

## NOTES ON THE GENUS *HAEMATOMMA* (ASCOMYCOTA, LECANORACEAE) IN ARGENTINA

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**Abstract.** Messuti, M. I. & I. N. de la Rosa. 2009. Notes on the genus *Haematomma* (Ascomycota, Lecanoraceae) in Argentina. *Darwiniana* 47(2): 297-308.

New information on the taxonomy, chemistry, distribution and ecology are given for seven taxa of the genus *Haematomma* occurring in Argentina. Two of them, *H. flexuosum* and *H. fluorescens* var. *fluorescens*, are reported for the first time for Argentina. An identification key to the recognized taxa of *Haematomma* in Argentina is provided.

**Keywords.** Argentina, chemistry, distribution, *Haematomma*, microlichens.

**Resumen.** Messuti, M. I. & I. N. de la Rosa. 2009. Notas sobre el género *Haematomma* (Ascomycota, Lecanoraceae) en Argentina. *Darwiniana* 47(2): 297-308.

Se presentan novedades sobre la taxonomía, química, distribución y ecología de los siete taxones del género *Haematomma* presentes en la Argentina. Dos de ellos, *H. flexuosum* y *H. fluorescens* var. *fluorescens* son registrados por primera vez para el país. Se incluye una clave del género *Haematomma* para la identificación de los taxones reconocidos en la Argentina.

**Palabras clave.** Argentina, distribución, *Haematomma*, microlíquenes, química.

### INTRODUCTION

The crustose lichen genus *Haematomma* A. Massal. (Ascomycota, Lecanoraceae) includes ca. 35 species, all distributed in warm-temperate to tropical regions of the world.

The genus is characterized by lecanorine apothecia, blood red to orange-red discs and thallus-coloured margins, epihymenium with red pigments, paraphyses somewhat branched and anastomosing, *Lecanora*-type asci, ascospores hyaline, oblong, fusiform to broadly acicular and transversely septate (3-25 septa) to submuriform (Brodo et al., 2001; Elix, 2004). *Haematomma* usually grows on the bark of trees and shrubs or on rocks.

Apothecial pigmentation and secondary chemistry play important roles for species delimitation in this genus. Notwithstanding, spore size, septa type (transverse or submuriform) and septa num-

ber are also used as important characters in separating species (Nelsen et al., 2006).

Recent studies on microlichens in Argentina, mainly from the South, North and Northeast, have provided additional information about the distribution and ecology of *Haematomma* species. The taxonomy, distribution, and ecology of *Haematomma* taxa were not clear before as some species mentioned in older publications had not yet been recollected (e.g. Hooker & Taylor, 1844; Crombie, 1877; Krempelhuber, 1878; Nylander, 1888; Müller, 1889; Cotton, 1915; Cengia Sambo, 1930; Räsänen, 1932; Santesson, 1942; Lamb, 1958; Ferraro, 1978; Osorio, 1980, 1981). Since the publication of a world monograph by Staiger & Kalb (1995) some records for Argentina needed correction and additional species were added to the checklist of Argentinean lichens (Grassi, 1950; Calvelo & Liberatore, 2002; Feuerer, 2007).

On the basis of available information, we pro-

pose for this work the following objectives: a) to give information of the species of the genus *Haematomma* in Argentina considering morphological and chemical characters, distribution and ecology and b) to establish a key to determine the species.

## MATERIALS AND METHODS

This study is based on extensive collections made by the authors deposited in BCRU and material from BCRU, BCRU (ex MSC), CTES and Hb. UNP Esquel.

Chemical, morphological and anatomical techniques were used as outlined by Orange et al. (2001). The chemical constituents of most of the extracts were analyzed using the A, B', C and E solvent systems of the high-performance thin layer chromatography method, HPTLC (Arup et al., 1993). To detect minor products or confirm the presence of certain substances, extracts were also analyzed by gradient-elution high performance liquid chromatography, HPLC, by Elix according with Lumbsch (2002).

The taxa are ordered alphabetically and each taxon contains the following issue: morphological description based on the material studied, chemistry, distribution, ecology in Argentina, and besides additional observations relating to the taxonomy, chemistry, distribution and habitat of each taxa and, finally, specimens examined.

## RESULTS AND DISCUSSION

We recognize six species and one variety in Argentina. Three geographical patterns of Argentinean *Haematomma* taxa can be distinguished: 1) endemic species: *H. chilenum* is confined mainly to the *Nothofagus* Blume forests in southern South America; 2) cool-temperate species, including *H. erythromma* and *H. nothofagi*, which are austral and/or antarctic elements; and 3) a tropical-subtropical element that includes *H. fenzlianum*, *H. flexuosum*, *H. fluorescens* var. *fluorescens* and *H. persoonii*.

## TAXONOMIC TREATMENT

***Haematomma chilenum*** C.W. Dodge, Nova

Hedwigia 12: 343. 1966. TYPE: Chile, Prov. Antofagasta, Oasis de Paposo, 1961, *G. Follmann* 14925 (holotype KASSEL not seen). Figs. 1A and 3A.

Thallus whitish to greenish grey, rugose, rimose-areolate to areolate, continuous, 0.2-0.5 mm thick, soredia and isidia lacking. Apothecia sessile, constricted at the base, scattered, 0.35-1.45(-2) mm diam.; disc reddish orange, cinnabarred to dark purple, rarely pruinose, thalline margin well developed, entire, smooth to weakly crenulate or undulate. Ascospores ellipsoid to fusiform, straight or slightly curved, 3-6-septate, (30-)36-50 x 4-6(-7)  $\mu$ m. Conidia not observed.

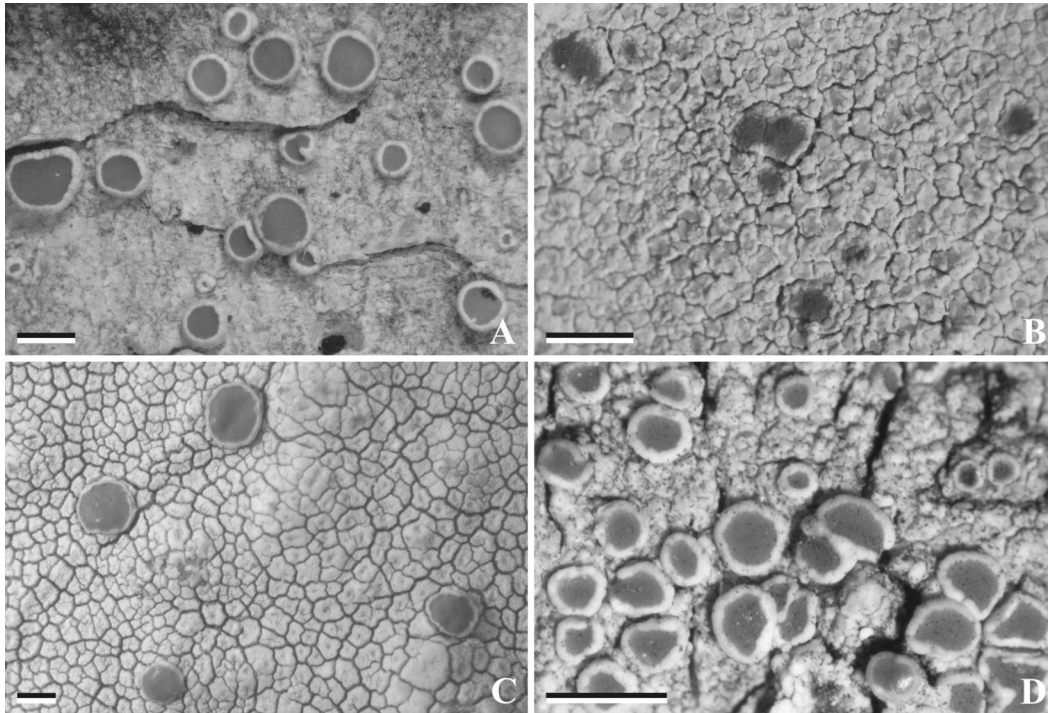
**Chemistry.** Thallus K+ yellow, C-, KC-, Pd-; disc K+ violet (haematommone). By HPTLC and HPLC analyses were detected: placodiolic acid (major), atranorin (minor), usnic acid ( $\pm$  trace, present only in BCRU 01063), haematommone (trace). Isopseudoplacodiolic acid was detected by HPTLC in one sample (BCRU 05101).

**Geographical distribution and habitat.** This species is widespread in Chile; and also common in Argentina, particularly in humid areas of the temperate Southwestern forest. The species was recorded for Argentina in Neuquén Province (lago Lacar/Lácar) by Staiger & Kalb (1995), and is reported here as new for Rio Negro and Chubut Provinces.

The specimens studied were found on bark and twigs of *Acer pseudoplatanus* L., *Discaria chacaye* (G. Don) Tortosa, *Lomatia hirsuta* (Lam.) Diels ex J. F. Macbr., *Populus nigra* L. and *Salix fragilis* L. It also grows on species of cacti and bark of *Cryptocarya alba* (Molina) Losser, *Nothofagus* spp., *Oxalis gigantea* Barnéoud and *Salix* spp. (Staiger & Kalb, 1995).

**Observations.** Although *Haematomma chilenum* is extremely variable in the apothecial morphology, the ascospores are 4- to 7-celled with rare exceptions. Most of the Chilean collections of *H. chilenum* reported by Staiger & Kalb (1995) contained methylplacodiolic acid, whereas in all of the Argentinean specimens this substance is absent.

It could be mistaken for two pantropical species,



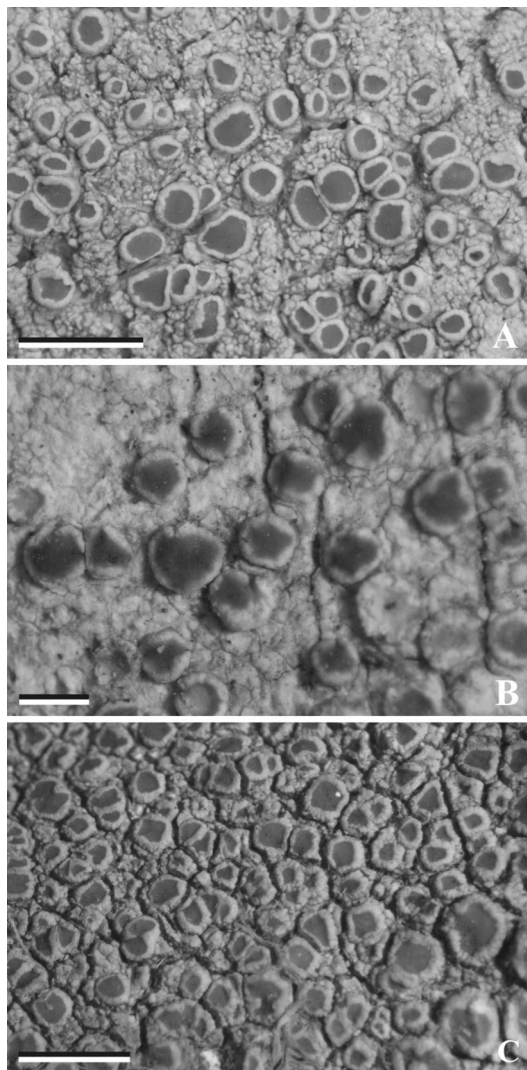
**Fig. 1.** *Haematomma*, habit of the currently known species in Argentina. **A**, *H. chilenum* (BCRU 04817). **B**, *H. erythromma* (BCRU 01100). **C**, *H. fenizianum* (BCRU 04842). **D**, *H. flexuosum* (BCRU 04841). Scale = 1 mm.

*Haematomma accolens* (Stirt.) Hillmann and *H. flexuosum*, by its external appearance. The distinction of *H. chilenum* from these two species is based mainly on chemistry, with methylplacodiolic acid present in the former species, and absent in the latter two species. Most specimens of *H. chilenum* studied here are congruent chemically with *H. accolens* (Staiger & Kalb, 1995) which contains epithelial pigment haematommone and the medullary dibenzofuran placodiolic acid. Nelsen et al. (2006) suggest that there is no reason to think that chemical characters should be more or less important in delimiting species than any other character, be it morphological or anatomical. Frequently, species are distinguished by a combination of characters, while the difference in only one character may be interpreted as infraspecific variation. Because of this, the Argentinean specimens recorded were identified as *H. chilenum* rather than *H. accolens* based on the spore size [(30-)36-50 x 4-6 (-7)  $\mu\text{m}$  vs. 35-55 x 3-5  $\mu\text{m}$ ], number of septa [3-6 vs. (4-)5-9(-11)] and the geographical distribution (endemic to southern South America vs. tropical).

#### Specimens examined

ARGENTINA. **Chubut.** El Desemboque, en el desemboque del río Epuyén, lago Puelo, 2007, *M. I. Messuti s.n.* (BCRU 04817); Parque Nacional Lago Puelo, Jardín Botánico en los alrededores de la Intendencia del Parque, 2009, *I. N. de la Rosa s.n.* (BCRU 05101). **Río Negro.** San Carlos de Bariloche, Península San Pedro, cerca de la costa del lago Nahuel Huapi, bajando por acceso a playa desde la Av. Campanario, 2009, *I. N. de la Rosa s.n.* (BCRU 05030); *M. I. Messuti & I. N. de la Rosa s.n.* (BCRU 05102); costa del lago Steffen, 1993, *M. I. Messuti s.n.* (BCRU 01063).

***Haematomma erythromma*** (Nyl.) Zahlbr., Kungl. Svenska Vetensk. Handl. 57: 37. 1917. *Lecanora erythromma* Nyl., Lichenes insularum Guineensium (San Thomé, do Principe, das Cabras): 44. 1889. TYPE: Falkland Islands, "ad. ins. orient. Sinum Port William Stanley, 1850, *W. Lechler*, pl. ins. Maclovian. 58" (holo-



**Fig. 2.** *Haematomma*, habit of the currently known species in Argentina. **A.** *H. fluorescens* var. *fluorescens* (CTES 75592). **B.** *H. nothofagi* (BCRU 04533). **C.** *H. persoonii* (BCRU 04882). Scale = 1 mm.

type H-NYL 24220 not seen; isotypes M, S not seen). Figs. 1B and 3A.

Thallus yellow to brownish yellow, smooth to rugose, continuous, rimose to areolate, 0.5-1.5 mm thick, soredia and isidia lacking. Apothecia immersed in the thallus or sessile, scattered, rarely in groups (2-3), (0.18-)0.2-0.6(-2.5) mm diam.; disc dark red, epruinose, thalline margin poorly developed, thin, entire, smooth to weakly crenu-

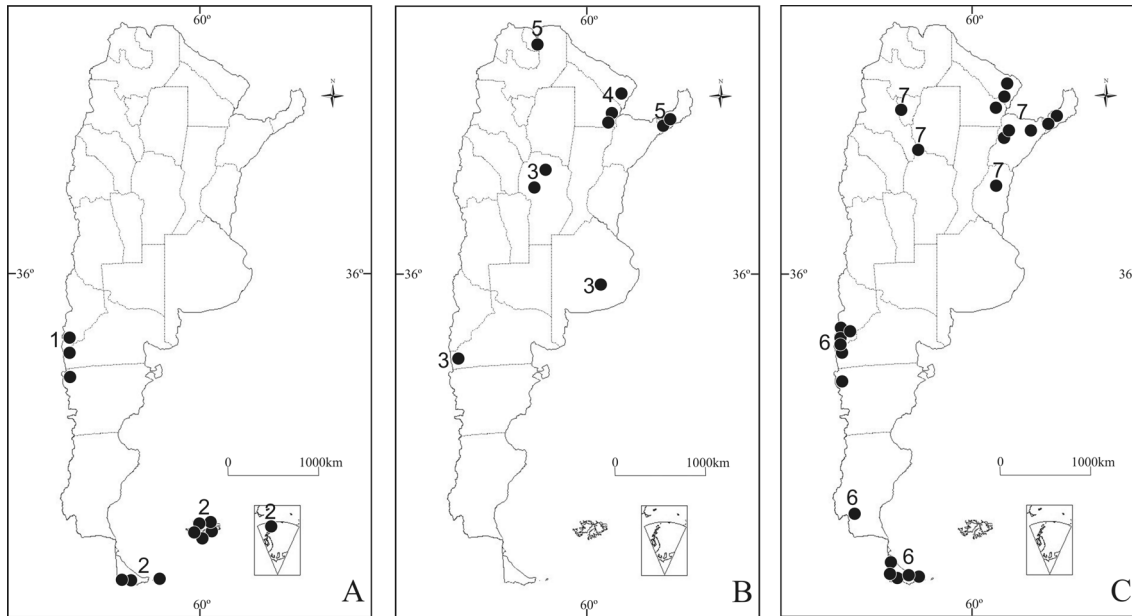
late. Ascospores ellipsoid to fusiform, straight or more or less curved, (2-)3-septate, 18-23(-25) x 5-7  $\mu$ m. Conidia not observed.

**Chemistry.** Thallus K<sup>+</sup> yellow, C<sup>-</sup>, KC<sup>-</sup>, Pd<sup>-</sup>, UV<sup>+</sup> orange; disc K<sup>+</sup> violet (haematommone). By HPTLC and HPLC analysis were detected: arthothelin (major), 6-*O*-methylarthothelin (minor), 2,4-dichloronorlichexanthone (minor), 2,5-dichloronorlichexanthone (minor), 4,5-dichloronorlichexanthone (minor), 2-chlorolichexanthone (minor), 2,5-dichloro-6-*O*-methylnorlichexanthone (minor), placodiolic acid (minor), lichexanthone (trace), thiophanic acid (trace), 4,5-dichloro-6-*O*-methylnorlichexanthone (trace), atranorin (trace).

**Geographical distribution and habitat.** This uncommon Antarctic species has been previously reported from Tierra del Fuego, Antarctica and the Islas Malvinas (Falkland Islands) (Zahlbruckner, 1917; Grassi, 1950; Staiger & Kalb, 1995; Øvstedal & Smith, 2001). It has a limited distribution and is infrequently collected in the extreme south of Argentina. In Tierra del Fuego the species occurs almost exclusively within a few kilometres of the coast near Puerto Moat on the Atlantic Ocean. This is the second confirmed record of this species from continental Argentina. It occurs usually on siliceous rocks in exposed areas along the maritime coast.

**Observations.** The combination of 3-septate ascospores, xanthonenes in the thallus with a UV<sup>+</sup> orange reaction, and epithelial haematommone make this saxicolous species one of the most distinctive taxa in Argentina.

Staiger & Kalb (1995) mentioned four chemotypes (a, b, c, d), with different combinations and concentrations of chloroxanthonenes and the presence or absence of placodiolic acid, pseudoplacodiolic acid, stictic acid or its derivatives and haematommone: a: lichexanthone, 2-chlorolichexanthone, arthothelin and placodiolic acid; b: lichexanthone, 2-chlorolichexanthone, arthothelin, c: lichexanthone, 2-chlorolichexanthone, arthothelin, pseudoplacodiolic acid and stictic acid, and d: divers xanthonenes, while pseudoplacodiolic acid, placodiolic acid, and stictic acid and its derivatives were not detected (Staiger & Kalb, 1995).



**Fig. 3.** Distribution of *Haematomma* species in Argentina. **A.** *H. chilenum* (1); *H. erythromma* (2). **B.** *H. fenizianum* (3); *H. flexuosum* (4); *H. fluorescens* var. *fluorescens* (5). **C.** *H. nothofagi* (6); *H. persoonii* (7).

These authors included Fuegian material in chemotype b. In contrast, the new chemical variety (chemotype e) found here, contains secondary substances of chemotype a (placodiolic acid) and chemotype b (with the depside atranorin), although, some xanthones as thiophanic acid may be present in minor or trace concentrations and chloroatranorin is absent.

#### Specimens examined

ARGENTINA. **Tierra del Fuego (Antártida e Islas del Atlántico Sur).** Isla Grande, Estancia Moat, junto a la costa del mar, 1993, *M. I. Messuti & G. Vobis s.n.* (BCRU 01100).

***Haematomma fenizianum*** A. Massal., Mem. Imp. Reale Ist. Veneto Sci. 10: 58. 1861. *H. fenizianum* A. Massal., Atti Reale Ist. Veneto Sci. Lett Arti, ser. 3, 5: 253. 1860, nom. nud. TYPE: South Africa, "Caput bona spei, Reise der

Corvette Carolina 1857-58", *Dr. H. Wawra* (holotype VER not seen). Figs. 1C and 3B.

**References.** For synonyms see Staiger & Kalb (1995).

Thallus yellowish white or yellowish grey to greenish grey, rarely brownish to pale orange, rugose, continuous, rimose to rimose-areolate, (0.25-) 0.5-1.0 mm thick, soredia and isidia lacking. Apothecia immersed or semi-immersed in the thallus, disc level with thallus, or sessile, flat when mature, scattered, singly or in groups, (0.5-)0.8-3 mm diam.; disc dark red to dark reddish orange or reddish brown, epruinose or rarely pruinose, thalline margin developed, rather thick and prominent, entire, smooth. Ascospores fusiform, straight or more or less curved, sigmoid or sinuous, (2-)3-7-septate, 20-30(-39) x 3.5-5(-8)  $\mu$ m. Conidia not observed.

**Chemistry.** Thallus K+ yellow, C-, KC-, Pd $\pm$  yellow; disc K+ red to purple-red (russulone). The

following secondary compounds were detected by HPTLC and HPLC analysis: atranorin (major), chloroatranorin (minor), placodiolic acid (minor), psoromic acid (minor) and russulone (trace).

#### Geographical distribution and habitat.

*Haematomma fenzlianum* occurs in Southwestern Europe, South Africa, Australia, New Zealand, the United States of America, Mexico, Chile, Paraguay, Argentina and Uruguay (Staiger & Kalb, 1995; Lumbsch et al., 1993) with a wide ecological range between warm and arid to cool and humid habitats.

In Argentina the species is uncommon, with a scattered distribution mainly in the central part of the country. It has previously been reported by Staiger & Kalb (1995) from Córdoba and Buenos Aires Provinces. Although *H. fenzlianum* has a pantropical to subtropical-mediterranean distribution, it is here reported for the first time from the Andean Patagonian forest in Río Negro Province. It is a species that typically grows on rocky substrates in exposed areas.

**Observations.** *Haematomma fenzlianum* appeared to be highly variable morphologically, with a great deal of variation in thallus thickness and apothecia size and development.

According to the secondary products present in *H. fenzlianum*, the species can present three different chemotypes, usually with russulone, atranorin, and/or sphaerophorin, and/or isosphaeric acid (chemotype a and c) present, and sometimes with psoromic acid (chemotype b) (Staiger & Kalb, 1995). Brodo et al. (2008: 393) also detected 2'-*O*-demethylpsoromic acid and chloroatranorin, without indicating to which chemotype belongs.

Regarding the chemistry of the studied specimens adds a fourth chemical variant type (chemotype d), with chloroatranorin, placodiolic and psoromic acid as minor substances, traces of russulone, and sphaerophorin and isosphaeric acid absent. The dibenzofuran, placodiolic acid, was not detected in any of the three chemotypes included in *H. fenzlianum* (Staiger & Kalb, 1995).

In the case of the single Patagonian collection studied by us, although presenting some chemical differentiation regarding *H. fenzlianum* (containing atranorin, sphaerophorin, isosphaeric acid,

psoromic acid and russulone) and the distributional range does not lie within the known range of the species, the morphological and anatomical features seem to be identical. The BCRU 04842 specimen has some aborted apothecia, but contains the chemistry mentioned above.

Following the criterion proposed by Lumbsch (1998), a subspecific rank could be accepted to accommodate the chemical races when there is a correlation with major distributional differences. Nevertheless, additional examination of more Argentinean material of this taxon may be necessary for more morphological, ecological and distributional data in order to recognize an infraspecific rank within *H. fenzlianum*.

#### Specimens examined

ARGENTINA. **Córdoba.** Parque Nacional Quebrada del Condorito, camino a la picada que lleva al mirador de la quebrada, cerca de la casa de visitantes, 2009, *I. N. de la Rosa s.n.* (BCRU 05128 ). **Río Negro.** San Carlos de Bariloche, Península San Pedro, ca. 800 m s.m., 1994, *M. I. Messuti et al. s.n.* (BCRU 04842).

**Haematomma flexuosum** Hillmann, Feddes Repertorium 49: 35. 1938?-1940. TYPE: Venezuela, "In vicinitate urbium Los Teques (locus classicus) et Encanto", sine data, *C. Vogel O.S.B.* (holotype M not seen). Figs. 1D and 3B.

Thallus cream-coloured or pale greyish to greenish grey, more or less smooth to rugose, continuous, rimose to rimose-areolate, up to ca. 0.5 mm thick, soredia and isidia lacking. Apothecia sessile or constricted at base, scattered or in groups, (0.25)0.5-1.5(-2) mm diam.; disc crimson, purple-red to orange-red, epruinose, thalline margin slightly prominent, smooth, crenulate to verrucose, even crenulate or flexuose. Ascospores filiform to fusiform, straight or slightly curved, (4-)5-7(-9)-septate, 35-55(-65) x 3.5-5(-6)  $\mu$ m. Conidia not observed.

**Chemistry.** Thallus K $\pm$  yellow, C-, KC-, Pd $\pm$  yellow; disc K+ violet. By HPTLC and HPLC

(BCRU 04841) analysis were encountered: atranorin (major), placodiolic acid (minor) isopseudoplacodiolic acid (minor) and haematommone (trace). The presence of isoplacodiolic acid was not revealed in any of the samples checked.

**Geographical distribution and habitat.** The pantropical *H. flexuosum* occurs in Southwestern Africa, Malaysia, the Southwestern United States of America, Cuba, Mexico, Costa Rica, Panama, Venezuela, Columbia, Brazil, Paraguay and Uruguay (Staiger & Kalb, 1995; Brodo et al., 2008). In Argentina it was collected in the North, in the phytogeographical area "Provincia Chaqueña" (Cabrera, 1976). Here it is reported from Formosa and Chaco Provinces, being the first record of the species for Argentina. This infrequent species grows on little twigs of plants of leguminous plants (e.g. *Acacia* spp.) in xerophilic forests and gallery forests near rivers.

**Observations.** The chemical results observed in the examined material are not in total agreement with those founded by Staiger & Kalb (1995) and Brodo et al. (2008) in *H. flexuosum*, where placodiolic acid was absent and isoplacodiolic and isopseudoplacodiolic acids were always present.

It is very similar to *H. accolens* which overlaps morphologically and anatomically but differs mainly by having placodiolic acid as a main secondary compound. There is no a priori way to decide whether the current concept used to distinguish these species is correct. Traditionally, the presence or absence of certain dibenzofurans has been used as a taxonomical criterion to distinguish species, such as these two species. Recently, Nelsen et al. (2006) analyzed the correlation between molecular data and the geographical distribution of the *H. flexuosum/H. accolens* complex. Their preliminary results indicate that a species concept based on chemistry alone might not hold up in this case. Lumbsch et al. (2008), conclude that the ITS sequences support the hypothesis that *H. accolens* and *H. flexuosum* are distinct species.

*Haematomma flexuosum* is also easily confused with *H. persoonii*, which occurs in Argentina, but the latter, however, differs significantly in epihymenial and medullary chemistry and it is also characterized by scattered, sessile and smaller apothecia rather than crowded, more or less

immersed ones. Another related species is *H. chilenum* but its spores are smaller [(30-)36-50 x 4-6(-7) µm] and with fewer septa (3-6-septate), and with quite different chemistry (atranorin, placodiolic acid and haematommone).

In the genus *Haematomma*, the species concepts are rather conflicting, overestimating, in some cases, the presence of certain chemical compounds to delimit the taxa. Following this, although the two specimens identified as *H. flexuosum* lacked isoplacodiolic acid they contain placodiolic acid, isopseudoplacodiolic acid and haematommone and also agreed with all of the morphological and anatomical characters of the species.

### Specimens examined

ARGENTINA. **Chaco.** Dpto. La Leonesa, cercanías Arroyo Canguí Grande, 1995, *L. I. Ferraro et al.* 5285 (CTES 261010); 5 km después de la localidad Margarita Belén, sobre la ruta que va en dirección a Formosa, 1995, *M. I. Messuti & L. I. Ferraro s.n.* (BCRU 04841). **Formosa.** Dpto. Pilcomayo, Arroyo Hé-Hé, interior de selva en galería, 1986, *A. Krapovickas et al.* 40687 (CTES 249736).

**Haematomma fluorescens** Kalb & Staiger var. **fluorescens**, *Bibl. Lichenol.* 59: 114. 1995. TYPE: Paraguay, "Cordillera de Peribébuy, sur les écores des arbres", 1987, *B. Balansa 4154* (holotype G not seen). Figs. 2A and 3B.

Thallus pale grey to yellowish white, rugose, verrucose to areolate, continuous, up to ca. 0.5 mm thick, soredia and isidia lacking. Apothecia sessile or constricted at base, scattered 0.3-0.5(-1.5) mm diam. [up to 3 mm diam., fide Brodo et al. (2008)]; disc cinnabar, scarlet to red-orange, epruinose, thalline margin slightly prominent, smooth, crenulate to verrucose, even crenulate or flexuose. Ascospores filiform to fusiform, curved, (6-)9-13(-15)-septate, 44-80(-86) x (3)4-6(-9) µm. Conidia not observed.

**Chemistry.** Thallus K<sup>+</sup> yellow, C<sup>-</sup>, KC<sup>-</sup>, Pd<sup>-</sup>, UV<sup>+</sup> yellow (lichexanthone); disc K<sup>+</sup> red to deep purple-red (russulone), apothecial margin UV<sup>+</sup>

yellow. In all specimens analyzed by HPTLC were detected atranorin, lichexanthone and sphaerophorin.

**Geographical distribution and habitat.** This neotropical species was reported in Costa Rica, Venezuela, Bolivia, Brazil and Paraguay (Staiger & Kalb, 1995; Brodo et al., 2008).

In Argentina it is reported to be scattered in the phytogeographical "Región Neotropical" ("Provincia de las Yungas" and "Provincia Paranense") (Cabrera, 1976). Although *H. fluorescens* var. *fluorescens* has been rarely collected so far, it is probably a characteristic element of this phytogeographical region. The variety is registered here from Salta and Misiones Provinces, and is the first record for the species in Argentina. It was collected on dry branches of angiosperms.

**Observations.** This variety is characterized by the UV+ gold-yellow thallus and apothecia margins, an inspersed hymenium, ascospores transversally septate with 9 to 13 septa, and the presence of lichexanthone and russulone in the epihymenium.

The secondary products found in the Argentinean specimens match those recorded by Staiger & Kalb (1995). Another variety endemic to Costa Rica, *Haematomma fluorescens* var. *longisporum* Nelsen, Lücking & Navarro, differs from the nominal variety in its significantly longer ascospores (75-120 x 4-6 µm) and the number of septa (13-27). *Haematomma fluorescens* is readily distinguished from the other species in the genus by its secondary lichen compounds. It can be confused with the corticolous species, *Haematomma subinnatum* (Malme) Kalb & Staiger, distributed in the "Región del Cerrado" in South America, which has ascospores with 5 to 7 septa and a non-inspersed hymenium (Staiger & Kalb, 1995; Nelsen et al., 2006).

#### Specimens examined

ARGENTINA. **Misiones.** Dpto. San Ignacio, Campos del Teyú Cuaré, 1981, *L. I. Ferraro et al.* 2375 (CTES 75592); Dpto. Candelaria, Loreto, 1981, *L. I. Ferraro et al.* 2355 (CTES 75707). **Salta.** Dpto. Orán, El Oculto, 40 km W de Orán, 5 km, 1998, *C. Saravia Toledo* 14689 (CTES 342739).

**Haematomma nothofagi** Kalb & Staiger, *Bibl. Lichenol.* 59: 139. 1995. TYPE: Argentina, Tierra del Fuego, Ushuaia, ca. 280 m s.m., 1940, *R. Santesson* 586 (holotype S not seen). Figs. 2B and 3C.

Thallus cream-coloured to yellowish, smooth to rugose, continuous, rimose to rimose-areolate, up to ca. 0.4 mm thick, soredia and isidia lacking. Apothecia immersed when young, then sessile, scattered, 0.5-1.55 mm diam.; disc dark scarlet to cinnabar-red with the color penetrating into the margin, epruinose, thalline margin thin, appearing almost granular to sorediate, evanescent with age. Ascospores fusiform, straight or slightly curved, 8-17-septate, 40-90(-94) x 4-6 µm. Conidia not observed.

**Chemistry.** Thallus K+ yellow, C-, KC-, Pd± yellow; disc K+ red to deep purple-red (russulone). The chemistry by HPTLC and HPLC of the Argentinean collections studied here agrees with that mentioned by Staiger & Kalb (1995) containing atranorin (major), placodiolic acid (minor) and russulone (trace).

**Geographical distribution and habitat.** This cool-temperate species occurs in Southeastern Australia, New Zealand, southern Argentina and southern Chile (Staiger & Kalb, 1995; Elix, 2004). The species has an austral-antarctic distribution in southern South America. Further field studies have revealed that *H. nothofagi* is one of the most common and widespread species of the genus in *Nothofagus* forests (Staiger & Kalb, 1995; Elix, 2004).

The species was collected for the first time by Santesson in 1940 in Ushuaia, Tierra del Fuego (Staiger & Kalb, 1995). It was mentioned previously from several places in Neuquén, Río Negro, Santa Cruz, and Tierra del Fuego, Antártida e Islas del Atlántico Sur Provinces (Staiger & Kalb, 1995; Vobis et al., 1995). This is the first report of the species from Chubut Province and additional new localities for this species are reported under Specimens examined.

Its altitudinal distribution ranges from lowland to alpine elevations. The species grows on smooth bark on twigs, branches and trunks of *Drymis winteri* J.R. Forst. & G. Forst. as well as on *Nothofagus* species, such as, *N. antarctica* (G. Forst.)



Oerst., *N. betuloides* (Mirb.) Oerst., *N. dombeyi* (Mirb.) Oerst. and *N. pumilio* (Poepp. & Endl.) Krasser. It was frequently collected in shaded and moist habitats.

**Observations.** *Haematomma nothofagi* is easily confused with the New Zealand endemic species *Haematomma hilare* Zahlbr., but the latter contains methylplacodiolic and usnic acids, and ascospores with 7-10 septa (Staiger & Kalb, 1995). It was previously recorded in Argentina as *H. hilare* (Calvelo & Lorenzo, 1989; Vobis et al., 1995; Calvelo & Liberatore, 2002).

### Specimens examined

**ARGENTINA. Chubut.** Ca. 60 km de Esquel, Puerto Sagrario, Brazo Norte del Lago Menéndez, 2007, *P. L. Codesal 45* (Hb. UNP Esquel). **Neuquén.** Cercanías de la aduana Argentina, 1993, *M. I. Messuti s.n.* (BCRU 01062); zona limítrofe con Chile, ruta 215, río Puyehue, 3 km antes de llegar al hito Argentino-Chileno, 1993, *M. I. Messuti s.n.* (BCRU 01067); desde Paso Córdoba a Villa La Angostura, mano derecha, a 5 km del lago Espejo, 1994, *M. I. Messuti s.n.* (BCRU 04538); lago Espejo, sobre la ruta 234, hotel Espejo, 1995, *M. I. Messuti s.n.* (BCRU 04539); Parque Nacional Los Arrayanes, Villa La Angostura, picada al istmo de Quetrihué, 2003, *I. N. de la Rosa s.n.* (BCRU 04635); Puerto Blest, picada a la laguna Ortiz Basualdo, La Heladera, 2004, *M. I. Messuti s.n.* (BCRU 04536); Parque Nacional Nahuel Huapi, Puerto Blest, en comienzo de la picada Paso de Los Raulíes, 2003, *I. N. de la Rosa s.n.* (BCRU 04537). **Río Negro.** Parque Nacional Nahuel Huapi, Puerto Blest, camino a Los Cántaros, 1985, *S. Calvelo 74* (BCRU 00044); a 500 m de la Estación Biológica, 2005, *M. I. Messuti s.n.* (BCRU 04676); a 2 m de la costa del lago Frías, 2005, *M. I. Messuti & I. N. de la Rosa s.n.* (BCRU 04675); Brazo Tristeza, en la costa del lago Nahuel Huapi, 1994, *M. I. Messuti s.n.* (BCRU 03984). **Tierra del Fuego (Antártida e Islas del Atlántico Sur).** Isla Grande, ruta 3, km 43, Tierra Mayor, Paso Garibaldi, 1995, *M. I. Messuti & G. Vobis s.n.* (BCRU 04839); lago Escondido, hostería El Petrel, 1995, *M. I. Messuti & G. Vobis s.n.* (BCRU 04838); 54° 48'S, 65°

16'W, Bahía Buen Suceso, grove of *Nothofagus* behind beach at head of bay, 1971, *H. A. Imshaug & K. E. Ohlsson 49959* (BCRU 03353, ex MSC); Glaciar Martial, N von Ushuaia, Aufstieg zur oberen Seilbahnstation, ENE exponierter Hang, *Nothofagus antarctica*-Wald, ca. 400 m alt., 54° 48'S, 65° 22'W, 1997, *R. Guderley et al. s.n.* (BCRU 04585); 54° 49'S, 68° 22'W, remnants of cut-over and grazed *Nothofagus* forest long Ushuaia-Lapataia road, 3.5 km W of Ushuaia, 1971, *H. A. Imshaug & K. E. Ohlsson 55152* (BCRU 03382, ex MSC); junto a la entrada del mar del lado derecho, dirección Bahía Lapataia, cerca del cartel indicador Arch. L. C., 1995, *M. I. Messuti & G. Vobis s.n.* (BCRU 04840); 54° 48'S, 68° 35'W, Parque Nacional Tierra del Fuego, *Nothofagus* forest on N shore of lago Roca near Chilean frontier, 1971, *H. A. Imshaug & K. E. Ohlsson 54973* (BCRU 03381, ex MSC); Isla de los Estados, 54° 49'S, 68° 28'W, Bahía Capitán Cánepa, open *Nothofagus* forest on N side of lake behind head of N arm, 1971, *H. A. Imshaug & K. E. Ohlsson 53051* (BCRU 03457, ex MSC).

**Haematomma persoonii** (Fée) A. Massal., Atti. I. R. Istit. Veneto ser. 3, 5: 253. 1860. *Lecanora persoonii* Fée, Essai Crypt. Écorc. 120. 1824. TYPE: "ad corticem *Clusiae albae* antillarum", sine data, without collector [lectotype G designated by Staiger & Kalb, Bibl. Lichenol. 59: 150. 1995, not seen]. Figs. 2C and 3C.

**References.** For synonyms see Staiger & Kalb (1995) and Brodo et al. (2008).

Thallus white or cream-coloured, pale grey to greenish grey, smooth to rugose, continuous, rimose to rimose-areolate, up to ca. 0.5 mm thick, soredia and isidia lacking. Apothecia immersed, aspicilioid, crowded, irregular in shape, rarely sessile, sometime confluent, (0.2-)0.3-1.5 mm diam.; disc dark scarlet-red, cinnabar-red with to reddish brown, epruinose, thalline margin very poorly developed, but becoming distinct, smooth or weakly crenulate in sessile apothecia. Ascospores fusiform, straight or curved, rarely sigmoid, 5-7-septate, (26-)30-52(-62) x 3-5(-6) µm. Conidia not observed.

**Chemistry.** Thallus K+ yellow, C-, KC-, Pd± yellow, UV± white or blue-white (sphaerophorin); disc K+ red to purple-red (russulone). By HPTLC and HPLC analyses were detected: atranorin (major), chloroatranorin (minor), isosphaeric acid (major), sphaerophorin (minor), russulone (trace). All of these five compounds, including the lectotypes of *Lecanora persoonii* Fée, *Lecanora cocinea* Fée, *Haematomma puniceum* var. *subarthoideoideum* Zahlbr., were reported by Staiger & Kalb (1995). However, other species included as synonyms of *H. persoonii* may not have chloroatranorin and isosphaeric acid.

**Geographical distribution and habitat.** *Haematomma persoonii* occurs in South and East Africa, Réunion, the Phillipines, New Caledonia and North, Central and South America (Staiger & Kalb, 1995; Elix, 2004; Brodo et al., 2008). This pantropical species has a wide ecological amplitude from arid to humid areas.

In Argentina, it seems to be a characteristic species from the neotropical region (the Central and North) which includes the phytogeographical areas of “Provincia de las Yungas”, “Provincia Chaqueña”, “Provincia Paranaense” and “Provincia del Espinal” (Cabrera, 1976; Ferraro, 1995). This is the first report of this species from Formosa, Chaco, Misiones, Salta, Santiago del Estero and Entre Ríos Provinces. It was previously recorded from Corrientes Province (Staiger & Kalb, 1995). It grows on the tree bark often in gallery forests or in open xerophilic forest.

**Observations.** *Haematomma persoonii* has a variable morphology of the thallus and the apothecia, both within and among specimens.

The Argentinean specimens could be included within the “chemotype 2” [atranorin, isosphaeric acid (major), sphaerophorin (minor) and russulone], according with Brodo et al. (2008). However, the samples analyzed by HPTLC (E solvent) and HPLC also showed the presence of chloroatranorin.

**Specimens examined**

ARGENTINA. **Chaco.** Cercanías al arroyo Cangui Grande, camino a la provincia de Formosa, de la ruta lado izq., 1995, *M. I. Messuti & L. I. Ferraro s.n.* (BCRU 04845). **Corrientes.** Dpto. San Martín, Arrocería Drews, 8 km de Carlos Pellegrini, 1976, *L. I. Ferraro & S. G. Tressens 797* (BCRU 04877). **Entre Ríos.** Parque Nacional El Palmar, en los alrededores de La Glorieta, en selva en galería, sobre la margen izquierda del arroyo El Palmar, 2007, *M. I. Messuti s.n.* (BCRU 04837). **Formosa.** Dpto. Pilcomayo, Arroyo Hé-Hé, interior de la selva en galería, 1986, *A. Krapovickas et al. 40687* (CTES 249736); Dpto. Capital, a 10 km de la reserva Guaycolec, en dirección a Paraguay, sobre ruta 11, 1995, *M. I. Messuti & L. I. Ferraro s.n.* (BCRU 04843); *M. I. Messuti & L. I. Ferraro s.n.* (BCRU 04844); *M. I. Messuti & L. I. Ferraro 5285* (CTES 261010). **Misiones.** San Ignacio, Pastoreo Chico, 27° 19’S, 55° 22’W, 275 m s.m., 1956, *Montes 100.78.F* (BCRU 04882); Dpto. Candelaria, Loreto, 1981, *L. I. Ferraro et al. 2338* (CTES 76142). **Salta.** Dpto. Guachipas, Alemania, km 81 a metros de la ruta, 2008, *L. Pérez s.n.* (BCRU 05029). **Santiago del Estero.** Dpto. Guasayán, Sierra de Guasayán, ruta 64, 70 km SW de Sgo. del Estero, 1981, *A. Krapovickas 37487* (CTES 76221).

**Key to species of *Haematomma* in Argentina (taxa potentially present, listed in old literature- but not yet reported, are excluded).**

- 1. Thallus saxicolous ..... 2
- 1. Thallus corticolous ..... 3
- 2(1). Epiphytenium with haematommone (when treated with KOH a violet or purple cloud appears); ascospores (2-)3-septate ..... *H. erythromma*
- 2. Epiphytenium with russulone (when treated with KOH the solution becomes red); ascospores (2-)3-7-septate ... *H. fenzlianum*
- 3(1). Epiphytenium with russulone (K+ red); ascospores 5-17-septate ..... 4

3. Epihymenium with haematommone (K+ violet or purple); ascospores 3-9-septate	6
4(3).Thallus and margin of apothecia UV+ gold-yellow (lichexanthone)	<i>H. fluorescens</i> var. <i>fluorescens</i>
4. Thallus and margin of apothecia UV- (without lichexanthone) or UV+ (white or blue-white)	5
5(4). Apothecia sessile; ascospores 8-17-septate	<i>H. nothofagi</i>
5. Apothecia usually immersed or aspicillioid, rarely sessile; ascospores 5-7-septate	<i>H. persoonii</i>
6(3). Ascospores with 3-6-septate	<i>H. chilenum</i>
6. Ascospores with (4-)5-7(-9)-septate	<i>H. flexuosum</i>

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