

New and interesting records of Argentinian Ricciaceae (Marchantiophyta) and hornworts (Anthocerotophyta)

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Abstract – A list of eight species belonging to Marchantiophyta (Ricciaceae) and ten species to Anthocerotophyta (Anthocerotaceae, Dendrocerotaceae, Notothyladaceae and Phymatocerotaceae) collected in several provinces of Argentina is presented. Five species are new records for the Argentinian bryophyte flora: *Riccia limicola*, *R. weinionis*, *Anthoceros macounii*, *A. venosus* and *Phaeoceros microsporus*. *Riccia paranaensis* and *Ricciocarpos natans*, collected in Corrientes are new reports from this province; *Riccia lamellosa* and *R. squamata* are new records from La Pampa, *R. lindmanii* from Misiones and *Nothoceros endiviifolius* from Salta. Four species are second national and provincial records: *Riccia australis* from Misiones, *Phymathoceros bulbiculosus* from Corrientes, *Phaeomegaceros squamuliger* from Neuquén, and *Anthoceros lamellatus* in Tucumán. For each species, ecology and distribution data for Argentina and South America are given.

Anthocerotes / bryophytes / liverworts / distribution / ecology / South America

Résumé – Une liste de huit espèces appartenant aux Marchantiophyta (Ricciaceae) et dix espèces d'Anthocerotophyta (Anthocerotaceae, Dendrocerotaceae, Notothyladaceae and Phymatocerotaceae) récoltées dans plusieurs provinces de l'Argentine est présentée. Cinq espèces sont nouvelles pour la flore bryologique de l'Argentine : *Riccia limicola*, *R. weinionis*, *Anthoceros macounii*, *A. venosus* et *Phaeoceros microsporus*. *Riccia paranaensis* et *Ricciocarpos natans* ont été récoltées par la première fois dans la province de Corrientes ; *Riccia lamellosa*, *R. squamata* dans la province de La Pampa, *R. lindmanii* dans la province de Misiones et *Nothoceros endiviifolius* pour la province de Salta. Cinq espèces sont récoltées pour la deuxième fois : *Riccia australis* pour Misiones, *Phymathoceros bulbiculosus* pour Corrientes *Anthoceros lamellatus* pour Tucumán and *Phaeomegaceros squamuliger* pour Neuquén. Des notes sur l'écologie et la distribution de chaque espèce sont données.

Anthocérotes / bryophytes / hépatiques / distribution / écologie / Amérique du Sud

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INTRODUCTION

In the last checklist of liverworts and hornworts of southern-South America, published by Hässel de Menéndez & Rubies (2009), 562 taxa of Marchantiophyta and 15 taxa of Anthocerotophyta were recognized for the Argentinian bryophyte flora. The Marchantiophyta included 24 taxa of Ricciaceae, belonging to *Riccia* and *Ricciocarpos* genera; the Anthocerotophyta belonged to the next six genera, according to the nomenclature proposed by Söderström *et al.* (2016): *Anthoceros* (Anthocerotaceae), *Nothoceros*, *Phaeomegaceros*, (Dendrocerotacea), *Notothylas*, *Phaeoceros* (Notothyladaceae), and *Phymatoceros* (Phymatocerotaceae).

As a follow-up to the last papers by Fuertes & Prada (2014) and Fuertes *et al.* (in press) on liverworts in Argentina, the aim of this work was to contribute to the knowledge of the Ricciaceae and hornworts of botanical and ecological interest from Argentinean Natural Reserves.

MATERIALS AND METHODS

This study is based on herbarium material from the next institutions: Museo Argentino de Ciencias Naturales Bernardino Rivadavia, Buenos Aires (BA), IMBIV-Museo Botánico, Córdoba, Argentina (CORD), Universidad Nacional de la Plata, Buenos Aires (LPS), Facultad de Biología, Universidad Complutense, Madrid (MACB), and Real Jardín Botánico de Madrid (MA). Also new collections were made during field expeditions carried out by the first author from 2005 to 2012, conserved at MACB. Duplicates were donated to BA, and when possible, also to MA, Missouri Botanical Garden (MO) and New York Botanical Garden (NY).

The fieldwork covered mainly three phytogeographic areas: Amazonic and Chaqueño Domains, both of which are part of the Neotropic Region and the Subantarctic Domain included in the Austral Region (Cabrera, 1976).

The main vegetation types in the Neotropic Region are constituted by the montane subtropical evergreen forest (the yungas) located in northwestern Argentina (Salta and Tucumán provinces), the Atlantic evergreen-rain forests located in the northeast (Corrientes and Misiones provinces), and the subtropical evergreen-mixed forests and scrublands towards the interior of Argentina (Córdoba and La Pampa provinces). In the Austral Region, two vegetation types are observed: the evergreen valdivian hyperhumide-temperate forests and the evergreen *Nothofagus betuloides* (Mirb.) Oerst. forests towards the western side of Argentina (Neuquén province), and the evergreen *N. betuloides* forests and the deciduous *N. pumilio* (Poepp. & Endl.) Krasser and *N. antarctica* (G. Forst.) Oerts. forests of the south of Argentina (Tierra del Fuego province) (Pisano & Dimitri, 1973; Veblen *et al.*, 1996).

The list of species is presented in alphabetical order of families within the two major groups. Systematics and nomenclature follow Crandall-Stotler *et al.* (2008), Renzaglia *et al.* (2008) and Söderström *et al.* (2016). Taxa were identified following Jack & Stephani (1895), Müller (1955), Jovet-Ast (1978, 1991, 1993), Hässel de Menéndez (1962, 1989, 1990), Yano (1989), Schuster (1992a, b), Hasegawa (1994), Gradstein & Pinheiro da Costa (2003), Stotler *et al.* (2005), Duff *et al.* (2007), and Villarreal *et al.* (2007, 2010). Nomenclature of vascular plants follows the IPNI (The International Plant Name Index (2015).

For each species the next information is given: 1) literature references including illustrations of the species; 2) data of the specimens studied, indicating first in bold the Argentinean province, than geographical data, habitat, collection data and herbarium voucher reference; 3) previous references and known distribution in Argentinean provinces, if any; 4) world distribution and known distribution area in South America based on literature references.

RESULTS

Marchantiophyta - Ricciaceae

Riccia australis Steph.

Illustrations: Hässel de Menéndez (1962), Jovet-Ast (1991)

Misiones. Department Iguazú, Iguazú National Park, between the stations Boca del Diablo and Pozo, moist and wet soils on the margins of the Iguazu river, 101 m a.s.l., 25°36' S 54°34' W, *E. Fuertes & C. Prada*, 14/06/2008 (MACB 107883).

Distribution in Argentina: Misiones (Jovet-Ast, 1991). Only known from a previous report in an indeterminate site, *E. Vianna*, 14/07/1968 (CORD 237). Second report for Misiones and Argentina.

Neotropical-subtropical (Hässel de Menéndez & Rubies, 2009). Present in Argentina, Brazil, Ecuador, Peru, Uruguay and Venezuela (Jovet-Ast, 1991; Bischler-Causse *et al.*, 2005).

Riccia lamellosa Raddi

Illustrations: Hässel de Menéndez (1962), Jovet-Ast (1991).

La Pampa. Department Lihuel Calel, Lihuel Calel National Park, Valley of Los Angelitos, growing in scrublands of *Larrea divaricata* Cav. (jarilla) and *Schinopsis haenkeana* Engl. (orco quebracho), on sandy to gravelly, seasonally waterlogged soils on the summits of hills, growing with *Riccia squamata*, 382 m a.s.l., 37°58' S 65°35' W, *E. Fuertes, C. Prada & T. Gallardo*, 22/11/2012 (MACB 107927).

Distribution in Argentina: Buenos Aires, Catamarca, La Rioja, Tucumán, (Jovet-Ast, 1991). New report for La Pampa. This species is present in the moist and warm mixed forests of the NW, and in the evergreen forests and scrublands of the moist pampa in the NE (Jovet-Ast, 1991).

Subcosmopolitan (Grolle, 1983; Hässel de Menéndez & Rubies, 2009; Konstantinova *et al.*, 1992). In South America is present in Argentina, Brazil, Colombia, Peru and Uruguay (Jovet-Ast, 1991).

Riccia limicola Jovet-Ast

Illustrations: Hässel de Menéndez (1962), Jovet-Ast (1993).

Corrientes. Department El Empedrado, San Lorenzo stream, sandy and acidic soils, seasonally waterlogged, growing amongst *Phaeoceros* sp., 70 m a.s.l., 27°56' S 58°47' W, *E. Fuertes, G. Oliván & S. Jiménez*, 09/09/2008 (MACB 107885).

New report for Argentina.

Neotropical (Jovet-Ast, 1993). The present distribution in South America is restricted to Argentina (this report) and Ecuador (Galapagos Islands) (Jovet-Ast, 1991).

Riccia lindmanii Steph.

Illustrations: Hässel de Menéndez (1962), Jovet-Ast (1991).

Misiones. Department Iguazú, Iguazú National Park, in the broad leaf evergreen forest- rain-forests, route 101 *pr.* Andresito, on the riverbanks of Ñandú stream, loamy acidic soils, 160 m a.s.l., 25°36'S 54°34'W, *E. Fuertes, G. Oliván, C. Prada & J. Herrero*, 13/09/2008 (MACB 107945).

Distribution in Argentina: Buenos Aires, Catamarca, Tucumán (Kühnemann, 1949, Hässel de Menéndez, 1962). New report for Misiones.

Neotropical-subtropical (Hässel de Menéndez & Rubies, 2009). In South America it is known from Argentina, Brazil, Paraguay, Peru and Uruguay (Jovet-Ast, 1991).

Riccia paranaensis Hässel

Illustrations: Hässel de Menéndez (1962), Jovet-Ast (1993).

Corrientes. Department El Empedrado, San Lorenzo stream, *paranaensis* sylvia, in acidic sandy soils, seasonally waterlogged, growing with *Phaeoceros* sp., 70 m a.s.l., 27° 56'S 58°47'W, *E. Fuertes, G. Oliván & S. Jiménez*, 09/09/2008 (MACB 107886).

Distribution in Argentina: Buenos Aires (Hässel de Menéndez & Rubies, 2009). New report for Corrientes.

Temperate South America (Hässel de Menéndez & Rubies, 2009). Present in Argentina and Brazil (Gradstein & Pinheiro da Costa, 2003).

Riccia squamata Nees

Illustrations: Hässel de Menéndez (1962), Jovet-Ast (1991).

La Pampa. Department Lihuel Calel, Lihuel Calel National Park, Valley of Los Angelitos, growing in scrubland of *Larrea divaricata*, on sandy to gravelly, seasonally waterlogged soils on the summits of hills, growing with *Riccia lamellosa*, 382 m a.s.l., 37°58'S 65°35'W, *E. Fuertes, C. Prada & T. Gallardo*, 22/11/2012 (MACB 107946).

Misiones. Department Iguazú, Iguazú National Park, of broad leaf evergreen- rain-forests, route 101 *pr.* Andresito, on the riverbanks of Ñandú stream, loamy acidic soils, growing with *Riccia lindmanii*, 160 m a.s.l., 25°36'S 54°34'W, *E. Fuertes, G. Oliván, C. Prada & J. Herrero*, 13/09/2008 (MACB 107884).

Distribution in Argentina: Misiones and Tucumán (Hässel de Menéndez, 1962; Jovet-Ast, 1991). New report for La Pampa.

Neotropical (Hässel de Menéndez & Rubies, 2009). In South America it is known from Argentina, Brazil and Chile (Jovet-Ast, 1991; Bischler-Causse *et al.*, 2005; Hässel de Menéndez & Rubies, 2009).

Riccia wainionis Steph.

Illustrations: Hässel de Menéndez (1962), Jovet-Ast (1991).

Corrientes. Department Mercedes, Esteros del Iberá Natural Park, on the waterlogged peaty substrates of floating rafts in the Iberá lagoon, 60 m a.s.l., 27°35'S 56°41'W, *E. Fuertes, G. Oliván & S. Jiménez*, 09/09/2008 (MACB 107882).

Misiones. Department Iguazú, Iguazú National Park, evergreen -rain forest, route 101 *pr.* Andresito, on the riverbanks of Ñandú stream, loamy acidic soils and roots, 150 m a.s.l., 25°36'S 54°34'W, *E. Fuertes, G. Oliván, C. Prada & J. Herrero*, 13/09/2008 (MACB 107880, MA).

New report for Argentina.

Neotropical (Jovet-Ast, 1991). The present distribution in South America is restricted to Argentina (this report), Brazil and Colombia (Jovet-Ast, 1991).

***Ricciocarpos natans* (L.) Corda**

Illustrations: Hässel de Menéndez (1962).

Corrientes. Department Concepción, route 22, from Pasaje Florida to Concepción, Esteros del Batelito, 64 m a.s.l., 28°22'S 57°52'W, *E. Fuertes, G. Oliván & S. Jiménez*, 09/09/2008 (MACB 107881, MA).

Distribution in Argentina: Buenos Aires, Entre Ríos, Formosa and La Rioja (Kühnemann, 1938, 1944, Hässel de Menéndez & Rubies, 2009). Specimens reviewed: Buenos Aires (Santa Catalina, *E. Clos 1926*, LPS 2369!) and Formosa (*Spegazzini 1901*, LPS!). New report for Corrientes.

Cosmopolitan (Schuster, 1983; Hässel de Menéndez & Rubies, 2009). In South America it is distributed in Argentina, Brazil and Uruguay (Jovet-Ast, 1991; Bischler-Causse *et al.*, 2005).

Anthocerotophyta**Anthocerotaceae*****Anthoceros lamellatus* Steph.**

Illustrations: Hässel de Menéndez (1990).

Tucumán. Department Tafí del Valle, San Javier, the Yungas forests, growing on rocks by waterfalls, 1160 m a.s.l., 26°45'S 65°21'W, *E. Fuertes & C. Prada*, 22/6/2007 (MACB 107929); Department Monteros, Reserva of the Quebrada de los Sosa, near the monument to the Indio, the Yungas, growing on moist rocks, 885 m a.s.l., 26°45'S 65°44'W, *E. Fuertes & C. Prada*, 21/06/2007 (MACB 107930).

Distribution in Argentina: Tucumán (Hässel de Menéndez & Rubies, 2009). Second report for Argentina and Tucumán province.

Neotropical (Hässel de Menéndez & Rubies, 2009). In South America it is known from Argentina and Brazil (Yano, 1989; Hässel de Menéndez & Rubies, 2009).

***Anthoceros macounii* M.Howe**

Illustrations: Hässel de Menéndez (1990), Schuster (1992a).

Tucumán. Department Monteros, Reserva of the Quebrada de los Sosa, the Yungas montane forest, growing on moist rocks, 885 m a.s.l., 26°45'S 65°44'W, *E. Fuertes & C. Prada*, 21/06/2007 (MACB 107931).

New report for Argentina.

Subcosmopolitan (Schuster, 1983). The present distribution in South America is restricted to Argentina.

***Anthoceros venosus* Lindenb. & Gottsche**

Illustrations: Hässel de Menéndez (1990).

Corrientes. Department El Empedrado, sylvia paranaense, San Lorenzo stream, acidic, silty to sandy, seasonally waterlogged soils, growing with *Riccia* sp., 70 m a.s.l., 27°56'S 58°47'W, *E. Fuertes, G. Oliván & S. Jiménez*, 09/09/2008 (MACB 107932).

New report for Argentina.

Neotropical, North-South America disjunction (Schuster, 1983; Hässel de Menéndez 1990; Hässel de Menéndez & Rubies, 2009). The present distribution in South America is restricted to Argentina.

Dendrocerotaceae***Nothoceros endiviifolius* (Mont.) J. Haseg. ex J.C. Villarreal, Hässel & N. Salazar**

Illustrations: Hässel de Menéndez (1962).

Salta. Department Orán, San Andrés Natural Reserve, Los Naranjos, the evergreen montane forest—the Yungas—, of *Alnus acuminata* Kuntze (aliso), *Podocarpus parlatorei* Pilg. (pino del cerro), *Cedrela angustifolia* DC. (cedro salteño), 400-590 m a.s.l., 23°10'S 63°29'W, *E. Fuertes & C. Prada*, 17/06/2008 (MACB 107937).

Tierra del Fuego. Department Ushuaia, route J, to Almansa, near waterfalls, growing on soils and stumps, in deciduous forest of *Nothofagus* (*N. antarctica* and *N. pumilio*), *E. Fuertes & M. Rodríguez*, 103 m a.s.l., 54°40'S 68°20'W, 23/04/2006 (MACB 107936); Estancia Moat, growing on oligotrophic soils sprinkled by waterfalls in evergreen forests of *Nothofagus betuloides*, *Drymis winteri* J.R. Forst. & G. Forst. and *Pilgerodendron uviferum* (D. Don) Florin, towards the south of Argentina, 20 m a.s.l., 54°44'S 68°33'W, *E. Fuertes & M. Rodríguez*, 19/03/2005 (MACB 107934).

In Argentina it was only reported from Tierra del Fuego mainland and Isla de los Estados: BA 11862!, BA 35628!, BA 14321, LPS 22065! (Hässel de Menéndez, 1984). New report for Salta.

Temperate South America and Andinopatagonian-subantarctic islands (Hässel de Menéndez & Rubies, 2009). In South America it is restricted to Argentina.

Nothoceros fuegiensis (Steph.) J.C. Villarreal

Illustrations: Hässel de Menéndez (1962).

Tierra del Fuego. Department Ushuaia, route J, between Ushuaia and Estancia Moat, on the riverbanks of Beagle Channel, humid and shaded rocks in road slopes growing with *Sphagnum fimbriatum* Wilson & Hooker, in evergreen forests of *Nothofagus betuloides*, *Drymis winteri*, *Pilgerodendron uviferum*, located towards south of Argentina, 20 m a.s.l., 54°44'S 68°33'W, *E. Fuertes & M. Rodríguez*, 19/03/2005 (MACB 107933).

Distribution in Argentina: Chubut, Río Negro, Tierra del Fuego (mainland and Isla de los Estados) and Tucumán (Hässel de Menéndez, 1962, 1984; Hässel de Menéndez & Rubies, 2009).

Temperate South America, Andinopatagonian-subantarctic islands (Hässel de Menéndez & Rubies (2009). In South America it occurs in Argentina and Chile (Hässel de Menéndez & Rubies, 2009).

Phaeomegaceros squamuliger (Spruce) J.C. Villarreal

Illustrations: Hässel de Menéndez (1989).

Neuquén. Department Siete Lagos, Lanín National Park, *pr.* San Martín de los Andes, northwest of the lake Lacar, Hua-Hum, growing in evergreen hyperhumide valdivian-temperate forest of *Nothofagus betuloides*, *N. obliqua* (Mirb.) Oerst., *N. procera* (Mirb.) Oerst. and *Araucaria auracana* (Molina) Koch, 800-110 m a.s.l., *E. Fuertes & M. Rodríguez*, 30/11/2005 (MACB 107941, 107942).

Distribution in Argentina: Neuquén (Hässel de Menéndez, 1989). This contribution is the second report for this province and Argentina.

Temperate South America (Hässel de Menéndez & Rubies, 2009). In South America is found in Argentina, Chile and Ecuador (Villareal *et al.*, 2010).

Notothykladaceae

Phaeoceros laevis (L.) Prosk. subsp. *laevis*

Illustrations: Hässel de Menéndez (1962).

Córdoba. Department Colón, road from La Cumbre to Ascochinga, Estancia Tiu Maryú, Tiu Maryú river, moist soils, 1400 m a.s.l., 30°58'S 64°25'W, *E. Fuertes & C. Prada*, 02/11/2011 (MACB 107944); Department Punilla, Sierra Grande, provincial route 28, from Tanti to Salsacate, between Durazno and cerro Blanco, Yuspe river, 1730 m a.s.l., 31°21'S 64°38'W, *E. Fuertes*, 19/09/2010 (MA).

Distribution in Argentina: Buenos Aires and Córdoba (Hässel de Menéndez & Rubies, 2009). Second report for Córdoba.

Cosmopolitan (Grolle, 1983; Piippo, 1990; Konstantinova *et al.*, 1992; Kürschner, 2000; Hässel de Menéndez & Rubies, 2009). In South America it is known from Argentina and Brazil (Hässel de Menéndez & Rubies, 2009).

***Phaeoceros microsporus* (Steph.) Hässel**

Illustrations: Hässel de Menéndez (1989).

Misiones. Department Montecarlo, route from Montecarlo to Puerto Parany, growing in soils under a secondary evergreen forest altered by logging, 95 m a.s.l., 26°41'S 54°49'W, *E. Fuertes & C. Prada*, 25/07/2007 (MACB 107940); Department Iguazú, Iguazú National Park, in “evergreen of broad leaf forests, “Bañado en la antigua mina Iguazú”, 25°36'S 54°34'W, 170-220 m a.s.l., *E. Fuertes & C. Prada*, 11/07/2007 (MACB 107939).

New report for Argentina.

Neotropical (Hässel de Menéndez, 1989). This report in Argentina is the first one in South America.

***Phaeoceros tenuis* (Spruce) Hässel**

Illustrations: Hässel de Menéndez (1989).

Tucumán. Department Chichigasta, Sierra of Aconquija, Las Banderitas, –the Yungas– moist rock walls between 1845-1860 m a.s.l., 27°18'S 65°54'W, *E. Fuertes & C. Prada*, 22/6/2007 (MACB 107943).

Distribution in Argentina: Buenos Aires, Corrientes (Hässel de Menéndez & Rubies, 2009) and Tucumán (Hässel de Menéndez, 1989).

Neotropical-subtropical (Hässel de Menéndez & Rubies, 2009). In South America it is known from Argentina, Paraguay and Peru (Hässel de Menéndez, 1989).

Phymatocerotaceae

***Phymatoceros bulbiculosus* (Brot.) Stotler, W.T. Doyle & Crand.-Stotl.**

Illustrations: Hässel de Menéndez (1989).

Corrientes. Department El Empedrado, Sylva paranaense, San Lorenzo stream, sandy and acid soils, seasonally waterlogged, growing amongst *Riccia* sp., 70 m a.s.l., 27°56'S 58°47'W, *E. Fuertes, G. Oliván & S. Jiménez*, 09/09/2008 (MACB 107938).

Distribution in Argentina: Jack & Stephani (1895) described *Anthoceros argentinus* J.B. Jack & Stephani based on a collection of Lorentz in 1873 from Corrientes province. Hässel de Menéndez (1989) considered this name to be conespecific with *Phaeoceros bulbiculosus* (Brot.) Prosk., which was considered by Stotler *et al.* (2005) as *Phymatoceros bulbiculosus* (Dendroceroitiidae, Phymatocerotales). This is the second record for Corrientes and Argentina.

Cosmopolitan (Grolle, 1983; Hässel de Menéndez, 1989; Piippo, 1990; Konstantinova *et al.*, 1992; Bischler, 2004). In South America it is known from Argentina, Brazil, Chile and Paraguay (Hässel de Menéndez, 1984).

DISCUSSION AND CONCLUSIONS

Eighteen species comprising eight complex thalloid liverworts (Marchantiophyta) and 10 hornworts (Anthocerotophyta) were sampled throughout Argentina. The Marchantiophyta included in this work are restricted to the family Ricciaceae and were exclusively found in the northern, neotropical-subtropical part of the country, in the provinces of Misiones, Corrientes and La Pampa (Table 1).

Table 1. Ricciaceae and hornworts species reported for the Argentinian provinces in this work. Abbreviations: CO (Córdoba), CRR (Corrientes), LP (La Pampa), MI (Misiones), NE (Neuquén), SA (Salta), TF (Tierra del Fuego), TU (Tucumán). Legend: ● New national report, * New provincial report, ▲ Second provincial and national report, + Other report

Species	CO	CRR	LP	MI	NE	SA	TF	TU
Marchantiophyta								
<i>Riccia australis</i>				▲				
<i>Riccia lamellosa</i>			*					
<i>Riccia limicola</i>		●						
<i>Riccia lindmanii</i>				*				
<i>Riccia paranaensis</i>		*						
<i>Riccia squamata</i>			*	+				
<i>Riccia weinionis</i>		●		●				
<i>Ricciocarpos natans</i>		*						
Anthocerotophyta								
<i>Anthoceros lamellatus</i>								▲
<i>Anthoceros macounii</i>								●
<i>Anthoceros venosus</i>		●						
<i>Nothoceros endiviifolius</i>						*	+	
<i>Nothoceros fuegiensis</i>							+	+
<i>Phaeoceros laevis</i>	+							
<i>Phaeoceros microsporus</i>				●				
<i>Phaeoceros. tenuis</i>								+
<i>Phaeomegaceros squamuliger</i>								▲
<i>Phymatoceros bulbiculosus</i>		▲						

Four taxa (*Riccia limicola*, *R. paranaensis*, *R. weinionis* and *Ricciocarpos natans*) were found in The Esteros del Iberá Natural Park (Corrientes), and four taxa (*Riccia australis*, *R. lindmanii*, *R. squamata* and *R. weinionis*) in the Iguazú National Park (Misiones), both provinces are located in the northeast Argentina which main vegetation is constituted by tropical evergreen rain forests. Only two species (*Riccia lamellosa* and *R. squamata*) were found towards interior of the country, in the Lihuel Calel National Park from La Pampa province.

Riccia limicola and *R. weinionis* are new records to Argentina; *R. paranaensis* and *Ricciocarpos natans* are new records for Corrientes; *Riccia lamellosa* and *R. squamata* are new for La Pampa; and *R. lindmanii* is new to Misiones; *R. australis* constitutes the second collected evidence for Argentina (Table 1).

The Anthocerotophyta reported in this work belong to four families and ten species found in two phylogeographic areas: the Neotropic Region (Salta, Tucumán, Corrientes, Misiones, and Córdoba provinces) and the Austral Region (Neuquén and, Tierra del Fuego provinces).

Seven taxa of the hornworts were exclusively found in the Neotropic Region: *Anthoceros lamellatus*, *A. macounii* and *Phaeoceros tenuis* in Tucumán;

Anthoceros venosus and *Phymatoceros bulbiculosus* in Corrientes, *Phaeoceros microsporus* in Misiones and *Phaeoceros laevis* in Córdoba. Only one taxa *Phaeoceros squamuliger* was exclusively found in the Austral Region (Neuquén); *Nothoceros endiviifolius* was collected in Salta and Tierra del Fuego and *N. fuegiensis* collected in Tucumán and Tierra del Fuego, growing in similar habitat in two disjunct areas of Argentina. They occurred in the Neotropic Region, in the montane yungas forest of northwestern Argentina and in the Austral Region.

Anthoceros macounii, *A. venosus* and *Phaeoceros microsporus* are new reports for the bryophyte flora of Argentina. *Nothoceros endiviifolius* is new report for Salta. The next taxa are second national and provincial records: *Anthoceros lamellatus* for Tucumán, *Phaeomegaceros squamuliger* for Neuquén, and *Phymatoceros bulbiculosus* for Corrientes (Table 1).

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REFERENCES

- BISCHLER-CAUSSE H., GRADSTEIN S.R., JOVET-AST S., LONG D.G. & ALLEN N.S. 2005 — The Marchantiidae. *Flora Neotropica Monograph* 97: 1-195.
- CABRERA A.L., 1976 — Regiones fitogeográficas argentinas. In: Kugler W.F. (ed.), *Enciclopedia argentina de agricultura y jardinería*, Tomo II, 2º ed. Buenos Aires, ACME, pp. 1-85.
- CRANDALL-STOTLER B.J., STOTLER R. & LONG D.G., 2008 — Morphology and classification of the Marchantiophyta. In: Goffinet B. & Shaw A.J. (eds.), *Bryophyte Biology, second edition*. Cambridge, Cambridge University Press, pp. 1-54.
- DUFF R.J., VILLARREAL J.C., CARGILL D.C. & RENZAGLIA K.S., 2007 — Progress and challenges toward developing a phylogeny and classification of the hornworts. *The bryologist* 110: 214-243.
- FUERTE E. & PRADA C., 2014 — New record and additions to the Argentinean Bryophyte Flora (Marchantiophyta). *Darwiniana, nueva serie* 2(1): 68-73.
- FUERTE E., ÁLVAREZ GERECHTER L. & PRADA C., In press — Aportaciones a la brioflora de la Argentina (Marchantiophyta, Lunulariales, Marchantiales). *Botanica Complutensis* 40.
- GRADSTEIN S.R. & PINHEIRO DA COSTA D. 2003 — The Hepaticae and Anthocerotae of Brazil. *Memoirs of the New York botanical garden* 87: 1-318.
- GROLLE R., 1983 — Hepatics of Europe including the Azores: an annotated list of species, with synonyms from recent literature. *Journal of bryology* 12: 403-459.
- HASEGAWA J., 1994 — New classification of Anthocerotae. *Journal of the Hattori botanical laboratory* 76: 21-34.
- HÄSSEL DE MENÉNDEZ G.G., 1962 — Estudio de las Anthocerotales y Marchantiales de la Argentina. *Opera Lilloana* 7: 1-297.
- HÄSSEL DE MENÉNDEZ G.G., 1984 — The occurrence and distribution of bryophytes in Southern Patagonia between latitude 51-52. *Journal of the Hattori botanical laboratory* 55: 45-64.
- HÄSSEL DE MENÉNDEZ G.G., 1989 — Las especies de *Phaeoceros* (Anthocerotophyta) en América del Norte, Sud y Central; la ornamentación de sus esporas y taxonomía. *Candollea* 44(2): 715-739.

- HÄSSEL DE MENÉNDEZ G.G., 1990 — Las especies de *Anthoceros* y *Folioceros* (Anthocerotophyta) de América del Norte, Sud y Central; la ornamentación de sus esporas y taxonomía. *Candollea* 45(1): 201-220.
- HÄSSEL DE MENÉNDEZ G.G. & RUBIES M.F., 2009 — Catalogue of Marchantiophyta and Anthocerotophyta of southern South America. *Nova Hedwigia, Beihefte* 134: 1-672.
- INTERNATIONAL PLANT NAMES INDEX, 2015 — The International Plant Name Index (IPNI). Web site: <http://www.ipni.org/>. Accessed 13.12.2015.
- JACK J.B. & STEPHANI F., 1895 — *Hepatica Lorentzianae*. *Hedwigia* 34: 313-318.
- JOVET-AST S., 1978 — *Riccia* des Îles Galapagos. *Revue bryologique et lichénologique* 44(4): 411-428.
- JOVET-AST S., 1991 — *Riccia* (Hépatiques, Marchantiales) d'Amérique Latine *Cryptogamie, bryologie et lichénologie* 12(3): 189-370.
- JOVET-AST S., 1993 — *Riccia* L. (Hepaticae, Marchantiales) from South America. Subgen. *Thallocarpus*, *Leptoriccia*, *Ricciella*. *Cryptogamie, Bryologie - Lichénologie* 14(3): 219-302.
- KONSTANTINOVA N.A., POTEMKIN A.D. & SCHLJAKOV R.N., 1992 — Check-list of the Hepaticae and Anthocerotae of the former USSR. *Arctoa* 1: 87-127.
- KÜHNEMANN O., 1938 — Géneros de hepáticas nuevos para Argentina. 1º Reunión Anual Sudamericana. *Botánica* 2: 211-213.
- KÜHNEMANN O., 1949 — Catálogo de las hepáticas argentinas. *Lilloa* 19: 319-375.
- KÜRSCHNER H., 2000 — Bryophyte flora of the Arabian Peninsula and Socotra. *Bryophytorum bibliotheca* 55: 1-131.
- MÜLLER K., 1955 — Lebermoose aus Südamerika. *Feddes repertorium specierum novarum regni vegetabilis* 58: 1-74.
- PIIPPO S., 1990 — Annotated catalogue of Chinese Hepaticae and Anthocerotae. *Journal of the Hattori botanical laboratory* 68: 1-192.
- PISANO E. & DIMITRI M., 1973 — Estudio ecológico de la región continental sur del área andino-patagónica. *Anales del instituto de la Patagonia* 4(1-3): 207-272.
- RENZAGLIA K.S., VILLARREAL J.C. & DUFF R.J., 2008 — New insights into morphology, anatomy, and systematics of hornworts. In: Goffinet B. & Shaw A.J. (eds), *Bryophyte Bryology*. Cambridge, Cambridge University Press, pp. 139-197.
- SCHUSTER R.M., 1983 — Phytogeography of the Bryophyta. In: Schuster R.M. (ed.), *New Manual of Bryology*. Volume 1. Nichinan, Miyazaki, Japan, The Hattori Botanical laboratory, pp. 463-626.
- SCHUSTER R.M., 1992a — *The Hepaticae and Anthocerotae of North America east of the hundredth meridian*. Volume V. Chicago, Field Museum of Natural History, 854 p.
- SCHUSTER R.M., 1992b — *The Hepaticae and Anthocerotae of North America east of the hundredth meridian*. Volume VI. Chicago, Field Museum of Natural History, 937 p.
- SÖDERSTRÖM L., HAGBORG A., VON KONRAT M., BARTHOLOMEW-BEGAN S., BELL D., BRISCOE L., BROWN E., CARGILL D.C., COSTA D.P., CRANDALL-STOTLER B.J., COOPER E.D., DAUPHIN G., ENGEL J.J., FELDBERG K., GLENNY D., GRADSTEIN S.R., HE X., HEINRICHS J., HENTSCHEL J., ILKIU-BORGES A.L., KATAGIRI T., KONSTANTINOVA N.A., LARRAÍN J., LONG D.G., NEBEL M., PÓCS T., PUCHE F., REINER-DREHWALD E., RENNER M.A.M., SASS-GYARMATI A., SCHÄFER-VERWIMP A., SEGARRA MORAGUES J.G., STOTLER R.E., SUKKHARAK P., THIERS B.M., URIBE J., VÁÑA J., VILLARREAL J.C., WIGGINTON M., ZHANG L. & ZHU R.-L., 2016 — World checklist of hornworts and liverworts. *PhytoKeys* 59: 1-821.
- STOTLER R.E., DOYLE W.T. & CRANDALL-STOTLER B.J., 2005. *Phymatoceros* Stotler, W.T Doyle & Crand.-Stotl., gen. nov. (Anthocerotophyta). *Phytologia* 87(2): 114-117.
- VEBLEN T.T., DONOSO C., KITZBERGER T. & REBERTUS A.J., 1996 — Ecology of southern Chilean and Argentinean *Nothofagus* forests. In: Veblen T.T., Hill R.S. & Read J. (eds), *The ecology and biogeography of Nothofagus forests*. New Haven and London, Yale University Press, pp. 293-353.
- VILLARREAL J.C., HÄSSEL DE MENÉNDEZ G.G. & SALAZAR ALLEN N., 2007 — *Nothoceros superbus* (Dendrocerotaceae), a new hornwort from Costa Rica. *The bryologist* 110: 279-285.
- VILLARREAL J.C., CARGILL D.C. & GOFFINET B., 2010 — *Phaeomegaceros squamuliger* subspecies *hassellii* (Dendrocerotaceae, Anthocerotophyta), a new taxon from the Southern Hemisphere. *Nova Hedwigia* 91(3-4): 349-360.
- YANO O., 1989 — An additional annotated checklist of Brazilian bryophytes. *Journal of the Hattori botanical laboratory* 66: 371-434.