CONTRIBUTION TO THE KNOWLEDGE OF THE LICHEN BIOTA OF BOLIVIA. 5

ADAM FLAKUS, HARRIE J. M. SIPMAN, KERSTIN BACH, PAMELA RODRIGUEZ FLAKUS, KERRY KNUDSEN, TEUVO AHTI, ULF SCHIEFELBEIN, ZDENĚK PALICE, AGNIESZKA JABŁOŃSKA, MAGDALENA OSET, ROSA I. MENESES Q. & MARTIN KUKWA

Abstract. This paper presents new records of 180 lichen species from Bolivia; 103 are new national records. Three species, Bryonora curvescens (Mudd) Poelt (also from Ecuador), Lepraria elobata Tønsberg and Pyrenula laetior Müll. Arg., are reported for the first time from the Southern Hemisphere, and five, Bathelium aff. sphaericum (C. W. Dodge) R. C. Harris, Lepraria jackii Tønsberg, Psiloparmelia arhizinosa Hale, Szczawinska tsugae A. Funk and Trinathotrema lumbricoides (Sipman) Sipman & Aptroot, are new to South America. To complement the rather poorly recognized distribution of some species, five of the taxa reported here are also new to Ecuador. Notes on distribution and chemistry are provided for most species, and some, especially those belonging to taxonomically critical groups, are discussed in greater detail.

Key words: biogeography, Ecuador, lichenized fungi, Neotropics, South America

INTRODUCTION

Bolivia has the highest ecosystem diversity in South America (Josse et al. 2003). Consequently, we can assume that its lichen biota is very rich, and the number of species should be at least as high as in countries as Brazil, Colombia, Peru or Venezuela (Lücking et al. 2009). Recently, considerable lichenological exploration has been undertaken in the country, mostly in years 2010–2013 (e.g., Krzewicka & Flakus 2010; Flakus & Kukwa 2012a, b; Flakus et al. 2011a, 2012a, b; Knudsen et al. 2012; Kukwa et al. 2012, 2013), with a preliminary overview of lichenized and lichenicolous fungi provided by Rodriguez Flakus et al. (2013). However, it appears that our
understanding of lichen diversity and distribution in Bolivia remains far from complete, and interesting discoveries are continuously being made.

This is the fifth part of our contribution to the understanding of Bolivian lichens based on recent collections by the authors and the continuing revision of herbarium material, mainly from B and LPB. Here, we present new records of many species, including numerous first reports for the country.

**Material and Methods**

Specimens are housed at B, BOLV, GOET, KRAM, LPB, PRA, QCA, UGDA, UPS (acronyms after Thiers 2012) and the private herbaria of A. Flakus and U. Schiefelbein. Thin layer chromatography (TLC) was used to identify the secondary lichen metabolites necessary and the private herbaria of A. Flakus and U. Schiefelbein; methods follow Culberson and Kristinsson (1970) and Orange for the recognition of some groups of lichens; methods follow Culberson and Kristinsson (1970) and Orange et al. (2001). The symbol (±) indicates that a particular substance was absent in some specimens only. In some cases, the fluorescence of the thallus in ultraviolet light (UV) was checked and spot tests were made using K (10% water solution of potassium hydroxide) and C (commercial bleach).

Notes on general distribution are presented only for those species reported as new to Bolivia. New national records are marked with an asterisk (*), those new to South America with two (**), and those new to the Southern Hemisphere with three (***)

The following abbreviations are used: **AF** – A. Flakus; **JQ** – J. Quisbert; **KB** – K. Bach; **MK** – M. Kukwa; **OP** – O. Plata; **PR** – P. Rodriguez Flakus; **RIM** – R. I. Meneses; **US** – U. Schiefelbein; **ZP** – Z. Palice; **NP** – National Park; **AMBORÓ** – Parque Nacional y Área Natural de Manejo Integrado Amboró; **APOLOBAMBA** – Área Natural de Manejo Integrado Nacional Apolobamba; **E.B. BENIK** – Reserva de la Biosfera Estación Biológica del Beni; **CARRASCO** – Parque Nacional Cerrasco; **COTAPATA** – Parque Nacional y Área Natural de Manejo Integrado Cotapata; **KAA-IYA** – Parque Nacional y Área Natural de Manejo Integrado Kaa-Iya del Gran Chaco; **SAJAMA** – Parque Nacional Sajama; **TARIQUÍA** – Reserva Nacional de Flora y Fauna Tariquía; **TUNI-CONDORIRI** - Parque Nacional Tuni Condoriri (abbreviations of protected areas according SERNAP Bolivia; [http://www.sernap.gob.bo](http://www.sernap.gob.bo)).

**Results**

New Bolivian records of 180 taxa are presented in this paper; 103 species are new to the country and 5 are new to Ecuador (Bryonora curvescens, Chaenotheca chlorella, C. sphaerocephala, Crocyia gossypina and Trichothelium caudatum). Five species are newly recorded from South America, and three are new to the Southern Hemisphere. Seventeen genera are reported for the first time from Bolivia: Bacidiopsora Kalb, Bryonora Poelt, Chaenotheca (Th. Fr.) Th. Fr., Cryptodiscus Corda, Eschatogonia Trevis., Gyalidea Lettau ex Vèzda, Heterocyphelium Vain., Hyperphyscia Müll. Arg., Ingvarella Guderley & Lumbsch, Letrouitia Hafellner & Bellem., Megaspora (Clauzade & C. Roux) Hafellner & V. Wirth, Physcidia Tuck., Polymeridium (Müll. Arg.) R.C. Harris, Pseudoprynula Müll. Arg., Sipmaniella Kalb, Szczawinska A. Funk and Tetramelas Norman.

**Acarospora boliviana** H. Magn.

This species has been reported for the first time from Bolivia by Magnusson (1929) and Weber (1968) and from one locality by Knudsen et al. (2008).

**Chemistry.** Epanorin and rhizocarpic acid (±).

**Specimens examined.** BOLIVIA. DEPT. COCABAMBA. Prov. Quillacollo, area of Incaraya-Sipe Sipe, 17°29′25″S, 66°22′09″W, 3146 m, semi-desert open area, saxicolous, 17 Dec. 2004, **AF 4975** (KRAM, LPB); DEPT. LA PAZ. Prov. Murillo, near Cumbre pass, 16°21′59″S, 68°02′37″W, 4604 m, high Andean Puna, saxicolous, 20 Dec. 2009, **AF 16307** & **PR (LPB)**; Prov. Quillacollo, area of Incaraya-Sipe Sipe, 17°29′25″S, 66°22′09″W, 3146 m, semi-desert open area, saxicolous, 17 Dec. 2004, **AF 4975** (KRAM, LPB); DEPT. LA PAZ. Prov. Murillo, near Cumbre pass, 16°21′59″S, 68°02′37″W, 4604 m, high Andean Puna, saxicolous, 20 Dec. 2009, **AF 16307** & **PR (LPB)**; Prov. Quillacollo, area of Incaraya-Sipe Sipe, 17°29′25″S, 66°22′09″W, 3146 m, semi-desert open area, saxicolous, 17 Dec. 2004, **AF 4975** (KRAM, LPB); DEPT. LA PAZ. Prov. Murillo, near Cumbre pass, 16°21′59″S, 68°02′37″W, 4604 m, high Andean Puna, saxicolous, 20 Dec. 2009, **AF 16307** & **PR (LPB)**; Prov. Omasuyos, Tajani, near Achacachi, 15°36′49″S, 69°04′02″W, 3869 m, Puna Húmeda, saxicolous, 6 July 2010, **AF 17792** & **PR (KRAM, LPB)**; DEPT. POTOSÍ. Prov. Daniel Campos, Puerto Chuvica, near Salar Uyuni, 20°36′06″S, 67°35′50″W, 3670 m, open semi-desert high Andean area, saxicolous, 4 Dec. 2009, **AF 14700** & **PR (KRAM, LPB)**; Prov. Nor Lípez, Pinturas Rupéstres, near Mallku Villamar, 21°46′20″S, 67°29′05″W, 4038 m, open semi-desert high Andean area, saxicolous, 6 Dec. 2009, **AF 14762** & **PR (KRAM, LPB)**.

*Acarospora bouardii* B. de Lesd.

This species has been reported in South America from Argentina and Venezuela. It is also known from North America (Knudsen et al. 2008).
**Acarospora chrysops** (Tuck.) H. Magn.

In South America this species has been found in Brazil, Columbia and Venezuela; it is also known from the Galapagos Islands, and it extends northward into Central America and the U.S.A. (Knudsen et al. 2008).

**Specimens examined.** BOLIVIA. DEPT. ORURO. Prov. Sajama, SAJAMA, ladera de la quebrada Kohniri, 18°07'07.1"S, 68°56'06.5"W, 4309 m, bosque de *Polylepis tarapacana* en una ladera con piedras grandes, on rock, 21 Nov. 2007, RIM et al. 4384 (B, LPB).

**Acarospora obpallens** (Nyl. ex Hasse) Zahlbr.

Previously reported from one locality in Bolivia (Knudsen et al. 2008).

**Chemistry.** Gyrophoric and lecanoric acids.

**Specimens examined.** BOLIVIA. DEPT. POTOSI. Prov. Camacho, al oeste de la ciudad de La Paz cerca de la comunidad de Ulla Ulla, en el cerro Wilamuku, 15°01'36.9"S, 69°11'52.9"W, 4770 m, vegetación Altoandina con rocas, on rock, 4 Dec. 2007, PR 250 (B, LPB).

**Acarospora rhabbarbarina** Hue

This species has been reported in Bolivia by Magnusson (1929) and Weber (1968) and recently from a few localities by Knudsen et al. (2008).

**Chemistry.** Rhizocarpic acid and epanorin (±).

**Specimens examined.** BOLIVIA. DEPT. LA PAZ. Prov. Franz Tamayo, APOLOBAMBA, Socondori Chico near Ulla Ulla, 15°00'38"S, 69°13'48"W, 4479 m, high Andean open vegetation, saxicolous, 4 July 2010, AF 17482 & PR (KRAM, LPB); Prov. Los Andes, an der Str. La Paz – Tiahuanacu, 3970 m, 14 June 1981, M. Liberman 295 (B); DEPT. ORURO. Prov. Sajama, SAJAMA, Aguas Calientes, near Sajama, 18°05'29"S, 69°02'28"W, 4448 m, Puna Sureña, shrubland dominated by *Baccharis*, saxicolous, 18 June 2010, AF 16523 & PR (KRAM, LPB); Huincurata, near Sajama, 18°07'01"S, 68°58'00"W, 4301 m, Puna Sureña, *Polylepis* forest, saxicolous, 19 June 2010, AF 16563 & PR (LPB); Jecha K'ala, 18°09'52"S, 68°49'08"W, 4184 m, Puna Sureña, grassland vegetation, saxicolous, 20 June 2010, AF 16717, 16608 & PR (KRAM, LPB).
Acarospora trachyticola (Müll. Arg.) Hue

This is the fifth locality of the species in Bolivia (Knudsen et al. 2012).

CHEMISTRY. No lichen substances detected by TLC.

Acarospora xanthophana H. Magn.

Previously known in Bolivia mostly from old records (Nylander 1861; Magnusson 1929; Weber 1968; Knudsen et al. 2008).

CHEMISTRY. Epanorin (+) and rhizocarpic acid (±).

Anzia parasitica (Fée) Zahlbr.

Previously known from only one locality in Bolivia (Flakus et al. 2011a).

Acarospora xanthophana (Müll. Arg.) Hue

Previously known in Bolivia mostly from old records (Nylander 1861; Magnusson 1929; Weber 1968; Knudsen et al. 2008).

CHEMISTRY. Epanorin (+) and rhizocarpic acid (±).

Chemistry. Divaricatic acid.

This species is widely distributed and occurs in all continents except Africa (Feuerer 2013). In South America it is known from Chile, Colombia, Ecuador and Venezuela (Arvidsson 1991; Marcano et al. 1996; Galloway & Quilhot 1998; Sipman et al. 2008).

Astrorhaphis alpina (Schaer.) R. Sant.

This pantropical species was reported in South America from Brazil, Colombia and the Guyanas (Hekking & Sipman 1988; Cáceres 2007; Sipman et al. 2008).

CHEMISTRY. Thallus UV –; pseudostroma with a superficial, orange, UV+ orange pigment.

Astrothelium cinnamomeum (Eschw.) Müll. Arg.

This pantropical species was reported in South America from Brazil, Colombia and the Guyanas (Hekking & Sipman 1988; Cáceres 2007; Sipman et al. 2008).

CHEMISTRY. Thallus UV –; pseudostroma with a superficial, orange, UV+ orange pigment.

Aspidothelium cinerascens Vain.

This species has been reported in Bolivia by Flakus and Wilk (2006).
Specimen examined. BOLIVIA. DEPT. LA PAZ. Prov. Nor Yungas, Coroico, Sol y Luna hotel, 1870 m, 16°11′56″S, 67°43′26″W, gardens with trees, on bark, 13 Dec. 2011, MK 10800 (LPB).

*Aspidothelium fugiens* (Müll. Arg.) R. Sant.

So far one locality was known from Bolivia (Flakus et al. 2012a).

Specimen examined. BOLIVIA. DEPT. LA PAZ. Prov. Nor Yungas, Coroico, Sol y Luna hotel, 1870 m, 16°11′56″S, 67°43′26″W, gardens with trees, on bark, 13 Dec. 2011, MK 10801 (LPB, UGDA).

**Bacidiopsora microphyllina** Kalb

This recently described species was known from Costa Rica, Brazil, Panama, Venezuela, as well as Cameroon and Réunion (Kalb 2004; Cáceres 2007).

Chemistry. Homosekikaic and sekikaic acids.

Specimens examined. BOLIVIA. DEPT. COCHABAMBA. Prov. Carrasco, CARRASCO, Ch’iqta rumi, 17°28′44″S, 65°17′06″W, 2120 m, Yungas cloud forest, corticolous, 21 July 2008, AF 10257, MK & PR (KRAM, LPB); near Sehuenças, 17°30′12″S, 65°16′30″W, 2220 m, Yungas cloud forest, corticolous, 21 July 2008, AF 10519, MK & PR (KRAM, LPB); DEPT. LA PAZ. Prov. Nor Yungas, COTAPATA, near Urpuma colony, 16°13′20″S, 67°52′34″W, 1989 m, Yungas montane forest, corticolous, 30 June 2010, AF 171882.2 & PR (KRAM, LPB).

*Bacidiopsora orizabana* (Vain.) Kalb

This rare lichen has been reported from Brazil and Mexico in the Neotropics (Kalb 2004; Cáceres 2007), and also from tropical Asia (Thailand and Taiwan) (Aptroot et al. 2007).

Specimens examined. BOLIVIA. DEPT. SANTA CRUZ. Prov. Cordillera, near Peto Blanco, park guard’s station, 18°48′25″S, 60°14′54″W, 330 m, transition Chiquitano-Chaqueño forest, corticolous, 6 Dec. 2011, AF 23768 (KRAM, LPB); KAA-IYA, Bañados del Izozog, near rio Parapeti, 18°28′40″S, 62°05′03″W, 320 m, Ribereño forest, corticolous, 2 Dec. 2010, AF 18881 & JQ (KRAM, LPB).

*Baemomyces rufus* (Huds.) Rebent.

This is the second record from Bolivia (Flakus et al. 2012a).

Specimen examined. BOLIVIA. DEPT. COCHABAMBA. Prov. Carrasco, CARRASCO, Koricaiza, 17°33′21″S, 65°16′29″W, 2950 m, Páramo Yungueño, terricolous, 18 Aug. 2012, AF 24620 (LPB).

*Bathelium madreporiforme* (Eschw.) Trevis.

According to Aptroot et al. (2008) *B. madreporiforme* is a Neotropical lichen, but it was also reported from Australia and Thailand (McCarthy 1993; Wolseley et al. 2002; Aptroot 2009). In the Neotropics it is known from Brazil, Colombia, Costa Rica, French Guiana, Paraguay and the U.S.A. (Florida) (Malme 1924; Hekking & Sipman 1988; Harris 1995; Cáceres 2007; Aptroot et al. 2008; Sipman et al. 2008).

Two of the samples cited here differ from the description provided in Aptroot et al. (2008) by having a yellow, UV+ orange thallus. However, according to Harris (1995; notes under *Trypetheium variolosum* Ach.) almost every lichexanthone-containing taxon has some lichexanthone-deficient specimens. Further study is required to determine whether these character states merit taxonomic recognition.

Chemistry. Thallus UV+ orange yellow or negative; pseudostroma containing orange, K+ red pigment.

Specimens with UV– thallus examined. BOLIVIA. DEPT. SANTA CRUZ. Prov. Cordillera, SSW of Roboré, 18°36′11″S, 59°53′06″W, 320 m, transition Chiquitano-Chaqueño forest, on tree bark, 4 Dec. 2011, MK 10601 (LPB, UGDA).

Specimens with UV+ orange thallus examined. BOLIVIA. DEPT. BENI. Prov. General José Ballivián Segurola, north of San Borja, 14°46′07″S, 66°46′51″W, 190 m, lowland Amazon forest surrounded by los Llanos de Mojos savanna, on bark, 3 Sept. 2012, MK 12052 (LPB, UGDA); DEPT. SANTA CRUZ. Prov. Cordillera, near Peto Blanco, 18°48′25″S, 60°14′54″W, 330 m, transition Chiquitano-Chaqueño forest, on bark, 6 Dec. 2011, MK 10679 (LPB, UGDA).
**Bathelium mastoideum** Afzel. *ex* Ach.

This species is known from tropical America and Africa (Harris 1995; Aptroot et al. 2008). In the Neotropics it has been reported from Brazil and Costa Rica (Cáceres 2007; Aptroot et al. 2008).

CHEMISTRY. Thallus UV+ orange-yellow; pseudostroma containing an orange pigment.

SPECIMEN EXAMINED. BOLIVIA. DEPT. SANTA CRUZ. Prov. Cordillera, 350 km on the road from Tucavaca to Roboré, 18°37’56”S, 59°36’50”W, 370 m, transition Chiquitano-Chaqueño forest, on twigs, 4 Dec. 2011, **MK 10531a** (LPB).

**Bathelium** aff. *sphaericum* (C. W. Dodge) R. C. Harris

This specimen is most similar to the African species *B. sphaericum*. However, it differs in having 4-spored asci and pseudostroma with sparse pigment crystals (in *B. sphaericum* the asci are 8-spored and the pigment crystals are abundant) (Dodge 1953; Letrouit-Galinou 1957; Harris 1995).

CHEMISTRY. Thallus UV--; pseudostroma with sparse crystals of orange-red pigment.

SPECIMEN EXAMINED. BOLIVIA. DEPT. LA PAZ. Prov. Franz Tamayo, between Apolo and Mapiri, 15°01’50”S, 68°18’33”W, 1120 m, Preandean Amazon forest, on bark, 23 Nov. 2011, **MK 10302** (LPB, UGDA).

*Bryonora curvescens* (Mudd) Poelt

This species was known previously from the Northern Hemisphere: Asia (Nepal), Europe (e.g., Austria, Fennoscandia), North America and South America (Venezuela) (Poelt & Obermayer 1991; Hafellner & Türk 2001; Santesson et al. 2004; Esslinger 2012).

CHEMISTRY. Not tested by TLC, but red needle-like crystals of norstictic acid formed in K from apothecial sections.

SPECIMEN EXAMINED. BOLIVIA. DEPT. LA PAZ. Prov. Murillo, near Cumbre pass, 16°21’59”S, 68°02’37”W, 4604 m, high Andean Puna, on terricolous bryophytes, 20 Dec. 2009, **AF 16315 & PR** (LPB). ECUADOR. Prov. Azuay, Área Nacional de Recreación Cajas, laguna Torreadora, 02°46’50”S, 79°13’40”W, 4100 m, over saxicolous bryophytes, 2 Aug. 1999, **ZP 3314** (PRA).

*Buellia mexicana* J. Steiner

This is the second record of the species from Bolivia (Feuerer & Sipman 2005).

SPECIMEN EXAMINED. BOLIVIA. DEPT. LA PAZ. Prov. Camacho, al oeste de la ciudad de La Paz cerca de la comunidad de Ulla Ulla, en el cerro Wilamuku, 15°02’4.1”S, 69°11’52.7”W, 4739 m, vegetation Altoandina con rocas, on rock, 4 Dec. 2007, **PR 228** (B, LPB).

*Bulbothrix suffixa* (Stirt.) Hale

This species occurs in tropical America and South Africa (Hale 1976a). In South America it was found in Brazil, Ecuador, Guyana and Venezuela (Hale 1976a; Fleig & Grüninger 2000; Nöske & Sipman 2004; Feuerer 2013).

CHEMISTRY. Not tested by TLC; medulla C+ red; cortex K+ yellow.

SPECIMEN EXAMINED. BOLIVIA. DEPT. LA PAZ. Prov. Franz Tamayo, between Apolo and Mapiri, 14°41’50”S, 68°25’07”W, 1510 m, savannah with scattered trees, on bark, 22 Nov. 2011, **MK 10216a** (LPB, UGDA).

*Bunodophoron macrocarpum* (Ohlsson) Wedin

Previously known from Chile, New Zealand and Tasmania (Wedin 1995), this lichen is...
reported here from its northernmost locality in South America.

Although one of the specimens (MK 11602) was sterile, it was very similar in overall morphology to the fertile collection.

**CHEMISTRY.** Sphaerophorin.

**SPECIMENS EXAMINED.** BOLIVIA. DEPT. COCHABAMBA. Prov. Carrasco, CARRASCO, Koricaza, 17°33′21″S, 65°16′29″W, 2950 m, Páramo Yungueño, on ground, 18 Aug. 2012, MK 11712 (LPB, UGDA); DEPT. SANTA CRUZ. Prov. Carrasco, near Sehuencas, 17°29′48″S, 65°16′22″W, 2250 m, Yungas cloud forest along the river, on bark, 18 Aug. 2012, MK 11602 (LPB, UGDA; sterile specimen).

*Byssoloma chlorinum* (Vain.) Zühlbr.

This lichen is already known from several localities in Bolivia (Ferraro 2002; Flakus & Lücking 2008; Lücking 2008).

**SPECIMENS EXAMINED.** BOLIVIA. DEPT. COCHABAMBA. Prov. Carrasco, CARRASCO, near Sehuencas, 17°29′48″S, 65°16′22″W, 2250 m, Yungas forest along the river, on bark, 18 Aug. 2012, MK 11758a (LPB, UGDA); DEPT. COCHABAMBA. Prov. Chapare, near Incachaca, 17°12′54″S, 65°49′30″W, 2028 m, Yungas cloud forest near road, corticolous, 7 July 2009, AF 13000 (KRAM, LPB).

*Calicium hyperelloides* Nyl.

This widely distributed species is known from Africa, southern and eastern Asia, Australia, South America, Oceania, and the southernmost parts of North America and Europe (Tibell 1996). In South America it has been reported from Argentina, Brazil, Colombia, Ecuador, French Guiana, Paraguay, Peru, Uruguay and Venezuela (Tibell 1996; Aptroot 2002; Sipman et al. 2008).

**CHEMISTRY.** Not tested by TLC; thallus C+ orange.

**SPECIMENS EXAMINED.** BOLIVIA. DEPT. COCHABAMBA. Prov. Chapare, CARRASCO, near Incachaca, 17°14′13″S, 65°49′02″W, 2294 m, Yungas cloud forest, on wood, 10 June 2006, AF 8259 (KRAM, LPB, UGDA).

*Calicium leucochlorum* Tuck.

This Neotropical lichen is already known from the Bahamas, Brazil, Cuba, the Dominican Republic, Paraguay, Peru and the U.S.A. (Florida) (Tibell 1991, 1996; Harris 1995).

**CHEMISTRY.** Thiophanic acid and an unidentified xanthone (similar in Rf classes to arthothelin); thallus C+ orange.

**SPECIMENS EXAMINED.** BOLIVIA. DEPT. BENI. Prov. Marbán, near San Lorenzo, 15°12′59″S, 64°47′08″W, 160 m, lowland Amazon forest surrounded by los Llanos de Moxos savanna, on palm, 28 Aug. 2012, MK 11896 (LPB, UGDA).

*Calicium salicinum* Pers.

Already known from a single locality in Bolivia (Flakus 2008).

**SPECIMENS EXAMINED.** BOLIVIA. DEPT. COCHABAMBA. Prov. Chapare, CARRASCO, near Incachaca, 17°14′13″S, 65°49′02″W, 2294 m, Yungas cloud forest, on wood, 10 June 2006, AF 8259.1 (LPB); DEPT. LA PAZ. Prov. Iturralde, near Cosmos colony, by the way between Ixiamas and Tumupasa, 14°01′35″S, 67°57′55″W, 300 m, open area, on wood, 27 July 2008, MK 6756 (LPB, UGDA); Tahua, 13°51′47″S, 67°54′32″W, 230 m, garden, on wood, 29 July 2008, MK 6919 (LPB, UGDA).

*Candelaria concolor* (Dicks.) Arnold

Reported from Bolivia by Feuerer et al. (1998) and Canseco et al. (2006), some or all of the previous records may belong to the recently distinguished *C. pacifica* M. Westb. & Arup, a widespread taxon known in South America from Chile (Westberg & Arup 2011).

**SPECIMENS EXAMINED.** BOLIVIA. DEPT. SANTA CRUZ. Prov. Florida, AMBORÓ, below la Yungu, 18°05′59″S, 63°56′55″W, 1650 m, dry forest on the slope, on rock, 8 June 2011, MK 9957a (LPB, UGDA).

*Canoparmelia amazonica* (Nyl.) Elix & Hale

This species has been reported in Bolivia by Hale (1976b) and Flakus et al. (2011a).

**CHEMISTRY.** Atranorin and protocetraric acid.
In one specimen, additional unidentified pigments (traces) were detected by TLC.

**Specimens examined.** BOLIVIA. DEPT. LA PAZ. Prov. Iturralde, forest above Tumupasa, 14°08′51″S, 67°53′34″W, 350 m, Subandean Amazon forest, on bark, 31 Aug. 2008, MK 7002 & 7090 (LPB, UGDA).

**Canoparmelia caroliniana** (Nyl.) Elix & Hale

This is the third record from Bolivia (Flakus *et al.* 2012a).

**Chemistry.** Perlatolic acid.

**Specimens examined.** BOLIVIA. DEPT. TARIJA. Prov. Aniceto Arce, Filo de Sidras, 22°14′50″S, 64°33′28″W, 1064 m, Tucumano-Boliviano submontane forest, on bark, 22 Nov. 2010, AF 18675 (KRAM, LPB, UGDA).

**Catapyrenium daedaleum** (Kremp.) Stein

This rather widely distributed species (Prieto *et al.* 2010) has been recorded in South America from Argentina, Chile and Peru (Breuss 1993; Galloyaw & Quilhot 1998).

**Specimens examined.** BOLIVIA. DEPT. LA PAZ. Prov. Camacho, al oeste de la ciudad de La Paz cerca de la comunidad de Ulla Ulla, en el cerro Wilamuku, 15°02′04″S, 69°11′52.7″W, 4739 m, vegetación Altoandina con rocas, terricolous, 4 Dec. 2007, PR 274 (B, LPB).

**Chaenotheca chlorella** (Ach.) Müll. Arg.

This is a widely distributed lichen, especially in temperate latitudes of the Northern and Southern Hemispheres. In Central and South America it is known from Brazil, Chile, Costa Rica and Colombia (Tibell 1996, 1998; Aptroot 2002; Sipman *et al.* 2008). It is reported here for the first time from Bolivia and Ecuador.

**Specimens examined.** BOLIVIA. DEPT. SANTA CRUZ. Prov. Caballero, El Rincón, 17°49′33″S, 64°38′50″W, 2670 m, Yungas cloud forest, on wood, 17 Aug. 2012, MK 11553 (LPB, UGDA). ECUADOR. Prov. Chimborazo, NP Sangay, El Altar, fragment of *Gynoxys* forest on the crest descending E of Laguna de Collantes (“Yellow Lagoon”), 01°40′10″S 78°25′45″W, 4150 m, on bark of *Gynoxys*, 26 Aug. 1999, ZP 3947 (PRA, UPS).

**Chaenotheca sphaerocephala** Nádv.

In South America this species has been reported from Argentina and Chile, but it is probably more common because several previous records of *C. brunneoala* (Ach.) Müll. Arg. are thought to belong to this species (Tibell 1998). A new record for Ecuador.

**Chemistry.** Barbatic acid (Bolivian material tested). Tibell (1998) also reported obtusatic acid in small concentrations, but this substance was not detected in Bolivian material as only small fragments were taken for TLC.

**Specimens examined.** BOLIVIA. DEPT. LA PAZ. Prov. Iturralde, forest above Tumupasa, 14°08′51″S, 67°53′34″W, 350 m, Subandean Amazon forest, on wood, 31 Aug. 2008, MK 7085 (LPB, UGDA); Prov. Larecaja, near Pajonal vilique, 15°28′02″S, 68°02′12″W, 890 m, Preandean Amazon forest, on bark of tree, 24 Nov. 2011, MK 10396 (LPB, UGDA). ECUADOR. Prov. Loja, NP Podocarpus, Cajanuma ranger station, mountain foggy forest, 04°07′S, 79°10′W, 2800–2850 m, on tree bark, 4 Aug. 1999, ZP 2982 (PRA, UPS); Prov. Carchi, volcán Chiles, along Tulcán–Maldonado road, ca 0.5 km ESE from laguna Verde, 00°47.96′N, 77°54.89′W, 4040 m, on roots, 12 July 1999, ZP 4599 (PRA, UPS).

**Cladonia andesita** Vain.

This Neotropical species is known from Brazil, Colombia, Ecuador, Peru and Venezuela (Ahti 2000).

**Specimens examined.** BOLIVIA. DEPT. COCHA-BAMBA. Prov. Ayopaya, 10 km de Cocapata hacia Cotacajes, 2800–2850 m, 16°38′S, 66°41′W, bosque húmedo, 10 May 1997, KB et al. 4 (B, LPB); 20 km de Cocapata hacia Cotacajes, 16°46′S, 66°44′W, 2000 m, bosque semideciduo intervenido, saxicolous, 15 May 1997, KB et al. 103 (B, LPB); comunidad de Saira Pata, 3500 m, 16°55′S, 66°55′W, sendero con rocas en bosque siempreverde, saxicolous, 15 Nov. 1997, KB 909 & I. Jiménez (B, LPB); DEPT. LA PAZ. Prov. Bautista Saavedra, cerro Asunta Pata, 1500 m, 15°05′S, 68°29′W, bosque siempreverde, on decaying wood, 21 June 1997, KB et al. 186 (LPB); 15 km de Charazani hacia Apolo, 2400 m, 15°11′S, 68°52′W, bosque húmedo secundario
con rocas, terricolous, 2 July 1997, KB et al. 291 (LPB); *ibidem*, 3500 m, 15°11'S, 68°52'W, bosque húmedo, terricolous, 4 July 1997, KB et al. 352 (LPB); Prov. Nor Yungas, Coscapa, *ca* 4 km de Cotapata hacia La Paz, 3450–3500 m, 16°23'W, 67°53'W, pastizal con rocas, on wood, saxicolous and terricolous, 9–10 Sept. 1997, KB et al. 463, 464 & 483 (B, LPB); San Vincente, *ca* 1 km al este de Chusipata, 3000 m, 16°21'S, 67°53'W, on saxicolous bryophytes, 21 Sept. 1997, KB et al. 581 (LPB); DEPT. SANTA CRUZ. Prov. Florida, Refugio Los Volcanes, 1000 m, 18°06'S, 63°36'W, ladera arenosa de una pared rocosa, saxicolous, 4 Oct. 1997, KB et al. 643 (LPB).

*Cladonia corymbites* Nyl.

In South America this species is known from Colombia, Ecuador, Peru and Venezuela; it is also known from Mexico, Costa Rica, Panama and the Caribbean, where it is apparently more common (Ahti 2000).

**SPECIMENS EXAMINED. BOLIVIA. DEPT. COCHABAMBA.** Prov. Chapare, CARRASCO, 130 km del camino antiguo de Cochabamba a Villa Tunari, 2200 m, 17°07’S, 65°36’W, bosque húmedo con paredes rocosas, terricolous, 10 Oct. 1997, KB et al. 702 (LPB); *ibidem*, 132 km del camino antiguo de Cochabamba a Villa Tunari, bosque siempreverde, epiphytic, 11 Oct. 1997, KB et al. 845 (LPB); DEPT. SANTA CRUZ. Prov. Florida, Refugio Los Volcanes, 1000 m, 18°06’S, 63°36’W, bosque semi-decidual, on decaying wood, 3 Oct. 1997, KB et al. 626 (B, LPB, with a specimen of Cladonia subradiata).

**Cladonia crispata** (Ach.) Flot.

This is the second collection of *C. crispata* from Bolivia (Flakus et al. 2012a).

**SPECIMEN EXAMINED. BOLIVIA. DEPT. LA PAZ.** Prov. Bautista Saavedra, 15 km de Charazani hacia Apolo, 2400 m, 15°11’S, 68°52’W, pastos con arbustos al lado del río Camata, terricolous, 1 July 1997, KB et al. 280 (LPB).

**Cladonia farinophylla** Ahti

Only recently reported from two localities in Bolivia (Flakus et al. 2012a).

**CHEMISTRY.** Fumarprotocetraric acid and related substances.

**SPECIMENS EXAMINED. BOLIVIA. DEPT. LA PAZ.** Prov. Nor Yungas, COTAPATA, Santa Catalina, 16°11’12’S, 67°52’07’W, Yungas montane forest, on soil, 22 May 2011, US (LPB, herb. Schiefelbein 2945).

**Cladonia furcata** (Huds.) Schrad.

This is the third Bolivian record of this species (Ahti 2000; Flakus et al. 2012a).

**SPECIMENS EXAMINED. BOLIVIA. DEPT. COCHABAMBA.** Prov. Ayopaya, comunidad de Saila Pata, 3700 m, 16°55’S, 66°55’W, quebrada en Puna con bosque siempreverde de Polylepis, terricolous, 15 Nov. 1997, KB 917 & I. Jiménez (B, LPB).

**Cladonia macilenta** Hoffm.

Previously reported from Bolivia by Flakus et al. (2012a).

**CHEMISTRY.** Barbatic acid (one specimen examined by TLC).

**SPECIMENS EXAMINED. BOLIVIA. DEPT. COCHABAMBA.** Prov. Ayopaya, 10 km de Cocapata hacia Cotacajes, 2800–2850 m, 16°38’S, 66°41’W, bosque húmedo, epiphytic, 10 May 1997, KB et al. 11c & 18c (B, LPB); DEPT. LA PAZ. Prov. Nor Yungas, near Pongo, 16°19’28’’S, 67°57’21’’W, 3822 m, Páramo Yungeño, on soil, 13 May 2009, US (LPB, herb. Schiefelbein 3337).

*Cladonia nana* Vain.

In South America this species has been reported from Brazil, Colombia, Ecuador, Paraguay, Peru and Venezuela (Ahti 2000). It is also known from the Azores, the Caribbean, Costa Rica, Guatemala, Mexico, Nicaragua, Panama and southeastern of the U.S.A. (Ahti 2000; Ahti unpubl.).

**SPECIMENS EXAMINED. BOLIVIA. DEPT. COCHABAMBA.** Prov. Chapare, CARRASCO, 130 km del camino antiguo de Cochabamba a Villa Tunari, 2200 m, 17°07’S, 65°36’W, bosque húmedo con paredes rocasas, terricolous, 10 Oct. 1997, KB et al. 701 (B, LPB); DEPT. LA PAZ. Prov. Bautista Saavedra, 15 km de Charazani hacia Apolo, 2400 m, 15°11’S, 68°52’W, pastos con arbustos al lado del río Camata, terricolous, 1 July 1997, KB et al. 279 (LPB). ECUADOR. Prov. Tungurahua, rio Verde, 1400–1420 m, 01°24’03’’S, 78°17’43’’W, on...
rock, 28 July 1999 & 24 Sept. 2000, ZP 2859 & 4256
(PRA, QCA).

**Cladonia ochrochlora** Flörke

These are the first recently confirmed Bolivian records of this much misinterpreted species (Ahti 2000).

CHEMISTRY. Fumarprotocetraric acid and related substances.

**Specimens examined.** BOLIVIA. DEPT. COCHABAMBA. Prov. Ayopaya, 10 km de Cocapata hacia Cotacajes, 2800–2850 m, 16°38’S, 66°41’W, bosque húmedo, on decaying wood, 10 May 1997, KB et al. 12 (B, LPB); DEPT. LA PAZ. Prov. Bautista Saavedra, 6 km de Pauji-Yuyo hacia Charazani, 1350 m, 15°02’S, 68°29’W, bosque siempreverde, on decaying wood, 14 June 1997, KB et al. 163 (LPB); 15 km de Charazani hacia Apolo, 2450 m, 15°11’S, 68°52’W, bosque húmedo secundario, at the base of tree, 2 July 1997, KB et al. 311 (B, LPB); Prov. Larecaja, near Consata, 15°20’46”S, 68°29’16”W, 1240 m, Yungas montano inferior secondary forest, on wood, 15 May 2011, US (LPB, herb. Schiefelbein 3336); Prov. Nor Yungas, Coscapa, senda al oeste del camino principal ca 4 km de Cotapata hacia La Paz, 3500 m, 16°23’S, 67°53’W, S-exposición, bosque siempreverde, epiphytic, 9 Sept. 1997, KB et al. 462 (LPB).

°**Cladonia ramulosa** (With.) J. R. Laundon

This is a widespread temperate to tropical species; in South America it is already known from Argentina, Brazil, Colombia, Paraguay, Uruguay and Venezuela (Ahti 2000).

CHEMISTRY. Fumarprotocetraric acid and related substances.

**Specimens examined.** BOLIVIA. DEPT. LA PAZ. Prov. Larecaja, cerca Consata, 15°20’46”S, 68°29’16”W, 1240 m, Yungas montano inferior secondary forest, on detritus, 15 May 2011, US (LPB, herb. Schiefelbein 2971).

°**Coenogonium leprieurii** (Mont.) Nyl.

This pantropical lichen is known in South America from Brazil, Colombia, French Guiana and Venezuela (Sipman 1992a; Rivas Plata et al. 2006, Cáceres 2007; Sipman et al. 2008).

Specimens examined. BOLIVIA. DEPT. LA PAZ. Prov. Nor Yungas, Cotapata cerca a la comunidad del Chairo, 1370 m, 16°13’18”S, 67°52’36”W, manchón de bosque cercano al río Huarinilla, corticolous, 11 May 2006, PR et al. 72 (B, LPB).

**Coenogonium linkii** Ehrenb.

In Bolivia this species was reported by Herzog (1922, 1923) and recently by Flakus (2008).

**Specimens examined.** BOLIVIA. DEPT. COCHABAMBA. Prov. Chapare, CARRASCO, 130 km del camino antiguo de Cochabamba a Villa Tunari, 2200 m, 17°07’S, 65°36’W, bosque húmedo, epiphytic, 10 Oct. 1997, KB et al. 700 (LPB); 137 km del camino antiguo de Cochabamba a Villa Tunari, 1600 m, 17°06’S, 65°35’W, bosque siempreverde, epiphytic, 11 Oct. 1997, KB et al. 760 (LPB); DEPT. LA PAZ. Prov. Nor Yungas, Hacienda Sacramento, ca 8 km del camino principal de Chusipata hacia Coiroco, 2500 m, 16°24’S, 67°47’W, bosque siempreverde, epiphytic, 20 Sept. 1997, KB et al. 553 (B, LPB); DEPT. SANTA CRUZ. Prov. Florida, Refugio Los Volcanes, 1000 m, 18°06’S, 63°36’W, bosque semideciduo, epiphytic, 2 Oct. 1997, KB et al. 596 (LPB).

°**Coenogonium nepalense** (G. Thor & Vězda) Lücking, Aptroot & Sipman

This species is known from Central and South America, and the eastern Paleotropics (Rivas Plata et al. 2006). In South America it has been reported from Argentina and Brazil (Cáceres 2007; Ferraro & Michlig 2013).

**Specimens examined.** BOLIVIA. DEPT. TARIFA. Prov. Burnet O’Connor, road between Entre Rios and Tarija, 21°28’29”S, 64°12’32”W, 1820 m, Tucumano-Boliviano montano forest, on bark, 11 Aug. 2012, MK 11412a (LPB, UGDA).

°**Coenogonium pulchrum** (Müll. Arg.) Kalb

Previously this lichen was known only from Brazil and Venezuela (Kalb 1991; Rivas Plata et al. 2006).

**Specimens examined.** BOLIVIA. DEPT. COCHABAMBA. Prov. Carrasco, CARRASCO, near Sehuencas, by río López Mendoza, 17°30’26”S, 65°16’55”W, 2226 m, Yungas cloud forest, corticolous, 22 July 2008, AF 10696, MK & PR (KRAM, LPB).
**Cora glabrata** (Spreng.) Fr.  

Dictyonema glabratum (Spreng.) D. Hawksw.

This species is common in humid habitats in the Bolivian Andes, but few records have been published (Flakus et al. 2012a; Rodriguez Flakus et al. 2013).

Some specimens have granular soredia at the margins of the thalli, but otherwise they match typical material. Although they are tentatively identified as *C. glabrata*, they require further study.

**Specimens examined.** BOLIVIA. DEPT. BENI. Prov. José Ballivián, 16 km por carretera maderera al SW del km 12 Yucumo – Rurrenabque, 700 m, 15°06′S, 67°07′W, quebrada con bosque siempreverde, saxicolous, 1 Aug. 1997, KB et al. 370 (B, LPB); DEPT. COCHABAMBA. Prov. Ayopaya, 10 km de Cocapata hacia Cotacajes, 2750 m, 16°38′S, 66°41′W, bosque húmedo, terricolous, 10 May 1997, KB et al. 1 (B, LPB); Prov. Carrasco, CARRASCO, near Phaqcha, 17°27′13″S, 65°16′44″W, montane cloud forest, among mosses, 20 July 2008, MK 6237 (LPB, UGDA); near Sehuencas by río López Mendoza, 17°30′38″S, 65°15′55″W, 2226 m, montane cloud forest, on bark of tree, 22 July 2008, MK 6634 (LPB, UGDA); near Incachaca, 17°15′10″S, 65°48′51″W, 2330 m, disturbed montane cloud forest, on bark of tree, 23 July 2008, MK 6690 (LPB, UGDA); Prov. Chapare, CARRASCO, 132 km del camino antiguo de Cochabamba a Villa Tunari, 1950 m, 17°06′S, 65°35′W, bosque húmedo, saxicolous, 10 Oct. 1997, KB et al. 673 (B, LPB); DEPT. LA PAZ. Prov. Camacho, cerca de la comunidad de Ulla Ulla, en el cerro Wilamuku, 4739 m, 15°02′06″S, 69°11′88″W, vegetación Altoandina, terricolous, 4 Dec. 2007, PR 265 (B, LPB); Prov. Nor Yungas, near Pucara, 16°12′10″S, 67°50′39″W, 1360 m, montane forest, on bark of tree, 3 Aug. 2008, MK 7140 & 7166 (LPB, UGDA); between Coroico and La Paz, 16°13′09″S, 67°49′32″W, 2600 m, open place by the road in montane cloud forest, on ground, 4 Aug. 2008, MK 7177a & 7182 (LPB, UGDA); Coroico, Sol y Luna hotel, 1870 m, 16°11′56″S, 67°43′26″W, gardens with trees, on ground, 13 Dec. 2011, MK 10830 (LPB, UGDA); CATOPATA, Santa Catalina, above Tunkini, 16°11′12″S, 67°52′07″W, ca 2700 m, Yungas montane forest, on ground, 22 May 2011, MK 9059 (LPB, UGDA); Prov. Sud Yungas, Mururata, bajo la mina Bolsa Negra, pasando por el pueblo de Tres Ríos, 3851 m, 16°35′S, 67°45′W, terricolous, 6 Apr. 1995, J. Gonzales 388 (B, LPB); DEPT. SANTA CRUZ. Prov. Ca-

This species is common in humid habitats in the Bolivian Andes, but few records have been published (Flakus et al. 2012a; Rodriguez Flakus et al. 2013).

Some specimens have granular soredia at the margins of the thalli, but otherwise they match typical material. Although they are tentatively identified as *C. glabrata*, they require further study.

**Specimens examined.** BOLIVIA. DEPT. COCHABAMBA. Prov. Carrasco, CARRASCO, between Sehuencas and Monte Punku, ca 2650 m, montane cloud forest, on humus, 22 July 2008, MK 6578 (LPB); DEPT. LA PAZ. Prov. Nor Yungas, between Coroico and La Paz, 16°13′09″S, 67°49′32″W, 2600 m, open place by the road in montane cloud forest, on ground, 4 Aug. 2008, MK 7190 (LPB, UGDA); DEPT. SANTA CRUZ. Prov. Carrasco, near Siberia, 17°49′38″S, 64°44′45″W, 3950 m, open Yungas cloud forest, on bark and ground, 16 Aug. 2012, MK 11459 & 11481 (LPB, UGDA).

*Crocynia gossypina* (Sw.) A. Massal.

This species is known from Australia, Asia, Oceania, Central and South America (Elix & McCarthy 1998; Umaña-Tenorio et al. 2002; Feuerer 2013). In South America it has been reported from Brazil, Colombia, French Guiana, Guyana, Surinam and Venezuela (Hekking & Sipman 1988; Sipman 1992a; Marcano et al. 1996; Cáceres 2007; Sipman et al. 2008; Feuerer 2013). Here is reported as new to Ecuador.

**Chemistry.** Atranorin and terpenoid.

**Specimens examined.** BOLIVIA. DEPT. BENI. Prov. Vaca Diez, Chacuela Esperanza, 10°32′09″S, 65°34′55″W, 128 m, lowland Amazon forest, on granite rock, 4 June 2006, AF 7494, 7497 & 7498 (KRAM, LPB); DEPT. SANTA CRUZ. Prov. José Miguel de Velasco, sendero de goma near Florida, 14°37′48″S, 61°12′02″W, 170 m, lowland Amazon secondary forest, corticolous, 16 Dec. 2009, AF 16128 & PR (KRAM, LPB). ECUADOR. Prov. Napo, NP Yasuni, río Tiputini, rainforest, 0°37′S, 76°28′W, 300 m, corticolous, 13 & 14. Aug. 1999, ZP 2545 & 2809 (PRA, QCA).

*Crocynia pyxinoides* Nyl.

Only recently reported from Bolivia (Flakus et al. 2012a).

**Chemistry.** Atranorin and 1 or 2 terpenoids.

**Specimens examined.** BOLIVIA. DEPT. LA PAZ. Prov. Nor Yungas, Cotapata, a 15 minutos de la carretera Polo Polo, 1375 m, 16°10′57.4″S, 67°45′8.4″W, bosque intervenido cerca encuentra la carretera secundaria hacia...
Charobamba, corticolous, 20 Dec. 2006, PR & S. Gallegos 336 (B, LPB); DEPT. BENI. Prov. Iténez, Puerto Feliz colony by Río Blanco, 13°09′23″S, 63°43′24″W, 137 m, lowland Amazon forest, corticolous, 16 Aug. 2008, AF 12121 & PR (KRAM); Prov. Vaca Diez, Cachuela Esperanza, 10°32′09″S, 65°34′55″W, 128 m, lowland Amazon forest, on granite rock, 4 June 2006, AF 7493 & 7495.1 (KRAM, LPB).

*Cryptodiscus similis* (Vêzda) Baloch

This rare lichen is known from Brazil and Jamaica (Baloch et al. 2009).

Specimens examined. BOLIVIA. DEPT. SANTA CRUZ. Prov. Andrés Ibáñez, AMBORÓ, on the road to San Mateo de Toresilla, 17°48′11″S, 64°39′28″W, 2250 m, Yungas cloud forest, terricolous, 9 June 2011, AF 22665 & OP (KRAM, LPB).

*Culbersonia nubila* (Moberg) Essl.

This species has been reported in Bolivia only from two localities (Obermayer et al. 2009).

Specimens examined. BOLIVIA. PROV. LA PAZ. Prov. Murillo, La Paz, Parque Zenón Iturralde, 3526 m, 16°30′24″S, 68°07′12″W, area verde, 3 July 2008, G. Yapu-Alcázar 221 (B, LPB); DEPT. POTOSÍ. Prov. Nor Lípez, Viscachitas, near del Árbol de Piedra, 21°55′33″S, 68°00′18″W, 4612 m, open semi-desert high Andean area, saxicolous, 5 Dec. 2009, AF 14736.4 & PR (LPB).

*Dibaeis globulifera* Kalb & Gierl

This Neotropical lichen is known only from Brazil, Colombia, Costa Rica and Venezuela (Gierl & Kalb 1993; Umaña-Tenorio et al. 2002; Sipman et al. 2008).

Specimens examined. BOLIVIA. DEPT. LA PAZ. Prov. Bautista Saavedra, Cerro Asunta Pata, 1500 m, 15°05′S, 68°29′W, pared lodoso, saxicolous, 21 June 1997, KB et al. 177 (B, LPB); Prov. Nor Yungas, Serranía Bellavista, ca 36 km por camino de Caranavi hacia Sapecho, 1500 m, 15°41′S, 67°30′W, pared rocosa, saxicolous, 31 Aug. 1997, KB et al. 435 (B, LPB).

*Dictyonema melvinii* Chaves, Lücking & Umaña

Three localities were so far reported from Bolivia (Chaves et al. 2004; Flakus et al. 2012a).

Specimens examined. BOLIVIA. DEPT. LA PAZ. Prov. Bautista Saavedra, Cerro Asunta Pata. 1500 m, 15°05′S, 68°29′W, bosque siemprevverde, epiphytic, 21 June 1997, KB et al. 195 (B, LPB).

*Dictyonema phyllogenium* (Müll. Arg.) Zahlbr. s.str.

In the Neotropics this lichen has been reported from Brazil, Costa Rica, Guyana, Ecuador, Panama, Peru and the U.S.A. (Florida) (Lücking 2008; Lücking et al. 2011a).

While this species might be best placed in *Cyphelostereum* D. A. Reid (Yáñez et al. 2012), no formal combination has been made so far.

Specimens examined. BOLIVIA. DEPT. COCHARABAMBA. Prov. Carrasco, CARRASCO, near Phaqcha, 17°27′13″S, 65°16′44″W, 2850 m, montane cloud forest, on bark of tree, 20 July 2008, MK 6206 (LPB, UGDA); DEPT. LA PAZ. Prov. Bautista Saavedra, Calzada, 15°09′06″S, 68°30′24″W, 835 m, Preandean Amazon secondary forest, on rock, 17 May 2011, MK 8804a (LPB).

*Dictyonema schenckianum* (Müll. Arg.) Zahlbr.

*D. sericeum f. schenckianum* (Müll. Arg.) Parm.

Flakus (2008) and Flakus et al. (2012a) recorded this taxon from only three localities in Bolivia.

Specimens examined. BOLIVIA. DEPT. COCHARABAMBA. Prov. Carrasco, CARRASCO, Korecasa, 17°33′21″S, 65°16′29″W, 2950 m, Páramo Yungueño, on bark, 18 Aug. 2012, MK 7169a (LPB, UGDA); DEPT. LA PAZ. Prov. Nor Yungas, near Pacallo, 16°12′10″S, 67°50′39″W, 1360 m, montane forest, on bark of tree, 3 Aug. 2008, MK 7169a (LPB); DEPT. SANTA CRUZ. Prov. Caballero, near Siberia, 17°49′34″S, 64°43′14″W, 2800 m, Yungas cloud forest, on bark, 16 Aug. 2012, MK 11480 (LPB, UGDA); near Siberia, 17°50′15″S, 64°42′36″W, 2700 m, Yungas cloud forest, on decaying pteridophytes, 16 Aug. 2012, MK 11495 (LPB, UGDA).

*Dictyonema sericeum* (Sw.) Berk. s.str.

This species has been reported only from a few Bolivian localities by Parmasto (1978) and Flakus (2008).

Specimens examined. BOLIVIA. DEPT. COCHARABAMBA. Prov. Carrasco, CARRASCO, near Phaqcha,
17°27′13″S, 65°16′44″W, 2850 m, montane cloud forest, among mosses, 20 July 2008, MK 6160 (LPB, UGDA); Prov. Chapare, CARRASCO, 130 km del camino antiguo de Cochabamba a Villa Tunari, 2200 m, 17°07′S, 65°36′W, bosque húmedo, epiphytic, 10 Oct. 1997, KB et al. 693 (LPB); 137 km del camino antiguo de Cochabamba a Villa Tunari, 1600 m, 17°06′S, 65°35′W, bosque siemprevéreder, epiphytic, 11 Oct. 1997, KB et al. 767 (LPB); 139 km del camino antiguo de Cochabamba a Villa Tunari, 1450 m, 17°07′S, 65°34′W, bosque siemprevéreder, epiphytic, 12 Oct. 1997, KB et al. 798 & 799 (LPB); 156 km del camino antiguo de Cochabamba a Villa Tunari, 850 m, 17°05′S, 65°32′W, bosque siemprevéreder, epiphytic, 12 Oct. 1997, KB et al. 842 (B, LPB); DEPT LA PAZ. 15 km de Charazani hacia Apolo, 2450 m, 15°11′S, 68°52′W, bosque húmedo secundario, at the base of tree, 2 July 1997, KB et al. 318 (B, LPB); 6 km de Pauji-Yuyo hacia Charazani, 1350 m, 15°02′S, 68°29′W, bosque siemprevéreder con Iritae y Geonoma, epiphytic, 14 June 1997, KB et al. 159 (LPB); Cerro Asunta Pata, 1500 m, 15°05′S, 68°29′W, bosque siemprevéreder, epiphytic, 21 June 1997, KB et al. 166 & 182 (B, LPB); Prov. Nor Yungas, near Pacallo, 16°12′10″S, 67°50′39″W, 1360 m, montane forest, on bark of tree, 3 Aug. 2008, MK 7169 (LPB, UGDA); Prov. Nor Yungas, Cotapata, 1 hora caminando desde Sandillani hacia Bajo Hornumi, 1520 m, 16°11′06″S, 67°49′30″W, bosque muy húmedo, corticolous, 13 Oct. 2006, PR et al. 182 (B, LPB); Prov. Larecaja, near Achiquiri, 15°13′31″S, 68°13′49″W, 1070 m, Yungas inferior secondord forest, on bark, 16 Nov. 2011, MK 8654 (LPB, UGDA); Prov. Nor Yungas, COTAPATA, Santa Catalina, above Tunkini, 16°11′12″S, 67°52′07″W, ca 2700 m, Yungas montane forest, on bark, 22 May 2011, MK 9012 (LPB, UGDA).

'Dipsochistella trapperi' (Kalb & Vězda) Lücking, Sérus. & Vězda

This very rare species is known only from the type locality in Bolivia (Kalb & Vězda 1988; Lücking et al. 2005).

SPECIMENS EXAMINED. BOLIVIA. DEPT. LA PAZ. Prov. Murillo, Valle del Zongo, 16°07′41″S, 68°05′55″W, 2446 m, Yungas cloud forest, saxicolous, 29 May 2011, AF 22018 & OP (KRAM, LPB).

ADDITIONAL SPECIMEN EXAMINED. Kalb, Lich. Neotrop. 423 (B, isotype of Gyalideopsis trapperi Kalb & Vězda).

Dirinaria planatana' (Fée) D. D. Awasthi

This pantropical-subtropical species was known from a single locality in Bolivia (Awasthi 1975).

SPECIMENS EXAMINED. BOLIVIA. DEPT. LA PAZ. Prov. Sud Yungas, Alto Beni, Nueva Israel, 15°34′46.2″S, 67°15′54.6″W, 540 m, plantation, on Theobroma cacao, 25 June 1999, N. Derakshani 14 (B, GOET).

*Eschatogonia dissecta* Timdal & R. Sant.

This lichen is known only from South America (Brazil, French Guiana, Peru, Venezuela) (Timdal 2008a; Kalb et al. 2012).

SPECIMENS EXAMINED. BOLIVIA. DEPT. BENI. Prov. Iténez, San Martinsito colony by rio San Martin, 13°18′07″S, 63°25′31″W, 150 m, lowland Amazon forest, corticolous, 20 Aug. 2008, AF 12753 & PR (KRAM, LPB).

*Glyphis cicatricosa* Achn.

This pantropical species was previously reported from Bolivia by Flakus and Wilk (2006).

CHEMISTRY. No substances detected by TLC.

SPECIMENS EXAMINED. BOLIVIA. DEPT. BENI. Prov. Mamoré, near La Esperanza, 13°55′26″S, 64°59′46″W, 140 m, los Llanos de Moxos savanna by lake, on bark, 1 Sept. 2012, MK 12013 (LPB, UGDA); Prov. Marbán, near San Lorenzo, 15°12′59″S, 64°47′08″W, 160 m, lowland Amazon forest surrounded by los Llanos de Moxos savanna, on twigs, 28 Aug. 2012, MK 11897a (UGDA, with a specimen of Glyphis scrophulinifera); DEPT. LA PAZ. Prov. Iturrelde, near San Pedro, 13°43′59″S, 68°00′38″W, 250 m, savanna, on bark of tree, 28 July

**Dictyonema sericeum** f. phyllophilum Parm.

This taxon has been reported from only three localities in Bolivia (Flakus et al. 2012a).

It is a member of the *D. sericeum* group and most probably it deserves the rank of species (Chaves et al. 2004; Yáñez et al. 2012).

SPECIMENS EXAMINED. BOLIVIA. DEPT. LA PAZ. Prov. Nor Yungas, COTAPATA, by Sillu Tincara pre-Columbian route, 16°17′22″S, 67°53′29″W, 3520 m, transition Páramo Yungueño-Yungas montane cloud forest, on bark, 25 May 2011, MK 9455 (LPB, UGDA); DEPT. SANTA CRUZ. Prov. Florida, AMBORÓ, above la Yunga, senda Los Helechos, 18°03′30″S, 63°54′36″W, 2330 m, Yungas cloud forest, on bark, 7 June 2011, MK 9761 (LPB).

No substances detected by TLC.
2008, MK 6898 (LPB, UGDA); Prov. Bautista Saavedra, on the road between Charazani and Apolo, 15°12'43"S, 68°47'25"W, 1650 m, Yungas montane forest, open area with boulders, on bark, 18 May 2011, MK 8868 (LPB, UGDA); DEPT. SANTA CRUZ. Prov. Cordillera, between Tucavaca and Roboró, 18°37'56"S, 59°36'50"W, 370 m, transition Chiquitano-Chaqueño forest, on bark, 4 Dec. 2011, MK 10515a (LPB); Prov. Ichilo, AMBORÓ, Macufucuc settlement, 17°43'38"S, 63°35'37"W, 460 m, Amazon forest, on twigs, 6 June 2011, MK 9697 (LPB, UGDA).

**Glyphis scyphulifera** (Ach.) Staiger

This lichen is already known from two Bolivian collections (Kukwa et al. 2013).

**SPECIMENS EXAMINED. BOLIVIA. DEPT. BENI. Prov. Marbán, near San Lorenzo, 15°12'59"S, 64°47'08"W, 160 m, lowland Amazon forest surrounded by los Llanos de Mojos savanna, on twigs, 28 Aug. 2012, MK 11897a (LPB, UGDA).**

**Glyphis substriatula** (Nyl.) Staiger

Kukwa et al. (2013) reported this species from two localities in Bolivia.

**SPECIMENS EXAMINED. BOLIVIA. DEPT. BENI. Prov. Cercado, Trinidad - Missiones Guarayos, ca 250 m, on bark, Nov. 1926, E. Werdermann 2906 (B); DEPT. SANTA CRUZ. Prov. Cordillera, KAA-IYA, near Peto Blanco, 18°56'26"S, 60°22'39"W, 340 m, Chiquitano forest, on twigs, 5 Dec. 2011, MK 10643 (LPB, UGDA).**

**Gomphillus hyalinus** (Pat.), Lücking, Kalb & Vězda

This species was recently reported from one locality in Bolivia (Flakus et al. 2012a, as *G. ophiitosporus* Kalb & Vězda).

**SPECIMENS EXAMINED. BOLIVIA. DEPT. LA PAZ. Prov. Bautista Saavedra, 15 km de Charazani hacia Apolo, 15°11'S, 68°52'W, 3500 m, bosque húmedo, epiphytic, 4 July 1997, KB et al. 342b & 345 (B, LPB).**

**Graphis argentata** Lücking & Umaña

Recently reported from Bolivia by Kukwa et al. (2013).

**CHEMISTRY. No lichen compounds detected by TLC.**

**Graphis duplicata** Ach.

This is the third Bolivian locality for this lichen (Kukwa et al. 2013).

**CHEMISTRY. No lichen compounds detected by TLC.**

**Graphis lumbricina** Vain.

Kukwa et al. (2013) reported one specimen from Bolivia.

**CHEMISTRY. Norstictic acid.**

**SPECIMENS EXAMINED. BOLIVIA. DEPT. LA PAZ. Prov. Nor Yungas, between Coroico and La Paz, 16°14'30"S, 67°49'58"W, 2848 m, Yungas secondary cloud forest, epiphytic, 23 May 2011, US (LPB, herb. Schiefelbein 3097, 3100, 3101); ibidem, 16°13'33"S, 67°49'20"W, 2600 m, Yungas secondary cloud forest, epiphytic, 23 May 2011, US (LPB, herb. Schiefelbein 3081); Chusipata, 16°17'09"S, 67°51'00"W, 3228 m, Yungas cloud forest, epiphytic, 24 May 2011, US (LPB).**

**Graphis nudiformis** Lücking

This species was recently reported from Bolivia, that being the first record from the Southern Hemisphere (Kukwa et al. 2013).

**CHEMISTRY. No lichen compounds detected by TLC.**

**SPECIMENS EXAMINED. BOLIVIA. DEPT. LA PAZ. Prov. Nor Yungas, near Nogalani, on the road from Coroico to La Paz, 16°12'57"S, 67°49'15"W, 2168 m, Yungas secondary cloud forest, epiphytic, 23 May 2011, US (LPB).**

**Graphis pinicola** Zahlbr.

The first South American record was recently reported from Bolivia by Kukwa et al. (2013).
**CHEMISTRY.** No lichen compounds detected by TLC.

**Specimens examined.** BOLIVIA. DEPT. LA PAZ. Prov. Franz Tamayo, near Apolo, 14°50′15″S, 68°26′58″W, 1430 m, Preandean Amazon forest, epiphytic, 17 May 2011, US (LPB, herb. Schiefelbein 2993); Prov. Larecaja, near Charapampa, 15°15′22″S, 68°13′02″W, 760 m, Amazon secondary forest, epiphytic, 16 May 2011, US (LPB, herb. Schiefelbein 2984); Prov. Nor Yungas, COTAPATA, Santa Catalina, above Tunkini, 16°11′12″S, 67°52′07″W, Yungas montane forest, epiphytic, 22 May 2011, US (LPB, herb. Schiefelbein 3028).

*Graphis ruiziana* (Fée) A. Massal.

Two localities were recently reported from Bolivia (Kukwa et al. 2013).

**CHEMISTRY.** No lichen compounds detected by TLC.

**Specimens examined.** BOLIVIA. DEPT. LA PAZ. Prov. Nor Yungas, COTAPATA, Santa Catalina, above Tunkini, 16°11′12″S, 67°52′07″W, Yungas montane forest, epiphytic, 22 May 2011, US (LPB, herb. Schiefelbein 3028).

*Graphis subflexibilis* Lücking & Chaves

This species was recorded for the first time from Bolivia and the Southern Hemisphere by Kukwa et al. (2013).

**CHEMISTRY.** No lichen compounds detected by TLC.

**Specimens examined.** BOLIVIA. DEPT. LA PAZ. Prov. Nor Yungas, COTAPATA, by Silu Tincara pre-Columbian route, 16°17′22″S, 67°53′29″W, 3518 m, transition Páramo Yungueño-Yungas montane cloud forest, epiphytic, 25 May 2011, US (LPB, herb. Schiefelbein 3454).

*Graphis tumidula* (Fée) Spreng.

This rare Neotropical lichen has been reported from two localities in Bolivia by Kukwa et al. (2013).

**CHEMISTRY.** No lichen compounds detected by TLC.

**Specimens examined.** BOLIVIA. DEPT. LA PAZ. Prov. Nor Yungas, COTAPATA, Santa Catalina, above Tunkini, 16°11′12″S, 67°52′07″W, Yungas montane forest, epiphytic, 22 May 2011, US (LPB).

*Gyalidea hyalinescens* (Nyl.) Vězda

In the Neotropics this species has been reported from Costa Rica and Ecuador (Umaña-Tenorio et al. 2002; Nöske & Sipman 2004); it is also known from Europe, Australia and New Zealand (e.g., Aptroot et al. 1999; Coppins 2002; Feuerer 2013; McCarthy 2013).

**Specimens examined.** BOLIVIA. DEPT. COCHABAMBA. Prov. Chapare, CARRASCO, 123 km del camino antiguo de Cochabamba a Villa Tunari, 2100 m, 17°06′11″S, 63°37′16″W, borde de camino con árboles y paredes rocosas, saxicolous, 9 June 2011, KB et al. 745 (LPB).

*Gyalideopsis kalbii* Vězda

So far known only from the type locality in Brazil (Vězda 1983).

**Specimens examined.** BOLIVIA. DEPT. SANTA CRUZ. Prov. Andrés Ibáñez, AMBORÓ, on the road to San Mateo de Toresilla, 17°48′11″S, 64°39′28″W, 2250 m, Yungas cloud forest, terricolous, 9 June 2011, AF 22665.1 & OP (KRAM, LPB).

**Additional specimens examined.** Vězda, Lich. Sel. Exs. 1965 (B, isotype).

*Heterocyphelium leucampyx* (Tuck.) Vain.

This tropical lichen is known from Africa, Australia and the Neotropics (from Florida to Venezuela and Brazil) (Tibell 1996).

The species produces 2-septate ascospores (Tibell 1996), but one specimen, cited below as *H. aff. leucampyx*, has 3-septate ascospores and requires further study.

**Specimens examined.** BOLIVIA. DEPT. TARIFA. Prov. Aniceto Arce, Filo de Sidras, 22°14′50″S, 64°33′28″W, 1064 m, Tucumano-Boliviano montane forest, on bark, 22 Nov. 2010, AF 18390 (KRAM, LPB); TARIQUIA, La Hierba, 22°08′46″S, 64°31′36″W,
1070 m, Tucumano-Boliviano submontane forest, near river, on bark, 25 Nov. 2010, \textit{AF} 19700 \& \textit{JQ} (KRAM, LPB).

\textbf{Specimen of \textit{Heteroclyphelium aff. Leucampyx}. BOLIVIA. DEPT. SANTA CRUZ. Prov. José Miguel de Velasco, sendero de goma, near Florida, 14°37′48″S, 61°12′02″W, 170 m, lowland Amazon secondary forest, 16 Dec. 2009, on bark, \textit{AF} 16082.1 \& PR (LPB)}

\textbf{\textit{Heterodermia arvidssonii} Moberg}

This species was recently described from Ecuador (Moberg 2011).

\textbf{Specimens examined. BOLIVIA. DEPT. LA PAZ. Prov. Bautista Saavedra, 15 km from Charazani, 15°11′02″S, 68°53′43″W, 2560 m, transition Yungas montane forest-cloud forest, on twigs, 18 May 2011, MK 8953a (LPB); DEPT. TARJIA. Prov. O’Connor, near San Diego, 21°26′28″S, 64°14′37″W, 1620 m, Tucumano-Boliviano altimontano forest, on bark, 9 Aug. 2012, MK 11187 (LPB, UGDA).}

\textbf{\textit{Heterodermia diademata} (Tayl.) D. D. Awasthi}

This lichen has been reported from Argentina, Brazil, Ecuador, Paraguay, Peru and Uruguay, and elsewhere from Africa, Asia, Australia and Central America (Moberg 2011).

\textbf{Specimens examined. BOLIVIA. DEPT. BENI. Prov. José Ballivián, 20 km por carretera maderera al SW del km 12 Yucumo – Rurrenabaque, 900–950 m, 15°07′S, 67°08′W, bosque siemprevére, epiphytic, 6 Aug. 1997, KB et al. 386 (B, LPB); DEPT. COCHABAMBA. Prov. Chapare, CARRASCO, 139 km del camino antiguo de Cochabamba a Villa Tunari, 1450 m, 17°07′S, 65°34′W, bosque siemprevére, epiphytic, 12 Oct. 1997, KB et al. 800 (LPB).}

\textbf{\textit{Heterodermia flabellata} (Fée) D. D. Awasthi}

Prior to this only two collections of this species were known from Bolivia (Flakus \textit{et al.} 2012a).

\textbf{Chemistry. Atranorin, zeorin and leucotylin (selected specimens examined by TLC); pigment on the undersurface of apothecial lobules K+ violet.}

\textbf{Specimens examined. BOLIVIA. DEPT. COCHABAMBA. Prov. Ayopaya, 20 km de Cocapata hacia Cotacajes, 1850–2000 m, 16°46′S, 66°44′W, bosque semideciduo intervenido, epiphytic, 15 May 1997, KB \textit{et al.} 86 (LPB); Prov. Carrasco, CARRASCO, near Sehuencas, 17°30′12″S, 65°16′30″W, 2220 m, montane cloud forest, along the road and close to the settlement, on bark of tree, 21 July 2008, MK 6320 (LPB, UGDA); DEPT. LA PAZ. Prov. Bautista Saavedra, 15 km de Charazani hacia Apolo, 2400 m, 16°11′06″S, 67°49′30″W, bosque humedo secundario con rocas, epiphytic, 2 July 1997, KB \textit{et al.} 301a (LPB); \textit{ibidem}, astos con arbustos al lado del Río Camata, terricolous, 1 July 1997, KB et al. 261c \& 273a (B, LPB); Prov. Iturrelde, 46 km por camino de Iximas hacia Alto Madidi, 300 m, 13°38′S, 68°26′W, bosque siemprevére, epiphytic, 13 Aug. 1997, KB \textit{et al.} 395 (LPB); Prov. Nor Yungas, Cotapata, 1520 m, 16°11′06″S, 67°49′30″W, bosque muy húmedo, corticolous, 13 Oct. 2006, PR \textit{et al.} 135 (B, LPB).}

\textbf{\textit{Heterodermia isidiophora} (Vain.) D. D. Awasthi}

This species has been reported from Bolivia by Moberg (2011).

\textbf{Chemistry. Atranorin, zeorin and additional terpenoids (one specimen tested by TLC).}

\textbf{Specimens examined. BOLIVIA. DEPT. COCHA- BAMBA. Prov. Ayopaya, 10 km de Cocapata hacia Cotacajes, 2750 m, 16°38′S, 66°41′W, bosque húmedo, on decaying wood, 12 May 1997, KB \textit{et al.} 51 (B, LPB), with a specimen of \textit{Heterodermia corallophora}; Prov. Carrasco, CARRASCO, near Sehuencas by río López Mendoza, 17°30′26″S, 65°16′55″W, 2226 m, montane cloud forest, on bark, 22 July 2008, MK 6642 (LPB, UGDA).}

\textbf{\textit{Heterodermia japonica} (M. Satô) Swinscow \& Krog}

Only a few collections have been reported from Bolivia (Flakus \textit{et al.} 2012a).

\textbf{Chemistry. Not tested by TLC; the thallus did not react with K.}

\textbf{Specimens examined. BOLIVIA. DEPT. LA PAZ. Prov. Franz Tamayo, between Apolo and Mapiri, 14°41′50″S, 68°25′07″W, 1510 m, savannah with scattered trees, on soil, 22 Nov. 2011, MK 10166 (LPB, UGDA).}

\textbf{\textit{Heterodermia palpebrata} (Tayl.) Vain.}

Flakus \textit{et al.} (2012a) recorded this species from three localities in Bolivia.
Specimens examined. BOLIVIA. Dept. LA PAZ. Prov. Bautista Saavedra, near Charazani, 15°10′39″S, 68°56′36″W, 2730 m, Yungas montane forest, on twigs, 18 May 2011, MK 8824 (LPB, UGDA). Prov. Franz Tamayo, between Apolo and Mapiri, 14°41′50″S, 68°25′07″W, 1510 m, savannah with scattered trees, on bark, 22 Nov. 2011, MK 10237 (LPB).

Heterodermia reagens (Kurok.) Elix

H. japonica var. reagens (Kurok.) J. N. Wu & Z. G. Qian.

Reported here for the second time from Bolivia (Flakus et al. 2012a).

Chemistry. Atranorin, zeorin, norstictic acid and fatty acid.

Specimens examined. BOLIVIA. Dept. COCHABAMBA. Prov. Carrasco, CARRASCO, near Sehuencas, 17°30′12″S, 65°16′30″W, 2220 m, montane cloud forest, on bark of tree, 21 July 2008, MK 6458 & 6351b (LPB, UGDA).

*Heterodermia spinigera* (Kurok.) Moberg

Previously this species was known only from Ecuador and Peru (Moberg 2011).

Specimens examined. BOLIVIA. Dept. COCHABAMBA. Prov. Ayopaya, 20 km de Cocapata hacia Cotacajes, 1850–2000 m, 16°46′S, 66°44′W, bosque semideciduo intervenido, epiphytic, 15 May 1997, KB et al. 85 & 94 (B, LPB); DEPT. LA PAZ. Prov. Nor Yungas, COTAPATA, between Tunkini and Chairo, above Tunkini, 16°11′S, 67°52′W, 2400 m, on bark, 22 May 2011, MK 9118a (LPB, UGDA); DEPT. SANTA CRUZ. Prov. Florida, Refugio Los Volcanes, 1000 m, 18°06′S, 63°36′W, bosque semi-deciduo, epiphytic, 2 Oct. 1997, KB et al. 603 (LPB).

*Heterodermia squamulosa* Degel.

This species occurs in Argentina, Brazil, Ecuador, Peru and Venezuela (Moberg 2011); it is also known from Asia, North America and Macaronesia (Madeira) (Sipman 1993; Hafellner 1995; Moberg 2011).

Chemistry. Atranorin, zeorin and two additional terpenoids.

Specimens examined. BOLIVIA. Dept. COCHABAMBA. Prov. Carrasco, CARRASCO, near Phaqcha, 17°27′13″S, 65°16′44″W, 2850 m, montane cloud forest, close to the river, on bark of tree, 20 July 2008, MK 6247a (LPB, UGDA); near Sehuencas, 17°30′12″S, 65°16′30″W, 2220 m, montane cloud forest, with some rocks in open place, on bark of tree, 21 July 2008, MK 6547 (LPB, UGDA); Prov. Chapare, CARRASCO, 137 km del camino antiguo de Cochabamba a Villa Tunari, 1600 m, 17°06′S, 65°35′W, bosque siempreverde, epiphytic, 11 Oct. 1997, KB et al. 772 (LPB); DEPT. LA PAZ. Prov. Franz Tamayo, río Bilipsa, ca 10 km NW de Apolo, 1100 m, 14°36′S, 68°27′W, bosque semideciduo intervenido, epífito, 4 July 1997, KB 241 (LPB); Prov. Nor Yungas, Cotapata cerca a la comunidad del Chairo, 1370 m, 16°13′18″S, 67°52′36″W, manchón de bosque cercano, corticolous, 11 May, 2006, PR et al. 79 (B, LPB); Cotapata, 1 hora caminando desde Sandillani hacia Bajo Hornuni, 1520 m, 16°11′06″S, 67°49′30″W, bosque muy húmedo, corticolous, 13 Oct. 2006, PR et al. 136 (B, LPB).

*Hyperphyscia syncolla* (Tuck.) Kalb

This species has been reported from Argentina, Brazil, Colombia, Peru and Uruguay (Osorio 1992; Rambold et al. 1994; Calvelo & Liberatore 2002; Spielmann 2006; Sipman et al. 2008); it is also known from Africa, Asia and North America (Feuerer 2013).

Specimens examined. BOLIVIA. Dept. COCHABAMBA. Prov. Cercado, Cochabamba, 2500 m, 17°22′00″S, 66°08′30″W, vegetación de los Valles Secos Interandinos, on Jacaranda mimosifolia, 27 Sept. 2006, M. Canazas MC-73 (B, BOLV); ibidem, 17°22′3′S, 66°08′6′W, on Grevillea robusta, M. Canazas MC-80 (B, BOLV); ibidem, 17°22′00″S, 66°08′30″W, on Jacaranda mimosifolia, M. Canazas MC-81 (B, BOLV); ibidem, 17°28′12″S, 66°08′36″W, on Grevillea robusta, M. Canazas MC-84 & MC-85 (B, BOLV).

*Ingvariella bispora* (Bagl.) Guderley & Lumbsch

This widely distributed species is known from every continent except Antarctica (e.g., Lumbsch 1989; Hafellner 1995; Hafellner & Türk 2001; Breuss & John 2004). In South America it has been reported from Argentina and Uruguay (Lumbsch 1989; Osorio 2000).

Chemistry. No substances detected by TLC.
**Specimens examined.** BOLIVIA. Dept. La Paz. Prov. Omasuyos, El Dragon hill by Chahualla, 15°51'17"S, 69°00'40"W, 3850 m, Puna Húmeda, saxicolous, 6 July 2010, **AF 17832 & PR** (LPB); DEPT. SANTA CRUZ. Prov. Manuel María Caballero, Siberia, 17°49'38"S, 64°45'14"W, 3000 m, open area near Yungas cloud forest, saxicolous, 15 Dec. 2004, **AF 4827** (KRAM).

**Lecanora farinacea** Fée

This species has been reported from Bolivia (as *L. blanda* Nyl.) only by Nylander (1861).

**Specimens examined.** BOLIVIA. Dept. La Paz. Prov. Murillo, camino a la Cumbre, 4850 m, ca 16°0'S, 68°0'W, piso subnival, vegetación Altoandina, on rock, 8 Feb. 2002, A. D. Canseco-Tarifa & J. L. Vila 148 (B, LPB).

**Lecanora stenotropa** Nyl.

Recently reported from Bolivia by Śliwa et al. (2012).

**Specimens examined.** BOLIVIA. DEPT. LA PAZ. Prov. Camacho, cerca de la comunidad de Ulla Ulla, en el cerro Wilamuku, 4770 m, 15°01'36.90"S, 69°11'52.9"W, vegetación Altoandina, on rock, 4 Dec. 2007, **PR 243** (B, LPB).

***Lepraria elobata** Tønsberg

This species was previously known mainly from numerous European records, less commonly from Asia and North America (e.g., Tønsberg 1992, 1998; Czyżewska & KuKwa 2005; Saag et al. 2009; Urbanavichus 2010).

**Chemistry.** Atranorin, zoerin and the stictic acid complex.

**Specimens examined.** BOLIVIA. DEPT. LA PAZ. Prov. Nor Yungas, COTAPATA, by Sillu Tincara pre-Columbian route, 16°17'38"S, 67°53'33"W, 3437 m, Yungas cloud forest, on soil and bryophytes, 23 Dec. 2009, **AF 16323 & PR** (KRAM, LPB).

**Lepraria lecanorica** Tønsberg

This is the second collection of this lichen from Bolivia (Flakus & KuKwa 2007)

**Chemistry.** Atranorin and lecanoric acid.

**Specimens examined.** BOLIVIA. DEPT. LA PAZ. Prov. Franz Tamayo, APOLOBAMBA, near Puyo Puyo, 14°56'55"S, 69°07'58"W, 4795 m, high Andean open vegetation, on schist rock, 5 July 2010, **AF 17680 & PR** (KRAM, LPB).

**Leprocaulon** aff. *textum* (K. Knudsen, Elix & Lendemer) Lendemer & Hodkinson

This species was mentioned briefly by Elix et al. (2011b). The Bolivian material differs from North American specimens by the absence of atranorin and fatty acids (Knudsen & Elix 2007); at present it is not clear whether this should be considered infraspecific variation.

**Chemistry.** Usnic acid and zeorin (±).

**Specimens examined.** BOLIVIA. DEPT. ORURO. Prov. Sajama, SAJAMA, Jecha K’ala, 18°09'52"S, 68°49'08"W, 4184 m, Puna Sureña, grassland vegetation, on soil and bryophytes, 20 June 2010, **AF 16703 & PR** (LPB); DEPT. POTOSÍ. Prov. Nor Lípez, Viscachitas, near del Árbol de Piedra, 21°55'33"S, 68°00'18"W, 4612 m, open semi-desert high Andean area, on soil and bryophytes, 5 Dec. 2009, **AF 14736.3, 14736.17, 14736.18 & PR** (KRAM, LPB).

**Lettrouitia flavidula** (Tuck.) Hafellner

This species is already known from Argentina, Brazil, Colombia, Costa Rica, Cuba, Mexico and Puerto Rico (Nylander 1863; Hafellner 1983; Breuss 2001; Calvelo & Liberatore 2002, Sipman et al. 2008).

**Specimens examined.** BOLIVIA. DEPT. LA PAZ. Prov. Nor Yungas, Cotapatá, 1520 m, 16°11'06"S,
67°49’30”W, bosque muy húmedo, corticolous, 13 Oct. 2006, \textit{PR et al. 150} (B, LPB).

\textit{Malmidea amazonica} (Redinger) Kalb, Rivas Plata & Lumbsch

This Neotropical lichen has been reported from Brazil, Costa Rica, French Guiana and Guyana (Redinger 1933; Breuss & Neuwirth 2007; Lücking 2008).

\textbf{Specimens examined.} \textbf{BOLIVIA. Dept. Beni.}
\textit{Prov. Iténez, Chaco lejos area, near Bella Vista, 13°16’24”S, 63°42’26”W, 140 m, lowland Amazon forest, corticolous, 17 Aug. 2008, AF 12388 & PR (KRAM, LPB); Dept. Santa Cruz. Prov. José Miguel de Velasco, PN Noel Kempff Mercado, camino a la Meseta, near Florida, 14°33’31”S, 61°48’08”W, 220 m, lowland Amazon forest, corticolous, 15 Dec. 2009, AF 16035 & PR (LPB).}

\textit{Malmidea granifera} (Ach.) Kalb, Rivas Plata & Lumbsch

A pantropical species, its range includes Brazil, Costa Rica, Colombia, Ecuador and Panama (Breuss & Neuwirth 2007; Cáceres 2007; Breuss 2008; Lücking 2008; Sipman \textit{et al}. 2008).

\textbf{Specimens examined.} \textbf{BOLIVIA. Dept. Beni.}
\textit{Prov. Iténez, El Prado colony, near Bella Vista, by río San Martin, 13°17’46”S, 63°35’21”W, 155 m, lowland Amazon forest, corticolous, 15 Aug. 2008, AF 12011.1 & PR (KRAM, LPB); Chaco lejos area, near Bella Vista, 13°16’24”S, 63°42’26”W, 140 m, lowland Amazon forest, corticolous, 17 Aug. 2008, AF 12402 & PR (KRAM, LPB).}

\textit{Malmidea hypomelaena} (Nyl.) Kalb & Lücking

This is the first modern Bolivian record of this species. It was previously reported from the country by Nylander (1859).

\textbf{Specimen examined.} \textbf{BOLIVIA. Dept. Tarija.}
\textit{Prov. Aniceto Arce, Filo de Sidras, near campamento de guardaparques, 22°14’50”S, 64°33’28”W, 1064 m, Tucumano-Boliviano submontane forest, corticolous, 22 Nov. 2010, AF 18507 (LPB).}

\textit{Malmidea leptoloma} (Müll. Arg.) Kalb & Lücking

This species was reported from Bolivia only by Müller (1895).

\textbf{Specimens examined.} \textbf{BOLIVIA. Dept. Tarija.}
\textit{Prov. Aniceto Arce, Filo de Sidras, 22°14’50”S, 64°33’28”W, 1064 m, Tucumano-Boliviano submontane forest, corticolous, 22 Nov. 2010, AF 18680 (KRAM, LPB).}

\textit{Malmidea piperis} (Spreng.) Kalb, Rivas Plata & Lumbsch

Reported from Bolivia only by Nylander (1859) and Flakus (2008).

\textbf{Specimens examined.} \textbf{BOLIVIA. Dept. Beni.}
\textit{Prov. Abel Iturralde, near San Pedro, 13°44’50”S, 64°35’21”W, 600 m, lowland Amazon forest, corticolous, 29 July 2008, AF 11242 & PR (KRAM, LPB).}

\textit{Malmidea rhodopsis} (Tuck.) Kalb, Rivas Plata & Lumbsch

This species has been reported from two Bolivian localities by Flakus (2008).

\textbf{Specimens examined.} \textbf{BOLIVIA. Dept. La Paz.}
\textit{Prov. Nor Yungas, entre Cotapata y Yucupi, 16°11’52.5”S, 67°49’25.0”W, 1475 m, bosque intervenido cercano a la comunidad de Yucupi y a la carretera secundaria de acceso, corticolous, 4 Dec. 2006, PR & S. Gallegos 298 (B, LPB).}

\textit{Malmidea vinosa} (Eschw.) Kalb, Rivas Plata & Lumbsch

In the Neotropics this lichen is known only from Brazil, Guyana and Florida (U.S.A.) (Cáceres 2007; Lücking 2008; Lücking \textit{et al}. 2011a).

\textbf{Specimens examined.} \textbf{BOLIVIA. Dept. La Paz.}
\textit{Prov. Nor Yungas, entre Cotapata y Yucupi, 16°11’52.5”S, 67°49’25.0”W, 1475 m, bosque intervenido cercano a la comunidad de Yucupi y a la carretera secundaria de acceso, corticolous, 4 Dec. 2006, PR & S. Gallegos 298 (B, LPB).}

\textit{Megalospora admixta} (Nyl.) Sipman

This Neotropical species is known from Brazil, Costa Rica, Colombia, Ecuador, Jamaica and Venezuela (Sipman 1986; Umaña-Tenorio \textit{et al}. 2002; Nöske & Sipman 2004).

\textbf{Specimens examined.} \textbf{BOLIVIA. Dept. Cochabamba.}
\textit{Prov. Chapare, near Incachaca, 17°12’54”S, 65°49’30”W, 2028 m, Yungas cloud forest near road, corticolous, 7 July 2009, AF 12982 & 13006 (KRAM);
Megaspora verrucosa (Ach.) L. Arcadia & A. Nordin

This widely distributed species (Feuerer 2013) is already known in South America from Argentina, Chile, Colombia, Ecuador and Venezuela (Arvidsson 1991; Marcano et al. 1996; Galloway & Quilhot 1998; Calvelo & Liberatore 2002; Sipman et al. 2008).

Phaeographis dendritica (Ach.) Müll. Arg.

This species has been reported from three Bolivian localities by Kukwa et al. (2013).

Phaeographis dendroides (Leight.) Müll. Arg.

Recently reported from two localities in Bolivia (Kukwa et al. 2013).

Phaeophyscia adiastola (Essl.) Essl.

This predominantly Northern Hemisphere lichen is known from East Africa, Europe (France), Canada and the U.S.A. (Esslinger 1977, 2004; Goward et al. 1994; Feuerer 2013). It was recorded
from Bolivia by Canseco et al. (2006), apparently the first report from the Southern Hemisphere.

**Specimens Examined.** BOLIVIA. DEPT. BENI. Prov. Cercado, isla de los Caimanes, near San Pedro Nuevo, 14°30′11″S, 64°52′21″W, 155 m, lowland Amazon forest surrounded by the Llanos de Mosox savanna, by lake, on bark, 1 Sept. 2012, MK 12005c (LPB); DEPT. LA PAZ. Prov. Murillo, La Florida, plaza Humboldt, camino a la avenida Costanera, 3251 m, 16°32.2′S, 68°05.5′W, Puna y vegetación Altoandina, on Populus balsamifera, 8 Feb. 2002, A. D. Canseco-Tarifa 129 (B, LPB).

**Phaeophyscia endococcinoides** (Poelt) Essl.

This species has been recorded from Bolivia on only three occasions (Feuerer et al. 1998; Flakus et al. 2012a).

**Specimens Examined.** BOLIVIA. DEPT. LA PAZ. Prov. Bautista Saavedra, 28 km from Charazani, on the road between Charazani and Apolo, 15°12′43″S, 68°47′25″W, 1650 m, Yungas montane forest, open area with boulders, on rock, 18 May 2011, MK 8910 (LPB, UGDA).

*Phylyctella andensis* (Nyl.) Nyl.

This species was reported in the Neotropics from Brazil, Colombia, Costa Rica, Ecuador and Uruguay (Oсорio 1972; Etayo 2002; Umaña-Tenorio et al. 2002; Nöske & Sipman 2004; Sipman et al. 2008; Feuerer 2013).

**Specimens Examined.** BOLIVIA. DEPT. LA PAZ. Prov. Nor Yungas, Cotapata, 1 hora caminando desde Sandillani hacia Bajo Hornuni. 1520 m, 16°11′06″S, 67°49′30″W, bosque muy húmedo, corticolous, 13 Oct. 2006, PR et al. 163 (B, LPB, with a specimen of Megalospora tuberculosa).

**Phyllopsora corallina** (Eschw.) Müll. Arg. s.str.

This is a widespread tropical lichen (Brako 1991). In South America it has been recorded from Argentina, Brazil, Ecuador, French Guiana, Guyana, Peru, Surinam and Venezuela (Brako 1991; Calvelo & Liberatore 2002).

**Chemistry.** No lichen substances detected by TLC.

**Specimens Examined.** BOLIVIA. DEPT. BENI. Prov. Iténez, Maconere by río San Martín, 13°16′45″S, 63°21′49″W, 145 m, lowland Amazon forest, corticolous, 20 Aug. 2008, AF 12792 & PR (KRAM, LPB); DEPT. TARIJA. Prov. Aniceto Arce, Papachacra, 21°41′54″S, 64°29′28″W, 2056 m, Tucumano-Boliviano montane forest, corticolous, 27 Nov. 2010, AF 20015 & JQ (LPB).

**Phyllopsora furfuracea** Zahlbr.

This is a widely distributed species in the tropics and subtropics (Brako 1991; Timdal 2008b); in South America it has been reported from Brazil, Colombia, Ecuador, French Guiana, Guyana, Peru, and Venezuela (Brako 1991; Timdal 2008b; Sipman et al. 2008).

**Chemistry.** No lichen substances detected by TLC.
Specimens examined. BOLIVIA. Dept. LA PAZ. Prov. Nor Yungas, COTAPATA, near Urpuma colony, 16°13′20″S, 67°52′34″W, 1989 m, Yungas montane forest, corticolous, 30 June 2010, AF 17214, 17317 & PR (KRAM, LPB).

*Phyllopsora isidiotyla* (Vain.) Riddle

Reported here for the first time from Bolivia, this lichen is already known from Brazil, Costa Rica, the southern U.S.A., Venezuela and northern Australia (Brako 1991; Umaña-Tenorio et al. 2002; Elix 2009b).

Chemistry. No lichen substances detected by TLC.

Specimens examined. BOLIVIA. Dept. TARIJA. Prov. Aniceto Arce, Papachacra, 21°41′54″S, 64°29′28″W, 2056 m, Tucumano-Boliviano montane forest, corticolous, 27 Nov. 2010, AF 19958 & JQ (KRAM, LPB).

*Phyllopsora kalbii* Brako

This species has been reported from Brazil, the Dominican Republic, the southern U.S.A., Kenya and Tanzania (Brako 1991).

Chemistry. No lichen substances detected by TLC.

Specimens examined. BOLIVIA. Dept. SANTA CRUZ. Prov. Cordillera, KAA-IYA, by Tucavaca colony, 18°31′40″S, 60°41′26″W, 314 m, Chiquitano forest, corticolous, 4 Dec. 2010, AF 19221 & JQ (KRAM, LPB).

*Phyllopsora parvifolia* (Pers.) Müll. Arg.

So far reported from Africa, Australia, the Neotropics, and the southern U.S.A. (Brako 1991). In South America it was collected in Argentina, Brazil, Colombia, Ecuador, Paraguay, Uruguay and Venezuela (Brako 1991; Sipman et al. 2008).

Chemistry. No lichen substances detected by TLC.

Specimens examined. BOLIVIA. Dept. COCHABAMBA. Prov. Carrasco, CARRASCO, near Sehuenca, by río López Mendoza, 17°30′26″S, 65°16′55″W, 2226 m, Yungas cloud forest, corticolous, 22 July 2008, AF 10697, MK & PR (KRAM, LPB); Dept. LA PAZ. Prov. Nor Yungas, Cotopata cerca a la comunidad del Chairo, 1370 m, 16°13′18″S, 67°52′36″W, manchón de bosque cercano al río Huarinilla, corticolous, 11 May 2006, PR et al. 84 (B, LPB); Dept. TARIJA. Prov. Aniceto Arce, Filo de Sidras, 22°14′50″S, 64°33′28″W, 1064 m, Tucumano-Boliviano submontane forest, corticolous, 22 Nov. 2010, AF 18496 (KRAM, LPB).

*Physcia antistrostriata* Moberg

This is a widely distributed tropical, subtropical and Mediterranean lichen (Feuerer 2013). In South America it has been reported from Argentina, Brazil, Colombia, Ecuador, French Guiana, Guyana, Peru, Surinam and Venezuela (Moberg 1990).

Specimens examined. BOLIVIA. Dept. LA PAZ. Prov. Sud Yungas, Alto Beni, Mapurichuqui, towards Villazón, 450 m, 15°31.749″S, 67°23.058″W, plantation, on *Theobroma cacao*, 22 April 1999, N. Derakshani 41 (B, GOET).

*Physcia pachyphylla* Müll. Arg.

Previously known only from Argentina, Brazil, Costa Rica, Ecuador, Guatemala, Peru, Uruguay and Venezuela (Moberg 1990). The Bolivian localities represent the altitudinal maximum for the species.

Specimens examined. BOLIVIA. Dept. LA PAZ. Prov. Murillo. La Paz, plaza Montenegro, Achumani, 3340 m, 16°31.9″S, 68°04.6″W, área verde recreacional, on *Pinus radiata*, 1 July 2008, G. Yapu-Alcázar 178 (B, LPB); plaza del Minero, 3609 m, 16°30.3″S, 68°06.6″W, área verde, on *Populus balsamifera*, 7 July 2008, G. Yapu-Alcázar 277 (B, LPB); plaza Los Leones, 3508 m, 16°30.5″S, 68°06.9″W, área verde deficiente, on *Ulmus pumila*, 8 July 2008, G. Yapu-Alcázar 315 (B, LPB).

*Physcia poncinsii* Hue

This species has been reported from Central and South America (Argentina, Brazil, Chile, Cuba, Ecuador, Colombia, Peru, Uruguay and Venezuela), Australia, East Africa, New Zealand and Papua New Guinea (Moberg 1990, Aptroot & Sipman 1991; Osorio 1992; Calvelo & Liberatore 2002; Galloway 2007; Elix 2009c; Feuerer 2013).

Specimens examined. BOLIVIA. Dept. LA PAZ. Prov. Sud Yungas, Alto Beni, Belén, 680 m, 15°33.80″S, 67°26.68″W, plantation, on *Citrus* bark, 15 June 1999, N. Derakshani 8 (B, GOET).
*Physcia sorediosa* (Vain.) Lynge

This species was mostly reported from South America (Argentina, Brazil, Colombia, Ecuador, French Guiana, Guyana, Paraguay, Surinam, Uruguay and Venezuela). It is also known from Africa, Asia, Australia, North America, Papua New Guinea and the Azores (Moberg 1990, Aptroot & Sipman 1991; Elix 2009c; Feuerer 2013).

**Specimens examined.** BOLIVIA. DEPT. LA PAZ. Prov. Sud Yungas, Alto Beni, Mapurichuqui, towards Villazón, 450 m, 15°31.749′S, 67°23.058′W, plantation, on *Theobroma cacao*, 22 April 1999, N. Derakshani 57 (B, GOET).

*Physcidia matogrossensis* Kalb & Elix

This species was previously known only from Brazil (Kalb & Elix 1995).

**Specimens examined.** BOLIVIA. DEPT. SANTA CRUZ. Prov. José Miguel de Velasco, sendero de goma, near Florida, 14°37′48″S, 61°12′02″W, 170 m, lowland Amazon secondary forest, corticolous, 16 Dec. 2009, AF 16098 & PR (KRAM, LPB).

*Placidium lacinulatum* (Ach.) Breuss

This rather widely distributed species is already known in South America from Argentina, Brazil and Peru (Breuss 1993; Prieto et al. 2010).

**Specimens examined.** BOLIVIA. DEPT. COCHABAMBA. Prov. Ayopaya, 20 km de Cocapata hacia Cotacajes, 2000 m, 16°46′S, 66°44′W, bosque semideciduio intervenido, epiphytic, 15 May 1997, KB et al. 114a (B, LPB).

*Platygramme caesiopruinosa* (Fée) Fée

This species was only recently reported from Bolivia (Kukwa et al. 2013).

**Chemistry.** No lichen compounds detected by TLC.

**Specimens examined.** BOLIVIA. DEPT. LA PAZ. Prov. Nor Yungas, between Coroico and La Paz, 16°13′33″S, 67°49′20″W, 2600 m, Yungas secondary cloud forest, on tree, 23 May 2011, US (LPB); COTAPATA, Santa Catalina, 16°11′12″S, 67°52′07″W, Yungas montane forest, on tree, 22 May 2011, US (LPB, herb. Schiefelbein 3046, 3048).

*Polymeridium albidum* (Müll. Arg.) R. C. Harris

This rare tropical lichen was previously known in South America only from Brazil (Harris 1986). It was also reported from Costa Rica, Papua New Guinea, Australia and Thailand (Aptroot et al. 1997; Wolseley et al. 2002; Breuss & Neuwirth 2007).

**Specimens examined.** BOLIVIA. DEPT. LA PAZ. Prov. Sud Yungas, Alto Beni Sapecho, Cooperativa Sapecho, 500 m, 15°32′S, 67°20′W, barbecho de 12 años, epiphytic, 2 Aug. 1999, A. Acebey & T. Krömer 995b (B, LPB).

*Polymeridium subcinereum* (Nyl.) R. C. Harris

This species was reported in South America from Brazil and Guyana (Feuerer 2013). It is also known from France, the U.S.A. and Australia (Aptroot 1998; Tucker & Harris 1980; McCarthy 2013).

**Specimens examined.** BOLIVIA. DEPT. LA PAZ. Prov. Bautista Saavedra, cerro Asunta Pata, 1500 m, 15°05′S, 68°29′W, bosque siempreverde, epiphytic, 21 June 1997, KB et al. 200 (B, LPB).

*Porina tetracerae* (Afzel.) Müll. Arg.

The lichen is widely distributed, mainly in the tropics (see the distribution map in McCarthy 2003). In South America it is known from Argentina, Brazil, Colombia, Ecuador, French Guiana, Guyana, Peru, Surinam and Venezuela (Aptroot & Sipman 1993; Calvelo & Liberatore 2002; Cáceres 2007; Neuwirth 2007; Lücking 2008; Sipman et al. 2008).

**Specimens examined.** BOLIVIA. DEPT. LA PAZ. Prov. Nor Yungas, Cotapata cerca a la comunidad del Chairo, 1370 m, 16°13′18″S, 67°52′36″W, manchón de bosque cercano al río Huarinilla, epiphytic, 11 May 2006, PR et al. 193 (B, LPB).

*Pseudopyrenula subnudata* Müll. Arg.

This pantropical lichen was known previously in South America only from Brazil (Müller 1883; Aptroot 2002).

**Specimens examined.** BOLIVIA. DEPT. SANTA CRUZ. Prov. Cordillera, 350 km on the road from
Tucavaca to Roboré, 18°37′56″S, 59°36′50″W, 370 m, transition Chiquitano-Chaqueño forest, on twig, 4 Dec. 2011, MK 10552a & 10531b (LPB, UGDA).

**Psiloparmelia arhizinosa** Hale

Previously known only from southern Africa (Lesotho) (Elix & Nash 1992).

CHEMISTRY. Atranorin, usnic and constipatic acids.

SPECIMENS EXAMINED. BOLIVIA. DEPT. LA PAZ. Prov. Franz Tamayo, APOLOBAMBA, near Puyo Puyo, 14°56′55″S, 69°05′58″W, 4888 m, high Andean open vegetation, on schist rock, 5 July 2010, AF 17566, 17581 & PR (KRAM, LPB); Prov. Manco Kapac, near Copacabana Mt Horca del Inca, 16°10′15″S, 69°05′05″W, 3974 m, high Andean Puna, saxicolous, 18 June 2006, AF 8608 & 8666 (LPB); Prov. Murillo, near Cumbre pass, 16°20′14″S, 68°02′20″W, 4672 m, high Andean Puna, on schist rock, 13 May 2006, AF 57141 (LPB); Prov. Omasuyos, Tajani cerca Acharachi, 15°36′49″S, 69°04′02″W, 3869 m, Puna Húmeda, on quartzite rock, 6 July 2010, AF 17796, 17806 & PR (KRAM, LPB); DEPT. ORURO. Prov. Sajama, SAJAMA, Ladera de la Quebrada Kohiri, 4309 m, 18°07′07″S, 68°56′06″W, bosque de Polylepis tarapacana en ladera con piedras grandes, sobre roca, 21 Nov. 2007, RIM et al. 4387 (B, LPB); ibidem, 4406 m, 18°07′08″S, 68°56′05″W, sobre roca. 21 Nov. 2007, RIM et al. 4393 (B, LPB); Aguas Calientes, near Sajama, 18°05′29″S, 69°02′28″W, 4448 m, Puna Sureña, shrubland dominated by Baccharis, saxicolous, 18 June 2010, AF 16546 & PR (KRAM, LPB).

**Psiloparmelia dichotoma** Elix & T. H. Nash

Previously known only from the type locality in Peru (Elix & Nash 1992).

CHEMISTRY: Atranorin and usnic acid.

SPECIMENS EXAMINED. BOLIVIA. DEPT. ORURO. Prov. Sajama, SAJAMA, Huincurata, near Sajama, 18°07′01″S, 68°58′00″W, 4301 m, Puna Sureña, Polylepis forest (Queñuales), saxicolous, 19 June 2010, AF 16546 & PR (KRAM, LPB).

**Psiloparmelia diffractaica** Elix & T. H. Nash

Known so far only from type locality in Argentina (Elix & Nash 1992).

CHEMISTRY: Diffractaica and usnic acids.

SPECIMENS EXAMINED. BOLIVIA. DEPT. ORURO. Prov. Sajama, SAJAMA, Aguas Calientes, near Sajama, 18°05′29″S, 69°02′28″W, 4448 m, Puna Sureña, shrubland dominated by Baccharis, saxicolous, 18 June 2010, AF 16521 & PR (KRAM, LPB); DEPT. POTOSÍ. Prov. Nor Lípez, Painturas Rupestres, near Mallku Villamar, 21°46′20″S, 67°29′05″W, 4038 m, open semi-desert high Andean area, on volcanic rock, 6 Dec. 2009, AF 14759 & PR (LPB, herb. Flakus).

**Psiloparmelia flavobrunnea** (Müll. Arg.) Elix & T. H. Nash

This species was previously recorded from two localities in Bolivia (Elix & Nash 1992).

CHEMISTRY. Atranorin, usnic, protoconstipatic, constipatic (+), dehydroxyconstipatic (+) and unknown fatty acid (+).

SPECIMENS EXAMINED. BOLIVIA. DEPT. LA PAZ. Prov. Nor Lípez, APOLOBAMBA, near Taypi Cañuma, 15°03′20″S, 69°09′07″W, 4506 m, high Andean open vegetation, saxicolous, 5 July 2010, AF 17526 & PR (KRAM, LPB); DEPT. ORURO. Prov. Sajama, SAJAMA, near Sajama, 18°07′49″S, 68°56′54″W, 4437 m, Puna Sureña, shrubland dominated by Baccharis, saxicolous, 18 June 2010, AF 16461 & PR (LPB).

**Psiloparmelia norstictica** Elix & T. H. Nash

This species was reported previously from Argentina, Ecuador and Peru (Elix & Nash 1992).

CHEMISTRY. Atranorin (trace), usnic and norstctic acids.

SPECIMENS EXAMINED. BOLIVIA. DEPT. LA PAZ. Prov. Nor Lípez, APOLOBAMBA, near Puyo Puyo, 14°56′55″S, 69°05′58″W, 4888 m, high Andean open vegetation, on schist rock, 5 July 2010, AF 17566, 17581 & PR (KRAM, LPB); Prov. Manco Kapac, near Copacabana Mt Horca del Inca, 16°10′15″S, 69°05′05″W, 3974 m, high Andean Puna, saxicolous, 18 June 2006, AF 8608 & 8666 (LPB); Prov. Murillo, near Cumbre pass, 16°20′14″S, 68°02′20″W, 4672 m, high Andean Puna, on schist rock, 13 May 2006, AF 57141 (LPB); Prov. Omasuyos, Tajani cerca Acharachi, 15°36′49″S, 69°04′02″W, 3869 m, Puna Húmeda, on quartzite rock, 6 July 2010, AF 17796, 17806 & PR (KRAM, LPB); DEPT. ORURO. Prov. Sajama, SAJAMA, Ladera de la Quebrada Kohiri, 4309 m, 18°07′07″S, 68°56′06″W, bosque de Polylepis tarapacana en ladera con piedras grandes, sobre roca, 21 Nov. 2007, RIM et al. 4387 (B, LPB); ibidem, 4406 m, 18°07′08″S, 68°56′05″W, sobre roca. 21 Nov. 2007, RIM et al. 4393 (B, LPB); Aguas Calientes, near Sajama, 18°05′29″S, 69°02′28″W, 4448 m, Puna Sureña, shrubland dominated by Baccharis, saxicolous, 18 June 2010, AF 16525, 16527, 16528 (KRAM, LPB); Huincurata, near Sajama, 18°07′01″S, 68°58′00″W, 4301 m, Puna Sureña, Polylepis forest (Queñuales), saxicolous, 19 June 2010, AF 16545, 16550, 16555, 16597 & PR (KRAM, LPB); Jecha K’ala, 18°09′52″S, 68°49′08″W, 4184 m, Puna Sureña, grassland vegetation, saxicolous, 20 June 2010, AF 16607, 16610, 16647, 16666 & PR (KRAM, LPB); near Sajama, 18°07′49″S, 68°56′54″W, 4437 m, Puna Sureña, shrubland dominated by Baccharis, saxicolous, 18 June 2010, AF 16460, 16462, 16508 & PR (KRAM, LPB); DEPT. POTOSÍ. Prov. Nor Lípez, Painturas Rupestres, near Mallku Villamar, 21°46′20″S, 67°29′05″W, 4038 m, open semi-desert high Andean area, saxicolous, 6 Dec. 2009, AF 14775 & PR (KRAM, LPB).
lylepis forest (Queñuales), saxicolous, 19 June 2010, AF 16544 & PR (KRAM, LPB, herb. Flakus).

*Psiloparmelia sorediosa* Elix & T. H. Nash

Previously this species was known only from the type locality in Argentina (Elix & Nash 1992).

**CHEMISTRY.** Atranorin (trace, ±), usnic and norstictic acids.

**SPECIMENS EXAMINED.** BOLIVIA. DEPT. ORURO. Prov. Sajama, SAJAMA, Huincurata, near Sajama, 18°07′01″S, 68°58′00″W, 4301 m, Puna Sureña, Polylepis forest (Queñuales), saxicolous, 19 June 2010, AF 16546.1, 16582 & PR (KRAM, LPB); Jehca K’ala, 18°09′52″S, 68°49′08″W, 4184 m, Puna Sureña, grassland vegetation, saxicolous, 20 June 2010, AF 16605, 16656, 16695, 16706.2 & PR (KRAM, LPB); near Sajama, 18°07′49″S, 68°56′54″W, 4437 m, Puna Sureña, shrubland dominated by Baccharis, saxicolous, 18 June 2010, AF 16474 & PR (LPB, herb. Flakus).

*Psiloparmelia subcrustosa* Elix & T. H. Nash

This lichen was previously known only from the type locality in Peru (Elix & Nash 1992).

**CHEMISTRY.** Atranorin and isousnic acid.

**SPECIMENS EXAMINED.** BOLIVIA. DEPT. ORURO. Prov. Sajama, SAJAMA, Aguas Calientes, near Sajama, 18°05′29″S, 69°00′52″W, 4448 m, Puna Sureña, shrubland dominated by Baccharis, on rock, 5 July 2010, AF & PR 17576 17623 (KRAM, LPB); near Sajama, 18°05′29″S, 69°02′28″W, 4448 m, Puna Sureña, shrubland dominated by Baccharis, on rock, 18 June 2010, AF 16517, 16532, 16520, 16524 & PR (KRAM, LPB, UGDA); Huincurata, near Sajama, 18°07′01″S, 68°58′00″W, 4301 m, Puna Sureña, Polylepis forest (Queñuales), saxicolous, 19 June 2010, AF 16570, 16585, 16587, 16600 & PR (KRAM, LPB); Jehca K’ala, 18°09′52″S, 68°49′08″W, 4184 m, Puna Sureña, grassland vegetation, saxicolous, 20 June 2010, AF 16619, 16633 & PR & PR (KRAM, LPB); near Sajama, 18°07′49″S, 68°56′54″W, 4437 m, Puna Sureña, shrubland dominated by Baccharis, saxicolous, 18 June 2010, AF 16459, 16500, 16501, 16512 & PR (KRAM); DEPT. ORURO. Prov. Franz Tamayo, APOLOBAMBA, near Puyo Puyo, 14°56′55″S, 69°07′11″W, 160 m, lowland Amazon forest surrounded by los Llanos de Moxos savanna, on bark, 30 Aug. 2012, MK 11956b (LPB, UGDA).

*Pyrenula aggregata* (Fée) Fée

This widespread Pantropical species has been reported in the Neotropics from Costa Rica and Paraguay (Müller 1888; Aptroot *et al.* 2008; Aptroot 2012).

**SPECIMENS EXAMINED.** BOLIVIA. DEPT. LA PAZ. Prov. Sud Yungas, Alto Beni, Nueva Israel, 540 m, 15°34′77″S, 67°15′91″W, plantation, on *Theobroma cacao*, 25 June 1999, N. Derakshani 32 (B, GOET).

*Pyrenula anomala* (Ach.) Vain.

This pantropical species has been reported in South America from Brazil, Colombia, Ecuador (the Galapagos Islands), French Guiana, Guyana and Venezuela (Sipman 1992a; Cáceres 2007; Sipman *et al.* 2008; Bungartz *et al.* 2013; Aptroot 2012; Feuerer 2013).

**CHEMISTRY.** Not tested by TLC; thallus UV–.

**SPECIMENS EXAMINED.** BOLIVIA. DEPT. BENI. Prov. Marbán, near road from Camiaco to San Lorenzo, 15°14′49″S, 64°49′11″W, 160 m, lowland Amazon forest surrounding los Llanos de Moxos savanna, on bark, 30 Aug. 2012, MK 11956b (LPB, UGDA).

***Pyrenula laetior*** Müll. Arg.

Previously this Neotropical taxon was known only from Costa Rica and Cuba (Müller 1885; Aptroot *et al.* 2008; Aptroot 2012). This new Bolivian record is also the first from the Southern Hemisphere.

**SPECIMENS EXAMINED.** BOLIVIA. DEPT. LA PAZ. Prov. Sud Yungas, Alto Beni, road crossing Tarapaca-Tupiza, 440 m, 15°33′81″S, 67°20′79″W, plantation, on *Theobroma cacao*, 11 June 1999, N. Derakshani 31 (B, GOET).

*Pyrenula mamillana* (Ach.) Trevis.

This pantropical species has been reported in South America from Brazil, Colombia and Guayanas (Zahlbrucker 1922; Hekking & Sipman 1988; Aptroot *et al.* 2008; Sipman *et al.* 2008; Aptroot 2012).

**SPECIMENS EXAMINED.** BOLIVIA. DEPT. BENI. Prov. Yacuma, La Trapiche, E.B. BENI, E of San Borja,
100 m, on bark, 20 Oct. 1988, S. Stab LB-207 (B);
DEPT. LA PAZ. Prov. Sud Yungas, Alto Beni, Sapecho,
405 m, 15°30.79'S, 67°30.79'W, plantation, on Theobroma cacao, 22 June 1999, N. Derakshani 30 (B, GOET).

*Pyrenula mastophoroides* (Nyl.) Zahlbr.

This Neotropical species was reported previously from Colombia and Costa Rica (Aptroot et al. 2008; Sipman et al. 2008).

Specimens examined. BOLIVIA. DEPT. LA PAZ. Prov. Nor Yungas, Cotapata, a la comunidad de Yucupi y a la carretera secundaria de acceso, 16°11′52″S, 67°49′25″W, 1475 m, bosque intervenido cercano, corticolous, 4 Dec. 2006, PR & S. Gallegos 307 (B, LPB).

*Pyrenula septicollaris* (Eschw.) R. C. Harris

This pantropical species has been reported in South America from Brazil, Colombia, French Guiana and Paraguay (Malme 1924; Hekking & Sipman 1988; Sipman et al. 2008; Aptroot 2012).

Specimens examined. BOLIVIA. DEPT. COCHABAMBA. Prov. Ayopaya, 10 km de Cocapata hacia Cotacajes, 2750 m, 16°38′S, 66°44′W, bosque húmedo, epiphytic, 11 May 1997, *KB et al*. 34 (B, LPB).

*Ramalina cochlearis* Zahlbr.

This Neotropical lichen has been reported from Brazil, Peru and Venezuela (Kashiwadani & Kalb 1993; Marcano & Morales Méndez 1994).

Specimens examined. BOLIVIA. DEPT. COCHABAMBA. Prov. Ayopaya, 10 km de Cocapata hacia Cotacajes, 2600–2700 m, 16°38′S, 66°41′W, bosque húmedo secundario, epiphytic, 11 & 14 May 1997, *KB et al*. 23 & 69 (LPB); 20 km de Cocapata hacia Cotacajes, 2000 m, 15°34.77′S, 67°15.91′W, plantation, on *Theobroma cacao*, 25 June 1999, N. Derakshani 43 (B, GOET).

*Ramalina peruviana* Ach.

This species has been reported in Bolivia only by Feuerer (2010).

Specimens examined. BOLIVIA. DEPT. COCHABAMBA. Prov. Ayopaya, 10 km de Cocapata hacia Cotacajes, 2600–2700 m, 16°38′S, 66°41′W, bosque húmedo, on decaying wood, 11 & 14 May 1997, *KB et al*. 23 & 69 (LPB); 20 km de Cocapata hacia Cotacajes, 2000 m, 16°46′S, 66°44′W, bosque semideciduo intervenido, epiphytic, 15 May 1997, *KB et al*. 111 (B, LPB); 15 km de Charazani hacia Apolo, 1300 m, 15°11′S, 68°52′W, bosque húmedo secundario, epiphytic, 3 July 1997, *KB et al*. 332b (LPB).

*Ramalina reducta* Krog & Swinscow

This species has been reported from Africa and South America (Colombia and Venezuela)
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Specimens examined. BOLIVIA. Dept. LA PAZ. Prov. Bautista Saavedra, near Charazani, 15°10′39″S, 68°56′36″W, 2730 m, Yungas montane forest, on twigs, 18 May 2011, MK 8822 (LPB, UGDA); Prov. Murillo, La Paz, Cota-Cota, Campus Universitario, 16°32.2′S, 68°04.0′W, 3582 m, Puna y vegetación Altoandina, on Schinus molle, 8 Feb. 2002, A. D. Canseco-Tarifa 141 (B, LPB).

*Sipmaniella sulphureofusca* (Fée) Kalb

This species is known from the Neotropics (Costa Rica, Colombia and Jamaica) and Réunion (Sipman 1983; Umaña-Tenorio et al. 2002; Sipman et al. 2008; Kalb et al. 2009).

Specimens examined. BOLIVIA. Dept. LA PAZ. Prov. Nor Yungas, Cotopata, 16°11′06″S, 67°49′30″W, 1520 m, bosque muy húmedo, corticolous, 13 Oct. 2006, PR et al. 159 (B, LPB); Prov. Nor Yungas, COTAPATA, near Urpuma colony, 16°13′20″S, 67°52′34″W, 1989 m, Yungas montane forest, corticolous, 30 June 2010, AF 17223 & PR (LPB).

*Tetramelas thiopolizus* (Nyl.) Giralt & P. Clerc

This lichen is known from Chile and Venezuela in South America, and elsewhere from Asia (Siberia) and Europe (Austria, France, Germany, the Iberian Peninsula, Italy) (Giralt & Clerc 2011).

Specimens examined. BOLIVIA. Dept. ORURO. Prov. Sajama, SAJAMA, ladera de la quebrada Kohiri, 18°07′07″S, 68°56′06″W, 4309 m, bosque de Polylepis tarapacana en ladera con piedras grandes, saxicolous, 21 Nov. 2007, RIM et al. 4376 (B, LPB).

**Toninia bullata** (Meyen & Flot.) Zahlbr.

This species seems to be widespread (Lesotho, Australia, New Zealand, Oceania, the U.S.A., Mexico, South America), but rare (Timdal 1992; Elix & McCarthy 1998; Galloway 2007). Its South American distribution includes Argentina, Chile, Ecuador, Peru and Venezuela (Timdal 1992; Calvelo & Liberatore 2002; Galloway 2007).

Specimens examined. BOLIVIA. Dept. ORURO. Prov. Sajama, SAJAMA, ladera de la quebrada Kohiri, 18°07′07″S, 68°56′06″W, 4309 m, bosque de Polylepis tarapacana en ladera con piedras grandes, saxicolous, 21 Nov. 2007, RIM et al. 4374 (B, LPB).

**Toninia cinereovirens** (Schaer.) A. Massal.

Known mainly from Europe and Asia, this lichen has also been reported from scattered localities in Africa, North and South America including Argentina, Peru and Venezuela (Timdal 1992, 2002).

Specimens examined. BOLIVIA. Dept. LA PAZ. Prov. Camacho, cerca de la comunidad de Ulla Ulla, en el cerro Wilamuku, 15°02′04.1″S, 69°11′52.7″W, 4739 m, vegetación Altoandina, terricolous, 4 Dec. 2007, PR 274a (B, LPB).

**Trichothelium caudatum** Lücking

Previously reported from the type locality in Peru (Lücking & Cáceres 2004). Here it is reported for the first time from Bolivia and Ecuador.
Specimens examined. BOLIVIA. DEPT. LA PAZ. Prov. Larecaja, between Tipuani and Guanay, 15°31’24”S, 67°58’06”W, 1200 m, Preandean Amazon forest, on corticolous bryophytes, 24 Nov. 2011, MK 10419 (LPB, UGDA); DEPT. SANTA CRUZ. Prov. Caballero, El Rincón, 17°49’33”S, 64°38’50”W, 2670 m, Yungas cloud forest, on bark, 17 Aug. 2012, MK 11545 (LPB). ECUADOR. Prov. Tungurahua, NP Llanga, 78°19’00”W, 3850 m, Yungas cloud forest, on bark, 17 Aug. 2012, MK 11756 (LPB). *Trichothelium horridulum* (Müll. Arg.) R. Sant. This species is widely distributed in Central and South America (Brazil, Costa Rica, Guyana, Paraguay and Uruguay; Lücking & Cáceres 2004).

Specimens examined. BOLIVIA. DEPT. COCHABAMBA. Prov. Chapare, PN Carrasco, near Inachaca, 17°14’11”S, 65°49’02”W, 2317 m, Pinus plantation near Yungas cloud forest, corticolous, 12 June 2006, AF 8349 (LPB).

**Trinathotrema lumbricoides** (Sipman) Sipman & Aptroot Previously reported from Japan, Papua New Guinea, Thailand and Vietnam (Aptroot et al. 1997; Wolseley et al. 2002; Lücking et al. 2011b).

Specimens examined. BOLIVIA. DEPT. LA PAZ. Prov. Iturralde, between Ixiamas and Santa Rosa de Maravillas, 13°49’16”S, 68°07’18”W, 305 m, Subandeian Amazon forest, on twig, 28 July 2008, MK 6834 (LPB, UGDA).

*Trypethelium aeneum* (Eschw.) Zahlbr. This species was only recently reported from three localities in Bolivia (Flaks et al. 2012a).

Chemistry. Unidentified K+ purple and UV+ orange-red anthraquinone on pseudostroma.

Specimens examined. BOLIVIA. DEPT. BENI. Prov. General José Ballivián Segurola, north of San Borja, 14°46’07”S, 66°46’51”W, 190 m, lowland Amazon forest surrounded by los llanos de Moxos savanna, on bark, 3 Sept. 2012, MK 12057 (LPB, UGDA); Prov. Marbán, near road from Camiaco to San Lorenzo, 15°14’49”S, 64°49’11”W, 160 m, lowland Amazon forest surrounded by Los Llanos de Moxos savanna, on bark, 30 Aug. 2012, MK 11956a (LPB, UGDA); DEPT. LA PAZ. Prov. Franz Tamayo, between Apolo and Mapiri, 14°41’50”S, 68°25’07”W, 1510 m, savannah with scattered trees, on bark, 22 Nov. 2011, MK 10156 (LPB, UGDA); Prov. Ituralde, near San Pedro, 13°43’59”S, 68°00’38”W, 250 m, savanna, on bark of tree, 28 July 2008, MK 6899 (LPB, UGDA); DEPT. SANTA CRUZ. Prov. Andrés Ibáñez, AMBORÓ, on the road to San Mateo de Toresilla, 17°48’11”S, 64°39’28”W, 2250 m, Yungas cloud forest, on bark, 9 June 2011, MK 9997 (LPB, UGDA).

*Trypethelium eluteriae* Spreng. Pantropical species. Its South American distribution includes Brazil, Ecuador (the Galápagos Islands), French Guiana, Paraguay and Venezuela (Malme 1924; López-Figuereiras 1986; Hekking & Sipman 1988; Marcano et al. 1996; Cáceres 2007; Aptroot et al. 2008; Bungartz et al. 2013).

Chemistry. Thallus and stroma K– and UV–, but an orange-yellow pigment reacting K+ purple is present in the pseudostroma.

Specimens examined. BOLIVIA. DEPT. BENI. Prov. General José Ballivián Segurola, north of San Borja, 14°46’07”S, 66°46’51”W, 190 m, lowland Amazon forest surrounded by los llanos de Moxos savanna, on bark, 3 Sept. 2012, MK 12057 (LPB, UGDA); Prov. Marbán, near road from Camiaco to San Lorenzo, 15°14’49”S, 64°49’11”W, 160 m, lowland Amazon forest surrounded by los Llanos de Moxos savanna, on tree bark, 30 Aug. 2012, MK 11955 (LPB, UGDA); near San Lorenzo, 15°12’59”S, 64°47’08”W, 160 m, lowland Amazon forest surrounded by los Llanos de Moxos savanna, on tree bark, 30 Aug. 2012, MK 11894 (LPB, UGDA); south of San Borja, 14°46’07”S, 66°46’51”W, 190 m, lowland Amazon forest surrounded by los llanos de Moxos savanna, on bark, 30 Aug. 2012, MK 11956a (LPB, UGDA); Prov. Marbán, near road from Camiaco to San Lorenzo, 15°14’49”S, 64°49’11”W, 160 m, lowland Amazon forest surrounded by los Llanos de Moxos savanna, on tree bark, 30 Aug. 2012, MK 11955 (LPB, UGDA); near San Lorenzo, 15°12’59”S, 64°47’08”W, 160 m, lowland Amazon forest surrounded by los Llanos de Moxos savanna, on tree bark, 30 Aug. 2012, MK 11894 (LPB, UGDA); DEPT. SANTA CRUZ. Prov. Cordillera, 350 km on the road from Tucavaca to Roboró, 18°37’56”S, 59°36’50”W, 370 m, transition Chiquitano-Chaqueño forest, on twigs, 4 Dec. 2011, MK 10531 & 10515 (LPB, UGDA); SSW of Roboró, 18°36’11”S, 59°53’06”W, 320 m, transition Chiquitano-Chaqueño forest, on twigs, 4 Dec. 2011, MK 10607 (LPB, UGDA); near Petó Blanco, 18°48’25”S, 60°14’54”W, 330 m, transition Chiquitano-Chaqueño forest, on bark, 6 Dec. 2011, MK 10678 (LPB, UGDA); KAA-IYA, by Petó Blanco, 18°51’36”S, 60°18’00”W, 310 m, transition Chiquitano-Chaqueño forest, on tree bark, 5 Dec. 2011, MK 10666 (LPB, UGDA).
Trypethelium nitidiusculum (Nyl.) R. C. Harris

This pantropical species is most common in lowland forest (Aptroot et al. 1997, 2008; Elix & McCarthy 1998; Umaña-Tenorio et al. 2002; Cáceres 2007). In South America it has been found in Brazil, Ecuador (the Galapagos Islands) and Venezuela (Sipman 1992a; Cáceres 2007; Bungartz et al. 2013).

Chemistry. Thallus K– and UV–.

Specimens examined. BOLIVIA. DEPT. BENI. Prov. Marbán, near road from Camiaco to San Lorenzo, 15°14’49”S, 64°49’11”W, 160 m, lowland Amazon forest surrounded by los Llanos de Mojos savanna, on bark, 30 Aug. 2012, MK 11948 (LPB, UGDA); DEPT. LA PAZ. Prov. Nor Yungas, near Pango, near the road from Coroico to La Paz, 16°19’28”S, 67°57’21”W, 3822 m, Páramo Yungueño, on bark, 26 Nov. 2011, MK 10495 (LPB, UGDA).

Trypethelium ochroleucum (Eschw.) Nyl.

Previously reported from two localities in Bolivia (Flakus & Kukwa 2012b; Flakus et al. 2012a).

Chemistry. Thallus K–, UV+ orange.

Specimens examined. BOLIVIA. DEPT. BENI. Prov. Cercado, Isla de los Caimanes, near San Pedro Nuevo, 14°30’11”S, 64°52’21”W, 155 m, lowland Amazon forest surrounded by los Llanos de Mojos savanna, by lake, on bark, 1 Sept. 2012, MK 12005a (LPB, UGDA); Casa del Tigre near Chuchini, 14°43’17”S, 64°56’33”W, 190 m, lowland Amazon forest, on bark, 31 Aug. 2012, MK 11968 (LPB, UGDA); Prov. General José Ballivián Segurola, north of San Borja, 14°46’07”S, 66°46’51”W, 190 m, lowland Amazon forest surrounded by los Llanos de Mojos savanna, on bark, 3 Sept. 2012 MK 12042 (LPB, UGDA); Prov. Mamoré, near La Esperanza, 13°55’26”S, 64°59’46”W, 140 m, los Llanos de Mojos savanna by lake, on bark, 1 Sept. 2012. MK 12009 & 12007; Prov. Marbán, near road from Camiaco to San Lorenzo, 15°14’49”S, 64°49’11”W, 160 m, lowland Amazon forest surrounded by los Llanos de Mojos savanna, on bark, 30 Aug. 2012, MK 11956 (LPB, UGDA); near San Lorenzo, 15°12’59”S, 64°47’08”W, 160 m, lowland Amazon forest surrounded by los Llanos de Mojos savanna, on bark, 28 Aug. 2012, MK 11893 (LPB, UGDA).

Trypethelium tropicum (Ach.) Müll. Arg.

This is a widely distributed lichen, though not recorded so far from Africa (Aptroot & Sipman 1991, 2001; Harris 1995; Elix & McCarthy 1998; Cáceres 2007). In South America it has been reported from Brazil, Ecuador (the Galapagos Islands), French Guiana, Guyana, Paraguay and Venezuela (Müller 1888; Malme 1924; López-Figueiras 1986; Hekking & Sipman 1988; Marcano et al. 1996; Cáceres 2007; Bungartz et al. 2013).

Chemistry. Thallus and pseudostroma K– and UV–.

Specimens examined. BOLIVIA. DEPT. LA PAZ. Prov. Nor Yungas, near Pongo, near the road from Coroico to La Paz, 16°19’28”S, 67°57’21”W, 3822 m, Páramo Yungueño, on bark, 26 Nov. 2011, MK 10495 (LPB, UGDA).

Varicellaria velata (Turner) Schmitt & Lumbsch

Pertusaria velata (Turner) Nyl.

This is the second record of this species from Bolivia (Flakus & Kukwa 2012a).

Chemistry. Not tested by TLC; thallus UV–, C+ carmine-red.

Specimen examined. BOLIVIA. DEPT. LA PAZ. Prov. Franz Tamayo, between Apolo and Mapiri, 15°01’50”S, 68°18’33”W, 1120 m, Preandean Amazon forest, on bark, 23 Nov. 2011, MK 10326a (LPB).

Xanthoparmelia callifolioides Adler, Elix & J. Johnst.

Previously reported from two localities in Bolivia (Nash et al. 1995; Feuerer & Sipman 2005).

Chemistry. Usnic, salazinic and consalazinic (±) acids.

Specimens examined. BOLIVIA. DEPT. LA PAZ. Prov. Murillo, Valle de la Luna, near Mallasa district, 16°34’03”S, 68°05’38”W, 3350 m, open semi-desert high Andean area, on soil, 17 Nov. 2009, AF 14652 & PR (KRAM, LPB); Prov. Omasuyos, Tajani, cerca Achacachi, 15°36’49”S, 69°04’02”W, 3869 m, Puna Húmeda, saxicolous, 6 July 2010, AF 17798, 17804 & PR (LPB, herb. Flakus).
**Xanthoparmelia conspersa** (Ehrh. ex Ach.) Hale

This species has been reported in Bolivia only by Nylander (1861).

**Chemistry.** Usnic, norstictic and stictic acids.

**Specimens Examined.** BOLIVIA. DEPT. ORURO. Prov. Sajama, SAJAMA, Jecha K’ala, 18°09′52″S, 68°49′08″W, 4184 m, Puna Sureña, grassland vegetation, on siliceous rock, 20 June 2010, AF 16622, 16708 & PR (KRAM, LPB, herb. Flakus).

*Xanthoparmelia cordillerana* (Gyeln.) Hale

This lichen is known from Australia and South America (Argentina, Chile, Ecuador, Peru and Uruguay; Nash et al. 1995).

**Chemistry.** Usnic, salazinic, consalazinic (±) and fatty (±) acids.

**Specimens Examined.** BOLIVIA. DEPT. ORURO. Prov. Sajama, SAJAMA, Jecha K’ala, 18°09′52″S, 68°49′08″W, 4184 m, Puna Sureña, grassland vegetation, on siliceous rock, 20 June 2010, AF 16632 & PR (KRAM); DEPT. POTOSI. Prov. Nor Lípez, Pinturas Rupestres, near Mallku Villamar, 21°46′20″S, 67°29′05″W, 4038 m, open semi-desert high Andean area, on volcanic rock, 6 Dec. 2009, AF 14758 & PR (LPB, herb. Flakus).

**Xanthoparmelia ferraroiana** T. H. Nash, Elix & J. Johnst.

This South American species is already known from one Bolivian locality (Nash et al. 1995).

**Chemistry.** Usnic, psoromic (major), 2-O-demethylpsoromic (trace) and fumarprotocetraric (minor) acids.

**Specimen Examined.** BOLIVIA. DEPT. POTOSI. Prov. Daniel Campos, Puerto Chuvica, near Salar Uyuni, 20°36′06″S, 67°35′50″W, 3670 m, open semi-desert high Andean area, on volcanic rock, 4 Dec. 2009, AF 14692 & PR (LPB).

*Xanthoparmelia hypopsila* (Müll. Arg.) Hale

This widespread lichen was reported in South America from Argentina, Brazil, Chile, Paraguay, Peru, Uruguay and Venezuela (Hale 1990b; Nash et al. 1995; Feuerer 2013).

**Chemistry.** Usnic, stictic and norstictic (trace) acids.

**Specimens Examined.** BOLIVIA. DEPT. LA PAZ. Prov. Omasuyos, Tajani, cerca Acharacachi, 15°36′49″S, 69°04′02″W, 3869 m, Puna Húmeda, terricolous, 6 July 2010, AF 17793 & PR (KRAM, LPB).

*Xanthoparmelia lineola* (E. C. Berry) Hale

This lichen is known from Australia, China, South Africa and North and South America (Argentina and Peru) (Hale 1990b; Wei 1991; Nash et al. 1995).

**Chemistry.** Atranorin, usnic, salazinic, consalazinic, norstictic (trace) and protocetraric (trace).

**Specimens Examined.** BOLIVIA. DEPT. SANTA CRUZ. Prov. Caballero, East Cordillera, Siberia, 17°49′38″S, 64°45′14″W, 3480 m, open area near Yungas montane cloud forest, on siliceous sandstone, 15 Dec. 2004, AF 4837 (LPB, KRAM).

**Xanthoparmelia microspora** (Müll. Arg.) Hale

This species has been reported from Bolivia by Hale (1990b) and Nash et al. (1995).

**Chemistry.** Usnic, salazinic and consalazinic (±) acids.

**Specimens Examined.** BOLIVIA. DEPT. COCHA-BAMBA. Prov. Chapare, cerca de la represa Corani, al lado del camino, on rock, 3250 m, 27 Sept. 1988, S. Arrazola 54 (LPB); DEPT. LA PAZ. Prov. Camacho, Pacoamba, near Wila Kala, 15°24′40″S, 69°04′24″W, 4283 m, Puna Húmeda vegetation, on saxicolous bryophytes, 6 July 2010, AF 17704.2 & PR (LPB); Prov. Los Andes, 10 km del camino Tiahuanacu-La Paz, 3970 m, on siliceous sandstone, 14 June 1981, M. Liberman 392 (LPB); DEPT. ORURO. Prov. Sajama, Parque Nacional Sajama, Jecha K’ala, 18°09′52″S, 68°49′08″W, 4184 m, Puna Sureña, grassland vegetation, on volcanic rock, 20 June 2010, AF 16710 & PR (KRAM).

*Xanthoparmelia neotaractica* Hale

This is the second locality of this species in South America (Nash et al. 1995); it is also known
from southeastern U.S.A. (Hale 1984, 1990b; Nash et al. 1995).

CHEMISTRY. Usnic, stictic, constrictic and norstictic (minor) acids.

**Specimen examined.** BOLIVIA. DEPT. COCHABAMBA. Prov. Ayopaya, 20 km de Cocapata hacia Cotacajes, 16°46′S, 66°44′W, 2000 m, bosque semidecduo intervenido, exposición W, on soil, 15 May 1997, KB et al. 114 (LPB).

*Xanthoparmelia plittii* (Gyeln.) Hale

A widely distributed species (Hale 1990b; Nash et al. 1995; Hawksworth et al. 2008), its South American range includes Argentina, Brazil, Colombia, Paraguay, Uruguay and Venezuela (Hale 1990b; Nash et al. 1995).

CHEMISTRY. Usnic acid and the stictic acid complex with norstictic acid.

**Specimens examined.** BOLIVIA. DEPT. LA PAZ. Prov. Murillo, TUNI-CONDORIRI, Comunidad Tuní, vegetación Altoandina, 16°13′28″S, 68°16′03″W, on siliceous schist, 17 March 2009, PR 994 (LPB); DEPT. LA PAZ. Prov. Bautista Saavedra, APOLOBAMBA, near Taypi Cañuma, 15°03′20″S, 69°09′07″W, 4506 m, high Andean open vegetation, saxicolous, 5 July 2010, AF 17492, 17556 & PR (KRAM, LPB, herb. Flakus); DEPT. ORURO. Prov. Sajama, SAJAMA, Jecha K’ala, 18°09′52″S, 68°49′08″W, 4184 m, Puna Sureña, grassland vegetation, saxicolous, 20 June 2010, AF 16686 & PR (KRAM).

*Xanthoparmelia sipmanii* T. H. Nash & Elix

This endemic South American species has been reported from Brazil, Paraguay and Venezuela (Nash et al. 1995).

CHEMISTRY. Usnic and protocetraric acids.

**Specimens examined.** BOLIVIA. DEPT. ORURO. Prov. Sajama, SAJAMA, Huincura, near Sajama, 18°07′01″S, 68°58′00″W, 4301 m, Puna Sureña, Polylepis forest, saxicolous, 19 June 2010, AF 16594 & PR (KRAM, LPB); DEPT. POTOSÍ. Prov. Nor Lípez, Pinturas Rupestres, near Mallku Villamar, 21°46′20″S, 67°29′05″W, 4038 m, open semi-desert high Andean area, on volcanic rock, 6 Dec. 2009, AF 14776 & PR (KRAM, LPB).

*Xanthoparmelia subsorediata* Hale

This lichen is known only from Brazil, Chile, Ecuador and Venezuela (Nash et al. 1995).

CHEMISTRY. Usnic, norstictic, stictic and con-norstictic acids.

**Specimens examined.** BOLIVIA. DEPT. LA PAZ. Prov. Bautista Saavedra, APOLOBAMBA, near Taypi Cañuma, 15°03′20″S, 69°09′07″W, 4506 m, high Andean open vegetation, saxicolous, 5 July 2010, AF 17502 & PR (KRAM, LPB).

*Xanthoparmelia subulcerosa* T. H. Nash & Elix

A South American species, *X. subulcerosa* is already known from Argentina, Colombia, Ecuador and Venezuela (Nash et al. 1995; Calvelo & Liiberatore 2002).

CHEMISTRY. Usnic and salazinic acids with a trace of norstictic acid.

**Specimens examined.** BOLIVIA. DEPT. LA PAZ. Prov. Murillo, La Paz, Cota Cota Calle 27, University Campus, Herbario Nacional de Bolivia, 16°32′16″S, 68°04′08″W, 3650 m, Botanical Garden, on rock, 28 June 2008, MK 5984 (LPB, UGDA).

*Xanthoparmelia xanthomelaena* (Müll. Arg.) Hale

This lichen has been reported from Argentina, Brazil and Venezuela, as well as Australia and South Africa (Hale 1976b; Nash et al. 1995; Triebel et al. 1995).

CHEMISTRY. Usnic, norstictic (trace) and stictic acids.

**Specimens examined.** BOLIVIA. DEPT. LA PAZ. Prov. Franz Tamayo, APOLOBAMBA, near Puyo Puyo, 14°56′55″S, 69°07′58″W, 4888 m, high Andean open vegetation, on schist rock, 5 July 2010, AF 17596.1 & PR (KRAM, LPB).

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