Phytotaxa 173 (1): 001–030
www.mapress.com/phytotaxa/

Article

ISSN 1179-3155 (print edition)
PHYTOTAXA
ISSN 1179-3163 (online edition)

http://dx.doi.org/10.11646/phytotaxa.173.1.1

Parmelioid lichens (Parmeliaceae) in southernmost South America

A. ELVEBAKK[1], J.W. BJERKE[2] & L.E. STØVERN[3]

[1] *Tromsø University Museum, University of Tromsø – Arctic University of Norway, N-9037 Tromsø, Norway. arve.elvebakk@uit.no*
[2]*Norwegian Institute for Nature Research NINA, FRAM – High North Research Centre for Climate and the Environment, N-9296 Tromsø, Norway. jarle.werner.bjerke@nina.no*
[3]*Department of Marine and Arctic Biology, University of Tromsø – Arctic University of Norway, N-9037 Tromsø, Norway. Present address: Norwegian Forest and Landscape Institute, N-9269 Tromsø, Norway. leif.einar.stovern@skogoglandskap.no*

Abstract

The parmelioid lichens is a speciose group in the Parmeliaceae family, and the biodiversity of this group is still far from completely understood in many regions of the world. One such region is southernmost South America, viz. the parts of Chile and Argentina south of 49 and 46° S, respectively, and the Falkland Islands. Based on examination of 366 herbarium samples and a study of relevant literature, 51 species of parmelioid lichens are here accepted for southernmost South America, whereas 12 species reported from the area during the last decades have been rejected. *Xanthoparmelia austrosorediata* and *X. tehuelchorum* are described as new to science here. In addition, six species are reported as new to southernmost South America, three of which are new to Chile, whereas an additional five species are new to the Chilean region of Magallanes. The apothecia of *Flavoparmelia gerlachei* and *Xanthoparmelia subplittii* are described for the first time here. *Xanthoparmelia* is the largest genus in the area with 21 species, two still undescribed, followed by *Hypotrachyna* with 11 and *Parmelia* with five. The lichenologically least explored part of the area is the Patagonian steppe and adjacent areas. Half of the total number of species, including all *Xanthoparmelia* species, is concentrated to these arid areas, and the majority of these are species which are endemic to South America. *Hypotrachyna* species are characteristic of the humid evergreen forest zone along the coast, and most of these species have wide pantropical or subcosmopolitan distribution ranges and few records from the present study area. The strongest focus of the present study is the National Park Torres del Paine in Magallanes, and a total of 35 parmelioid species are reported from this area here. Several of these have had their only known localities in southernmost South America destroyed by the 2011/2012 forest fire. Exploration history, frequency, distribution and evolutionary patterns are also discussed for single species or groups of species.

Key words: Argentina, biodiversity, biogeography, Chile, Falkland Islands, new species, taxonomy, *Xanthoparmelia*

Introduction

Parmeliaceae is the largest family of lichen-forming fungi (Thell *et al.* 2012). Most members of the family are large and conspicuous, and representatives of the family are dominant in lichen communities throughout the world. Parmeliaceae taxonomy has been dominated by revisions particularly at generic level during the last four decades, in addition to a large number of new species descriptions. The introduction of molecular data in taxonomy together with international cooperating networks of lichenologists is now introducing a more stable situation regarding circumscriptions of both the family and its genera (Crespo *et al.* 2010). Traditionally named informal categories related to growth forms, such as alectorioid, cetrarioid, hypogymnioid, parmelioid and usneoid groups are now being studied phylogenetically and revised as clades (Crespo *et al.* 2007, Thell *et al.* 2012).

The family or parts of the family has also been reviewed critically for certain geographical areas, such as Europe (Hawksworth *et al.* 2008), the Alps (Thell *et al.* 2010), the Nordic countries (Thell *et al.* 2004, Thell & Moberg 2011), Taiwan (Kurokawa & Lai 2001) and New Caledonia (Louwhoff & Elix 2002). Southernmost South America has attracted lichenologists for a very long period. Northern Hemisphere scientists have found this area particularly interesting (see e.g. Tuhkanen *et al.*1990), being remote, isolated and botanically exotic, but still with climatic conditions related to those of their home countries and with a considerable number of species also well-known in the Northern Hemisphere. The best example is the cetrarioid group, where all accepted species present in the area have bipolar distributions, see discussion by Elvebakk & Moberg (2002), although there are two undocumented/critical taxa in *Tuckermanopsis* (Øvstedal & Smith 2001, Calvelo & Liberatore 2002) .

Accepted by Thorsten Lumbsch: 23 May 2014; published: 20 Jun. 2014

In spite of numerous lichen studies there is still no critical review of Parmeliaceae species of the area with documentation such as direct or indirect references to voucher specimens. Hypogymnioid species have been reviewed recently in the case of *Hypogymnia* (Elvebakk 2011) and *Menegazzia* (Bjerke 2005). The latter has been excluded from the hypogymnioid group although it still might have affinities to it (Crespo *et al.* 2007, 2010, Thell *et al.* 2012). The previous concept of the usneoid group has been abandoned, because of *Usnea, Protousnea* and letharioid species being clearly polyphyletic (Crespo *et al.* 2007, Thell *et al.* 2012). Still, there are recent studies from the area on important groups such as the *Neuropogon* group of *Usnea,* also polyphyletic according to Wirtz *et al.* (2008), and *Protousnea* (Calvelo *et al.* 2005), whereas the dominant, corticolous *Usnea* species remain unstudied in modern times.

The remaining group, the parmelioid lichens, is the richest in both species and genera, and is the topic of the present treatment. Parmeliaceae has received more attention in southernmost Argentina than in corresponding parts of Chile. The Argentinian lichen catalogue by Calvelo & Liberatore (2002) is the most recent review, also listing distribution by provinces. They accepted 38 species of parmelioid lichens, as defined here, from the two southernmost Argentinian provinces, in addition to the Falkland Islands/Islas Malvinas, and 9 of these species were stated to be new to Argentina, but without references to studied specimens. Parmeliaceae has also been reviewed for southern parts of Argentina by Calvelo (1998a) and Adler & Calvelo (2002), although collection data were lacking, except that the latter study indicated dot symbols on coarse-scale maps showing the global distribution of the species treated. Other studies by these authors focusing on parmelioid lichens in southernmost Argentina have provided specimen citations (Calvelo & Adler 1999, 2001).

Some global or continent-scale monographs have treated genera in the area, such as *Hypotrachyna* (Hale 1975), recently circumscribed in a broader sense (Divakar *et al.* 2013), the brown *Parmelia* s. l. species (Esslinger 1977), now e.g. in *Xanthoparmelia, Melanelixia* and *Melanohalea*, *Parmelia* s. str. (Hale 1987a), modified by the recent separation of *Notoparmelia* (Ferencova *et al.* 2014), and yellow *Xanthoparmelia* species (Nash *et al.* 1995). Other species are dealt with in regional studies, such as Stenroos (1991) and Kurokawa (1999). Older floristic studies, e.g. Räsänen (1932) and studies reviewed by Grassi (1950), applied species concepts which in many cases differ from those established today.

The selection of parmelioid species used in the present study follows Thell *et al.* (2012), but also includes the genera *Himantormia, Imshaugia, Omphalodium* and *Pannoparmelia*, which were all treated as having uncertain clade affiliation within Parmeliaceae by Thell *et al.* (2012). Two of these have morphological affinities with the parmelioids, whereas the umbilicate *Omphalodium* is included here for its biogeographical importance and for the lack of a better alternative regarding morphology and phylogeny-based group affiliation. *Himantormia* is apparently cetrarioid. However, its closest relative in the phylogram presented by Thell *et al.* (2007) was a single *Xanthoparmelia* sample.

The major aim of this study is to contribute to an increased knowledge about this important group of lichens in southernmost South America. This includes presentation of the accepted species from the area, in addition to a selection of rejected species among those reported from the area during the last decades. The study also discusses patterns of diversity, phytogeography and evolution. The study is based on literary reports, herbarium samples and field work in Magallanes in Chile by the first author during the years 1992−2000, in 1998 also accompanied by the second author, and with supplementary field work in 2013−2014. The field work focused on the National Park Torres del Paine, and the parmelioids occurring in this area are indicated separately. Four undescribed species were discovered in the area and two of these are described below.

Material and methods

Southernmost South America is defined here as comprising the XII Región de Magallanes in Chile, the provinces of Santa Cruz and Tierra del Fuego in Argentina and the Falkland Islands/Islas Malvinas, but excludes the territorial claims of Antarctica incorporated by these two countries in their southernmost administrative units. The treatment is based on literary reports, studies on own material deposited at TROM, some collections also at CANB, H, HIP, LE, MAF, SGO and UV, and parts of the rich material deposited in S, particularly the collections by R. Santesson. Most samples were subjected to chemical studies based on standard TLC methods (Culberson 1972, Orange *et al.* 2001), involving solvent systems A and C, in some cases A only, and indicating concentrations roughly by adding ‘major’, ‘minor’ or ‘trace’. The present study is based on examination of 366 herbarium specimens from the study area, among these 197 samples of the genus *Xanthoparmelia*. Most of these were collected by the first author in Magallanes during the period 1992−2000 and in 2013/2014.

There are numerous reports of taxa with dubious identity in the older literature. The present treatment is restricted to species reported during the last decades. When no significant new information is available for a given species, a short comment including a key literary reference is made, and, in the case of common species of the genera *Melanelixia, Melanohalea* and *Parmelia*, own specimens are not referred to. Synomyms are not listed here, as publication references are given for all species.

Supplementary information is included on frequency and distribution patterns. Frequency of each species is summarized as 'single occurrence', 'rare', 'scattered', 'widespread' and 'common' based on literature and own field studies. These concepts do not refer to the whole study area, but to climatic zones where the species occur. Notes on world distribution are included based on literary sources, in particular Adler & Calvelo (2002). The concept 'bipolar distribution' is restricted here to species reaching high latitudes, such as boreal, boreal-alpine or Arctic areas in the Northern Hemisphere or anti-boreal (*sensu* Tuhkanen 1992), anti-boreal/andine or Antarctic in the Southern one. Species which instead are restricted to temperate areas of both hemispheres are here referred to as amphi-tropical.

TABLE 1. List of parmelioid species accepted from the study area of southernmost South America, with notes on general distribution, range expansions, occcurrences in the National Park Torres del Paine and frequency within climatically relevant areas of the study area.

Name	Gen. distr.	Range expansion	Paine	Frequency
Flavoparmelia gerlachei (Zahlbr.) Hale	S. Am.& Ant. endemic		*	Common
Himantormia deusta (Hook. f.) A. Thell & Søchting	S. Am. endemic		*	Scattered
Hypotrachyna brevirhiza (Kurok.) Hale	Pantropical-austral		*	Common
H. caraccensis (Taylor) Hale	Neotropical-austral			Single occ.
H. chilensis (Kurok.) Divakar et al.	S Am endemic	New to S SAm	*	Common
H. densirhizinata (Kurok.) Hale	Pantropical-austral		*	Rare
H. laevigata (Sm.) Hale	Cosmopolitan			Rare
H. oostingii (Dey) Hale	Bipolar/amphi-tropical			Rare
H. rockii (Zahlbr.) Hale	Cosmopolitan/subc.			Scattered
H. sinuosa (Sm.) Hale	Cosmop.		*	Common
H. sorocheila (Vain.) Divakar et al.	Pantropical-austral	New to Magallanes	*	Widespread
H. sublaevigata (Nyl.) Hale	Austral			Rare
H. swinscowii (Hale) Krog & Swinscow	Pantropical-austral		*	Rare
Melanelixia subglabra (Räs.) A. Crespo, Divakar & Elix	Austral		*	Common
Melanohalea elegantula (Zahlbr.) O. Blanco et al.	Bipolar		*	Common
M. inactiva (P.M. Jørg.) Blanco, O. et. al.	Austral			Scattered
M. ushuaiensis (Zahlbr.) O. Blanco et al.	S Am. endemic		*	Common
Notoparmelia cunninghamii (Crombie) A.Crespo, Ferencova & Divakar	Austral		*	Common
N. protosulcata (Hale) A.Crespo, Ferencova & Divakar	Austral			Common
Omphalodium pisacomense Meyen & Flot.	S. Am. endemic			Common
Pannoparmelia angustata (Pers.) Zahlbr.	Austral		*	Common
Parmelia araucana Adler & Calvelo	S. Am. endemic	New to Chile and S SAm	*	Scattered
P. kerguelensis F. Wilson	Subcosmopolitan			Rare
P. lindsayana Øvstedal & Elix	End. Falkl. Ant.			Rare
P. saxatilis (L.) Ach.	Cosmop.		*	Common
P. sulcata Taylor	Cosmop.		*	Common
Parmeliopsis hyperopta (Ach.) Arnold	Bipolar	New to Magallanes	*	Scattered
Parmotrema perforatum (Jacq.) A. Massal.	Temp.-subtrop, Am.			Rare
P. reticulatum (Taylor) Choisy	Cosmop.	New to Magallanes	*	Widespread
Punctelia stictica (Delise in Duby) Krog	Cosmop.		*	Common
Xanthoparmelia austrosorediata Elvebakk	S. Am. endemic	New to science	*	Common
X. delisei (Duby) O. Blanco et. al.	Amphi-tropical		*	Common
X. farinosa (Vain.) Nash, Elix, & J. Johnston	S. Am. endemic	New to S SAm	*	Scattered
X. glabrans (Nyl.) O. Blanco et. al.	Amphi-tropical	New to Magallanes	*	Rare
X. imitatrix (Taylor) O. Blanco et. al.	Austral		*	Common
X. microspora (Müll. Arg.) Hale	S. Am. endemic		*	Rare
X. mougeotii (Schaer.) Hale	Amphi-tropical		*	Widespread
X. patagonica (Henssen) Amo, Lumbsch & Crespo	S. Am. endemic			Single occ.
X. peltata Amo, Lumbsch & Crespo	S. Am. endemic			Single occ.
X. skottsbergiana Nash & Elix	S. Am. endemic	New to S SAm	*	Rare
X. squamans (Stitzenb.) O. Blanco et al.	Austral			Rare
X. stygiodes (Nyl. ex Cromb.) O. Blanco et. al.	Austral	New to Magallanes	*	Scattered
X. subhosseana (Elix) O. Blanco et. al.	Amphi-tropical		*	Common
X. submougeotii Hale	S. Am. endemic		*	Common
X. subplittii Hale	S. Am. endemic	New to Chile and SSAm	*	Scattered
X. substenophylloides Hale	S. Am. endemic			Rare
X. tehuelchorum Elvebakk	S. Am. endemic	New to science	*	Common
X. ulcerosa (Zahlbr.) Hale	S. Am. endemic			Rare
X. wrightiana Nash, Elix & Johnston	S. Am. endemic	New to Chile and SSAm	*	Scattered
X. sp. 1	S. Am. endemic		*	Rare
X. sp. 2	S. Am. endemic		*	Rare

The genera and their species

Accepted species

A total of 51 species of parmelioid lichens are accepted for southernmost South America, including four new species of *Xanthoparmelia*, of which *X. austrosorediata* and *X. tehuelchorum* are described here. In addition, six species are reported as new to southernmost South America and three of these are new to Chile, whereas an additional five species are new to the Chilean region of Magallanes. *Xanthoparmelia* is the largest genus in the area with 21 species, including the two undescribed ones, followed by *Hypotrachyna* and *Parmelia* with 11 and five species each, respectively. Table 1 lists the accepted species with a description of their global and regional distribution, regional frequency and occurrence in the National Park Torres del Paine, where own field work has been concentrated. A total of 35 parmelioid species are reported here from the latter area.

FIGURE 1. The study area comprising four administrative units in southernmost South America. In addition the following important place names are indicated by numbers: 1. Parque Nacional Torres del Paine; 2. Puerto Natales; 3. Morro Chico; 4. Parque Nacional Pali-Aike; 5. Punta Arenas; 6. Ushuaia; 7. Río Gallegos; 8. Sierra Baguales; 9. Seno Skyring; 10. Seno Otway; 11. Península de Brunswick; 12. Isla de los Estados.

Flavoparmelia gerlachei (Zahlbr.) Hale (1986: 604)

Flavoparmelia gerlachei has been found by us to be very common and dominant on strongly exposed rocks in the steppe zone in the study area. The species has been confused with what is here described as *Xanthoparmelia austrosorediata*, but differs in its rotund and rather broad lobe apices which lack the strongly glossy surface and the dark-pigmented margin of *X. austrosorediata,* where lobe apices are more or less truncate (Figs. 2−4). These two species are also chemically distinct, with physodalic and malonprotocetraric acids in the former and protocetraric acid in *X. austrosorediata*, both in addition to usnic acid. All TLC spots of the suspected protocetraric acid of *F. gerlachei* were systematically in positions below protocetraric acid references, with R_f values of 2 vs. 3 in solvent A and 4 vs. 5 in solvent C, respectively. These values correspond exactly with those of malonprotocetraric acid as described from a *Parmotrema* species by Keogh (1977) and Huneck & Yoshimura (1996), and is determined here as this substance, although no reference has been available.

The species was reported with one locality from Magallanes and one from Santa Cruz in addition to localities in Antarctica and Venezuela by Hale (1986). Hale (1986) cited its chemistry as protocetraric and usnic acids in his own collections from Venezeula, which makes us believe that these collections are either *X. austrosorediatum* or another

species. The two cited samples from Chile and Argentina contain physodalic, protocetraric and usnic acid, a chemotype also reported later from Santa Cruz and Argentinian Tierra del Fuego by Calvelo & Adler (1999). Hale (1986) also cited the species to contain physodalic and usnic acids, which obviously would refer to his cited Antarctic specimens. This agrees with Øvstedal & Smith (2001), who studied numerous specimens from Antarctica and only reported on a chemotype with physodalic and usnic acids. The 11 collections studied by TLC here all have physodalic and malonprotocetraric acids in addition to usnic acid.

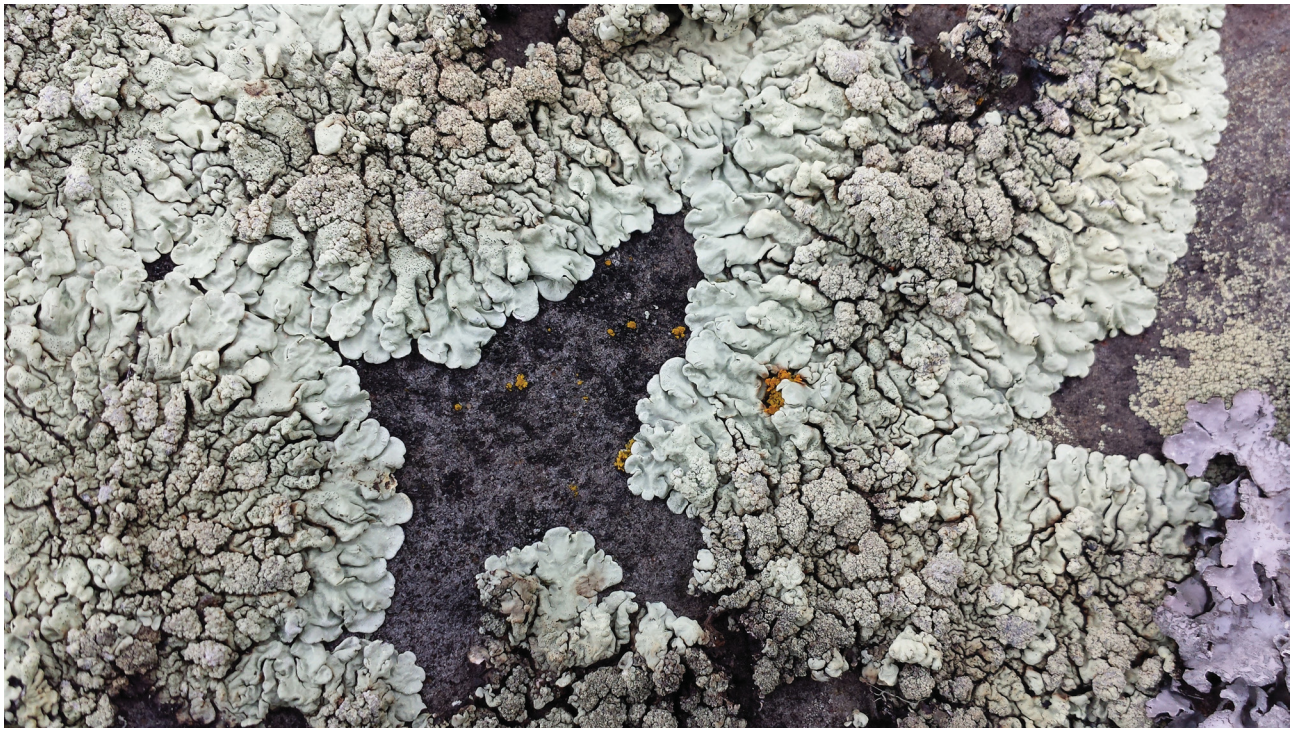

FIGURE 2. *Flavoparmelia gerlachei* photographed at Morro Chico, Chile.

FIGURE 3. *Xanthoparmelia austrosorediata* (left) and *Flavoparmelia gerlachei* (right) photographed at Morro Chico.

Here, *Flavoparmelia gerlachei* is reported as fertile for the first time, and apothecia were found in the collections *Elvebakk 13:081* and *14:030,* collected c. 100 m apart on the southern side of Morro Chico (Fig. 4). The apothecia are scattered, substipitate, 1−2.5 mm across, and urn-shaped with concave chestnut-brown discs. The thalline excipuli are conspicuously broad, c. 0.5 mm as seen from above, and sorediate in all mature apothecia. The ascospores are short-

ellipsoid with proper ascospores 6−8.5 × 12.5−14 µm, surrounded by perispores 6.5−9.5 × 13.5−15 µm. The perispore is 0.5−1 µm thick, smooth in immature spores, verruculose in at least some of mature spores. A single spore has an apical perispore extension. The spores are a bit shorter and the perispore thinner than generally cited for *Flavoparmelia* by Hale (1986; >15 µm long and c. 2 µm thick, respectively).

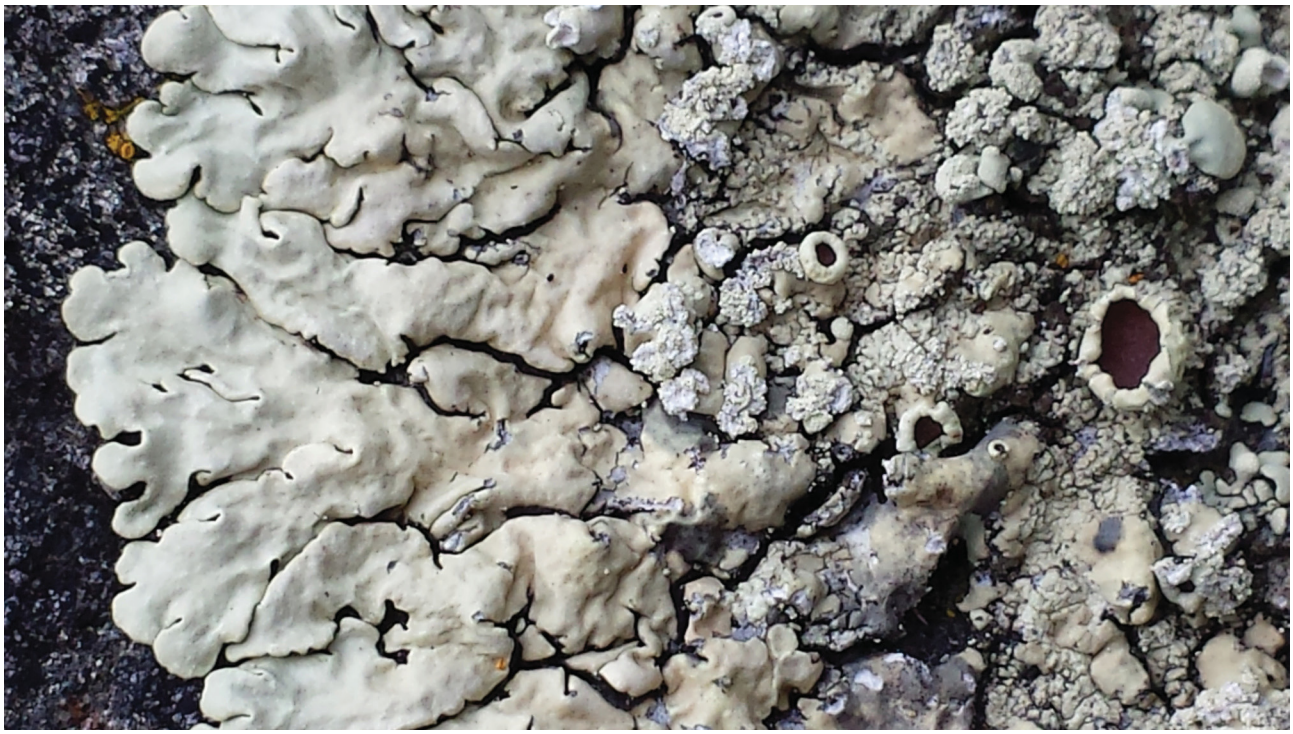

FIGURE 4. A fertile specimen of *Flavoparmelia gerlachei* (*Elvebakk 13:081*) photographed at Morro Chico.

It is striking that the apothecia have only been found in a site where the species obviously has its optimum, at the lowermost part of the cool, vertical basalt cliff, obviously strongly manured by dust, and where the lichen vegetation is strongly similar to the one of an Antarctic bird-cliff (Fig. 5).

FIGURE 5. The S-facing basalt cliff wall of Morro Chico, dominated by *Haematomma erythromma, Ramalina terebrata* and *Usnea acromelaena*.

Specimens examined: ARGENTINA. Provincia de Tierra del Fuego; **Sierra Alvear**, the southern slope, c. 650 m, on exposed rocks in the alpine region, 9 Feb 1940, *Santesson, R. 884* (S); CHILE. XII Región de Magallanes: **Sierra Baguales**, 1 km N of Estancia Las Tres Erres, 50°45'39"S, 72°24'52"W, on soft sandstones in a steppe landscape, 5 Dec 1999, *Elvebakk, A. 99:1156* (TROM); *14:020* (TROM); 3–4 km S of Estancia Las Tres Erres, 50°48'S, 72°25'W, 250 m, rocks in a steppe landscape, 5 Dec 1999, *Elvebakk, A. 99:1162* (TROM); 1.3 km S of the junction between the roads towards Las Chimas and Las Cumbres, 50°53'S, 72°23'W, 2−300 m, on an erratic boulder in a steppe landscape, 5 Dec 1999, *Elvebakk, A. 99:1145* (TROM); **Parque Nacional Torres del Paine,** 1.5 km N of Laguna Blanquillos, on the most exposed parts of rock outcrops or exposed boulders, 1 Jan 2014, *Elvebakk, A. 14:014* (TROM); *14:015* (TROM); 3−400 m SE of Laguna Los Flamencos, 51°02'S, 72°48'W. on the top of exposed boulders, 2 Dec 1999, *Elvebakk, A. 99:1013* (TROM); Lago Nordenskjöld S, 1 km W of the Miradór, 51°02'30"S, 72°56'W, 70 m, on shaded rocks, 1 Dec 2000, *Elvebakk, A. 00:860* (TROM); 100 m N of Salto Grande, 51°03'57.3"S, 73°00'25.7"W, 80 m, on a light-exposed rock, 3 Dec 1999, *Elvebakk, A. 99:1022* (TROM); 1 km W of Guardería Lago Grey, 51 07'30"S, 73 10'30"W, 80 m, on light-exposed open rocks near the river, 4 Dec 1999, *Elvebakk, A. 99:1098A* (TROM); **Morro Chico**, on strongly dust-manured, vertical cliff, 30 Dec 2013, *Elvebakk, A. 13:074* (TROM)*; 13:076* (TROM); *13:081* (MAF; TROM); 28 Nov. 1999, *Elvebakk, A. 99:819* (TROM).

Himantormia deusta (Hook.f.) A. Thell & Søchting (in Thell *et al.* 2007: 537)

This species was first described in the monotypic genus *Nimisia* (Kärnefelt & Thell 1993) from a single locality in Argentinian Tierra del Fuego. Later Fryday (2005) added more localities, including the Falkland Islands and the Cape Horn area in Chilean Tierra del Fuego. When transferring the species to *Himantormia*, Thell *et al.* (2007) based their phylogeny on an additional collection from Chilean Magallanes.

Hypotrachyna brevirhiza (Kurok.) Hale (1975: 26)

This species was described with its type (S) from Mina Elena at Isla Riesco, Magallanes (Hale & Kurokawa 1968). The species was described as common in southernmost South America, a conclusion confirmed by our studies. All studied specimens contain atranorin and salazinic acids (majors), and norstictic acid (minor).

Specimens examined: ARGENTINA. Provincia de Tierra del Fuego: **Río Irigoyen**, *Stenroos, S. 2715* (H; immixed with, and filed below *Menegazzia magellanica*). CHILE. XII Región de Magallanes: **Parque Nacional Torres del Paine**, 2 km N of Salto Grande, 51°04'S, 73°01'W, 80 m, on S-facing rocks and on bases of *Berberis microphylla*, 7 Dec 2000, *Elvebakk, A. 00:921* (TROM); Lago Pehoe NW, 500 m SE of Refugio y Camping Pehoe, 51°04'30"S, 73°07'W, 80 m, on a log in a river gorge, 6 Jan 1998, *Elvebakk, A. 98:060* (TROM); Lago Pehoe E, at Camping Pehoe, 51°07'S, 73°01'W, on *Nothofagus antarctica*, Mar 1998, *Elvebakk, A. 98:343 & Bjerke, J.W.* (TROM); **Puerto Natales**, Cerro Dorotea, on sandstone rocks, 9 May 1940, *Santesson, R. 8246a* (S), **Seno Skyring**, N part, 3 km W of Puerto Altamirano, 52°35'S, 72°06'W, 30 m, on a fallen log of *Nothofagus antarctica*, 30 Nov 1999, *Elvebakk, A. 99:979* (TROM); **Península Brunswick**, Punta Arenas W, Río de las Minas, 100 m, on *Nothofagus pumilio*, 12 Mar 1992, *Elvebakk, A. 92:003;* 21 Mar 1992, *Elvebakk, A. 92:082* (TROM).

H. caraccensis (Taylor) Hale (1975: 26)

Listed from Argentinian Tierra del Fuego by Calvelo & Liberatore (2002) without any locality or collection information.

H. chilensis (Kurok.) Divakar, A. Crespo, Sipman, Elix & Lumbsch (2013: 31)

Hypotrachyna chilensis has previously only been reported from a very restricted area near Coyaique and Puerto Aisén in the XI Region of Aisén in Chile, where it was stated to be locally common (Kurokawa 1999). It is reported here with one additional collection from the same area, but it has also been found to be common in the central parts of the region of Magallanes. Here, several collections are also from Chile in the mountain Cerro Dorotea near Puerto Natales and many from eastern and central areas in the National Park Torres del Paine, partly made by the first author, partly by R. Santesson. All collections were made on rocks, and they are situated in the driest, thermophilous part of the forests bordering the temperate Patagonian steppe, characterized by *Mulinum spinosum* or *Junellia tridens*, see map of bioclimatic units in Magallanes proposed by Elvebakk & Moberg (2002). The westernmost records at Río Pingo and Lago Grey are from a north-facing slope, obviously with higher temperatures than elsewhere in the area.

The material has been compared with corticolous Central Chilean material of *H. sorocheila*, and the distinguishing characters given by Kurokawa (1999); shorter lobes, shorter cilia and presence of rhizines; were found to be convincing. All specimens of *H. chilensis* studied by us contain atranorin and salazinic acid as majors, in addition to a few unknown substances recorded in minor or trace quantities.

Specimens examined: CHILE. XI Región de Aysén: **Coyhaique,** Coyhaique Bajo, Baquedano, on a boulder in a field with scattered *Nothofagus antarctica,*14 Jun 1940, *Santesson, R. 8423* (S); XII Región de Magallanes: **Parque Nacional Torres del Paine**, 2 km NE of E end of Lago Sarmiento Chico, 51˚03'S, 72˚55'W, 250 m, on rocks, Nov 1995, *Elvebakk, A. 95:454* (SGO); Laguna Mellizas E, 51˚04'30"S, 72˚58'W, 100 m, on protected rock surface,1 Dec 2000, *Elvebakk, A. 00:883* (TROM); 1.5 km NW of Guardería Lago Grey, 51˚07'30"S, 71˚10'30"W, 80 m, on a steep south-facing cliff wall, 4 Dec 1999, *Elvebakk, A. 99:1089* (TROM); Pudeto, 300 m W of the northernmost inlet, 51˚04'S, 73˚01'W, 100 m, on a south facing rock surface in *Mulinum spinosum* shrubland, 11 Dec 1999, *Elvebakk, A. 99:1304* (TROM); 1.5 km N of Salto Grande, 51˚03'30"S, 73˚02'W, 80 m, on rocks, 7 Dec 1995, *Elvebakk, A. 95:511* (TROM); Lago del Toro (L. Maravilla), Estancia Río Paine, on exposed rocks above the river, 15 Mar 1941, *Santesson, R. 6591* (S); *6592* (S); on exposed rocks, 14 Mar 1941, *Santesson, R. 6498* (S); on stony ground in an open *Nothofagus antarctica* forest, 16 Mar 1941, *Santesson, R. 6478* (S); **Puerto Natales**, Cerro Dorotea, on sandstone rocks, 9 May 1940, *Santesson, R*. 8244 (S).

H. densirhizinata (Kurok.) Hale (1975: 31)

One large colony was discovered on a north-facing rock wall in Torres del Paine National Park. The specimens contain atranorin, α-alectoronic acid and cf. α-collatolic acid. In the study area it has previously only been reported from Puerto Yartou in Chilean Tierra del Fuego (Hale & Kurokawa 1968).

Specimen examined: CHILE. XII Región de Magallanes: **Parque Nacional Torres del Paine**, between Lago Grey and Lago Pehoe, 200 m S of 'elevation 269', 51˚06'S, 73˚09'W, 150 m, on a vertical, north-facing cliff wall, ass. with *Parmotrema reticulata* and *Normandina pulchella*, 11 Mar 1998, *Elvebakk, A. 98:472 & Bjerke, J.W.* (TROM, SGO).

H. laevigata (Sm.) Hale (1975: 44)

Listed as new to Argentina from i.a. Tierra del Fuego by Calvelo & Liberatore (2002). However, it was reported from one locality in Argentinian Tierra del Fuego (Puesto Millaldeo) and another one from the Chilean side ('Fjordo Finlandia') by Räsänen (1932).

H. oostingii (Dey) Hale (1975: 51)

Reported from Chilean Tierra del Fuego by Hale (1975), and mapped from this area by Adler & Calvelo (2002).

H. rockii (Zahlbr.) Hale (1975: 62)

Reported from two localities in southernmost Chile by Hale (1975) and from several localities in Argentinian Tierra del Fuego by Calvelo & Adler (2001).

H. sinuosa (Sm.) Hale (1975: 63)

Hypotrachyna sinuosa is a very common species in the study area (Hale 1975, Calvelo & Adler 2001, as *H. sinuosa* and *H. flavovirens,* and Bjerke & Elvebakk 1999, as *Flavoparmelia soredians*), see further comments below 'Rejected species'.

H. sorocheila (Vain.) Divakar, A. Crespo, Sipman, Elix & Lumbsch (2013: 32)

One saxicolous collection from Torres del Paine is reported here as this species, which has been considered to be more northern prior to its report of being widespread in the extremely southern part of Argentina, such as Isla de los Estados (Calvelo & Fryday 2006). These authors did not discuss this taxon vs. *H. chilensis* (see above), and there is an obvious need for more studies on this species pair. The species was also listed from Isla Navarino by Etayo & Sancho (2008).

Specimen examined: CHILE. XII Región de Magallanes: **Parque Nacional Torres del Paine**, 1 km W of Guardería Lago Grey, 51˚07'30"S, 73˚10'30"W, 80 m, on a south-facing rock wall, 4 Dec 1999, *Elvebakk, A. 99:1075* (TROM).

H. sublaevigata (Nyl.) Hale (1975: 66)

Reported from Chilean Tierra del Fuego by Hale (1975) and mapped from the same area by Adler & Calvelo (2002).

H. swinscowii (Hale) Krog & Swinscow (1987: 420)

Mapped from a couple of localities in Magallanes by Adler & Calvelo (2002). The specimen reported below contains atranorin, salazinic and lobaric acids (analyzed and annotated on specimen by M.E. Hale Jr.).

Specimen examined: CHILE. XII Región de Magallanes: **Parque Nacional Torres del Paine**, Lago del Toro (L. Maravilla), Estancia Río Paine, on stony ground in an open *Nothofagus antarctica* forest, 16 Mar 1941, *Santesson, R. 6478* (S).

Melanelixia subglabra (Räsänen) A. Crespo, Divakar & Elix (2010: 1750)

Common in the area, according to Esslinger (1977), a conclusion agreed to here.

Melanohalea elegantula (Zahlbr.) O. Blanco *et al.* (2004a: 882)

Melanohalea elegantula was mapped as saxicolous and common in the drier part of the study area by Esslinger (1977), where we have found it to be extremely common also on trunks and particularly on dead, strongly light-exposed twigs and lignum.

M. inactiva (P.M. Jørg.) O. Blanco, , A. Crespo, Divakar, Essl., D. Hawksw. & Lumbsch (2004a: 882)

Melanohalea inactiva was described by Jørgensen (Galloway & Jørgensen 1990, as *Melanelia*) for what was previously interpreted as *Melanelia olivaceoides* (Krog.) Essl. in South America by Esslinger (1977, as *Parmelia*), who reported the species from 11 localities in southernmost Chile and Argentina. It was also reported (as *M. olivaceoides* and as new to Argentina) from Tierra del Fuego and Santa Cruz by Calvelo & Liberatore (2002). It has not been collected by us.

M. ushuaiensis (Zahlbr.) O. Blanco, A. Crespo, Divakar, Essl., D. Hawksw. & Lumbsch *et al.* (2004a: 883)

Common in the area (Esslinger 1977), a conclusion supported here.

Notoparmelia cunninghamii (Cromb.) A. Crespo, Ferencova & Divakar (in Ferencova *et al.* 2014: 63)

Common in the area, see distribution map in Stenroos (1991).

N. protosulcata (Hale) A. Crespo, Ferencova & Divakar (in Ferencova *et al.* 2014: 63)

Common in the area, see distribution map in Stenroos (1991).

Omphalodium pisacomense Meyen & Flot. (1843: 223)

Reported from Santa Cruz by Calvelo & Liberatore (2002). Redón (1985) reported it from basaltic volcanoes in the eastern Patagonian steppes, in a study dealing with a trans-continental Fuego-Patagonian gradient. However, he did not indicate any localities for the lichens he reported, not even which country it was collected from. However, Etayo & Sancho (2008) reported it from the Chilean National Park Pali-Aike, and we can confirm that it is common on volcanic rocks there and on the basaltic volcano caldera of Morro Chico, also in Chile.

Specimens examined: CHILE. XII Región de Magallanes: **Parque Nacional Pali-Aike,** near Cueva de Pali-Aike, 52˚05'S, 69˚47'W, 200 m, on volcanic rocks in a steppe landscape, *Elvebakk, A. 00:757* (TROM); **Morro Chico**, 52˚03'24"S, 71˚25'25"W, 150 m, on basaltic rocks, 30 Dec 2014, *Elvebakk, A. 13:085* (MAF; TROM).

Pannoparmelia angustata (Pers.) Zahlbr. (1930: 195)

Pannoparmelia angustata belongs to an austral genus of five species with a spongy hypothallus, and the present species is yellowish from usnic acid. A few collections have been reported from the study area by Redón & Quilhot (1977) and Calvelo & Adler (1992), and the latter authors reduced *P. anzioides* Darb. (type material from the Ushuaia area) to synonomy with *P. angustata*. It was also reported from Isla Navarino by Etayo & Sancho (2008). According to our own observations it is much more common than indicated by the rather few reports and collections referred to here. In humid areas of Magallanes its most typical habitat is on light-exposed, smooth bark, such as trunks of *Nothofagus betuloides* in forest margins along bogs.

Selected specimens examined: ARGENTINA. Tierra del Fuego: **3.5 km W of Ushuaia**, semishaded *Nothofagus* forest, 54˚49'S, 68˚22' W, *Imshaug, H. 55160 & Ohlsson* (S); Ushuaia, 8 May 1896, *Dusén, P.* (S); **Fiordo de Agostini**, 22 Feb 1929, *Räsänen, V.* (S).

CHILE. XII Región de Magallanes: **Parque Nacional Torres del Paine,** 1 km W of the base of the E slope of Cerro Donoso, 51˚15'S, 73˚08'W, 70 m, on *Nothofagus betuloides* in a forest margin, Nov 1995, *A. Elvebakk 95:257* (TROM); near Refugio Zapata, 51˚05'S, 73˚16'W, 200 m, on *Nothofagus betuloides*, 28 Feb 1998, *Elvebakk, A. 98:258* (TROM); *Bjerke, J.W. 253/98* (UV).

Parmelia araucana Adler & Calvelo (in Calvelo & Adler 1999: 146)

Parnelia araucana was described by Calvelo & Adler (1999), and it has only been known from the type locality in Parque Nacional Lanín in the Neuquén province in central Argentina, until it was added from another locality in the neighbouring province of Río Negro (Adler & Calvelo 2007). Stenroos (1991) described and illustrated a *Parmelia* with marginal isidia from Argentinian Tierra del Fuego, based on two collections housed in H. She concluded that it might represent an undescribed species, but that more material was needed. We believe these specimens represent *P. araucana*, although Adler & Calvelo (1993) already interpreted them within the variability of *P. saxatilis*. *Parmelia araucana* is reported here from four localities in Magallanes, in addition to two localities further to the north in Chile, both in deciduous and evergreen *Nothofagus* forests. The species has obviously been overlooked in southernmost South America. *Parmelia araucana* has not been included in any of the recent morphological and phylogenetic studies on *Parmelia.* From a biogeographical point of view it could be expected to belong in the new genus *Notoparmelia,* a mainly Southern Hemisphere genus deviating from *Parmelia* s. str. principally based on phylogeny and apothecium anatomy (Ferencova *et al.* 2014). However, all our samples are sterile and a phylogenetic analysis is necessary to decide on its affiliation.

Specimens studied: CHILE. IX Región de la Araucanía: **Reserva Nacional Malalcahuello**, just outside of its SE boundary, 1.2 km NE of the confluence of the rivers Río Colorado and Río Cautín, along Río Cautín. 38˚26'34.8"S, 71˚31'03.3"W, 1180 m, on trunk of *Nothofagus antarctica*, 15 Dec 2009, *Elvebakk, A. 09:173* (TROM); X Región de Los Lagos: **Lago Llanquihue**, E side, 0.5 km N of Ensenada, at Miradór. 41˚12'S, 72˚32'W, on *Eucryphia cordifolia*, 100 m, 19 Nov 2000, *Elvebakk, A. 00:556* (TROM); XII Región de Magallanes: **Parque Nacional Torres del Paine**, Lago Grey, 1.5 km S of Laguna Roca, 80 m, 51˚04'30"S, 73˚10'W, on cortex in an old-growth *Nothofagus pumilio* forest, 9 Mar 1998, *Elvebakk, A. 98:427* (SGO); 0.5 km SW of Refugio Zapata, 51˚05'S, 73˚16'W, 150 m, on rocks in a moist gorge, 28 Feb 1998, *Elvebakk, A. 98:251 & Bjerke, J.W.* (TROM); Valle Francés, 1996, *Henríquez, J.M.* (HIP); **Puerto Natales area**, Silla del Diablo, 1–2 km S of Cueva del Milodón, 51˚37'S, 72˚32'W, 150 m, on an old horizontal trunk of *Nothofagus pumilio*, *Elvebakk, A. 95:31* (TROM).

P. kerguelensis F. Wilson (1900: 87)

Reported from the Falkland Islands by Calvelo & Fryday (2006).

P. lindsayana Øvstedal & Elix (in Øvstedal *et al.* 1996: 151)

Described from South Orkney Island and the Falkland Islands.

P. saxatilis (L.) Ach. (1803: 204)

Common in the area, see distribution map in Stenroos (1991).

P. sulcata Taylor (in Mackay 1836: 145)

Common in the area, see distribution map in Stenroos (1991).

Parmeliopsis hyperopta (Ach.) Arnold (1881: 117)

Calvelo & Adler (2001) reported the species from several localities in Argentinian Tierra del Fuego and stated that no localities of this species had been reported from South America before. However, as shown under the comment on *Imshaugia aleurites* among the rejected species (see below), *Parmeliopsis hyperopta* was first reported from Argentina by Räsänen (1932) under the incorrect name *Parmelia pallescens.* Galloway & Quilhot (1998) listed *Parmeliopsis hyperopta* from Chile, however, the cited sources do not indicate localities in Chile. We now list its first confirmed localities in this country, in addition to another four localities in Argentina. Most collections are from *Nothofagus* forests, but three of the collections (*Santesson 7549, Elvebakk 99:1124, 14:034*) are on eroded lignum. The lignicolous habitat resembles acidic epiphytic occurrences in the Northern Hemisphere.

Specimens examined: ARGENTINA. Tierra del Fuego: **Ushuaia**, Rio Pipo (Rio Alej), on *Nothofagus antarctica* in a swamp in a *Nothofagus pumilio* forest, 23 Jan 1940, *Santesson, R. 430* (S); Ushuaia. In truncis frutesc., 5 May 1896, *Dusén, P. 246* (S); Valle Lasifashaj (Larsiparchie), Las Cotorras (about 20 km ENE of Ushuaia), c. 650 m, on *Nothofagus pumilio* in a *Nothofagus pumilio* forest, on lignum, 10 Nov 1940, *Santesson, R. 877* (S); **Canal Beagle**, Lapataia, east of Río Roca, on a decaying *Nothofagus pumilio* trunk. *Santesson, R.* (S); **Fuegia Media**, Estancia Carmen, Puesto Millaldeo, 16 Jan 1929, *Roviainen, H.* (S); CHILE. XII Región de Magallanes: **Rio Rubens**, near Hotel Río Rubens, on *Nothofagus antarctica* in a *Nothofagus antarctica* forest, 19 Jan 1941, *Santesson, R. 5580a, b.* (S); *5581* (S); **Morro Chico**, on the NE side of the gorge across the volcano, 52˚03.47'S, 71˚25.03'W, 233 m, on an old and eroded trunk of *Nothofagus antarctica* lying on the ground between *Festuca gracillima* tussocks, 3 Jan 2014, *Elvebakk, A. 14:034* (MAF, TROM); **Punta Arenas,** 16 Dec 1895, *Dusén, P. 56* (S); Tres Puentes, on the ground in a *Nothofagus betuloides* forest, 24 Apr 1940, *Santesson, R. 1876* (S); Cerros Mina Rica, 450─500 m, on *Nothofagus pumilio* in a *Nothofagus pumilio* forest, 24 Dec 1940, *Santesson, R. 5261* (S); **Parque Nacional Torres del Paine**, Chorillo de Salmones, 100 m, on a fallen, very old decorticated log of *Nothofagus pumilio,* 73˚12' W, 51˚06'30" S, 4 Dec 1999, *Elvebakk, A. 99:1124* (TROM).

Parmotrema perforatum (Wulfen) A. Massal. (1860: 248)

A mostly North American species listed from Tierra del Fuego and three other provinces as new to Argentina by Calvelo & Liberatore (2002).

P. reticulatum (Taylor) Choisy (1952: 175)

Reported from Argentinian Tierra del Fuego and Falkland Islands/Islas Malvinas by Calvelo & Liberatore (2002). The species is common in central parts of Torres del Paine National Park, more often on rocks than tree trunks.

Specimens examined: CHILE. XII Región de Magallanes: **Parque Nacional Torres del Paine**, 300 m E of Camping Pehoe, 51˚07'S, 73˚00'W, 80 m, on *Nothofagus* sp., 12 Mar 1998, *Bjerke, J.W. 159/98* (TROM); 0.5 km NW of Guardería Laguna Amarga. 50˚59'S, 72˚47'W, 80 m, on cortex of *Nothofagus antarctica* in a SW facing slope near the river, 27 Nov 1996, *Elvebakk, A. 96:521* (TROM); 500 m N of the western lake of Lagunas Mellizas, 51˚03'30"S, 72˚59'W, 100 m, very large specimens on rock surfaces in an open forest in a S-facing slope, 3 Dec 2000, *Elvebakk, A. 00:900* (TROM); *00:904* (TROM); Pudeto, 300 m W of the northernmost inlet, 51˚04'S, 73˚01'W, 100 m, on a S-facing rock surface in *Mulinum spinosum* shrubland, 11 Dec 1999, *Elvebakk, A. 99:1303* (TROM); Camping Pehoe, E side of Lago Pehoe, 51˚07'S, 73˚01'W, 70 m, on trunks of *Nothofagus antarctica*,10 Mar 1998, *Elvebakk, A. 98:459 & Bjerke, J.W.* (TROM).

Punctelia stictica (Delise ex Duby) Krog (1982: 291)

Punctelia stictica was first reported from Argentina and Chilean Tierra del Fuego by Stenroos (1991). The species has an essentially amphi-tropical distribution pattern (Stenroos 1991), and is primarily a temperate species, but extends to the boreal zone in Europe (map by Krog 1970) and the anti-boreal zone in Tierra del Fuego. Stenroos (1991) listed three localities from the Ushuaia area. It is reported here with 18 new collections, concentrated to the Patagonian steppe areas, where the species is very common. In addition to atranorin and gyrophoric acid, all our samples contain an unidentified substance.

Specimens examined: CHILE. XII Región de Magallanes: **Parque Nacional Torres del Paine**, Lago Nordenskjöld S, 1 km W of Mirador Lago Nordenskjöld, 51˚02'30"S, 72˚56'W, 70 m, on pebbles, 1 Dec 2000, *Elvebakk, A. 00:869* (TROM); *00:861* (TROM); 1.5 km N of Salto Grande, 51˚03'30"S, 73˚02'W., 80 m, on rocks, richly fertile, 7 Dec 1995, *Elvebakk, A. 95:512* (TROM); 0.5–1 km N of Salto Grande, 51˚04'S, 73˚02'W, 100 m, on rocks, Nov 1995, *Elvebakk, A. 95:463* (TROM); 3 km SW of Guardería Laguna Amarga, 51˚00'S, 72˚50'W, 2050 m, on rocks, 15 Mar 1992, *Elvebakk, A. 92:053* (TROM); 2 km NW of Guardería Laguna Amarga, 50˚59'30"S, 72˚49'W, 150 m, on sun-exposed rocks, Nov 1995, *Elvebakk, A. 95:457* (TROM); 1.5 km SW of Guardería Laguna Amarga, 50˚59'30"S, 72˚48'W, 100 m, on an exposed rock outcrop, 5 Jan 1996, *Elvebakk, A. 96:073* (SGO); 1.5 km N of E end of Lago Sarmiento Chico, 51˚03'S, 72˚56'W, 150–200 m, on rocks, 2 Nov 1995, *Elvebakk, A. 95:440* (TROM); Pudeto, 400 m E of the easternmost lake of Lagunas Mellizas, 51˚03'30"S, 72˚58'W, 80 m, on a slightly exposed rock near a very exposed outcrop 50 m N of the road, locally common, 3 Dec 1999, *Elvebakk, A. 99:1033* (TROM); 1.5 km SE of Laguna de los Cisnes, 51˚03'S, 72˚51'W, 2–300 m, on gravel on exposed very dry ridge, ass. with *Physcia dubia,* 3 Dec 1999, *Elvebakk, A. 99:1051* (TROM); Lago del Toro (L. Maravilla), La Península, on the ground on a forestless,

rocky slope, 10 Mar 1941, *Santesson, R. 6336* (S); Lago del Toro (L. Maravilla), Estancia Río Paine, on exposed rocks above the river, 15 Mar 1941, *Santesson, R. 6541* (S); **Seno Otway**, 2 km NE of Punta Espólon, 52°47'S, 71°12'W, 5 m, on an erratic, andesite rock, 30 Nov 1999, *Elvebakk, A. 99:906* (TROM); **Seno Skyring**, Estancia María, on a block of stone in a grass heath, 28 Apr 1940, *Santesson, R. 7050* (S); *7051* (S); **Morro Chico**, 52°03'S, 71°28'W, 200 m, on rocks in a NW-facing, protected slope, 28 Nov 1999, *Elvebakk, A. 99:851* (TROM).

Xanthoparmelia austrosorediata Elvebakk, *spec. nov.*

Xanthoparmeliae tehuelcorum similis, sed capitatis soraliis, rarissime apotheciis minutis, plerumque marginibus sorediatis instructa.

MycoBank # 808978
(Figs. 3, 6–7)

Type:—CHILE: XII Región de Magallanes y de la Antártica Chilena: Provincia Magallanes, Morro Chico, SW part, 52°03'S, 71°28'W, 200 m, on exposed basaltic rocks in a W-facing boulder slope, 28 Nov 1999, *Elvebakk, A. 99:780* (holotype SGO, isotypes BM, NY, S, TROM).

Morphologically, anatomically and chemically identical to *X. tehuelchorum* except in the following characters:

Soralia common, capitate, 2–8 mm diam., composed of single soredia 0.1–0.2 mm diam, fluffy and partly conglutinated.

Apothecia very rare, 0.5–1 mm diam, thalline excipulum margin often sorediate, ascospores short-ellipsoid and 5–7 × 8–12 µm diam.

Etymology: Named after its conspicuous soralia and its distinctly southern distribution.

Additional specimens examined: ARGENTINA. Provincia de Tierra del Fuego: **Ushuaia**, on a small island in the Beagle Channel off the town, on rocks near the sea-shore, 30 Jan 1940, *Santesson, R. 534* (S); Provincia de Santa Cruz: **Puerto Deseado**, on exposed rocks near the sea-shore,12 Jan 1940, *Santesson, R.* 238 (S).

FIGURE 6. *Xanthoparmelia austropatagonica* (*Elvebakk 13:083*) to the right together with *X. tehuelchorum* (*Elvebakk 13:082*), photographed at Morro Chico.

CHILE. XII Región de Magallanes: **Sierra Baguales**, 1.3 km S of the junction between the roads towards Las Chinas and Las Cumbres, 50°52'40"S, 72°23'06"W, 2–300 m, on the vertical surface of an erratic boulder, 5 Dec 1999, *Elvebakk, A. 99:1137* (TROM); **Parque Nacional Torres del Paine,** 200 m S of Salto Grande, W of the Pudeto inlet, 51°03'30"S, 73°01'W, 70 m, on exposed rocks, 5 Dec 2000, *Elvebakk, A. 00:922* (TROM); Refugio Pudeto, E side of the northernmost bay, 51°04'S, 73°01'W, 70 m, on rocks, 11 Dec 1999, *Elvebakk, A. 99:1274* (TROM); 4 km

ENE of Salto Grande, 4−500 m W of 'altitude 222', 51˚03'30"S, 72˚57'W, 100 m, on rocks, 11 Dec 1999, *Elvebakk, A. 99:993B* (TROM); 100 m N of Salto Grande, 51˚03'57.3"S, 73˚00'25.7"W, 80 m, on a light-exposed rock, 3 Dec 1999, *Elvebakk, A. 99:1023* (LE); 1.5 km N of N end of Lago Sarmiento Chico, 51˚03'S, 72˚56'W, 150 m, on rocks, Nov 1995, *Elvebakk, A. 95:424* (LE); Lago Grey S, 1 km N of Guardería Lago Grey, 51˚07'30"S, 73˚10'30"W, 70 m, on a vertical, N-facing cliff wall, 8 Dec 2000, *Elvebakk, A. 00:946* (TROM); Lago Pehoe NW, 3−500 m SE of Refugio Pehoe, 51˚04'30"S, 73˚07'W, 70 m, on rocks on an exposed ridge, 11 Dec 1999, *Elvebakk, A. 99:1239* (TROM); Lagunas Mellizas E, 51˚04'30"S, 72˚58'W, 100 m, on exposed rock, 1 Dec 2000, *Elvebakk, A. 00:879* (TROM); 1.5 km SW of Guardería Laguna Amarga, 50˚59'30"S, 72˚48'W, 80 m, on an exposed gravelly ridge, 24 Jan 1996, *Elvebakk, A. 96:111A* (TROM); Lago Sarmiento E, Baño Viejo, 50˚56'S, 72˚34'W, 70 m, sun-exposed rock in the steppe, 7 Dec 2000, *Elvebakk, A. 00:934* (TROM); Lago del Toro (L. Maravilla), Estancia Río Paine, on exposed rocks, 14 Mar 1941, *Santesson, R. 6495* (S); **Seno Skyring**, Ea. Río Verde, 3 km W of Maria Felicinda, 52˚26'S, 71˚22'W, 2 m, on the E side of supralittoral rocks, 30 Nov 1999, *Elvebakk, A. 99:944* (TROM); **Seno Otway area**, 2 km NE of Punta Espolón, 52˚47'S, 71˚12'W, 5 m, on an erratic rock of andesite, 30 Nov 1999, *Elvebakk, A. 99:907* (TROM); *Elvebakk, A. 99:911* (CANB); 20 m, on erratic rocks in heathlands, *Elvebakk, A. 99:928* (TROM); 1 km S of Carpa Manzana, 50˚36'40"S, 71˚09'07"W, 50 m, on a small erratic boulder, 6 Dec 1999, *Elvebakk, A. 99:110* (TROM); **Morro Chico**, 52˚03'S, 71˚28' W, common on wind-exposed basaltic rocks, 28 Nov 1999, *Elvebakk, A. 99:822C; 99:835; 99:840; 99:835; 99:880; 99:881* (TROM); 30 Dec 2013 *Elvebakk, A. 13:075* (TROM); *13:077* (TROM); *13:083* (MAF; TROM); **Kampen-Aike**, 1 km NW of E end of Laguna Cabeza del Mar, 52˚42'S, 70˚53'W, 30 m, on a single granitic erratic boulder, 25 Nov 1999, *Elvebakk, A. 99:722* (TROM); **Parque Nacional Pali-Aike**, 2−3 km E of Laguna Ana, 52˚04'S, 69˚44'W, 250 m, on rocks, 16 Oct 2000, *Elvebakk, A. 00:815* (TROM); *00:992* (TROM); **Tierra del Fuego**, Porvenir, in dry *Empetrum rubrum* heath, 27 Dec 1940, *Santesson, R. 6901* (S).

This species is common all along the eastern and dry part of the Chilean region of Magallanes, as indicated by the 31 collections from Magallanes cited here. It is probably also common in adjacent parts of Argentina, although only two collections have been available for this study. The species grows together with its fertile counterpart, *X. tehuelchorum*, and is associated also with *Flavoparmelia gerlachei*, although the latter occupy the most exposed parts of rock outcrops and boulders. It is astonishing that these two large *Xanthoparmelia* species have not been described previously, and the only explanation is that their distribution is distinctly southern. The Argentinian province of Santa Cruz is almost unknown lichenologically, and further to the south, lichenologists have focused on the humid coastal forests, and neglected the southernmost steppes.

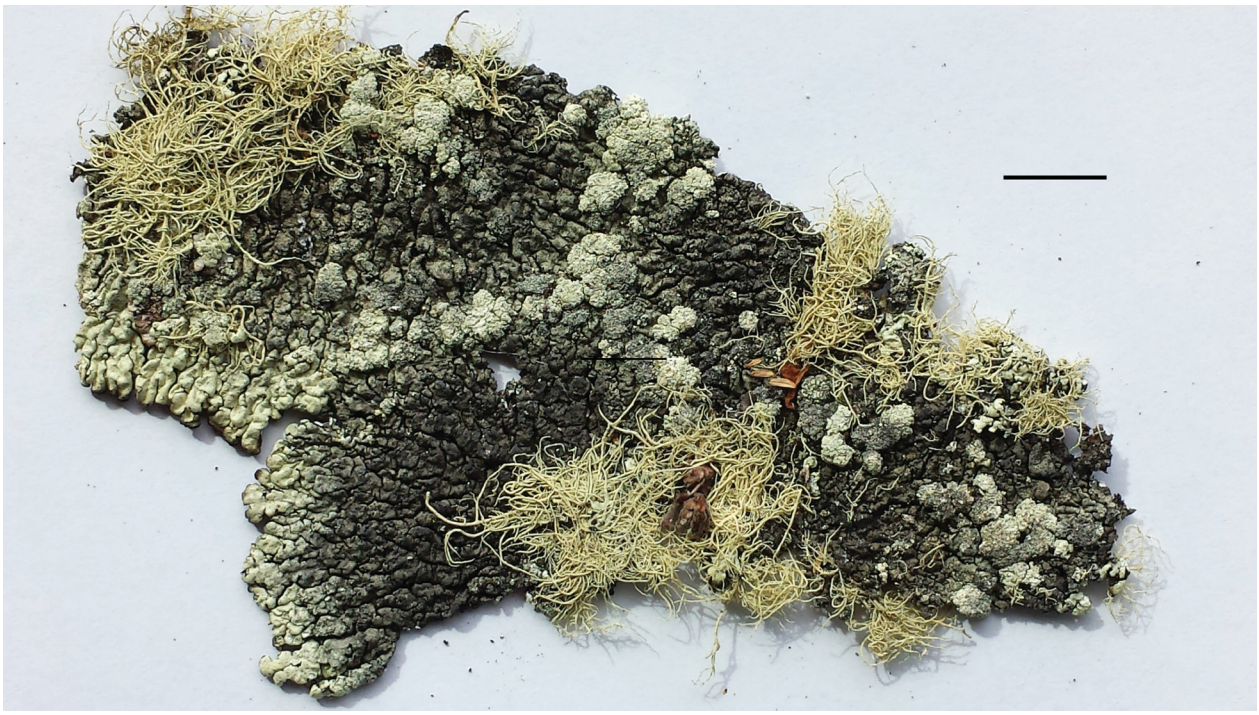

FIGURE 7. *Xanthoparmelia austrosorediatum,* HOLOTYPE. Scale bar = 1 cm.

Xanthoparmelia austrosorediatum can be mistaken for *Flavoparmelia gerlachei*. However, their lobe margins and outlines are different as shown below *F. gerlachei*, and in Fig. 3. The chemistry is constant, and the 24 specimens which have been studied by TLC all have protocetraric and usnic acids as major compounds.

Apothecia are very rare, and were present only in two of the studied collections (*Elvebakk 99:881* and *99:907*). They are 1−1.5 mm wide, and many of the apothecia have sorediate thalline excipulae. The ascospores are of a typical *Xanthoparmelia* type, short-ellipsoid and only 5−7 × 8−12 µm in size, and shorter than those of *F.Ilgerlachei* which measure 6−8.5 × 12.5−14 µm, with a thin perispore in addition. Their few apothecia available for study probably explains the slight deviation in spore size as compared with *X. tehuelchorum*.

In their *Xanthoparmelia* monograph, Nash *et al.* (1995) stated that quite a number of the species 'become darker (to almost blackish) in the older central parts with age'. In species such as *X. mougeotii, skottsbergiana* and *X. submougeotii* this is apparently due to pigmentation patterns. However, in *X. tehuelchorum* and *X. austrosorediata* a similar decoloration in practically all specimens is instead caused by a network of strange hyphae of conidia-like cells on the surface of the lichen. These hyphae belong to a lichenicolous fungus now under study by Zhurbenko (2013, pers. comm.).

X. delisei (Duby) O. Blanco, A. Crespo, Elix, D. Hawksw. & Lumbsch. (2004b: 967)

The species was reported from one locality in Santa Cruz and one locality in Chilean Tierra del Fuego (Yendegaia very close to the Argentinian border) by Esslinger (1977). He stated that South American and Australian samples were somewhat different morphologically from Northern Hemisphere material, however, no definitive characters could be defined separating them.

According to our experience, *X. delisei* is locally very common in the steppe areas and drier parts of the forested areas of the National Park Torres del Paine in Magallanes. A total of 20 collections are cited here from this area, in addition to a single collection from another part of the region. The species varies from having long, diverging and very discrete lobes, to being more compact, and then with narrower lobes and smaller apothecia than *X. imitatrix*, which it most often can be confused with. However, their chemistry is distinct and all our studied specimens of *X. delisei* contain perlatolic, glomelliferic, and glomellic acids as well as a forth unidentified substance. This is the only species from our study area with this distinct chemosyndrome, whereas the other four species with this chemosyndrome treated by Esslinger (1977) are isidiate.

Specimens examined: CHILE. XII Región de Magallanes: **Parque Nacional Torres del Paine**, 500 m N of the western lake of Lagunas Mellizas, 51°03'30"S, 72°59'W, 150 m, on a non-forested exposed hill, 3 Dec 2000, *Elvebakk, A. 00:906* (TROM); Lagunas Mellizas E, 51°04'30"S, 72°58'W, 100 m, on rocks, 1 Dec 2000, *Elvebakk, A. 00:872* (TROM); Pudeto, 400 m E of the easternmost lake of Lagunas Mellizas, 51°03'30"S, 72°58'W, 80 m, on strongly exposed outcrop 50 m N of the road, locally common, 3 Dec 1999, *Elvebakk, A. 99:1029* (TROM); *99:1030* (TROM); *99:1031* (TROM); *14:004* (MAF, TROM); 200 m S of Salto Grande, W of the Pudeto inlet, 51°03'30"S, 73°01'W, 70 m, 5 Dec 2000, *Elvebakk, A. 00:924* (TROM); *00:932* (TROM); 500 m W of Laguna Los Flamencos, 51°01'30"S, 72°50'W, 250−300 m, on pebbles on an exposed, dry ridge, 2 Dec 1999, *Elvebakk, A. 99:999* (SGO); *99:1000* (TROM); 200 m S of Salto Grande, W of the Pudeto inlet, 51°03'30"S, 73°01'W, 70 m, 5 Dec 2000, *Elvebakk, A. 00:930* (TROM); Lago Nordenskjöld S, 1 km W of Mirador Lago Nordenskjöld, 51°03'S, 72°56'W, 250 m, on exposed rocks,1 Dec 2000, *Elvebakk, A. 00:855* (TROM); Lago Pehoe NW, 3−500 m SE of Refugio & Camping Pehoe, 51°04'30"S, 73°07'W, 70 m, on rocks on an exposed ridge near the lake, 11 Dec 1999, *Elvebakk, A. 99:1247* (TROM); *99:1248* (TROM); 2 km N of E end of Lago Sarmiento Chico, 51°03'S, 72°56'W, 250 m, on rocks, 2 Jan 1998, *Elvebakk, A. 98:018* (TROM); 2.5 km E of Laguna Blanquillos, 51°00'34,9"S, 72°51'35,8"W, 110 m, on rocks, 2 Dec 1999, *Elvebakk, A. 99:994* (TROM); *99:995* (TROM); *99:998A* (TROM); *99:998B* (TROM); 0.5 km E of Refugio & Camping Pehoe, 500 m NE of the river and 500 m SE of Lago Skottsberg, 51°04'S, 73°07'W, 110 m, on an erratic granitic boulder, 11 Dec 1999, *Elvebakk, A. 99:1252* (TROM); **Seno Skyring**, Estancia Río Verde, 3 km W of Maria Felicinda, 52°26'S, 71°22'W, 2 m, on the E sides of supralittoral rocks, 30 Nov 1999, *Elvebakk, A. 99:943* (TROM).

X. farinosa (Vain.) Nash, Elix, & J. Johnston (1987: 286)

Xanthoparmelia farinosa has not been reported from southernmost South America before. TLC shows norstictic, stictic (major), constictic and usnic acid, which is the same as in *X. submougeotii*, but the species differs from the latter in the characters presented by Nash *et al.* (1995).

Specimens examined: CHILE. XII Región de Magallanes: **Parque Nacional Torres del Paine**, 5−600 m W of the S end of Lago Skottsberg, 51°04'S, 73°07'W, 150 m, on erratic boulders, 11 Dec 1999, *Elvebakk, A. 99:1250A* (TROM); **Puerto Natales**, 8−9 km S of the town, along the main road, 51°41'35,0"S, 72°23'16,3",W, 50−100 m, on a small erratic rock of granite, 6 Dec 1999, *Elvebakk, A, 99:1176* (TROM); *99:1180* (TROM); **Seno Skyring**, 3−4 km W of Estancia Maria Felicinda/Ea. Río Verde, 52°26'S, 71°22'W, 2 m, on seashore rocks, on E-facing sides, 30 Nov 1999, *Elvebakk, A. 99:994* (TROM); *99:947* (TROM); *99:949* (TROM).

X. glabrans (Nyl.) O. Blanco, A. Crespo, Elix, D. Hawksw. & Lumbsch (2004b: 968)

Xanthoparmelia glabrans was reported from one locality at Estancia Güer-Aike in the Argentinian province Santa Cruz by Esslinger (1977). We have only found it at one locality within the study area, and conclude that it is much rarer than the morphologically similar *X. imitatrix* and *X. delisei*. Its chemosyndrome with alectoronic acid is distinct.

Specimens examined: CHILE. XII Región de Magallanes: **Parque Nacional Torres del Paine**: 1.5 km N of N end of Laguna Sarmiento Chico, 51˚03'S, 72˚56'W, 150 m, on rocks, ass. with *Xanthoparmelia mougeotii,* Nov 1995, *Elvebakk, A. 95:423* (TROM).

X. imitatrix (Taylor) O. Blanco, A. Crespo, Elix, D. Hawksw. & Lumbsch (2004b: 968)

Xanthoparmelia imitatrix was reported from one locality in Magallanes and two in Argentina (Santa Cruz and Tierra del Fuego) by Esslinger (1977). We have found it to be very common in the National Park Torres del Paine and from scattered localities elsewhere within the steppes of Magallanes, and 19 collections are cited here. All samples contain physodic acid.

Specimens examined: CHILE. XII Región de Magallanes: **Sierra Baguales**, 1.3 km S of the junction between the roads leading to Las Chinas and Las Cumbres, 50˚52'39.9"S, 72˚23'06.1"W, 2–300 m, exposed erratic boulders, ass. with *Rhizoplaca melanophthalma,* 5 Dec 1999, *Elvebakk, A. 99:1138* (TROM); *99:1139* (TROM); **Parque Nacional Torres del Paine**, 500 m W of Laguna Los Flamencos, 51˚01'30"S, 72˚50'W, 250−300 m, on pebbles of an exposed, dry ridge, 2 Dec 1999, *Elvebakk, A. 99:998* (TROM); 4−5 km SW of Guardería Laguna Amarga, 50˚59'30"S, 72˚51'W, 120 m, on exposed rocks, 14 Nov 1995, *Elvebakk, A. 95:343* (TROM); 1.5 km N of Laguna Blanquillos, 50˚59'55"S, 72˚48'19"W, 370 m, on exposed rocks, 1 Jan 2014, *Elvebakk, A. 14:012* (MAF); *14:016* (MAF); *14:018* (MAF); 0.5 km SW of Guardería Laguna Amarga, 50˚59'30"S, 72˚48'W, 100 m, on exposed rocks in a steppe area, 4-5 Jan 1996, *Elvebakk, A. 98:024* (SGO); *96:076* (TROM); 0.5−1 km N of Salto Grande, 51˚04'N, 73˚02'W, 100 m, on rocks, Nov 1995, *Elvebakk, A. 95:461* (TROM); Lago Sarmiento E, Baño Viejo, 50˚56'S,72˚34'W, 70 m, sun-exposed rock in a steppe area, 7 Dec 2000, *Elvebakk, A. 00:936* (TROM); c. 500 m W of Guardería Lago Grey, 51˚08'S, 73˚10'30"W, 80 m, on rocks, ass. with *Umblicaria* spp., 4 Dec 1999, *Elvebakk, A. 99:1063* (TROM); 2 km SW of Laguna Larga, 51˚03'S, 72˚54'W, 250 m, on rocks, 2 Nov 1995, *Elvebakk, A. 95:446* (TROM); 1.5 km N of E end of Lago Sarmiento Chico, 51˚03'S, 72˚56'W, 150−200 m, on rocks, 2 Nov 1995, *Elvebakk, A. 95:435* (TROM); 1 km SE of Laguna de los Cisnes, 51˚02'30"S,72˚51'W, 80 m, on dry twigs on the ground and on rocks, 3 Dec 1999, *Elvebakk, A. 99:1040* (TROM); *99:1041* (TROM); 4 km ENE of Salto Grande, 4−500 m W of altitude '222', 51˚03'30"S, 72˚57'W, 100 m, on rocks, 11 Dec 1999, *Elvebakk, A. 99:993A* (TROM); **Seno Otway**, 2 km NE of Punto Espolón, 52˚47'S, 71˚12'W, 10 m, on an erratic boulder of andesite, 30 Nov 1999, *Elvebakk, A. 99:910* (TROM); **Morro Chico**, NW part, 52˚03'S, 71˚28'W, 150 m, on rocks in a slope, 8 Dec 1999, *Elvebakk, A. 99:1229* (TROM); 30 Dec. 2013, (MAF, TROM); 200 m, on a rock near the S summit, 28 Nov 1999, *Elvebakk, A. 99:833* (TROM); **Parque Nacional Pali-Aike**, 0.5 km E of Laguna Ana, 51˚04'35.2"S, 69˚46'44.6"W, 130 m, on rocks in the steppe, 26 Nov 2000, *Elvebakk, A. 00:817* (TROM).

X. microspora (Müll. Arg.) Hale (1974: 488)

Xanthoparmelia microspora is very common further north in South America, but seems to be more uncommon in the southern parts, and we have only found it at one locality. It has previously been reported from two localities in the study area, near Punta Arenas in Magallanes and Puerto Deseado in Santa Cruz (Nash et. al. 1995). Our sample contains salazinic, usnic (majors) and norstictic acids (trace).

Specimen examined: CHILE. XII Región de Magallanes: **Parque Nacional Torres del Paine**, 1−2 km SW of Guardería Laguna Amarga, 50˚59'30"S, 72˚48'W, 100 m, on sun-exposed rocks, Dec 1995, *Elvebakk 95:520* (TROM).

X. mougeotii (Schaer.) Hale (1974: 488)

Xanthoparmelia mougeotii was reported from three localities in the study area by Nash *et al.* (1995). We have studied 17 specimens, and the species is probably common in our study area. All share the same chemistry of usnic, norstictic, stictic, constictic and cryptostictic acids, but three specimens also have menegazziaic acid, and some specimens also contain an unidentified substance. The soralia are more fine-grained and whitish as compared with those of *X. submougeotii* (Figs. 8 and 9).

FIGURE 8. *Xanthoparmelia mougeotii* photographed near the Administration Centre of the National Park Torres del Paine, Chile).

Specimens examined: CHILE. XII Región de Magallanes: **Parque Nacional Torres del Paine,** 500 m W of Laguna Los Flamencos, 51˚01'30"S, 72˚50'W, 300 m, on rocks on an exposed ridge, 2 Dec 1999, *Elvebakk, A. 99:999* (TROM); 0.5−1 km N of Salto Grande, 51˚04'S, 73˚02'W, 100 m, on rocks, Nov 1995. *Elvebakk, A. 95:460* (TROM); Lago Nordenskjöld S, 1 km W of Miradór Lago Nordenskjöld, 51˚03'S, 72˚56'W, 250 m, on weakly protected rocks, 1 Dec 2000, *Elvebakk, A. 00:856* (SGO); Lagunas Mellizas W, 51˚04'S, 72˚59'W, 100 m, on S-facing rocks, 3 Dec 2000, *Elvebakk, A. 00:894* (TROM); 500 m E of Laguna Las Mellizas, 51˚03'30"S, 75˚58'W, 200 m, on rocks on a ridge, 3 Dec 1999, *Elvebakk, A. 99:1028* (TROM); 100 m N of Salto Grande, 51˚04'S, 73˚00'W, 80 m, on rocks near the lake shore, 3 Dec 1999, *Elvebakk, A. 99:1026* (TROM); Miradór Lago Nordenskjöld, 2−3 km N of Salto Grande, 51˚03'S, 73˚01'W, 300 m, on rock in S-facing slope, 3 Dec 2000, *Elvebakk, A. 00:919* (TROM); Refugio Pehoe, 200 m NW of the northern part of the bay, 51˚04'S, 73˚01'W, 100 m, *Elvebakk, A. 99:1320* (TROM); Lago Pehoe NW, 3-500 m SE of Refugio Pehoe, 70 m, 51˚02˚30"S, 73˚07'W, on rocks of an exposed ridge, 11 Dec 1999, *Elvebakk, A. 99:1238A* (TROM); 5−600 m W of the S end of Lago Skottsberg, 51˚04'S, 73˚07'W, 150 m, on erratic boulders, 11 Dec 1999, *Elvebakk, A. 99:1257* (TROM); Lago del Toro (L. Maravilla), Estancia Río Payne, on rocky, forestless slopes by the river Río Payne, 13 Mar 1941, *Santesson, R. 6440* (S); **Puerto Natales,** 8−9 km S of the town, along the main road, 51˚42'S, 72˚23'W, 50−100 m, on rocks, 6 Dec 1999, *Elvebakk, A. 99:1181* (TROM); Cerro Dorotea, on a big boulder in a very thin forest, 9 May 1940, *Santesson, R. 2100* (S); **Seno Otway area**, 2 km N of Punta Espolón, 52˚47'S, 71˚12'W, 5 m, on rocks, 30 Nov 1999, *Elvebakk, A. 99:913* (TROM); 4.5-5 km W of Kampenaike, 52˚41'36"S, 70˚52'36"W, 65 m, on a small rock in a steppe-like ridge, 29 Dec. 2013, *Elvebakk, A. 13:073* (MAF); **Parque Nacional Pali-Aike**, Escorial del Diablo, 52˚04'S, 69˚38'W, 130 m, on volcanic rock, 26 Nov 2000, *Elvebakk, A. 00:822* (TROM); *00:827* (TROM).

X. patagonica (Henssen) Amo, Lumbsch & Crespo (in Amo de Paz *et al.* 2010: 381)

A rare Argentinian endemic previously known as *Placoparmelia patagonica* Henssen (Amo de Paz *et al.* 2010), and known from the type locality near Calafate in Santa Cruz with an additional locality reported from the Río Negro province further to the north (Henssen 1992).

X. peltata Amo, Lumbsch & Crespo (in Amo de Paz *et al.* 2010: 381)

Another rare Argentinian endemic previously known as *Omphalodiella patagonica* Henssen, and only known from two localities, one at Calafate in Santa Cruz (Amo de Paz *et al.* 2010, Henssen 1991).

X. skottsbergiana Nash & Elix (in Nash *et al.*1995: 98)

We here report this rarely collected species as new to southernmost South America, from two localities in Torres del Paine National Park. It has previously been known from four localities in central/northern Argentina and Chile (Nash *et al.* 1995). The specimens studied by us has distinctly narrower lobes than the sorediate *X. microspora*, the only additional species from the area with the same chemistry (salazinic and norstictic acids).

Specimen examined: CHILE. XII Región de Magallanes: **Parque Nacional Torres del Paine,** Lago Nordenskjöld S, 1 km W of Miradór Lago Nordenskjöld, 51˚02'30"S, 72˚56'W, 70 m, on pebbles, 1 Dec 2000, *Elvebakk, A. 00:867* (TROM); 0.5−1 km N of Salto Grande, 51˚04'S, 73˚02'W, 100 m, on distintegrating rocks, Nov 1995, *Elvebakk, A. 95:459* (TROM).

X. squamans (Stitzenb.) O. Blanco, A. Crespo, Elix, D. Hawksw. & Lumbsch (2004b: 971)
Reported from one locality in Santa Cruz and one locality in Magallanes by Esslinger (1977).

X. stygiodes (Nyl. ex Cromb.) O. Blanco, A. Crespo, Elix, D. Hawksw. & Lumbsch (2004b: 971)

Reported from a rather limited number of localities in Australia and New Zealand, in addition to the type locality at Kerguelen Islands and a single locality in Argentinian Tierra del Fuego (Esslinger 1977). It was reported as new to Argentina from Tierra del Fuego by Calvelo & Liberatore (2002), and generally listed from Chile in Galloway & Quilhot (1998), without references to published records. We have found the species in four different areas within the dry sectors of Magallanes. Its small size indicates that it is easily overlooked. All specimens were found to contain fumarprotocetraric acid, being the only brown to black *Xanthoparmelia* species from the study area producing this acid.

Specimens examined: CHILE. XII Región de Magallanes: **Sierra Baguales**, 1.3 km S of the junction between the roads leading to Las Chinas and Las Cumbres, 50˚52'39.9"S, 72˚23'06.1"W, 2−300 m, on an erratic, granitic boulder in a steppe landscape, 5 Dec 1999, *Elvebakk, A. 99:1134* (TROM); **Parque Nacional Torres del Paine,** 400 m N of Salto Grande, 51˚04'30"S, 73˚02'W, 60 m, slightly protected from wind on lake shore rocks, 3 Dec 1999, *Elvebakk, A. 99:1019* (TROM); **Seno Skyring**, Estancia Río Verde, 3 km W of María Felicinda, 52˚26'S, 71˚22'W, 2 m, on the W side of supralittoral rocks, 30 Nov 1999, *Elvebakk, A. 99:942A* (TROM); **1 km S of Carpa Manzana**, 52˚36'40.2"S, 71˚09'07.2"W, 50 m, on a small erratic boulder, 6 Dec 1999, *Elvebakk, A. 99:1292* (TROM).

X. subhosseana (Elix) O. Blanco, A. Crespo, Elix, D. Hawksw. & Lumbsch (2004b: 971)

The species was reported with one locality from Santa Cruz and two from Magallanes by Esslinger (1977), and from Santa Cruz as new to Argentina by Calvelo & Liberatore (2002). *Xanthoparmelia subhosseana* appears to be scattered in the National Park Torres del Paine, but more common in steppes elsewhere in Magallanes, and was noted in the field to be the most common brown *Xanthoparmelia* species at Morro Chico. All the studied specimens were found to contain hypostictic, hyposalazinic and hypoconstictic acids.

Specimens examined: CHILE. XII Región de Magallanes: **Sierra Baguales**, 1.3 km S of the junction between the roads leading to Los Chinos and Los Cumbres, 50˚52'39.9"S, 72˚23'06,1"W, 2−300 m, on rocks in a steppe area, 5 Dec 1999, *Elvebakk, A. 99:1141* (TROM); **Parque Nacional Torres del Paine,** 500 m W of Laguna Los Flamencos, 51˚01'30"S, 72˚50'W, 200−250 m, on a boulder below a S-facing cliff, 2 Dec 1999, *Elvebakk, A. 99:1011* (TROM); near Refugio Pudeto, 51˚04'S, 73˚01'W, 70 m, on partly protected rocks, Dec 1999, *Elvebakk, A. 99:1309* (TROM); hill 300 m E of Lagunas Las Mellizas, 51°03'30"S, 72°57'04"W, 150 m, on extremely exposed outcrop, 1 Jan 2014, *Elvebakk, A. 14:001* (TROM); *14:003* (MAF)**; Seno Otway**, 2 km NE of Punta Espolón, 52˚47'S, 71˚12'W, 10 m, on an erratic boulder of andesite, 30 Nov 1999, *Elvebakk, A. 99:909* (TROM); **Seno Skyring**, Estancia Río Verde, 3 km W of María Felicinda, 52˚26'S, 71˚22'W, 2 m, on the E side of supralittoral rocks, 30 Nov 1999, *Elvebakk, A. 99:943* (TROM); **Morro Chico**, 52˚03'S, 71˚28'W, 200 m, on basaltic rocks in a NW-facing slope, 28 Nov 1999, *Elvebakk, A. 99:776* (TROM); *99:822* (TROM); *99:836* (TROM); *99:839* (TROM); 13:088 (MAF). **Estrecho de Magallanes**, 1 km NW of E end of Laguna Cabeza del Mar (Estancia Kampen Aike), 52˚42'S, 70˚53'W, 30 m, on a single erratic boulder near the road, 25 Nov 1999, *Elvebakk, A. 99:720* (TROM).

X. submougeotii Hale (1989: 561)

When *X. submougeotii* was described it was only reported from its type locality in the Juan Fernández Islands (Chile), whereas Nash *et al.* (1995) later added one collection from Mendoza in Argentina and two from the Falkland Islands. However, Calvelo & Adler (2001) reported it from many localities in Argentinian Tierra del Fuego, Etayo & Sancho (2008) added it from Chilean Isla Navarino and we have studied another 25 collections, indicating that this species is very common. All samples show the same chemistry with usnic, norstictic, stictic and constictic acids, and most specimens have characteristic subterminal soralia (Fig. 9).

Specimens examined: CHILE. XII Región de Magallanes: **Parque Nacional Torres del Paine,** 600–700 m W of S end of Lago Skottsberg, 51˚04'S,73˚07'W, 150 m, on an erratic boulder of andesite, 11 Dec 1999, *Elvebakk, A. 99:1250A* (TROM); *99:1250C* (TROM); *98:311* (TROM); 1 km W of Guardería Lago Grey, 51˚07'30"S, 73˚10'30"W, 80 m, on open rocks near the river, 4 Dec 1999, *Elvebakk, A. 99:1098A* (TROM); NE-facing, protected cliff wall, *Elvebakk, A. 99:1092* (SGO); Lago Pehoe NW, 300–500 m SE of Refugio Pehoe, 51˚04'30"S, 73˚07'W, 70 m, on rocks on an exposed cliff, 11 Dec 1999, *Elvebakk, A. 99:1238B* (TROM); *99:1246* (TROM); *99:1300* (TROM); between Lago Pehoe and Río Paine, 2 km NE of Laguna Linda, 51˚08'30"S, 72˚59'W, 70 m, on a W-facing rock, overgrown by a *Caloplaca* sp., 19 Dec 1997, *Elvebakk, A. 97:469* (TROM); Refugio Pudeto, 51˚04'S, 73˚01'W, 70 m, on a rock in a *Pernettya* shrubland on the E side of the northernmost bay, 11 Dec 1999, *Elvebakk, A. 99:1273* (TROM); Lagunas Mellizas W, 51˚04'S, 72˚59'W, 100 m, on S-facing rocks, *Elvebakk, A. 00:893* (TROM); 2 km NE of E end of Lago Sarmiento Chico, 51˚03'S, 72˚55'W, 200 m, on rocks, Nov 1995, *Elvebakk, A. 95:470* (TROM); Miradór Lago Nordenskjöld, 2–3 km N of Salto Grande, 51˚03'S, 73˚01'W, 300 m, on sandstones, 3 Dec 2000, *Elvebakk, A. 00:917* (TROM); **Seno Otway**, 2 km NE of Punta Espolón, 52˚47'S, 71˚12'W, 20 m, on granitic, erratic rock in *Chiliotrichum* shrubland, 30 Nov 1999, *Elvebakk, A. 99:900* (TROM); *99:917* (TROM); *99:924* (TROM); **Seno Skyring,** 3–4 km W of Estancia María Felicinda/Estancia Río Verde, 52˚26'S, 71˚22'W, 2 m, on seashore rocks, 30 Nov 1999, *Elvebakk, A. 99:938* (TROM); **Tierra del Fuego**, Porvenir, on a boulder in a *Chiliotrichum* heath, 2 Jan 1941, *Santesson, R. 5473a* (S); 27 Dec 1940, *Santesson, R. 5281* (S); Canal Beagle, Yendegaia, near the saw-mill, 510 m, on rocks, 1 Mar 1940, *Santesson, R. 1395* (S).

FIGURE 9. *Xanthoparmelia submougeotii* photographed near the Administration Centre of the National Park Torres del Paine.

X. subplittii Hale (1987b: 330)

In central parts of Torres del Paine National Park two isidiate yellow *Xanthoparmelia* species grow together. *Xanthoparmelia subplittii* has broad lobes with pale brown lower sides and short, somewhat swollen isidia, whereas *X. wrightiana* have dark brown to black lower sides, more narrow lobes closely attached to the substrate and isidia becoming cylindrical. Chemically they are identical, except that some samples of *X. subplittii* contain menegazziaic

acid which is not produced by *X. wrightiana*. One of the examined specimens of *X. subplitti* was identified by J.A. Elix (pers. comm., 2008). A single, 0.8 mm wide apothecium with thick and inrolled thalline excipulum was found in the sample *Elvebakk 14:011*, with a few ellipsoid spores 7.5−8 × 10.5−12.5 µm in size (Fig. 10). This is the first report of a fertile specimen of this species. The species was previously known from the province of Chubut in central Argentinian Patagonia and northwards to Venezuela, Colombia and Curacao (Nash *et al.* 1995), and is here reported from southernmost South America for the first time.

FIGURE 10. *Xanthoparmelia subplittii* with a single apothecium (*Elvebakk 14:011*) photographed in the National Park Torres del Paine.

Specimens examined: CHILE. XII Región de Magallanes: **Parque Nacional Torres del Paine,** 2 km NE of E end of Lago Sarmiento Chico, 51˚03'S, 72˚55'W, 200 m, on eroded bedrock, Nov 1995, *Elvebakk, A. 95:469* (TROM); 1.5 km N of E end of Lago Sarmiento Chico, 51°03'S, 72˚56'W, 150 m, on dry and shattered rocks, Nov 1995, *Elvebakk, A. 95:422* (TROM); 1.5─2 km SE of Laguna de los Cisnes, 51˚03'S, 72˚51'W, 150 m, on an exposed rock slope weathered into small pieces, 3 Dec 1999, *Elvebakk, A. 99:1050b* (TROM); 2─300 m, on gravel on an exposed, very dry ridge, *Elvebakk, A. 99:1053* (SGO); 1.5 km SV of Guardería Laguna Amarga, 50˚59'30"S, 72˚48'W, 100 m, on an exposed rock in a steppe area, 5 Jan 1996, *Elvebakk, A. 96:075* (TROM); Salto Grande, 51˚04'30"S, 73˚02'W, 100 m, on rock in a dry, N-facing slope, *Elvebakk, A. 96:103* (TROM); 2─3 km NE of Laguna Larga, 51˚00'34.9"S, 72˚51'35.8"W, 250 m, on dry eroded rocks in a N-facing slope, 2 Dec 1999, *Elvebakk, A. 99:997* (TROM); 1.5 km NW of Laguna Blanquillos, 51˚00'15"S, 72˚50'12"W, 410 m, 1 Jan 2014, *Elvebakk, A. 14:011* (TROM).

X. substenophylloides Hale (1989: 562)

In our study area only reported from one locality in Argentinian Tierra del Fuego by Nash *et al.* (1995). We have not collected this isidiate species.

Xanthoparmelia tehuelchorum Elvebakk, *spec. nov.*

Xanthoparmeliae hypomelaenae similis, sed thallo minus adnato, ascosporis latioribus acidoque protocetrarico in medulla praesenti differt.

MycoBank # 808979.

Type:—CHILE: XII Regiòn de Magallanes y de la Antártica Chilena: Provincia Magallanes, Morro Chico, 52˚03'S, 71˚28'W, 200 m, on northwest-facing volcanic rocks, 28 Nov 1999, *Elvebakk, A. 99:811* (holotype SGO, isotypes TROM, NY, S, BM, MAF).

Figs. 6, 11, 12.

FIGURE 11. *Xanthoparmelia tehuelchorum*, HOLOTYPE. Scale bar = 1 cm.

Thallus 3−20 cm large, foliose and adnate to loosely attached to acidic rock surfaces; *lobes* elongate and irregularly and densely branched, becoming contiguous and areolate in central parts of the thalli, glossy in younger parts, 0.5−1 mm wide, 250−300 µm thick, weakly convex, lobe tips rounded to truncate, margins smooth and eciliate; *upper surface* yellowish green, emaculate, black-rimmed of a peripheral 0.2−0.3 mm wide marginal zone of young lobe tips being black-pigmented, soon fading to dark brown, whereas the whole thallus is normally dark grey in central parts due to a cover of filaments of a lichenicolous fungus becoming gradually dominant towards the centre; *lower surface* dark brown near lobe apices, otherwise black, rhizines common, 0.3−0.5 mm long, black, stout and simple, in some cases tufted when in contact with the substrate, absent only from a narrow, 0.3−0.7 mm broad marginal zone; *upper cortex* 20−25 µm thick, paraplectenchymatic, yellowish from usnic acid; *medulla* white, lax, 150−250 µm thick, upper 25−35 µm composed of a photobiont layer of globose to subglobose trebuxioid cells 7−12 µm diam.; *lower cortex* compact, paraplectenchymatic, blackish, c. 10 µm thick.

Apothecia common, substipitate, 1−4 mm broad, disc dark chestnut brown, concave, thalline excipulum persistent and concolorous with thallus; *epithecium* dark brown, 10−15 µm thick, hymenium colourless, 30−40 µm thick, asci clavate, 8-spored, 15 × 35 µm; *paraphyses* septate, sparingly branched, apices swollen; *hypothecium* colourless, 50−60 µm thick, photobiont layer present below the hypothecium; *ascospores* 6−8 × 10−12 µm, simple, short-ellipsoid, smooth, perispore lacking; *conidiomata* pycnidia, common and laminal, immersed in thallus, ostiole black, conidia bifusiform, 1.5 × 5.5 µm, few seen.

Chemistry; usnic acid and protocetraric acids (majors).

Etymology: Named after the indigeneous people Tehuelches, now known as Aonikenk, who used to live in the distribution area of this species in Chile, but who are now only present on the Argentinian side.

Additional examined specimens (paratypes): ARGENTINA. Provincia de Santa Cruz: **Río Gallegos**, Estancia Güer-Aike, on basaltic rocks at the edge of the meseta just above the valley of Río Gallegos, 18 Jan 1940, *Santesson, R. 302* (S).

CHILE. XII Regiòn de Magallanes y de la Antartica Chilena: **Sierra Baguales**, 1.3 km S of the junction between the roads leading to Las Chinas and Las Cumbres, 50°53’S, 72°23’W, 250 m, on erratic, granitic boulders, 5 Dec 1999, *Elvebakk, A. 99:1132* (TROM); *99:1142* (LE); *99:1143* (TROM); 3-4 km S of Estancia Tres Erres, 50°47’30.5”S, 72°24’43.2”W, 300 m, on exposed, very soft sandstones, 5 Dec 1999*, Elvebakk, A. 99:1163* (TROM); *99:1164* (TROM); **Parque Nacional Torres del Paine**,700 m SE of Laguna de los Cisnes, 51°02’30”, 72°51’W, 200 m, on rocks, 3 Dec 1999, *Elvebakk, A. 99:1041* (TROM); 3−400 m SE of Laguna Los Flamencos, 51°02’S, 72°48’W, 250 m, on lower parts of boulders, 3 Dec 1999, *Elvebakk, A. 99:1014* (TROM); 2.5 km NE of N end of Lago Sarmento Chico, 51°02’30”S, 72°55’W, 200 m, on rocks, 18 Dec 1997, *Elvebakk, A. 97:424* (TROM); Refugio Pudeto, on the E side of the northernmost bay, 51°04’S, 73°01’W, 80 m, on rocks, 11 Dec 1999, *Elvebakk, A. 99:1294* (TROM); 500 m E of Lagunas Las Mellizas, 51°03’30”S, 72°58’W, 150 m, on rocks on a ridge, 3 Dec 1999, *Elvebakk, A. 99:1037* (TROM); *14:008* TROM); at eastern Lagunas Mellizas, 51°04’30”S, 72°58’W, 100 m, on exposed rock, 1 Dec 2000,

Elvebakk, A. 00:880A (TROM); Lago Pehoe, NW, 3–500 m SE of Refugio Pehoe, 51˚04'30"S, 73˚07'W, 70 m, on rocks on an exposed ridge, 11 Dec 1999, *Elvebakk, A. 99:1245* (TROM); c. 2 km SW of Guardería Laguna Amarga, 51˚00'S, 72˚50'W, 80 m, on rocks, 12 Dec 1995, *Elvebakk, A. 95:570* (LE); 1.5 km SW of Guardería Laguna Amarga, 150 m, 50˚59'30"S, 72˚48'W, on exposed rocks, 4 Jan 1998, *Elvebakk, A. 98:025* (TROM); 2 km NW of Guardería Laguna Amarga, 50˚59'30"S, 72 ˚49'W, 150 m, on sun-exposed rocks, Nov. 1995, *Elvebakk, A. 95:456* (TROM); **Morro Chico**, 52˚03'S, 71˚28'W, 200 m, on rocks in a SW-facing slope, 28 Nov 1999, *Elvebakk, A 99:790* (TROM); *99:810* (TROM); *99:812* (TROM); on N-facing rocky slopes, *Elvebakk, A 99:821* (TROM); *99:825* (TROM); *99:827* (TROM); *99:834* (TROM); *99: 855B* (TROM); *13:082* (MAF; TROM); *13:086* (TROM); *13:087* (TROM); on exposed rocks on the southern summit, *Elvebakk, A. 99:882* (TROM); **Parque Nacional Pali-Aike**, 0.5 km E of Laguna Ana, 51˚04'35.2"S, 69˚46'44.6"W, 130 m, in steppe, 26 Nov 2000, *Elvebakk, A. 00:816* (TROM).

Xanthoparmelia tehuelchorum is very common along the whole eastern sector of Magallanes from Pali-Aike northwards to Sierra Baguales, as indicated by the 31 herbarium samples reported here. It is probably also a very common species in the lichenologically poorly investigated province of Santa Cruz in Argentina, although only one herbarium specimen has been seen from this area. This is the only known fertile yellow-green *Xanthoparmelia* in the study area. The species grows with *X. austrosorediata* and *Flavoparmelia gerlachei* on exposed siliceous rocks in the Patagonian steppes and in neighbouring more or less unforested areas. The species is a fertile counterpart of the sorediate *X. austrosorediata*, which it grows together with. Morphologically, it is most similar to the more northern and fertile species *X. hypomelaena* (Hale) Hale, which is more adnate, has more narrow ascospores and fumarprotocetraric acid as its diagnostic secondary compound. Apart from *X. austrosorediata* only two other yellow *Xanthoparmelia* species from South America contain protocetraric acid, one is isidiate and one is subcrustose and sorediate (Nash *et al.* 1995), and no other species elsewhere have been found to be conspecific with the present species, a conclusion agreed to by J.A. Elix after examining one specimen (pers. comm., 2008).

FIGURE 12. *Xanthoparmelia tehuelchorum* (*Elvebakk 13:086*) photographed at Morro Chico.

X. ulcerosa (Zahlbr.) Hale (1974: 490)

Reported from Santa Cruz by Nash *et al.* (1995).

X. wrightiana Nash, Elix & Johnston (1987: 290)

Grows together with *X. subplittii* in central parts of Torres del Paine National Park in Magallanes. One of the examined specimens was identified by J. A. Elix (pers. comm., 2008). The species has previously been reported from Mendoza in central Argentina and northwards to Bolivia and Brazil (Nash *et al.* 1995) and is here reported from southernmost South America for the first time. The samples contain stictic, norstictic, constictic and cryptostictic acids.

Specimens examined: CHILE. XII Región de Magallanes: **Parque Nacional Torres del Paine,** 1.5 km N of E end of Lago Sarmiento Chico, 51˚03'S, 72˚56'W, 150−200 m, on eroded, exposed rocks, 2 Nov 1995, *Elvebakk, A. 95:438* (TROM); 1.5−2 km SE of Laguna de los Cisnes, 51˚03'S, 72˚51'W, 150 m, on an exposed rock slope weathered into small pieces, 3 Dec 1999, *Elvebakk, A. 99:1049* (TROM); *99:1050a* (TROM); 1.5 km SW of Guardería Laguna Amarga, 50˚59'30"S, 72˚48'W, 80 m, on an exposed gravelly ridge, associated with *Xanthoparmelia imitatrix,* 24 Jan 1996, *Elvebakk, A. 96:111B* (TROM); Refugio Pehoe, 100−200 m E of the northernmost bay, 51˚04'S, 73˚00'W, 100 m, on a N-facing rock slope in a steppe area,12 Dec 1999, *Elvebakk, A. 99:1315* (TROM); Lago Nordenskjöld S, 1 km W of Mirador Lago Nordenskjöld, 51˚03'S, 72˚56'W, 250 m, on rocks,1 Dec 2000, *Elvebakk, A. 00:854* (SGO); 200 m S of Salto Grande, W of the Pudeto inlet, 51˚04'30"S, 73˚02'W, 70 m, on exposed rocks, 5 Dec 2000, *Elvebakk, A. 00:923* (CANB); Laguna Mellizas W, 51˚04'S, 72˚59'W, 100 m, on rock surfaces, partly over mosses in a S-facing steep slope, 3 Dec 2000, *Elvebakk, A. 00:886* (TROM).

X. sp. 1
An undescribed blackish brown *Xanthoparmelia* species containing the stictic acid chemosyndrome has been found in Torres del Paine National Park, and will be described in a separate study including a phylogenetic analysis.

X. sp. 2
An undescribed blackish species with gyrophoric acid tentatively referred to the genus *Xanthoparmelia* has also been found in Torres del Paine, and will be described separately.

Rejected species

Flavoparmelia soredians (Nyl.) Hale (1986: 605)

Many localities of *Hypotrachyna sinuosa* were erroneously reported and mapped from Magallanes as *Flavoparmelia soredians* by Bjerke & Elvebakk (1999). The latter species has a more northern distribution in Chile.

Imshaugia aleurites (Ach.) S.F.L. Mey. (1985: 338)

In addition to *Parmeliopsis hyperopta*, Calvelo & Liberatore (2002) also listed *P. pallescens* (Neck.) Zahlbr., from Argentina, referring to its inclusion from Argentinian Tierra del Fuego by Grassi (1950), whose source was Räsänen (1932), both treating it as *Parmelia pallescens* (Neck.) Räs. However, *P. pallescens* is a synonym of *Imshaugia aleurites* (Santesson *et al.* 2004), and not *Parmeliopsis hyperopta*, although listed as such by Räsänen (1932). His inclusion of the character 'soredia semisphaeroidea' indicates that the species in question is *P. hyperopta,* which has been confirmed by us by a study of the reported collection at S. Thus, *Imshaugia aleurites* remains unknown from South America.

Hypotrachyna flavovirens (Kurok.) Hale (1975: 37)

Hypotrachyna flavovirens (Kurok.) Hale was described with its holotype from southernmost Chile near Hotel Río Rubens, 50 km S of Puerto Natales (Hale & Kurokawa 1968). Hale (1975) found it to be morphologically, but not chemically, identical with *H. sinuosa*, and hypothesized that the species was the product of hybridization between the latter and an unknown progenitor. Calvelo & Adler (2001), who reported eight collections of this species pair from Argentinian Tierra del Fuego and maintained the two entities as separate species, found traces of intermediate chemistry in parts of thalli. We have analyzed more than 20 samples and found all intermediates between the two major medullary chemotypes of protocetraric vs. norstictic and salazinic acids, and also found four samples with the deviating chemotype norstictic, stictic and constictic acids. Therefore, *H. flavovirens* is reduced to synonomy of *H. sinuosa* here.

Melanelixia subaurifera (Nyl.) O. Blanco, A. Crespo, Elix, D. Hawksw. & Lumbsch (2004a: 882)

Melanelixia subaurifera reported from Isla Navarino, Chile, by Redón & Quilhot (1977) probably refers to *M. subglabra*.

Melanohalea olivacea (L.) O. Blanco *et al.* (2004a: 883)

Melanohalea olivacea had some unreliable reports from Argentina from the older literature cited by Grassi (1950). However, it was reported again from Tierra del Fuego as new to Argentina by Calvelo & Liberatore (2002). Esslinger (1977) did not recognize this very distinct species from the Southern Hemisphere in his monograph, and the species is not accepted from southern South America here as long as no studied specimens have been documented and published.

Notoparmelia tenuirima (Hook. f. & Taylor) A. Crespo, Ferencova & Divakar (in Ferencova *et al.* 2014: 63)

Accepted for Argentina by Calvelo & Libertore (2002) based on the inclusion by Grassi (1950) from the Falkland Islands, from where it was reported by Zahlbruckner (1917), as "*Parmelia tenuirimis* Tayl. (Syn.: *Parmelia reticulata* Tayl.)". Hale (1987a) and Ferencova *et al.* (2014), however, only cited *N. tenuirima* from Australia and New Zealand, and the former cited it to be the species with the broadest lobes of any species in *Parmelia* s. str., now including also *Notoparmelia*. The citation of *Parmotrema reticulatum* as a synonym by Zahlbruckner (1917) makes us believe that the report refers to the latter species.

Parmelia fuegiensis Dodge (1966: 346)

Described as new to science as *Parmelia ('Xanthoparmelia') fuegiensis* from "Chile, Tierra del Fuego, Mt. Dorothea". This probably refers to Cerro Dorothea, which is situated near Puerto Natales in Chile far from Tierra del Fuego. The taxon is a *Flavoparmelia* according to also Hale & DePriest (1999), which in the area should be *F. gerlachei* (Zahlbr.) Hale.

P. omphalodes (L.) Ach. (1803: 204)

Listed from Santa Cruz and the Falkland Islands by Calvelo & Liberatore (2002), but not accepted from the Southern Hemisphere by Hale (1987a), nor by any other recent authority, nor included in the regional monograph by Stenroos (1991).

P. scholanderi Dodge (1966: 346)

Parmelia ('*Xanthoparmelia'*) *scholanderi* was described as new to science based on material from Puerto Eden in northern Magallanes by Dogde (1966), but was reduced to synonymy with *Hypotrachyna sinuosa* by Hale & DePriest (1999).

Punctelia borreri (Sm.) Krog (1982: 291)

Punctelia borreri was accepted for Argentina by Calvelo & Liberatore (2002), referring to Grassi (1950), who cited Cotton (1915), as a source for its report from the Falkland Islands, as '*Parmelia borreri* Turn.'. We think this should not be accepted without a restudy of the specimen, given the fact that Stenroos (1991) in her regional monograph on *Punctelia* cited *P. stictica* to be the only *Punctelia* species in southernmost South America.

P. microsticta (Müll. Arg.) Krog (1982: 291)

Listed from Argentinian Tierra del Fuego by Calvelo & Liberatore (2002). However, it was cited to have a more northern distribution in Argentina by Adler & Calvelo (2010).

Xanthoparmelia conspersa (Ach.) Hale (1974: 485)

Xanthoparmelia conspersa was listed from the Falkland Islands by Calvelo & Liberatore (2002) and Adler & Calvelo (2007), both referring to Nash *et al.* (1995). However, Nash *et al.* (1995) did not accept it from southern parts of South America, where instead other isidiate species occur.

Discussion

Diversity

The present study accepts 51 parmelioid species from southernmost South America as defined here, whereas 12 species reported during the last decades are considered doubtful. This is the first list of parmelioid species from this area, and the only partially comparable list is the one from southernmost Argentina and the Falkland Islands by Calvelo & Liberatore (2002). The latter included 38 species, and nine of these were reported as new to Argentina. However, six of these had already been reported from Argentina by Esslinger (1977), whereas *Xanthoparmelia delisei, microspora* and *ulcerosa* published by Esslinger (1977) or Nash *et al.* (1995) from southernmost Argentina were not included. In addition to the 33 species accepted here among the 41 referred to above, three species (*Parmelia kerguelensis, P. lindsayana, Hypotrachyna sorocheila*) have been published from southernmost Argentina and the Falkland Islands later, and *Hypotrachyna densirhizinata, H. oostingii, H. sublaevigata* and *H. swinscowii* have only been recorded from the Chilean part of the study area.

This comparison with the literature leaves eight of the presently reported species as new to the study area. Apart from *Hypotrachyna chilensis* and *Parmelia araucana* these are all *Xanthoparmelia* species, including two which will be described separately. With 19 known species and two still undescribed species *Xanthoparmelia* is by far the most species-rich parmelioid genus in southernmost South America. As shown by Table 1, four usnic acid-containing species (*X. austrosorediatum, X. mougeotii, X. submougeotii,* and *X. tehuelchorum*) and three melanin-containing species (*X. delisei, X. imitatrix* and *X. subhosseana*) are considered to be common or widespread, however, only on light-exposed rocks in the Patagonian steppe zone and in adjacent areas.

This illustrates that it is the arid part of southernmost South America which is the least explored area lichenologically. This is also indicated by the fact that the locally extremely common steppe species *Flavoparmelia gerlachei, Omphalodium pisacomense* and *Punctelia stictica* were previously only known from single localities in Magallanes (Hale 1986, Stenroos 1991, Etayo & Sancho 2008). Calvelo (1998b) also indicated this lack of lichenological explorations of the drier regions, as the large Argentinian province of Santa Cruz at that time only had 27 recorded lichen species, contrasting 398 for the subantarctic part of Tierra del Fuego and 200 for the Falkland Islands. Future lichenological studies in Santa Cruz will probably increase the number of *Xanthoparmelia* species known from the study area. Such studies are also needed to obtain knowledge about the status of the two endemics *X. patagonica* and *X. peltata*, each only known from two Argentinian localities and thus to be considered as very rare based on the present knowledge.

The second largest genus is *Hypotrachyna* with 11 species. Among these, as many as six species have only been reported from one to three localities from coastal areas, mostly on the Chilean side. This shows that also the other climatic extreme of the study area, the poorly accessible archipelago, has been insufficiently explored, at least by specialists on parmelioid species. Most of these species will probably have their frequencies increased by future studies.

Our field observations indicate that the only Torres del Paine locality of *H. densirhizinata* has almost certainly been destroyed by the strong forest fire in Torres del Paine in 2011/2012, which obliterated all lichens in central parts of the affected area. Only one additional locality has been reported from southernmost South America of this species. The same is probably the case with both the new localities reported here for the very rare species *Xanthoparmelia skottsbergiana,* these are the only known localities in southern South America. The only known locality of *X. glabrans* from Magallanes is within the forest fire area, but in a more marginal part, and it is to hope that it has survived. All the cited localities of *Parmotrema reticulatum* have also probably been lost, as well as all Torres del Paine localities of *Hypotrachyna brevirhiza* and many of those of *H. chilensis.*

Five species of the genus *Parmelia* are known from the study area. The newly described species *P. araucana* is probably overlooked and much more widespread than indicated by the six new collections published here and the two localities indicated by Stenroos (1991, as *Parmelia* sp.). The latter study critically discussed reports of *P. kerguelensis* from the area, and concluded that they should be included within *P. saxatilis*. However, based on the rather recent report by Calvelo & Fryday (2006) it is accepted here as an isolated occurrence on Falkland Islands, where it is joined by the newly described and chemically distinct endemic species *P. lindsayana*. Two *Melanohalea* and one *Melanelixia* species are also common in the deciduous forest zone, or in the eastern part of the evergreen forest zone, where also *Pannoparmelia angustata* is common on smooth bark, although the latter has not been collected much.

Phytogeography and evolution

Southernmost South America has such contrasting climates that not a single parmelioid species occurs commonly throughout its territory, although a cosmopolitan species such as *Parmelia sulcata* could be a candidate for such a pattern. However, *Flavoparmelia gerlachei* shows an unexpected pattern as it is dominant on exposed rocks in the dry steppe zone along the southern part of the Andes mountains, but is also found on manured rocks as far south as in coastal parts of Antarctica (Øvstedal & Smith 2001). This apparently strange distribution pattern comprising both dry Patagonian steppes and maritime Antarctic habitats is shared with several other species such as *Caloplaca regalis, Haematomma ochroleuca, Ramalina terebrata, Kohlmeyera (Turgidoscutulum) complicatula,* and *Usnea* species of the *Neuropogon* group. The explanation is probably that the strong winds of the dry Patagonian steppes transports salts and nutrients from seasonally desiccating saline lakes, thus producing a 'dry manuring' effect, ecologically similar to salts and nutrients brought by sea-spray in wind-exposed sea coasts and even manure deposited by seabirds in and near bird cliffs. This pattern is best seen on the S-facing slope of the basaltic volcano Morro Chico.

Regarding regional distribution patterns, 26 species, or 51 % (all *Xanthoparmelia* spp., *Flavoparmelia gerlachei, Omphalodium pisacomense, Parmelia kerguelensis, P. lindsayana,* and *Punctelia−stictica*) of the species, are confined to rocks of the light-exposed Patagonian steppe and anti-boreal heathland as mapped by Elvebakk & Moberg (2002).

The latter bioclimatic zone also includes the Falkland Islands where the two rare *Parmelia* species grow. Some of the species of this group may also occur on seashore rocks, but this has only been seen along seashores in mostly deforested and rather dry areas, such as eastern parts of Seno Otway and Seno Skyring in Magallanes, and yet not along the outer coast. A total of 9 species, or 18 % (the seven rare or scattered *Hypotrachyna* species, *Pannoparmelia angustata* and possibly *Parmotrema perforatum*), grow in the wet, coastal evergreen forest zone. Very few species have been recorded from the andine zones above the tree limit, a fact matching conditions in Antarctica and South Georgia, which only have seven parmelioid species (Øvstedal & Smith 2001). However, *Himatormia deusta* can be characterized as an exclusively andine species in the southernmost part of the study area (Fryday 2005). The remaining 15 species (or 29 %) are concentrated to the intermediate anti-boreal deciduous forest zone, although many of them also extend into neighbouring bioclimatic zones.

These regional patterns seem to be related both to global distribution patterns as well as evolutionary patterns. Adler & Calvelo (2002) state that Tierra del Fuego does not seem to have been a key area in the evolutionary history of Parmeliaceae lichens, except the case of *Himantormia deusta*. However, if the geographical context is broadened there is a strong element of South American endemism among the parmelioid species, including 21 species or 40 % of those recorded from the present study area. These are in addition to *H. deusta*, *Hypotrachyna chilensis, Melanohalea ushuaiensis, Omphalodium pisacomense, Parmelia araucana,* and *P. lindsayana* no less than 14 *Xanthoparmelia* species.

Nine of these endemics have their present distributions restricted to southernmost South America. However, they are scattered over the genera *Flavoparmelia* (when the doubtful Venezuelan records of *F. gerlachei* are excluded), *Himantormia, Hypotrachyna, Melanohalea, Parmelia,* and *Xanthoparmelia*, and one would suspect these to represent marginal evolutionary processes in different lineages. This is a strong contrast to evolution in *Menegazzia* (Bjerke 2005), many genera within Pannariaceae (Jørgensen 2003; Elvebakk *et al.* 2010), *Bunodophoron* (Wedin 1993), *Placopsis* (Galloway 2010), *Pseudocyphellaria* (Galloway 1992) and several others. These genera have high numbers of South American endemics distributed in southern humid areas, with related species in other austral areas with similar climates. Most lichenologists believe that these have been formed by evolutionary lineages which date back to the breaking-up of Gondwanaland in addition to more recent long-distance dispersal (e.g. Galloway 1987). Among vascular plant biogeographers, views differ between those who favour long-distance dispersal (McGlone 2005), and those who have emphasized even Antarctica as a key continent for evolution during periods of less glaciation (Wagstaff *et al.* 2011).

However, a recent phylogeny of *Flavoparmelia* (Del-Prado *et al.* 2013) indicated that this genus arose in southern South America c. 33 Ma years ago, with secondary migration to Australasia much later. The southernmost species *F. gerlachei* was not included in this study. The two species of the genus *Himantormia* also are in a similar biogeographical element as *F. gerlachei*.

Xanthoparmelia tehuelchorum and *X. austrosorediatum* appear to be a strongly southern species pair, of one sorediate and one primarily fertile species, and could be hypothesized to represent a separate evolutionary lineage. The high degree of attack by a distinct and dominant lichenicolous fungus is also a particular feature shared by these two species, and only traced in two other of the *Xanthoparmelia* collections studied here, one of *X. farinosa* and one of *X. submougeotii,* and rarely found in *Flavoparmelia gerlachei*.

The remaining 13 *Xanthoparmelia* species which are endemic to South America are mostly distributed in dry steppe areas. *Xanthoparmelia patagonica, peltata* and *submougeotii* are restricted or almost restricted to Patagonia, which is also the case with the two undescribed species, whereas the remaining species have a distribution more concentrated to central parts of South America. Amo de Paz *et al.* (2012) recently studied the evolution of some of the lineages of the brown species, including some of the non-endemic species. They concluded that the present distribution patterns are the result of several trans-oceanic migrations. Thus *X. imitatrix* migrated into South America c. 8 million years ago from a radiation centre in Australia of a clade partly sharing compounds related to its physodalic acid. *Xanthoparmelia squamans* and *X. subhosseana* represent an amphi-tropical, c. 3 million-year old disjunction of a clade with the hypostictic acid complex formed by long-distance migrations between North and South America. Amo de Paz *et al.* (2012) also concluded that several other large-disjunct taxa, such as *X. delisei*, were not monophyletic and thus in need of new taxonomic studies. South American material of *X. delisei* should therefore be compared with material from Europe, from where the species was described, and material from Australia which is genetically very different.

The truly bipolar taxa, on the other hand, only include *Melanohalea elegantula* and *Parmeliopsis hyperopta* after the rejection here of regional records of four additional species within this category. It is striking that the three common species in the Northern Hemisphere, *P. hyperopta*, *P. ambigua* and *Imshaugia aleurites,* the latter previously in *Parmeliopsis*, have such different and small distribution areas in the southern Hemisphere, the two latter only known from Australia (Kantvilas & Jarman 1999), and *I. aleurites* also from South Africa (Brusse 1993). This could be

explained as relatively recent immigration from the Northern Hemisphere, parallel to what has been proposed for the two *Flavocetraria* species (Bjerke & Elvebakk 2004, Geml *et al.* 2010). The strongly southern distribution and small number of species indicate that *Melanohalea* and *Melanelixia* are bipolar elements even at the generic level.

The panaustral element consists of eight species, viz. three *Xanthoparmelia* species, two *Hypotrachyna* species, and one species each from the genera *Melanohalea, Parmelia* and *Pannoparmelia*. Four of these are sorediate, and one could imagine that they could be rather easily dispersed with strong austral winds at high southern latitudes. *Pannoparmelia angustata* on the other hand, is a primarily fertile species of a small, strongly southern genus with a yet unresolved phylogeny, and it may have a longer history.

The species which are regionally concentrated to climatically intermediate biogeographic zones have a strongly mixed proportion of austral, endemic, bipolar, pantropical and cosmopolitan elements. Central parts of the National Park Torres del Paine could be characterized as a climatically favourable area, with relatively high temperatures throughout the year, in combination with moderate precipitation and little drought stress. Several species seem to have their optimum there, such as *Hypotrachyna chilensis, H. brevirhiza, Parmotrema reticulata, Xantoparmelia subplittii* and *X. wrightiana*. Tentatively, these can be suggested to belong to a thermophilous element in southernmost South America, at least if future studies will confirm that these species avoid the more summer-cool coastal areas and the winter-cold and dry continental areas.

Regarding the group of coastal species, most of them are pantropical or subcosmopolitan with extensions southwards into the wettest austral areas, like most *Hypotrachyna* species. The ecological similarities between wet, high-altitude forests in tropical and subtropical areas of South America and the wet coastal archipelago of southern Chile are not fundamentally different. However, the lichen mycobiotas of these two areas have very different phytogeographical affinities. Presence of minute soredia may be the most important factor explaining the wide distribution of these *Hypotrachyna* species, although most austral, fine-sorediate species from humid/moist areas never made the journey northwards across the desert and steppe-like landscapes. One could hypothesize that the dispersal capacities powered by cyclones in the subtropical belt are different from those powered by high latitude storms in the Southern Hemisphere. Phylogeographical studies are needed to study the origin of these biogeographic patterns.

Acknowledgements

Prof. J.E. Elix, National Museum of Australia, Canberra, is acknowledged for determination of some selected samples of *Xanthoparmelia*, M. Zhurbenko, Komarov Botanical Institute, Russian Academy of Science, St. Petersburg, for information about a lichenicolous fungus, curators at S for arranging a loan, an anonymous referee for useful comments, and CONAF - Corporación Nacional Forestal in Punta Arenas and the National Park of Torres del Paine for permission to collect, and for accomodation in the Park. Per Pippin Aspaas, the University Library at the University of Tromsø kindly translated diagnoses into Latin.

Literature cited

Acharius, E. (1803) *Methodus qua omnes detectos lichens secundum organa carpomorpha ad genera, species et variatates redigere atque onservationibus illustrare.* F.D.D. Ulrich, Stockholmiæ, 394 pp.
http://dx.doi.org/10.5962/bhl.title.79411

Adler, M. & Calvelo, S. (1993) New reports on Parmeliaceae s.str (lichenized Ascomycotina) from southwestern Argentina. *Mycotaxon* 46: 105−127.

Adler, M. & Calvelo, S. (2002) Parmeliaceae species (lichenized Ascomycetes) from Tierra del Fuego (southern South America) and their world distribution patterns. *Mitteilungen aus dem Institut für Allgemeine Botanik in Hamburg* 30–32: 9−24.

Adler, M. & Calvelo, S. (2007) Ampliación de las distribuciones de especies de Parmeliaceae (Ascomycota Liquenizados) en la República Argentina. *Boletín de la Sociedad Argentina de Botánica* 42: 1−11.

Adler, M. & Calvelo, S. (2010) *Flavoparmelia baltimorensis, Parmotrema yodae* y *Xanthoparmelia braziliensis*, primeras citas para Argentina y ampliación de distribuciones para otras *Parmeliaceae* (Ascomycota Liquenizados). *Boletín de la Sociedad Argentina de Botánica* 45: 5−16.

Amo de Paz, G., Lumbsch, H.T., Cubas, P., Elix, J.A. & Crespo, A. (2010) The morphologically deviating genera *Omphalodiella* and *Placoparmelia* belong to *Xanthoparmelia* (Parmeliaceae). *Bryologist* 113: 376−386.

http://dx.doi.org/10.1639/0007-2745-113.2.376
Amo de Paz, G., Cubas, P., Crespo, A., Elix, J.A. & Lumbsch, H.T. (2012) Transoceanic dispersal and subsequent diversification on separate continents shaped diversity of the *Xanthoparmelia pulla* group (Ascomycota). *Plos One* 7; 6 e39683. http://dx.doi.org/10.1371/journal.pone.0039683
Arnold, F. (1881) Lichenologische Ausflüge in Tirol. XXI. *Verhandlungen der Zoologish-Botanischen Gesellschaft in Wien* 30: 95−154.
Bjerke, J.W. (2005) Synopsis of the lichen genus *Menegazzia* (Parmeliaceae, Ascomycota) in South America. *Mycotaxon* 91: 423−454.
Bjerke, J. W. & Elvebakk, A. (1999) *Flavoparmelia soredians*, a common but previously overlooked lichen species in southernmost Chile. *Anales del Instituto de la Patagonia, Serie Ciencias Naturales* 27: 17−23.
Bjerke, J.W. & Elvebakk, A. (2004) Distribution of the lichen genus *Flavocetraria* (Parmeliaceae, Ascomycota) in the Southern Hemisphere. *New Zealand Journal of Botany* 42: 647−656. http://dx.doi.org/10.1080/0028825x.2004.9512916
Blanco, O., Crespo, A., Divakar, P.K., Esslinger, T.L., Hawksworth, D.L. & Lumbsch, H.T. (2004a) *Melanelixia* and *Melanohalea,* two new genera segregated from *Melanelia* (Parmeliaceae) based on molecular and morphological data. *Mycological Research* 108: 873−884. http://dx.doi.org/10.1017/s0953756204000723
Blanco, O., Crespo, A., Elix, J.A., Hawksworth, D.L. & Lumbsch, H.T. (2004b) A molecular phylogeny and a new classification of parmelioid lichens containing *Xanthoparmelia*-type lichenan (Ascomycota: Lecanorales). *Taxon* 53: 959−975. http://dx.doi.org/10.2307/4135563
Brusse, F.A. (1993) Eight new species in the lichen genus *Parmelia* (Ascomycotina, Parmeliaceae) from Southern Africa, with notes on Southern African lichens. *Mycotaxon* 49: 1−17.
Calvelo, S. (1998a) Keys to genera and species of *Parmeliaceae* s. lat. from Patagonia, Tierra del Fuego and South Atlantic Islands (Argentina). *In:* Marcelli, M.P. & Seaward, M.R.D. (eds.) *Lichenology in Latin America: history, current knowledge and applications.* CETESB, São Paulo, pp. 117−128.
Calvelo, S. (1998b) Lichenology in Argentina: past, present and future. *In* Marcelli, M.P. & Seaward, M.R.D. (eds.) *Lichenology in Latin America: history, current knowledge and applications.* CETESB, São Paulo, pp. 1−24.
Calvelo, S. & Adler, M. (1992) *Pannoparmelia anzioides*: a taxonomic synonym of *Pannoparmelia angustata* (Parmeliaceae, Lichenes). *Mycotaxon* 43: 487−498.
Calvelo, S. & Adler, M. (1999) *Parmelia araucana* sp. nov. and new reports in the Parmeliaceae sensu stricto (Lichenized Ascomycotina) from Patagonia and Tierra del Fuego (Argentina). *Sydowia* 51: 145−154.
Calvelo, S. & Adler, M. (2001) Novedades para la flora liquénica de Tierra del Fuego (Argentina): Parmeliaceae s. str. (Ascomycetes liquenizados). *Hickenia* 3: 105−110.
Calvelo, S. & Fryday, A.M. (2006) New reports of lichens from Argentine Tierra del Fuego and the Falkland Islands (Islas Malvinas). *Bryologist* 109: 372−380. http://dx.doi.org/10.1639/0007-2745(2006)109[372:nrolfa]2.0.co;2
Calvelo, S. & Liberatore, S. (2002) Catálogo de los líquenes de la Argentina. *Kurtziana* 29: 7−170.
Calvelo, S., Stocker-Wörgotter, E., Liberatore, S. & Elix, J.A. (2005) *Protousnea* (Parmeliaceae, Ascomycota), a genus endemic to southern South America. *Bryologist 108*: 1−15. http://dx.doi.org/10.1639/0007-2745(2005)108[1:ppaage]2.0.co;2
Choicy, M. (1952) Catalogue des lichens de la région lyonnaise. Fasc. 9. *Bolletin Mensuel de la Societé Linnéenne de Lyon* 21: 165−180.
Cotton, A.D. (1915) Cryptogams from the Falkland Islands, collected by Mrs. Vallentin, described by A.D.C. *Journal of the Linnaean Society* 43: 137−231. http://dx.doi.org/10.1111/j.1095-8339.1915.tb00606.x
Crespo, A., Lumbsch, H.T., Mattsson, J.-E., Blanco, O., Divakar, P.K., Articus, K., Wiklund, E., Bawingan, P.A. & Wedin, M. (2007) Testing morphology-based hypotheses of phylogenetic relationships in Parmeliaceae (Ascomycota) using three ribosomal markers and the nuclear RPB1 gene. *Molecular Phylogenetics and Evolution* 444: 812−824. http://dx.doi.org/10.1016/j.ympev.2006.11.029
Crespo, A., Kauff, F., Divakar, P.K., del Prado, R., Pérez-Ortega, S., Amo de Paz, G., Ferencova, Z., Blanco, O., Roca-Valiente, B., Núñez-Zapata, J., Cubas, P., Argüello, A., Elix, J.A., Esslinger, T.L. & Hawksworth, D.L. (2010) Phylogenetic generic classification of parmelioid lichens (Parmeliaceae, Ascomycota) based on molecular, morphological and chemical nevidence. *Taxon* 59: 1735−1753.
Culberson, C.F. (1972) Improved conditions and new data for the identification of lichen products by a standardized thin layer chromatography method. *Journal of Chromatography* 72: 113−125. http://dx.doi.org/10.1016/0021-9673(72)80013-x
Del-Prado, R., Blanco, O., Lumbsch, H.T., Divakar, P.K., Elix, J.A., Molina, M.C. & Crespo, A. (2013) Molecular phylogeny and historical

biogeography of the lichen-formingfungal genus *Flavoparmelia* (Ascomycota: Parmeliaceae). *Taxon* 62: 928–939. http://dx.doi.org/10.12705/625.22

Divakar, P.K., Crespo, A., Núñez-Zapata, J., Flakus, A., Sipman, H.J.M., Elix, J.A., & Lumbsch, H.T. (2013) A molecular perspective on generic concepts in the *Hypotrachyna* clade (Parmeliaceae, Ascomycota). *Phytotaxa* 132: 21−38. http://dx.doi.org/10.11646/phytotaxa.132.1.2

Dodge, C. W. (1966) New lichens from Chile. *Nova Hedwigia* 12: 307−352.

Elvebakk, A. (2011) A review of the genus *Hypogymnia* (Parmeliaceae) in Chile. *Bryologist* 114: 379−388. http://dx.doi.org/10.1639/0007-2745-114.2.379

Elvebakk, A., Robertsen, E.H., Park, C.H. &. Hong, S.G. (2010) *Psorophorus* and *Xanthopsoroma*, two new genera for yellow-green, corticolous and squamulose lichen species, previously in *Psoroma*. *Lichenologist* 42: 563−585. http://dx.doi.org/10.1017/s0024282910000083

Elvebakk, A. & Moberg, R. (2002) Foliose and placodioid species of the lichen family Physciaceae in southernmost Chile. *Lichenologist* 34: 311−320. http://dx.doi.org/10.1006/lich.2002.0389

Esslinger, T.L (1977) A chemosystematic revision of the brown Parmeliae. *Journal of the Hattori Botanical Laboratory* 42: 1−211.

Etayo, J. & Sancho, L.G. (2008) Hongos liquenícolas del sur de Sudamérica, especialmente de Isla Navarino (Chile). *Bibliotheca Lichenologica* 98: 1−302. http://dx.doi.org/10.1639/0007-2745-112.3.621

Ferencova, Z., Cubas, P., Divakar, P.K., Molina, M.C. & Crespo, A. (2014) *Notoparmelia*, a new genus of Parmeliaceae (Ascomycota) based on overlooked reproductive anatomical features, phylogeny and distribution pattern. *Lichenologist* 46: 51−67. http://dx.doi.org/10.1017/s0024282913000649

Fryday, A. (2005) *Nimisia deusta*, the correct name for *N. fuegiae*, with additional notes on morphology, chemical composition, and distribution. *Lichenologist* 37: 313−319. http://dx.doi.org/10.1017/s0024282905015239

Galloway, D.J. (1987) Austral lichen genera: some biogeographical problems. *Bibliotheca Lichenologica* 25: 385−399.

Galloway, D.J. (1992) Studies in *Pseudocyphellaria* (lichens) III. The South American species. *Bibliotheca Lichenologica* 46:1−275.

Galloway, D.J. (2010) Additions to the *Placopsis* mycobiota (Trapeliaceae, Ascomycota) of southern South America, with notes on new records (including *Aspiciliopsis macrophthalma*), and a revised regional key to the species. *Lichenologist* 42: 727−737. http://dx.doi.org/10.1017/s0024282910000460

Galloway, D.J. & Quilhot, W. (1998) Checklist of Chilean lichen-forming and lichenicolous fungi. *Gayana Botanica* 55: 111−185.

Galloway, D.J. & Jørgensen, P.M. (1990) *Bartlettiella*, a new lichen genus from New Zealand, with notes on a new species of *Melanelia* and a new chemodeme of *Bryoria indonesica* in New Zealand. *New Zealand Journal of Botany 28*: 5−12. http://dx.doi.org/10.1080/0028825x.1990.10412338

Geml, J., Kauff, F., Brochmann, C. & Taylor, D.J. (2010) Surviving climate change: high genetic diversity and transoceanic gene flow in two arctic-alpine lichens, *Flavocetraria cucullata* and *F. nivalis* (Parmeliaceae, Ascomycota). *Journal of Biogeography* 37: 1529−1542. http://dx.doi.org/10.1111/j.1365-2699.2010.02287.x

Grassi, M.M. (1950) Contribución al catálogo de líquenes argentinos, I. *Lilloa* 24: 5−296.

Hale Jr., M.E. (1974) *Bulbothrix, Parmelina, Relicina* and *Xanthoparmelia*, four new genera in the Parmeliaceae. *Phytologia* 28: 479−490.

Hale Jr., M.E. (1975) A revision of the lichen genus *Hypotrachyna* (Parmeliaceae) in tropical America. *Smithsonian Contributions to Botany* 25: 1−73. http://dx.doi.org/10.5479/si.0081024x.25

Hale Jr., M.E. (1986) *Flavoparmelia*, a new genus in the lichen family Parmeliaceae (Ascomycotina). *Mycotaxon* 25: 603−605.

Hale Jr., M.E. (1987a) A monograph of the lichen genus *Parmelia* Acharius sensu stricto (Asocmycotina: Parmeliaceae). *Smithsonian Contributions to Botany* 66: 1−55. http://dx.doi.org/10.5479/si.0081024x.66

Hale Jr., M.E. (1987b) New or interesting species of *Xanthoparmelia* (Vainio) Hale (Ascomycotina: Parmeliaceae). *Mycotaxon* 30: 319−334.

Hale Jr., M.E. (1989) New species in the lichen genus *Xanthoparmelia* (Ascomycotina: Parmeliaceae). *Mycotaxon* 34: 541−564.

Hale Jr., M.E. & Kurokawa, S. (1968) Studies on *Parmelia* subgenus *Parmelia*. *Contributions from the United States National Herbarium* 36: 121−191.

Hale, B.W. & DePriest, P. (1999) Mason E. Hale's list of epithets in the parmelioid genera. *Bryologist* 102: 462−544. http://dx.doi.org/10.2307/3244234

Henssen, A. (1991) *Omphalodiella patagonica*, a new peltate lichen genus and species from South America. *Lichenologist* 23: 333−342.
Henssen, A. (1992) *Placoparmelia patagonica*, a new lichen genus and species from Argentina (Parmeliaceae). *Lichenologist* 24: 133−142.
Hawksworth, D.L., Blanco, O., Divakar, P.K., Ahti, T, & Crespo, A. (2008) A first checklist of parmelioid and similar lichens in Europe and some adjacent territories, adopting revised generic circumscriptions and with indications of species distributions. *Lichenologist* 40: 1−21.
http://dx.doi.org/10.1017/s0024282908007329
Huneck, S. & Yoshimura, I. (1996) *Identification of lichen substances*. Berlin, Heidelberg, New York: Springer-Verlag.
Jørgensen, P. M. (2003) Conspectus familiae *Pannariaceae* (Ascomycetes lichenosae). *Ilicifolia* 4**:** 1–79.
Kantvilas, G & Jarman, S.J. (1999) Lichens of rainforest in Tasmania and south-eastern Australia. *Flora of Australia Supplementary Series* 9: 1−212.
Kärnefelt, I. & ,Thell, A. (1993) *Nimisia fuegiae* (Parmeliaceae), a new lichen genus and species from Argentina. *Lichenologist* 25: 369−377.
http://dx.doi.org/10.1017/s0024282993000465
Keogh, M.F. (1977) Malonprotocetraric acid from *Parmotrema conformatum*. *Phytochemistry* 16: 1102.
Krog, H. (1970) The Scandinavian members of the *Parmelia borreri* group. *Nytt Magasin for Botanikk* 17: 11−15.
Krog, H. (1982) *Punctelia*, a new lichen genus in the Parmeliaceae. *Nordic Journal of Botany* 2: 287−292.
http://dx.doi.org/10.1111/j.1756-1051.1982.tb01191.x
Krog, H. & Swinscow, T.D.V. (1987) New species and new combinations in some parmelioid lichen genera, with special emphasis on East African taxa. *Lichenologist 19*: 419−431.
http://dx.doi.org/10.1017/s0024282987000392
Kurokawa, S. (1999) A note on pustulate or sorediate species of *Cetrariastrum* (Parmeliaceae). *Journal of Japanese Botany* 74: 251−255.
Kurokawa, S. & Lai, M. (2001) Parmelioid genera and species in Taiwan. *Mycotaxon* 77: 225−284.
Louwhoff, S.H.J.J. & Elix, J.A. (2002) The Parmeliaceae (lichenized Ascomycota) of New Caledonia. *Lichenologist* 34: 373−394.
http://dx.doi.org/10.1006/lich.2002.0412
Mackay, J.T. (ed.) (1836) *Flora hibernica, comprising the flowering plants, Characeae, Musci, Hepaticae, Lichenes and Algae of Ireland arranged accordingly to the natural system with a synopsis of the genera according to the Linnaean system. Part second comprising the Musci, Hepaticae and Lichenes*, W.C. Jun et Comp., Dublin, London and Edinburgh, 275 pp.
http://dx.doi.org/10.5962/bhl.title.28754
Massalongo, A.B. (1860) Esame comparative di alcune genere di licheni. *Atti dell'Istituto Veneto di Scienze, Lettere ed arti.* Vol. 5, Ser. 3: 247−267; 313−337.
McGlone, M.S. (2005) Goodbye Gondwana. *Journal of Biogeography* 32: 739−740.
http://dx.doi.org/10.1111/j.1365-2699.2005.01278.x
Meyen, I. & de Flotow, I. (1843) Lichenes. F.J.F. Meyenii observationes botanicas, in itinere circum terram institutas. Opus posthumum, sociorum academiae curis suppletum. *Novorum actorum Academiae Caesarae Leopoldino-Carolinae naturae curiosorum,* 11, Suppl. 1: 209−232, XII Tab.
Meyer, S.L.F. (1985) The new lichen genus *Imshaugia* (Ascomycotina, Parmeliaceae). *Mycologia* 77: 336−338.
http://dx.doi.org/10.2307/3793090
Nash III, T.H., Elix, J.A. & Johnston, J. (1987) New species, new records and a key for *Xanthoparmelia* (Lichenized Ascomycotina) from South America. *Mycotaxon* 28: 285−296.
Nash III, T.H., Gries, C., Elix, J.A. (1995) A revision of the lichen genus *Xanthoparmelia* in South America. *Bibliotheca Lichenologica* 56:1−157.
Øvstedal, D.O., Elix, J.A. & Lewis Smith, R.I. (1996) A new species of *Parmelia* (lichenized Ascomycotina) from the Antarctic. *Nova Hedwigia* 55: 179−182.
Øvstedal, D. O. & Smith, R.I.L. (2001) *Lichens of Antartica and South Georgia. A guide to their identification and ecology*. Cambridge University Press, Cambridge, pp. 1−411.
Orange, A., James, P.W. & White, F.J. (2001). *Microchemical methods for the identification of lichens.* British Lichen Society, London, pp. 1−101.
Räsänen, V. (1932) Zur Kenntnis der Flechtenflora Feuerlands sowie der Prov. de Magallanes, Prov. de Chiloë und Prov. de Ñuble in Chile auf Grund des von H. Roivainen gesammelten Materiales. *Annales Botanici Societatis Zoologicae-Botanicae Fennicae 'Vanamo'* 2, I–VI: 1–65.
Redón, J. (1985) Catálogo de los líquenes. *In*: Boelcke, O., Moore, D.M & Roig, F.A. (eds.). *Transecta botanica de la Patagonia austral.* Consejo Nacional de Investigaciones Científicas y Técnicas, Instituto de la Patagonia, Royal Society; Buenos Aires, pp. 343−349.

Redón, J. & Quilhot, W. (1977) Los líquenes de isla Navarino. I: Estudio sistemático y ecológico preliminar. *Serie Cientifico del Instuto Antártico Chileno* 5: 65−79.

Santesson, R., Moberg, R., Nordin, A., Tønsberg, T, & Vitikainen, O. (2004) *Lichen-forming and lichenicolous fungi of Fennoscandia*. Museum of Evolution, Uppsala University, pp. 1−359.

Stenroos, S. (1991) The lichen genera *Parmelia* and *Punctelia* in Tierra del Fuego. *Annales Botanici Fennici* 28: 241−245.

Thell, A., Crespo, A., Divakar, P.K., Kärnefelt, I., Leavitt, S.D., Lumbsch, H.T. & Seaward, M.R.D. (2012) A review of the lichen family Parmeliaceae – history, phylogeny and current taxonomy. *Nordic Journal of Botany* 30: 641−664. http://dx.doi.org/10.1111/j.1756-1051.2012.00008.x

Thell, A. & Moberg, R. (eds.) (2011) *Nordic Lichen Flora*, Vol. 4. Uppsala University & The Nordic Lichen Society, Uppsala, pp 1−184.

Thell, A., Søchting, U., Kärnefelt, I., Elix, J. A., Sancho, L. G. (2007) Phylogeny of *Himantormia,* an Antarctic genus in the Parmeliaceae (lichenized ascomycetes). *In:* Kärnefelt, I. & Thell, A. (eds.): Lichenological Contributions in Honour of David Galloway. *Bibliotheca Lichenologica* 95: 531−541.

Thell, A., Westberg, M. & Kärnefelt, I. (2004) Biogeography of the lichen family Parmeliaceae in the Nordic countries with taxonomic remarks. *Symbolae Botanicae Upsalienses* 34: 429−452.

Thell, A., Westberg, M. & Kärnefelt, I. (2010) A key to the Parmeliaceae in the Alps with notes on their distribution and phylogeny. *Bibliotheca Lichenologica* 104: 275−298.

Tuhkanen, S. (1992) The climate of Tierra del Fuego from a vegetation geographical point of view and its eecoclimatic counterparts elsewhere. *Acta Botanica Fennica* 145: 1−64.

Tuhkanen, S.I., I. Kuokka, J. Hyvönen, S. Stenroos & J. Niemelä. (1990) [1992] Tierra del Fuego as a target for biogeographical research in the past and present. *Anales del Instituto de la Patagonia, Ciencias Naturales* 19: 5−107.

Wagstaff, S.J., Breitweiser, I. & Ito, M. (2011) Evolution and biogeography of *Pleurophyllum* (Astereae, Asteraceae), a small genus of megaherbs endemic to the subantarctic islands. *American Journal of Botany* 98: 62−75. http://dx.doi.org/10.3732/ajb.1000238

Wedin, M. (1993) A phylogenetic analysis of the lichen family Sphaerophoraceae (Caliciales); a new generic classification and notes on character evolution. *Plant Systematics and Evolution* 187: 213−241.

Wilson, F.R.M. (1900) Lichenes kerguelenses a Roberto Hall anno 1898 prope Royal Sound in Kerguelen Insula lecti, et in herbario nationali melbourniensi depositi. *Mémoires de l'Herbier Boissier* 18: 89−88.

Wirtz, N., C. Printzen & H.T. Lumbsch. (2008) The delimitation of Antarctic and bipolar species of neuropogonoid *Usnea* (Ascomycota, Lecanorales): a cohesion approach of species recognition for the *Usnea perpusilla* complex. *Mycological Research* 112: 472−484. http://dx.doi.org/10.1016/j.mycres.2007.05.006

Zahlbruckner, A. (1917) Botanische Ergebnisse der schwedischen Expedition nach Patagonien und dem Feuerlande 1907–1909. VI. Die Flechten. *Kongliga Svenska Vetenskaps-Akademiens Handlingar* 57: 1−62.

Zahlbruckner, A. (1930). Lichenes (Übersicht über sämtliche bisher aus China bekannten Flechten). *In*: Handel-Mazzetti, H. (Red.). *Symbolae sinicae. Botanische Ergebnisse der Expedition der Fig. and Akademie der Wissenschaften in Wien nach Südwest-China 1914−1918*. III. Teil, pp. 1−254.