. – *Lichen lucidus* Ach. – *Lecidea lucida* (Ach.) Ach. – *Pulveraria alboflava* Flörke – *Biatora lucida* (Ach.) Fr.

Psilolechia lucida is characterized by a leprose to leprose-granular, bright yellow thallus which contains rhizocarpic acid. The rarely produced apothecia are convex, sometimes tuberculate and yellow-green to yellow-orange, 0.1–0.3 mm (up to 0.5–0.7 mm) in diam. (see Coppins & Purvis 1987). It has a worldwide distribution and is rather common in Europe, but in South America it has been recorded only from Chile so far (Feurerer 2006). *Psilolechia lucida* prefers shaded places and occurs on vertical rock faces and under overhanging rocks, on plant debris, wood and bark (Coppins & Purvis 1987; Tønsberg 1992). The Bolivian specimen of *P. lucida* was sterile and contained rhizocarpic acid. It was found on siliceous schist in a very shaded place within high Andean Puna vegetation at 4604 m a.s.l.

GENERAL DISTRIBUTION. Europe: Svalbard (Elvebakk & Tønsberg 1992); British Isles, Sweden, France, Portugal, Germany, Austria, Italy (Coppins & Purvis 1987); Belgium and Luxembourg (Diederich & Sérusiaux 2000); Romania (Moruzi *et al.* 1967); Poland (Coppins & Purvis 1987; Fałtynowicz 2003); Czech Republic (Vězda & Liška 1999); Slovakia (Pišút *et al.* 1998). Middle East: Turkey (John & Breuss 2004). Asia: Japan (Yoshimura & Harada 2004). Africa: Canary Islands, Madeira (Coppins & Purvis 1987). Australoecania: Hawaii, Australia, Tasmania, New Zealand (Coppins & Purvis 1987); Oceania (Elix & McCarthy 1998). North America: U.S.A. (Coppins & Purvis 1987). Central America: Costa Rica (Coppins & Purvis 1987; Umaña-Tenorio *et al.* 2002). South America: Chile (Feurerer 2006). Antarctica: Antarctic Peninsula (Øvstedal & Smith 2001).

The species and the genus are new to Bolivia.

SPECIMENS EXAMINED. BOLIVIA: DEPT. LA PAZ, Prov. Murillo, East Cordillera, near Cumbre pass, 16°21'59"S/68°02'37"W, alt. 4604 m, high Andean Puna vegetation, on siliceous schist in shaded place, 13 May 2006, *A. Flakus* 5799 (KRAM-L, LPB, UGDA).

Trapeliopsis granulosa (Hoffm.) Lumbsch

in Hertel, Lecid. Exsicc. Fasc. **5**, No. 99. 1983. – *Lecidea decolorans* (Hoffm.) Flörke, *L. granulosa* (Hoffm.) Ach. – *L. quadricolor* (Dicks.) Borrer – *Trapelia granulosa* (Hoffm.) V. Wirth – *Verrucaria granulosa* Hoffm.

Sterile specimens of *T. granulosa* are characterized by a whitish to pale grey, sometimes partly pinkish (rarely greenish grey) thallus composed of crowded granular to verrucose areoles (1.2–5.0 mm diam.) with granular and irregular whitish to cream-yellow (sometimes grey-green) soralia and the presence of gyrophoric acid (Purvis 1992). This cosmopolitan species has been rarely recorded from South America and was known only from Argentina (Øvstedal & Gremmen 1995; Messuti *et al.* 2003) and Venezuela (Feurerer 2006). In the Bolivian locality it was found on plant debris, humus and terricolous bryophytes in open conditions.

GENERAL DISTRIBUTION. Europe: Sweden, Norway, Finland (Santesson *et al.* 2004); British Isles (Coppins 2002); Romania (Moruzi *et al.* 1967); Austria (Hafellner & Türk 2001); Switzerland (Clerc 2004); Poland (Fałtynowicz 2003); Slovakia (Pišút *et al.* 1998); Czech Republic (Vězda & Liška 1999); Ukraine (Konratyuk *et al.* 1998); Italy (Nimis & Martellos 2003); Belgium, Luxembourg (Diederich & Sérusiaux 2000); Iberian Peninsula (Llimona & Hladun 2001). Asia: Russia (Andreev *et al.* 1996); Mongolia (Cogt 1995); Kazakhstan (Wagner & Spribile 2005). Australoecania: Oceania (Elix & McCarthy 1998). North America: Greenland, Canada (Thomson 1997); U.S.A. (Thomson 1997; Printzen & McCune 2004). Central America: Costa Rica (Umaña-Tenorio *et al.* 2002). South America: Argentina (Øvstedal & Gremmen 1995; Messuti *et al.* 2003); Venezuela (Ahti 1992). Antarctica: Antarctic Peninsula (Øvstedal & Smith 2001).

The species is new to Bolivia.

SPECIMENS EXAMINED. BOLIVIA: DEPT. LA PAZ, Prov. Murillo, East Cordillera, near Cumbre pass, 16°19'18"S/68°04'42"W, alt. 4550 m, high Andean Puna vegetation, 17 June 2006, *A. Flakus* 8591/1 (KRAM-L, LPB).

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