

Additions to the bryophyte flora of Ecuador

Alfons SCHÄFER-VERWIMP^{a*}, Rosemary WILSON^b, Santiago YANDÚN^c,
Kathrin FELDBERG^b, Michael BURGHARDT^b, Jiří VÁŇA^d
& Jochen HEINRICHS^b

^aMittlere Letten 11, 88634 Herdwangen-Schönach, Germany

^bAlbrecht-von-Haller-Institut, Untere Karspüle 2, 37073 Göttingen, Germany

^cHerbario QCA, Pontificia Universidad Católica del Ecuador,
Facultad de Ciencias Exactas y Naturales, Av. 12 de Octubre, Quito, Ecuador.

^dDepartment of Botany, Charles University, Benátská 2, CZ-128 01 Praha 2,
Czech Republic

(Received 20 September 2005, accepted 30 September 2005)

Abstract – Eighteen species of hepatics and one moss are newly reported from Ecuador. New province records are listed for 70 bryophyte species. Notes on the geographical distribution and habitats of the species are provided. Range extension of the Bolivian/southern Peruvian *Plagiochila buchtiniana* to Ecuador is supported by phylogenetic analyses of nrITS sequences.

Bryophytes / Ecuador / South America / diversity / new records / nrITS / phylogeny

INTRODUCTION

Over the last few years much progress has been made in mapping the bryophyte flora of Ecuador. Recent fieldwork in Southern Ecuador has already led to *ca* 100 new country records and the description of several new taxa (e.g., Engel & Gradstein, 2003; Heinrichs *et al.*, 2003; Nöske *et al.*, 2003; Parolly *et al.*, 2004; Schäfer-Verwimp, 2004). However, knowledge on the bryophyte flora and the distribution of the species is still incomplete. Here we report some results of a collecting trip of JH, ASV, RW, and SY in Northern Ecuador in August 2004.

MATERIAL AND METHODS

This investigation is based on about 800 specimens of bryophytes which were collected in Northern Ecuador in August 2004. The specimens are deposited in the herbaria QCA, GOET, and Schäfer-Verwimp. Only selected specimens are

* Correspondence and reprints: Moos.Alfons@t-online.de

cited: JH = J. Heinrichs *et al.*, RW = R. Wilson *et al.*, SV = A. Schäfer-Verwimp *et al.* Specimens have been determined using Fulford (1963-1976) as well as numerous smaller taxonomic revisions and monographs. Several specimens were revised or determined by specialists. Data on the distribution of bryophytes in Ecuador have been taken from León-Yáñez *et al.* (in press).

Molecular investigation. DNA extraction, PCR amplification and sequencing of the nrITS region of JH 4485 (*Plagiochila buchtiniana*) followed the protocols described in Heinrichs *et al.* (2004b). The new sequence and 24 sequences from Genbank (Appendix 1) were aligned manually in BioEdit version 5.09 (Hall, 1999), resulting in a dataset including 765 putatively homologous sites. The ingroup includes the main neotropical lineages of *Plagiochila*. *Chiastocaulon* and *Plagiochilion* (Plagiochilaceae) were chosen as outgroups, based on the results of Groth & Heinrichs (2003). A phylogenetic tree was inferred using maximum parsimony criteria as implemented in PAUP version 4.0b (Swofford, 2000). The analysis was performed with the following options implemented: heuristic search mode with 1000 random-addition sequence replicates, tree bisection-reconnection branch swapping, MUL-trees option on, and collapse zero-length branches off. All characters were treated as equally weighted and unordered. Gaps were coded as unknown characters. Clade support was estimated from 1000 bootstrap replicates using heuristic searches with TBR branch swapping.

NEW RECORDS

HEPATICAEE

Adelanthus lindenbergianus (Lehm.) Mitt.

Pichincha: Papallacta pass, on *Polylepis*, 3880 m, SV 24199, 24204, both c. per.

Widespread in Africa, Europe (Ireland), and Latin America (Mexico to Tierra del Fuego), detailed distribution in Grolle (1972); occurring on earth, rotting wood, earth-covered rocks and epiphytic, from near sea level in southernmost S. America to about 4155 m in Colombia. From Ecuador known from Tungurahua and Zamora-Chinchipe; **new to Pichincha.**

Amblyolejeunea fulfordiae Jovet-Ast

Napo: road Baeza – Tena, km 28, very sparse on *Baccharis*, c. per., 2220 m, SV 24223/D, conf. M.E. Reiner-Drehwald.

New to South America. To date known only from the type (Guadeloupe).

Anastrophyllum nigrescens (Mitt.) Steph.

Pichincha: Papallacta pass, in *Polylepis* forest, 3940 m, SV 24444.

The species occurs from Costa Rica southwards to Peru, at altitudes from 200 to 4300 m. Noted from Ecuador not until 1999 (Gradstein, 1999).

Anastrophyllum piligerum (Reinw., Blume & Nees) Steph.

Napo: Papallacta pass, Páramo de la Virgen, on shrub, 4000 m, SV 24271.

Pantropic species, first record from Ecuador by Nöske *et al.* (2003). **New to Napo.**

Anastrophyllum tubulosum (Nees) Grolle

Napo: Papallacta pass, Páramo de la Virgen, on rocky slope, 4100 m, SV 24464.

Widespread in mountainous regions of the Neotropics. Up to now known only from prov. Zamora-Chinchipec of Ecuador (Parolly *et al.*, 2004).

Aphanolejeunea camillii (Lehm.) R.M.Schust.

Esmeraldas: Lita, epiphyllous on Rio Lita, 500 m, SV 24419/B.

Usually epiphyllous, more rarely on bark and rotting wood from sea level up to 2000 m. Widespread in the Neotropics; recorded from Ecuador for the first time by Parolly *et al.* (2004); **new to Esmeraldas.**

Aphanolejeunea gracilis Jovet-Ast

Esmeraldas: Lita, epiphyllous on Rio Lita, mixed with *Leptolejeunea exocellata*, 500 m, SV 24419/C pp.

Widespread in the Neotropics, exclusively on living leaves from sea level to 2000 m; from Ecuador known from Galapagos and Zamora-Chinchipec; **new to Esmeraldas.**

Aphanolejeunea microscopica (Taylor) Evans var. *africana* (Pócs) Pócs & A. Lücking

Imbabura: road Otavalo – Laguna Mojanda, on bark of *Polylepis*, mixed with *Campanocolea fragmentissima*, *Metzgeria consanguinea*, *Microlejeunea colombiana* and *Drepanolejeunea granatensis*, 3620 m, SV 24264/A. **Napo:** road Baeza – Tena, km 28, epiphyllous on fern frond, c. per., 2220 m, SV 24226/C.

Epiphytic and on living leaves. Widespread in Africa and South America, from 1000 m – 3620 m. First record for Ecuador (Zamora-Chinchipec) by Nöske *et al.* (2003); **new to Imbabura and Napo.**

Aphanolejeunea microscopica (Taylor) Evans var. *exigua* (A. Evans) A. Lücking & Pócs

Pichincha: road Nono – Nanegalito, on shrub, 2270 m, SV 24498/C; Bella Vista Cloud Forest Reserve northwest of Quito, epiphyllous, 2300-2350 m, SV 24328/E, 24519/D.

On bark and living leaves in montane forests. Widespread in the Neotropics, until now known from prov. Pastaza and Sucumbios of Ecuador; **new to Pichincha.**

Blepharolejeunea saccata (Steph.) van Slag. & Kruijt

Tungurahua: Rio Topo (tributary of Rio Pastaza), on shrub, 1540 m, SV 24241/C.

A rare species, known from a few localities in the Greater Antilles, Costa Rica, Colombia, and Venezuela, up to now in Ecuador collected only in “Napo-Pastaza” (type of *B. harlingii*) (Gradstein, 1994).

Blepharolejeunea securifolia (Steph.) R.M. Schust.

Imbabura: road Otavalo – Laguna Mojanda, 3620 m, SV 24264/E. **Napo:** Papallacta pass, Páramo de La Virgen, 4000-4120 m, SV 24269, 24286, 24470; *ibidem*, between Papallacta pass and the village of Papallacta, 3670 m, SV 24195/C.

Widespread from Mexico to Chile and SE Brazil, at altitudes between 2000 and 4600 m. This species is a rather common epiphyte of the páramos of Northern Ecuador. We also collected *B. securifolia* in the provinces of Carchi

(páramo El Ángel: SV 24286, 24349, 24359, 24384) and Pichincha (Papallacta pass: SV 24167); **new to Imbabura.**

Brachiolejeunea laxifolia (Taylor) Schiffner

Napo: Papallacta pass. On bark in secondary forest, 3670 m, RW 04-116.

Throughout central and tropical America at elevations of (1500-) 2000 to 3500 m. Particularly common in Andes on bark and rock. **New to Napo.**

Campanocolea fragmentissima (R.M. Schust.) R.M. Schust.

Carchi: Reserva Ecológica El Ángel, El Voladero, 3700 m, SV 24383/C, 24388.

Napo: Papallacta pass, Páramo de la Virgen, 4000-4120 m, SV 24273, 24303, 24469.

Pichincha: Papallacta pass, 3820-3950 m, SV 24157/B, 24201 (c. per.), 24452/A

This species seems to be a rather common epiphyte in the páramos of Northern Ecuador. It is known from Costa Rica and from Venezuela to northern Peru, between 3200 and 4200 m altitude. From Ecuador mentioned only once by Gradstein (1999).

Chiloscyphus breutelii (Gottsche) J.J.Engel & R.M.Schust.

[=*Lophocolea trapezoidea* Mont.].

Pichincha: road Quito – Mindo, near Mindoloma, 1800 m, SV 24248; *ibidem*, Papallacta pass, 3950 m, SV 24442.

Widespread neotropical species, **new to Pichincha.**

Cololejeunea ecuadorensis Pócs

Esmeraldas: Lita, epiphyllous on Rio Lita, together with *Aphanolejeunea camillii*, 500 m, SV 24419/B *p.p.* **Pichincha:** road Quito - Mindo, near El Pahuma Orchid Reserve, 1950 m, SV 24131/B, and near “Las Palmas”, 1800 m, SV 24315/C; *ibidem*, Mindo, 1380 m, SV 24132/A, all collections very sparse.

A rare and little known epiphyllous or epiphytic (on outermost branches of shrubs) species (500-1950 m) which was recently described from Ecuador (Pócs, 2002) and hitherto known only from the type collection. **New to Esmeraldas.** The single hyaline apical cell which is often eroded in older leaves and the curved leaf lobe are very characteristic of this species. In youngest leaves sometimes up to 11 hyaline cells cluster at the extreme leaf tip.

Cololejeunea minutissima subsp. ***myriocarpa*** (Nees & Mont.) R.M. Schust.

Imbabura: Laguna Cuicocha near Cotacachi, 3200 m, SV 24473.

Pantropical. A pioneer species, mostly on bark in open primary and secondary vegetation, from sea level to 3200 m. From Ecuador known from Azuay, Galapagos and Zamora-Chinchipec; **new to Imbabura.**

Colura calyptrifolia (Hook.) Dumort.

Carchi: Páramo El Ángel, trail El Voladero, c. per., with *Colura ornithocephala*, 3700 m, SV 24375/B. **Napo:** between Papallacta village and Papallacta pass, c. per., 3670 m, SV 24191/B.

An amphiatlantic-temperate species (Africa, Latin America and western Europe, Engel (1978)), growing epiphyllous and on bark, mostly on twigs of shrubs, or creeping on other bryophytes from near sea level to 3300 m on Mt. Kilimanjaro. **First record for Ecuador and new altitudinal record.**

Colura naumannii (Schiffn.) Steph.

Carchi: Páramo El Ángel, trail El Voladero, 3700 m, *SV 24377/A*.

Scattered from Costa Rica to Tierra del Fuego, from sea level to 3800 m; from Ecuador mentioned only once by Gradstein (1999).

Colura ornithocephala Herzog

Carchi: Páramo El Ángel, El Voladero, 3420-3700 m, *SV 24347/A, 24375/A, 24391/A*. **Cotopaxi:** NP Cotopaxi, shrubby vegetation along road, 3550 m, *SV 24492/A*. **Napo:** páramo between Papallacta village and Papallacta pass, 3670 m, *SV 24193*; Papallacta pass, Páramo de la Virgen, 4020 m, *SV 24277*; **Pichincha:** old road Quito – Santo Domingo de los Colorados, small ravine near summit, 3400 m, *SV 24100/B*; *Ibidem*, Papallacta pass, 3820-3880 m, *SV 24177, 24206/A*, all c. spor. or c. per.

High Andean species (3300 – 4020 m), usually epiphytic in very small patches on twigs in páramo vegetation, known from Colombia and Venezuela. In Ecuador to date known only from the type locality (Herzog, 1952); **new to Carchi, Napo and Pichincha**.

Colura tenuicornis (A.Evans) Steph.

Carchi: Páramo El Ángel, El Voladero, 3650-3750 m, c. per., *SV 24347/B, 24374/D*. **Pichincha:** old road Quito – Santo Domingo de los Colorados, small ravine near summit, 3400 m, *SV 24100/A*; *ibidem*, road Quito – Mindo, km 62, epiphytic in pasture, 1900 m, *SV 24319/B*; *ibidem*, road Nono – Nanegalito NW of Quito, on *Alnus acuminata*, 2180 m, *SV 24506/A*; *ibidem*, Bella Vista Cloud Forest Reserve NW of Quito, 2300 m, *SV 24519/B*, all. c. per.

Pantropical. Probably the most frequent species of the genus, epiphytic and on living leaves in humid forests and shrubby vegetation, from near sea level up to 3750 m; previous records from Ecuador: Galapagos, Los Rios and Zamora-Chinchipec; **new to Carchi and Pichincha**.

Colura tortifolia (Mont.) Steph.

Esmeraldas: Lita, epiphyllous on Río Lita, 500 m, with *Cololejeunea obliqua*, *Crossomitrium patrisiae* and others, *SV 24407/A*.

Widespread in neotropical lowland and lower montane rain forests; from Ecuador only a single record from Pastaza; **new to Esmeraldas**.

Diplasiolejeunea alata Jovet-Ast

Napo: road Baeza – Tena, km 28, on *Baccharis*, 2220 m, *SV 24226/A, 24228*. **Pichincha:** near Mindoloma, 1800 m, *SV 24145*; *ibidem*, old road Quito - Santo Domingo de los Colorados, 1980 m, *SV 24114/B, 24116/A*, both c. per.

Widespread neotropical species, occurring in open humid vegetation from 700-3200 m. First records from Ecuador by Schäfer-Verwimp (2004) and Parolly *et al.* (2004); **new to Napo and Pichincha**.

Diplasiolejeunea brunnea Steph.

Esmeraldas: on Río Lita at Lita, 500 m, *SV 24420*. **Pichincha:** road Nono – Nanegalito, 1850 m, *SV 24512/B*; old road Quito - Santo Domingo de los Colorados, 1900 m, *SV 24111/A*.

Widespread neotropical species; **new to Pichincha**.

***Diplasiolejeunea cavifolia* Steph.**

Esmeraldas: Río Lita near Lita, 500 m, *SV 24408/A*. **Pichincha:** widespread NW and SW of Quito along road to Mindo and Santo Domingo de los Colorados, from 1380 m (near Mindo, *SV 24132*) up to 2780 m (*SV 24104/A*). **Tungurahua:** Río Topo (tributary of Río Pastaza) between Baños and Puyo, 1540 m, *SV 24241/B*.

Pantropical, widespread in the Neotropics, from sea level up to 3000 m; **new to Esmeraldas, Pichincha and Tungurahua.**

***Diplasiolejeunea involuta* Winkler**

Pichincha: road Nono – Nanegalito NW of Quito, very sparse on *Baccharis*, 2270 m, *SV 24505/B*.

This pioneer species is known from El Salvador, Costa Rica, Venezuela and southern Ecuador (Nöske *et al.*, 2003); **new to Pichincha.**

***Diplasiolejeunea papilionacea* R.M.Schust.**

Napo: road Baeza – Tena, km 20, epiphytic on *Clusia*, 1970 m, *SV 24212/A*.

A rare species, known only from a few collections from Venezuela, Colombia and Southern Ecuador between 1850 and 3500 m (Schäfer-Verwimp, 2004); **new to Napo.**

***Diplasiolejeunea pauckertii* (Nees) Steph.**

Carchi: Páramo El Ángel, El Voladero, 3700 m, *SV 24383/D*. **Napo:** road Baeza – Tena, km 20, on *Clusia*, 1970 m, *SV 24212/B*. **Tungurahua:** Río Topo (tributary of Río Pastaza) between Baños and Puyo, 1540 m, *SV 24241/A*.

Widespread in the Neotropics between 1000 and 4150 m. Rather common in Southern Ecuador (numerous own collections of the first author), but obviously only very scattered in Northern Ecuador; **new to Carchi, Napo and Tungurahua.**

***Diplasiolejeunea replicata* (Spruce) Steph.**

Carchi: Páramo El Ángel, El Voladero, 3420-3750 m, *SV 24351/B*, *24389/C*, *24362/A*, *24373/B*, *24374/B*. **Napo:** road Baeza – Tena, km 20, on *Clusia*, 1970 m, *SV 24212/C*; *ibidem*, km 28, 2220 m, on *Baccharis* (*SV 24227*) and epiphyllous on fern frond, *SV 24226/B*. **Pichincha:** Bella Vista Cloud Forest Reserve NW of Quito, 2050-2350 m, epiphyllous (*SV 24328/C*) and epiphytic, *SV 24329/A*, *24519/A*, *24532*; *ibidem*, road Nono – Nanegalito, 2270 m, *SV 24500*; *ibidem*, old road Quito - Santo Domingo de los Colorados, 1980 m, *SV 24116/B*.

On twigs of shrubs and on living leaves. Widespread but scattered in the Neotropics, **new to Carchi, Napo and Pichincha.** The hitherto known altitudinal range of this species (1200-3400 m fide Schäfer-Verwimp, 2004) is exceeded by all specimens from Carchi.

***Drepanolejeunea andina* Herzog**

Carchi: Páramo El Ángel, El Voladero, 3650-3700 m, *SV 24351/A*, *24382/B*. **Napo:** Papallacta pass, Páramo de la Virgen, 3980-4030 m, *SV 24284*, *24299*. **Pichincha:** Papallacta pass, 3820-3920 m, *SV 24179*, *24206/B*, *24426*.

A high Andean species, hitherto known only from Ecuador (type, fide Bischler (1964): Pichincha: Páramo de Guamané, 4100 m – not Tungurahua, as cited in Herzog (1957) and from Colombia (3350-4150 m) (Uribe & Gradstein,

1998). Obviously not uncommon in the páramos of northern Ecuador. **New to Carchi and Napo.**

Drepanolejeunea araucariae Steph. var. *araucaria*

Napo: road Baeza – Tena, km 28, c. per., 2220 m, *SV 24231*. **Pichincha:** road Nono – Nanegalito, c. per., 2270 m, *SV 24498/A, 24504*; *ibidem*, Bella Vista Cloud Forest Reserve NW of Quito, 2300 m, *SV 24519/C*.

On bark and on living leaves, 500-4000 m. Widespread in tropical and subtropical South America; for the first time recorded from Ecuador by Parolly *et al.* (2004); **new to Napo and Pichincha.**

Drepanolejeunea crassiretis A.Evans

Napo: road Baeza – Tena, on old tree stem, 2120 m, *SV 24215/E*.

On bark and rotten wood, up to 2200 m. Known from the West Indies and Brazil; recently reported from Southern Ecuador by Parolly *et al.* (2004); **new to Napo.**

Drepanolejeunea granatensis (J.B.Jack & Steph.) Bischler

Carchi: Páramo El Ángel, El Voladero, 3700 m, *SV 24383/B*. **Imbabura:** road Otavalo – Laguna Mojanda, 3620 m, *SV 24264/C*. **Pichincha:** Papallacta pass, on irrigated rock, 3950 m, *SV 24450/C*.

Usually on bark, occasionally on rocks at high altitudes, from 1900-3700 m. Known only from Colombia, SE Brazil and Ecuador [first record by Arnell (1962) from Loja]; **new to Carchi, Imbabura and Pichincha. New altitudinal record.**

Drepanolejeunea grandistipula R.M.Schust.

Napo: Papallacta pass, Páramo de la Virgen, on *Hesperomeles* shrub, 4010 m, *SV 24293*; **Pichincha:** Papallacta pass, 3820-3950 m, *SV 24156, 24452/B*.

A rare and little known species, hitherto known only from Venezuela (type, Schuster (1996)); **new to Ecuador.** This species is very similar to *D. andina* and may prove to be a synonym of the latter. At least part of the distinguishing characters given by Schuster (1996: 24) in table 1 seem to be untenable because several specimens from Venezuela, Costa Rica and Ecuador (own collections of the first author) are intermediate concerning size of underleaves and underleaf lobes, marginal dentition of leaf lobes as well as the number of ocelli.

Drepanolejeunea inchoata (Meissn.) Steph.

Pichincha: road Quito – Mindo, 1900 m, *SV 24111/B*.

On bark and on living leaves, up to 2800 m. A common neotropical species, **to date not reported from Pichincha.**

Drepanolejeunea orthophylla (Nees & Mont.) Bischl.

Pichincha: Bella Vista Cloud Forest Reserve NW of Quito, 2350 m, *SV 24328*.

On living leaves. Widespread neotropical species, occurring in lower montane forests up to 2350 m. In Ecuador reported from Galapagos, Pastaza, and Zamora-Chinchipa; **new to Pichincha.**

Frullania bicornistipula Spruce

Pichincha: pasture near Mindoloma northwest of Quito, 1800 m, *SV 24153*.

A rare species, known from Costa Rica, Venezuela, Colombia and Ecuador (Chimborazo, Pastaza and Tungurahua provinces); **new to Pichincha**. *Frullania bicornistipula* usually grows in appressed mats on bark in montane forests (1500-1900 m). The newly detected population grow on shady soil, with all stems upright. However, the plants have the characteristic acute leaf lobes, large underleaves which are only at apex emarginate, curious long apiculi at the apices of the underleaf lobes and a long uniseriate stylus (see also Stotler, 1969).

Gongylanthus granatensis (Gottsche) Steph.

Carchi: Páramo El Angel, El Voladero, 3600 m, *SV 24364*. **Napo:** Papallacta pass, Páramo de la Virgen, 3980 m, *SV 24297*. **Pichincha:** Papallacta pass, 3950 m, *SV 24456*.

A high Andean species growing at 2500-4050 m alt. Known only from Colombia and Peru (Gradstein, 1999); **new to Ecuador**.

Gongylanthus liebmanianus (Lindenb. & Gottsche) Steph.

Napo: Papallacta pass, Páramo de la Virgen, 4100 m, *SV 24468/B*.

On bare soil or earth-covered rocks at altitudes from 1800 to 4500 m. Widely distributed in the Neotropics; from Ecuador reported from Chimborazo and Zamora-Chinchipec; **new to Napo**.

Gongylanthus limbatus (Herzog) Grolle & Vána

Napo: Papallacta pass, Páramo de la Virgen, 4100 m, *SV 24468/A*.

On soil or earth-covered rocks between 3100 and 4600 m. Reported from Colombia, Venezuela (Gradstein, 1999) and Bolivia (Gradstein *et al.*, 2003); from Ecuador known only from the type [Cotopaxi, (Herzog, 1942), as *Haplozia limbata*]; **new to Napo**.

Gongylanthus muelleri (Gottsche) Steph.

Pichincha: road Quito – Mindo, near El Pahuma Orchid Reserve, 1920 m, *SV 24123*.

On soil or earth-covered rocks, lava crevices, cliffs and river banks, from about 1400 m (Costa Rica) to 4500 m (Mexico, Fulford & Sharp, 1990). Hitherto known only from Mexico and Costa Rica. **New to South America**.

Harpalejeunea grandistipula R.M.Schust.

Carchi: Páramo El Ángel, road to El Voladero, 3420 m, *SV 24393*; *ibidem*, 3600 m, c. per., *SV 24372/B*. **Napo:** Páramo vegetation between Papallacta village and Papallacta pass, 3670 m, *SV 24188/A*; Papallacta pass, Páramo de la Virgen northeast of Quito-Papallacta road, 4020 m, *SV 24289*. **Pichincha:** Papallacta pass west of the Andean crest, páramo vegetation, on *Gynopxis* and *Polylepis*, 3820-3880 m, *SV 24163/B*, *24206/D*.

A poorly known páramo epiphyte hitherto known only from the scanty and sterile type collection from the Papallacta pass region (4200-4300 m) (Schuster, 1999). Our collections allow to emend the diagnosis given in the protologue: leaf apices of the same plant are either acute, blunt or narrowly obtuse, underleaves may be very large, the lobes are up to 10 cells wide, with an up to 20 cells long margin (base to apex); rarely a third ocellus has been observed which is separated from the two basal ones by one normal cell, or side by side with the basal ocelli. Gynoecium terminal on main stem or on branches, with two sterile or again fertile lejeuneoid innovations. Female bracts larger than leaves, connate at extreme base, margin smooth to faintly crenulate, lobe obovate, apex acute, ending in a single cell or in two superposed cells, 750-825 µm long and

375-450 μm wide, no ocelli seen; lobule narrower and shorter, broadly rounded at apex, 370-410 μm long and 300 μm wide. Female bracteole connate at base with the lobule of the bract, oblong to cuneate-obovate, 450-500 μm long and 300-370 μm wide, margin entire, apex truncate to emarginate or rarely incised with sharp sinus. Perianth long obovoid, emerging about 1/3 to 1/4 from bracts, 800-950 μm long and 375-450 μm wide, strongly 5-carinate, keels \pm smooth; beak cylindrical, 90-120 μm long and 50 μm wide, with cells in (4-)5(-6) storeys.

Harpalejeunea uncinata Steph. var. ***setulosa*** Herzog

Napo: road Baeza – Tena, km 28, 2220 m, *SV 24223/B*. **Tungurahua:** Rio Topo, 1540 m, *SV 24240/A*.

This poorly known taxon is reported only from Colombia (80-1500 m, Herzog (1955)) and Venezuela (1630 m, Grolle & Reiner-Drehwald (1999)); **new to Ecuador**, where it was growing epiphytic on shrubs in rather open and humid situations. The prominent perianth keels in both specimens are typically biseriate ciliate-laciniate, the ciliae composed of up to 12 cells in a row (up to 7 cells long in the type specimens, Herzog (1955)). *Harpalejeunea uncinata*, considered possibly as a synonym of *H. oxyphylla* by Gradstein & Costa (2003) has perianth keels with dentate to spinose wings, the projections consisting of one to three cells only (Evans, 1903). The genus *Harpalejeunea* urgently needs more study.

Jamesoniella rubricaulis (Nees) Grolle

Napo: Papallacta pass, Páramo de la Virgen, 4100 m, *SV 24467*.

A common neotropical species (500-4500 m) which occurs also on the Azores (Gradstein & Costa, 2003). **First record for Napo.**

Jensenia spinosa (Lindenb. & Gottsche) Grolle [= *Jensenia erythropus* (Gottsche) Grolle]

Napo: Papallacta pass, Páramo de la Virgen, 4000 m, *SV 24290*.

On soil at altitudes between 1900 and 4000 m, occurring in Latin America and Africa. From Ecuador to date known only from Carchi and Zamora-Chinchiipe; **new to Napo**. *Jensenia erythropus* has recently been synonymized with *J. spinosa* by Schuette & Stotler (2005).

Lejeunea angusta (Lehm. & Lindenb.) Mont.

Pichincha: near Mindo northwest of Quito, 1380 m, *SV 24133/A*; road Quito – Mindo, km 48, 1800 m, *SV 24312/A p.p.*, both det. M.E. Reiner-Drehwald.

On bark, rotting branches, living leaves and on rocks, from ca 500-2800 m. Known from Mexico (type), Cuba, Haiti, Peru and French Guiana (Fulford & Sharp, 1990); **new to Ecuador**.

Lejeunea cancellata Nees & Mont.

Pichincha: Bella Vista Cloud Forest Reserve NW of Quito, 2050 m, *SV 24531*, conf. M.E. Reiner-Drehwald.

On bark of trees and shrubs, from sea level to 2050 m. Known from Costa Rica, Cuba, Florida, Surinam, Brazil, Argentina and Hawaii (Holz *et al.*, 2001); **new to Ecuador**.

Lejeunea cerina (Lehm. & Lindenb.) Gottsche *et al.*

Pichincha: Bella Vista Cloud Forest Reserve NW of Quito, 2050 m, *SV 24530*, det. M.E. Reiner-Drehwald.

Epiphytic, on living leaves and on rocks, from sea level to 3000 m. Widely distributed in tropical America; **new to Pichincha.**

Lejeunea laeta (Lehm. & Lindenb.) Gottsche *et al.* [= *Lejeunea geophila* Spruce]

Esmeraldas: Lita, shady rock on Rio Lita, c. per., 500 m, *SV 24412*. **Tungurahua:** tributary of Rio Pastaza between Puyo and Baños, 1170 m, c. per., *SV 24233*, both. det. M.E. Reiner-Drehwald.

On soil or soil-covered rocks, normally along streams, up to 900 m. Hitherto known from Colombia, Brazil, northern Argentina (Reiner-Drehwald (1995), as *L. geophila*) and Surinam (Gradstein & Hekking, 1989); **new to Ecuador.**

Lejeunea magnoliae Lindenb. & Gottsche

Esmeraldas: Rio Lita at Lita, 500 m, *SV 24419/A*. **Pichincha:** road Quito – Mindo, km 48, 1800 m, *SV 24312/A*. **Tungurahua:** tributary of Rio Pastaza between Puyo and Baños, 1170 m, *SV 24235*, all det. M.E. Reiner-Drehwald.

A poorly known species growing epiphytic or epiphyllous, up to now known only from Mexico (Fulford & Sharp, 1990). **New to South America.**

Lejeunea megalostipa Spruce

Imbabura: road Otavalo – Laguna Mojanda, epiphytic on *Polylepis*, c. per. 3620 m, *SV 24260/A*. **Pichincha:** road Nono – Nanegalito NW of Quito, on shrub and rotting branch along creek, c. per., 2270 m, *SV 24499/A, 24501*, all det. M.E. Reiner-Drehwald.

Known only from Ecuador; **new to Imbabura and Pichincha.**

Lejeunea pallescens Mitt.

Napo: road Baeza – Tena, km 25, 2120 m, *SV 24217/B*; **Pichincha:** road Quito – Mindo, 1800-1920 m, *SV 24121, 24146; ibidem*, Bella Vista Cloud Forest Reserve, *SV 24526*.

Known from mountainous regions of Costa Rica southwards to Peru, at altitudes between 1800-3800 m. **First record for Napo.**

Lejeunea reflexistipula (Lehm. & Lindenb.) Gottsche *et al.*

Carchi: Páramo El Ángel, El Voladero, 3750 m, *SV 24374/A*. **Napo:** road Baeza – Tena, km 25, 2120 m, *SV 24215/A*. **Tungurahua:** Río Topo, 1540 m, *SV 24242*.

Widespread tropical American epiphyte occurring from sea level to about 3750 m. **First records for Carchi, Napo and Tungurahua.**

Lejeunea ramulosa Spruce

Napo: road Baeza – Tena, several localities between km 8 and km 25, 1870-2120 m, *SV 24208* (c. per.), *24211/A* (c. per.), *24217/A*. **Pichincha:** old road Quito - Santo Domingo de los Colorados, 1980 m, *SV 24117/B*; road Quito – Mindo, 1800 m, c. per., *SV 24312/C*.

Hitherto known from Costa Rica and Ecuador at altitudes between 1680-3300 m (Holz *et al.*, 2001), where this species seems to be rather common; **new to Napo and Pichincha.**

Lejeunea tapajosensis Spruce

Esmeraldas: Rio Lita at Lita, 500 m, *SV 24410/A*, det. M.E. Reiner-Drehwald.

Epiphytic and on living leaves, from sea level to 2150 m. Known from Brazil and northern Argentina, first record from Ecuador by Nöske *et al.* (2003); **new to Esmeraldas.**

Lepidozia caespitosa Steph.

Napo: Papallacta pass, 4000 m, *SV 24298/A*. **Pichincha:** Papallacta pass, 3930 m, *SV 24437/B*.

On soil, rocks and tree trunks from 1000-3800 m; widespread in the Neotropics, from Ecuador known from Azuay, Pastaza and Tungurahua, **new to Napo and Pichincha**. The plants would key out in Fulford (1963-1976) to *L. lindigiana* Spruce which most probably is a synonym of *L. caespitosa*.

Lepidozia incurvata Lindenb.

Carchi: Páramo El Ángel, El Voladero, 3600 m, *SV 24365*.

On bark, rocks and on earth between other bryophytes from 1750-3600 m. Known from Central America southwards to Bolivia and SE Brazil; recently reported from Southern Ecuador by Nöske *et al.* (2003); **new to Carchi.**

Lepidozia macrocolea Spruce

Carchi: Páramo El Ángel, El Voladero, 3600 m, *SV 24370*. **Pichincha:** Papallacta pass, 3920 m, *SV 24430*.

Andean species, up to now known from provinces Tungurahua and Zamora-Chinchi of Ecuador; **new to Carchi and Pichincha.**

Leptolejeunea exocellata (Spruce) A. Evans

Esmeraldas: Rio Lita at Lita, 500 m, *SV 24407/C*, *24419/C*.

Widespread neotropical epiphyllous lowland and lower montane rain forest species; obviously **hitherto not reported from Ecuador.**

Leptoscyphus cuneifolius (Hook.) Mitt.

Pichincha: Papallacta pass, on twig of *Gynoxis*, c. per., mixed with *Physotheca autoica* and *Campanocolea fragmentissima*, 3820 m, *SV 24159 pp*.

Growing epiphytic among other bryophytes or more rarely on rocks, from nearly sea level to 4400 m. Widespread but uncommon in Europe, North and South America; for the first time reported from Ecuador by Gradstein (1999); **new to Pichincha.**

Leptoscyphus gibbosus (Taylor) Mitt.

Napo: Papallacta pass, Páramo de la Virgen, 3980 m, *SV 24296*.

Widespread but scattered in the Neotropics, known from the Antilles, Costa Rica, Colombia, Venezuela, Guyana, SE Brazil and southern Ecuador (Nöske *et al.*, 2003). **New to Napo.**

Leptoscyphus hexagonus (Nees) Grolle

Pichincha: Papallacta pass, on *Polylepis*, 3920 m, *SV 24429* (QCA, GOET).

A rare mountainous neotropical species known only from very few old collections from Peru and Ecuador (Grolle, 1963).

***Marchesinia brachiata* (Sw.) Schiffn.**

Esmeraldas: Rio Lita at Lita, 500 m, *SV 24421/B* (epiphytic) and *24423* (on rock), both c. per. **Pichincha:** Bella Vista Cloud Forest Reserve northwest of Quito, 2050 m, *SV 24527*.

Epiphytic, on rocks and mossy slopes, from sea level up to 3300 m. Widespread and common in tropical America and East Africa; **new to Esmeraldas and Pichincha.**

***Marsupella lacerata* (Steph.) Váña [= *Gymnomitrium andinum* R.M.Schust.]**

Napo: Papallacta pass, Páramo de la Virgen, on rocky slope, 4100 m, *SV 24463*.

Widespread in the Neotropics from Mexico southwards to Bolivia (2960-4900 m), and in South Africa. Váña (2003) reported this species from Chimborazo province and supposed that *Marsupella hyalina* R.M. Schust. (type from Papallacta pass) is a synonym of *M. lacerata*.

***Metzgeria consanguinea* Schiffn.**

Carchi: Páramo El Angel near El Voladero, 3650 m, *SV 24350*. **Cotopaxi:** NP Cotopaxi, 3550 m, *SV 24490/A*; *ibidem*, Laguna Limpiopungo, 3830 m, *SV 24481/A*. **Napo:** road Baeza – Tena, km 28, 2220 m, *SV 24226/C p.p.* **Imbabura:** road Otavalo – Laguna Mojanda, on *Polylepis*, 3620 m, *SV 24264/A p.p.* **Pichincha:** old road Quito – Santo Domingo de los Colorados, 3430 m, *SV 24101*; Papallacta pass, 3950 m, *SV 24452/D*; Bella Vista Cloud Forest Reserve northwest of Quito, 2350 m, *SV 24328/E p.p.*

Pantropical species, common in northern Ecuador at altitudes between 2000 and 4000 m, usually on twigs and on living leaves; first record for Ecuador by Parolly *et al.* (2004) from Zamora-Chinchipec; **new to Carchi, Cotopaxi, Imbabura, Napo and Pichincha.**

***Metzgeria dorsipara* (Herz.) Kuwah.**

Carchi: Páramo El Angel, El Voladero, 3600-3700 m, *SV 24372/A, 24385*.

On shrubs at high altitudes, 3350-3900 m. Seems to be a rather rare species, known only from Colombia and one single collection from Tungurahua, Ecuador (the type, Kuwahara (1976)); **new to Carchi.**

***Metzgeria liebmanniana* Lindenb. & Gottsche**

Pichincha: Papallacta pass, on *Gynopxis* and *Polylepis*, 3820-3880 m, *SV 24161, 24200*.

Usually as epiphyte from 800-4000 m. Known from Mexico, Venezuela, Colombia and Peru; only once mentioned from Ecuador by Gradstein (1999).

***Metzgeria polytricha* Spruce**

Pichincha: Papallacta pass, 3980 m, *SV 24283*. **Napo:** Papallacta pass, Páramo de la Virgen, 4000 m, *SV 24300*.

Epiphytic and on mossy slopes, from 700-4040 m. Known from Colombia, Peru and Ecuador (first record by Herzog (1952)); **new to Pichincha.**

***Microlejeunea acutifolia* Steph.**

Pichincha: Bella Vista Cloud Forest Reserve NW of Quito, 2350 m, *SV 24328/A*.

Primarily a neotropical lowland rain forest species. **New to Ecuador, new altitudinal record.**

Microlejeunea colombiana Bischler

Carchi: Páramo El Ángel, El Voladero, 3600-3700 m, *SV 24345, 24362/B, 24377/B*.
Cotopaxi: NP Cotopaxi, 3550 m, *SV 24492/B*. **Imbabura:** road Otavalo – Laguna Mojanda, 3620 m, *SV 24258, 24264/B*. **Napo:** Papallacta pass, Paramo de la Virgen, 4020 m, *SV 24287*.
Pichincha: Papallacta pass, 3820-3880 m, *SV 24165, 24206/C; ibidem*, road Nono – Nanegalito northwest of Quito, 2270 m, *SV 24498/B*.

Usually epiphytic on twigs of shrubs, occasionally on living leaves, occurring from 1800-3880 m (new altitudinal record). Recently reported from Southern Ecuador (Zamora-Chinchipec) by Parolly *et al.* (2004). Rather common in the páramos of Northern Ecuador; **new to Carchi, Cotopaxi, Imbabura, Napo and Pichincha.**

Odontolejeunea decemdentata (Spruce) Steph.

Pichincha: road Quito – Mindo, El Pahuma orchid reserve, near Nanegalito, 1920-1950 m, *RW 04-54; ibidem*, near Mindo, secondary forest along river, 1380 m, *RW 04-40*.

On leaves in humid rain forests along Andes from Venezuela to Bolivia and SE Brazil. From sea level to 1800 m. **New to Pichincha.**

Oryzolejeunea saccatiloba (Steph.) Gradst.

Napo: road Baeza – Tena, km 25, 2120 m, *SV 24215/C*. **Tungurahua:** Río Topo (tributary of Río Pastaza), 1540 m, *SV 24240/B*.

Usually epiphytic in lowland to upper montane rain forests, up to 2650 m. Scattered in the West Indies, Central America and SE Brazil; recently reported from Southern Ecuador by Nöske *et al.* (2003). **New to Napo and Tungurahua.**

Physotheca autoica J.J. Engel & Gradst.

Napo: Papallacta pass, Páramo de la Virgen, on shrub in small quantity, 4000 m, c. per, *SV 24301*. **Pichincha:** Papallacta pass, on twig of *Gynopsis*, c. per., mixed with *Leptoscyphus cuneifolius* and *Campanocolea fragmentissima*, 3820 m, *SV 24159*.

Recently described from the provinces Loja and Zamora-Chinchipec of Southern Ecuador (2760 m - 3050 m) and considered to be a local endemic (Engel & Gradstein, 2003; Parolly *et al.*, 2004); **new to Napo and Pichincha.**

Plagiochila bifaria (Sw.) Lindenb. var. *bifaria*

Napo: Papallacta pass, Páramo de la Virgen, 4030 m, *SV 24283, JH 4482*.

Widespread in the Neotropics and Europe (Heinrichs *et al.*, 2004a), **new to Napo.**

Plagiochila buchtiniana Steph.

Imbabura: Otavalo, Laguna Mojanda, *Polylepis* forest, on trunk, 3680 m, *JH 4485*.

New to Ecuador. To date known only known from high Andean cloud forests and subpáramos of Bolivia and Southern Peru (Heinrichs *et al.*, 2000). An ITS sequence generated from the sterile Ecuadorian specimen is resolved in a robust monophyletic lineage with *P. buchtiniana* from Bolivia (Fig. 1). The short branches within section *Glaucoscentes* Carl indicate a rather recent diversification which could be correlated with the late Miocene uplift of the Central and Northern Andes.

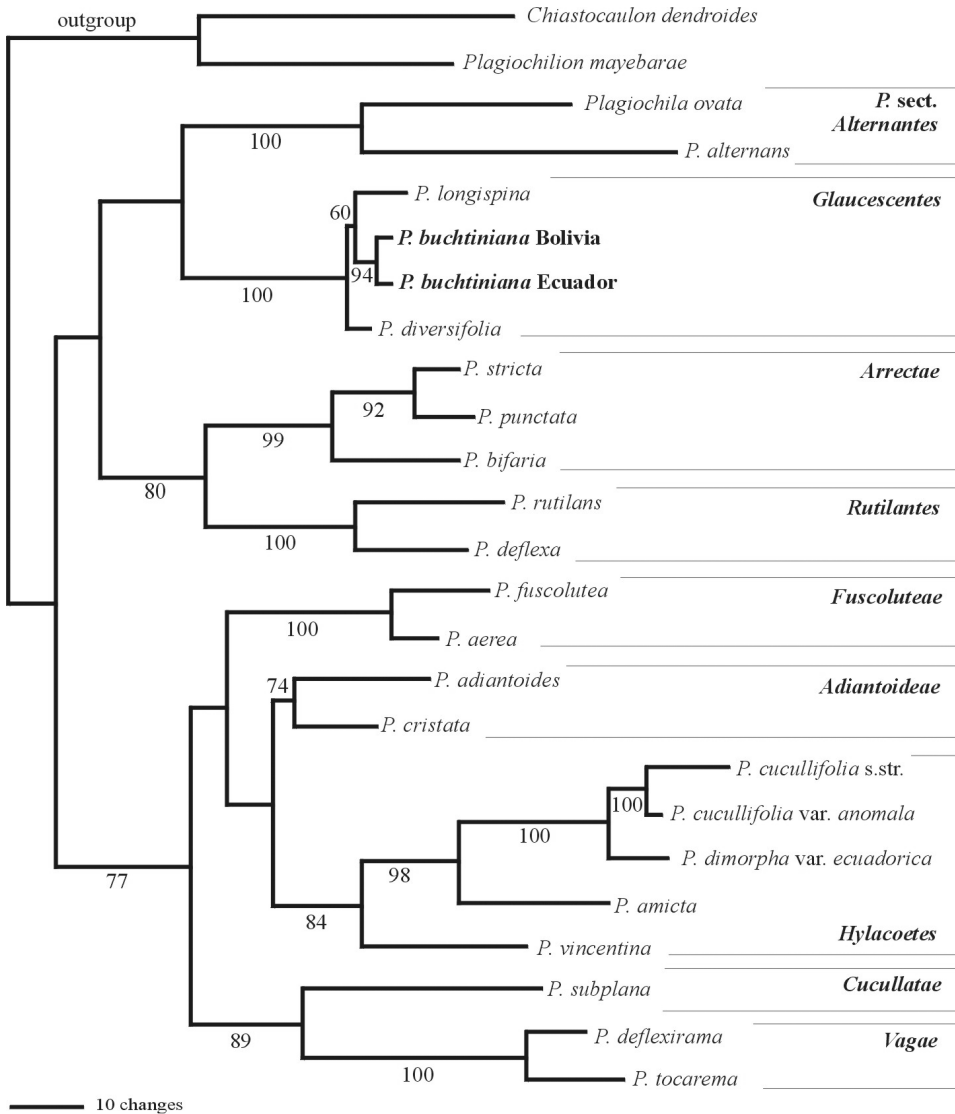


Fig. 1. Single most parsimonious tree (length 700 steps) recovered during 1000 random taxon addition heuristic searches of an nrITS sequence alignment. Bootstrap support (> 50%) is indicated at branches. The Ecuadorian sequence of *Plagiochila buchtiniana* is placed in a robust monophyletic lineage with a sequence from Bolivia.

***Plagiochila dimorpha* Lindenb. & Gottsche var. *ecuadorica* (Inoue) J. Heinrichs**

Pichincha: Bella Vista Cloud Forest Reserve NW of Quito, 2300-2360 m, JH 4462 & 4479.

A rare taxon, known only from a few localities in Bolivia, Costa Rica, and Ecuador (Carchi, Napo) (Heinrichs *et al.*, 2003b). **New to Pichincha.**

Plagiochila longispina Lindenb. & Gottsche

Carchi: Páramo El Ángel near El Voladero, 3420 m, *JH 4460, SV 24394*; above El Moran, 3550 m, *SV 24400*.

Known from mountainous regions from Mexico southwards to Ecuador (Heinrichs *et al.*, 2000). **New to Carchi.**

Plagiochila pachyloma Taylor

Carchi: Páramo El Ángel above El Moran, 3280-3550 m, *JH 4426, SV 24404*.
Imbabura: road Otavalo – Laguna Mojanda, *Polylepis* stand, 3620 m, *JH 4437, SV 24266*.

A montane species occurring from Costa Rica southwards to Ecuador (Holz *et al.*, 2001). **New to Carchi and Imbabura.**

Plagiochila turgida Herzog

Pichincha: Mindoloma (on road Quito – Mindo), 1800 m, *SV 24147*.

Reported from Southern Ecuador by Heinrichs (2002); **new to Pichincha.**

Porella squamulifera (Taylor) Trev.

Carchi: Páramo El Ángel above El Moran, 3550 m, *SV 24401*.

An Andean species occurring from Venezuela to Boliva (So, 2005), at altitudes from 1200 to 4000 m. **New to Carchi.**

Prionolejeunea arguta (Nees) Steph.

Zamora-Chinchipec: Podocarpus National Park 5 km south of Zamora, Rio Bombuscara, 1020 m, 19 April 2003, *Schäfer-Verwimp & Preußing 23399*, det. A. L. Ilkiu-Borges.

On wet rocks. Known from the West Indies and northern South America, from French Guiana to Peru (A.L. Ilkiu-Borges *in litt.*); **new to Ecuador.**

Prionolejeunea decora (Taylor) Steph.

Pichincha: road Quito – Mindo, near Mindoloma, 1800 m, *SV 24144*, det. A.L. Ilkiu-Borges.

On bark, rotting wood, shady rocks and on soil, known from the West Indies from altitudes between 600 m and 1100 m (Grolle, 1991) and Northern Andes (A. L. Ilkiu-Borges *in litt.*); **new to Ecuador.**

Radula flaccida Lindenb. & Gottsche

Esmeraldas: Río Lita at Lita, 500 m, *SV 24422*.

Usually on living leaves, occasionally on bark, between 0 and 500 m. Common in tropical Africa and America, obviously **first record for Ecuador.**

Radula saccatiloba Steph.

Esmeraldas: Río Lita, 500 m, *SV 24421/C*.

Widespread and frequent in the West Indies, rarely in South America, here reported from Peru, Brazil, and Southern Ecuador (Parolly *et al.*, 2004); **new to Esmeraldas.**

Radula stenocalyx Mont.

Esmeraldas: Río Lita, 500 m, on bark, *SV 24410/B*.

Primarily on living leaves, also on bark in rain forests, from sea level to 2300 m. Widespread in Africa and tropical America; **new to Ecuador.**

Radula tenera Mitt. ex Steph.

Carchi: Páramo El Angel, El Voladero, 3700 m, *SV 24383/A*. **Imbabura:** road Otavalo – Laguna Mojanda, on *Polylepis*, 3620 m, *SV 24260/B*. **Napo:** road Baeza – Tena, km 28, on *Baccharis*, 2220 m, *SV 24230*. **Pichincha:** Bella Vista Cloud Forest Reserve, 2350 m, *SV 24332*.

Epiphyte on twigs of shrubs mainly at high altitudes, from 500 m up to 3700 m. Known from Colombia, Brazil and Costa Rica (Gradstein *et al.*, 1994); first record for Ecuador by Nöske *et al.*, (2003); **new to Carchi, Imbabura, Napo and Pichincha.**

Radula voluta Taylor

Cotopaxi: NP Cotopaxi, 3550 m, *SV 24495*. **Napo:** Papallacta pass, Páramo de la Virgen, 4000 m, *SV 24270, 24300/A*. **Pichincha:** Papallacta pass, on *Gynopsis*, 3820 m, *SV 24170*.

On bark and rock, from 450-4200 m. Widespread in western Europe, Africa and tropical America; **new to Cotopaxi.**

Rectolejeunea berteriana (Gottsche) A. Evans

Esmeraldas: Rio Lita at Lita, 500 m, *SV 24411, 24421/A*.

On bark, rotten wood or living leaves in humid open situations from sea level to 1830 m. Widely distributed in tropical America; **new to Esmeraldas.**

Syzygiella anomala (Lindenb. & Gottsche) Steph.

Pichincha: Mindoloma (on road Quito – Mindo), 1800 m, *SV 24150*.

On rock and soil, occasionally on bark and rotten wood, 1500-3650 m. Widespread but scattered in tropical America. First records from Ecuador by Gradstein (1999) and Nöske *et al.*, (2003); **new to Pichincha.**

Syzygiella pectiniformis Spruce

Napo: road Baeza – Tena, km 25, 2120 m, *SV 24216*. **Pichincha:** Bella Vista Cloud Forest Reserve northwest of Quito, 2300 m, *SV 24521*.

A rare species known only from very few collections from Peru, Ecuador (type only: “in sylvia Canelos”), Colombia and Costa Rica (Gradstein *et al.*, 1994). Judging from the two collections cited above the species prefers humid and shady locations in rain forests; **new to Napo and Pichincha.**

Trichocolea flaccida (Spruce) J.B. Jack & Steph.

Pichincha: Bella Vista Cloud Forest Reserve northwest of Quito, 2370 m, *SV 24343*.

On bark, rotten wood and on rocks in rain forests, 600-3150 m. Tropical American species, **new to Pichincha.**

Trichocolea sprucei Steph.

Pichincha: Papallacta pass, *Polylepis* stand, 3880 m, *SV 24203*.

Main distribution in the West Indies, from South America hitherto reported only from Colombia (up to 3650 m, Uribe & Gradstein (1998)); **new to Ecuador and new altitudinal record.**

There is a another specimen of this species in the first author’s herbarium: **Azuay:** western slope of eastern Cordillera between Gualaca and General L. Plaza, 3000 m, 1991, *leg. T. Arts 30/033*, conf. R. Grolle. According to S. R. Gradstein (*in litt.*) a small phenotype of *Trichocolea tomentosa*.

***Trichocolea tomentosa* (Sw.) Gottsche**

Pichincha: Bella Vista Cloud Forest Reserve NW of Quito, 2370 m, SV 24343.

Neotropical species, **new to Pichincha.**

MUSCI***Blindia magellanica* Schimp. in Müll. Hal.**

Pichincha: Papallacta pass, on dripping cliff, 3950 m, SV 24447.

On wet rocks, sometimes submerged, 0-4200 m. A Southern Hemispheric species. Detailed distribution in Bartlett & Vitt (1986); from Ecuador known only from old Jameson collections.

***Brachymitrium moritzianum* (Müll. Hal.) A. Kop.**

Napo: road Baeza – Tena, km 25, destroyed rain forest, on rotting log, 2120 m, SV 24213.

On rotten wood, 1400-3500 m. Afro-American species, in America known from Costa Rica, Venezuela, Colombia, from Ecuador (Loja) described as *Tayloria papulata* Müll. Hal. (Koponen, 1977).

***Tayloria magellanica* (Brid.) Mitt.**

Pichincha: Papallacta pass, on branch of *Polylepis*, 3950 m, SV 24462.

An Andean species occurring at high altitudes (3200 m - 3950 m) in Colombia and Peru and down to sea level in Tierra del Fuego; **first record for Ecuador.**

CONCLUSION

Many of the bryophyte species listed here have been published as new to Ecuador only very recently (Heinrichs, 2002; Nöske *et al.*, 2003; Parolly *et al.*, 2004; Schäfer-Verwimp, 2004), based on collections from Southern Ecuador. Others were reported by Gradstein (1999) in his Páramo checklist (without citing specimens). The results of our short field trip to Northern Ecuador indicate that these species are more widespread than currently known. Especially the liverwort flora of Ecuador is still incompletely known.

Eighteen species of liverworts are reported as new to Ecuador, leading to a total number of about 700 hepatic species. The forthcoming catalogue of the liverworts of Ecuador (León-Yáñez *et al.*, in press) may serve as a good basis for further detailed exploration of the rich liverwort flora of Ecuador.

Acknowledgements. Thanks are due to Anna Luiza Ilkiu-Borges (Göttingen), Elena Reiner-Drehwald (Göttingen), and the late Riclef Grolle for revision or determination of specimens. Rob Gradstein (Göttingen) kindly provided comments on this manuscript and offered access to an unpublished manuscript on the liverwort flora of Ecuador. Sincere thanks to Suzanna León-Yáñez and Hugo Navarrete (herbarium QCA, Quito) for logistic support in Ecuador. This study was supported by the German Research Foundation (grants HE 3584 / 1, GR 1588 / 9 to Rob Gradstein and JH).

REFERENCES

- ARNELL S., 1962 — Contribution to the knowledge of the Hepaticae of Ecuador. *Svensk botanisk tidskrift utgifven af Svenska botaniska foreningen* 56: 334-350.
- BARTLETT J.K. & VITT D.H., 1986 — A survey of species in the genus *Blindia* (Bryopsida, Seligeriaceae). *New Zealand journal of botany* 24: 203-246.
- BISCHLER H., 1964 — Le genre *Drepanolejeunea* Steph. en Amérique Centrale et Méridionale. *Revue bryologique et lichénologique* 33: 15-179.
- ENGEL J.J., 1978 — A taxonomic and phytogeographic study of Brunswick Peninsula (Strait of Magellan): Hepaticae and Anthocerotae. *Fieldiana, Botany* 41: 1-319.
- ENGEL J.J. & GRADSTEIN S.R., 2003 — Studies on Geocalycaceae XIV. *Physotheca* J.J.Engel & Gradst., a new genus of Hepaticae from Ecuador, belonging to a new subfamily, Geocalycaceae subfam. Physothecoideae J.J. Engel & Gradst. *Taxon* 52: 763-773.
- EVANS A.W., 1903 — Hepaticae of Puerto Rico, III. *Harpalejeunea*, *Cyrtolejeunea*, *Euosmolejeunea* and *Trachylejeunea*. *Bulletin of the Torrey botanical club* 30: 544-563.
- FULFORD M.H., 1963-1976 — Manual of the Leafy Hepaticae of Latin America - Part I-IV. *Memoirs of the New York botanical garden* 11: 1-535.
- FULFORD M. & SHARP A.J., 1990 — The Leafy Hepaticae of Mexico: One Hundred and Twenty-seven Years after C. M. Gottsche. *Memoirs of the New York botanical garden* 63: 1-86.
- GRADSTEIN S.R. & HEKKING W.H.A., 1989 — A catalogue of the bryophytes of the Guianas. I. Hepaticae and Anthocerotae. *Journal of the Hattori botanical laboratory* 66: 197-230.
- GRADSTEIN S.R., 1994 — Lejeuneaceae: Ptychantheae, Brachiolejeuneae. *Flora neotropica monograph* 62: 1-216.
- GRADSTEIN S.R., LÜCKING A., MORALES A. & DAUPHIN G., 1994 — Additions to the hepatic flora of Costa Rica. *Lindbergia* 19: 73-86.
- GRADSTEIN S.R., 1999 — Hepatics. In J. L. Luteyn J.L. (ed.), "Páramos". *Memoirs of the New York botanical garden* 84: 65-73.
- GRADSTEIN S.R. & COSTA D.P., 2003 — The Liverworts and Hornworts of Brazil. *Memoirs of the New York botanical garden* 87: 1-317.
- GRADSTEIN S.R., MENESES Q.R.I. & ARBE B.A., 2003 — Catalogue of the Hepaticae and Anthocerotae of Bolivia. *Journal of the Hattori botanical laboratory* 93: 1-67.
- GROLLE R., 1963 "19623 — Monographie der Lebermoosgattung *Leptoscyphus* *Mitteilungen Nova acta Leopoldina, Neue Folge* 25(161): 1-143.
- GROLLE R., 1972 — Zur Kenntnis von *Adelanthus* Mitt. *Journal of the Hattori botanical laboratory* 35: 325-370.
- GROLLE R., 1991 — Miscellanea hepaticologica 281-290. *Journal of the Hattori botanical laboratory* 69: 185-194.
- GROLLE R. & REINER-DREHWALD M.E., 1999 — Review of the genus *Harpalejeunea* (Lejeuneaceae) including the description of *H. grandis*, a new species from the páramos of Colombia. *Journal of bryology* 21: 31-45.
- GROTH H. & HEINRICHS J., 2003 — Reinstatement of *Chiasmocaulon* Carl (Plagiochilaceae), based on evidence from nuclear ribosomal ITS and chloroplast gene rps4 sequences. *Plant biology* 5: 615-622.
- HALL T.A. 1999 — BioEdit: a user-friendly biological sequence alignment editor and analysis program for Windows95/98/NT. *Nucleic acids, Symposia series* 41: 95-98.
- HEINRICHS J., ANTON H., GRADSTEIN S.R. & MUES R., 2000 — Systematics of *Plagiochila* sect. *Glaucescetes* Carl (Hepaticae) from tropical America: a morphological and chemotaxonomical approach. *Plant systematics and evolution* 220: 115-138.
- HEINRICHS J., 2002 — A taxonomic revision of *Plagiochila* sect. *Hylacoetes*, sect. *Adiantoideae* and sect. *Fuscoluteae* in the Neotropics with a preliminary subdivision of Neotropical Plagiochilaceae into nine lineages. *Bryophytorum bibliotheca* 58: 1-184.

- HEINRICH S. J., GRADSTEIN S. R., GROTH H. & LINDNER M., 2003a — *Plagiochila cucullifolia* var. *anomala* var. nov. from Ecuador, with notes on discordant molecular and morphological variation in *Plagiochila*. *Plant systematics and evolution* 242: 205-216.
- HEINRICH S. J., WILSON R. & GROTH H., 2003b — A new locality of *Plagiochila dimorpha* var. *ecuadorica* (Plagiochilaceae, Hepaticae). *Cryptogamie, Bryologie* 24: 155-158.
- HEINRICH S. J., GROTH H., LINDNER M., FELDBERG K. & RYCROFT D. S., 2004a — Molecular, morphological and phytochemical evidence for a broad species concept of *Plagiochila bifaria* (Hepaticae). *The bryologist* 107: 28-40.
- HEINRICH S. J., LINDNER M. & PÓCS T., 2004b — nrDNA internal transcribed spacer data reveal that *Rhodoplagiochila* R.M.Schust. (Jungermanniales, Marchantiophyta) is a member of *Plagiochila* sect. *Arrectae* Carl. *Organisms diversity and evolution* 4: 109-118.
- HERZOG T., 1942 — Beiträge zur Kenntnis neotropischer Bryophyten. *Beihefte zum botanischen Centralblatt* 61: 559-590.
- HERZOG T., 1952 — Hepaticae ecuadorienses A CL. D:Re Gunnar Harling Annis 1946-1947 Lectae. *Svensk botanisk tidskrift utgifven af Svenska botaniska foreningen* 46: 62-108.
- HERZOG T., 1955 — Hepaticae aus Columbia und Peru. *Feddes repertorium* 57: 156-203.
- HERZOG T., 1957 — Lebermoose aus Ecuador gesammelt von Dr. E. Asplund. *Svensk botanisk tidskrift utgifven af Svenska botaniska foreningen* 51: 187-196.
- HOLZ I., HEINRICH S. J., SCHÄFER-VERWIMP A. & GRADSTEIN S. R., 2001 — Additions to the hepatic flora of Costa Rica III. *Cryptogamie, Bryologie* 22: 255-273.
- KOPONEN A., 1977 — *Tayloria* subgen. *Pseudotetraplodon*, subgen. nov., and new combinations in *Brachymitrium*, *Moseniella* and *Tayloria* (Splachnaceae, Musci). *Annales botanici fennici* 14: 193-196.
- KUWAHARA Y. 1976 — Studies of genus *Metzgeria* of Colombia collected by M^{me} Hélène Bischler, 1956-59. *Journal of the Hattori botanical laboratory* 40: 259-290.
- LEÓN-YÁNEZ S., GRADSTEIN S. R. & WEGNER C. (in press). Catalogue of the Liverworts (Marchantiophyta) and Hornworts (Anthocerotophyta) of Ecuador.
- NÖSKE N. M., GRADSTEIN S. R., KÜRSCHNER H., PAROLLY G. & TORRACCHI S., 2003 — Cryptogams of the Reserva Biológica San Francisco (Province Zamora-Chinchipec, Southern Ecuador). I. Bryophytes. *Cryptogamie, Bryologie* 24: 15-32.
- PAROLLY G., KÜRSCHNER H., SCHÄFER-VERWIMP A. & GRADSTEIN S. R., 2004 — Cryptogams of the Reserva Biológica San Francisco (Province Zamora-Chinchipec, Southern Ecuador). III. Bryophytes — Additions and new species. *Cryptogamie, Bryologie* 25: 271-289.
- PÓCS T., 2002 — New or little known epiphyllous liverworts, IX. Two new neotropical *Cololejeunea* species. *Acta botanica Hungarica* 44: 371-382.
- REINER-DREHWALD M. E., 1995 — *La familia Lejeuneaceae (Hepaticae) en Misiones, Argentina: Estudio taxonómico-florístico*. Tesis, Univ. Buenos Aires. 236 pp. + fotografías (fig. 50-56).
- SCHÄFER-VERWIMP A., 2004 — The genus *Diplasiolejeunea* (Lejeuneaceae, Marchantiopsida) in the tropical Andes, with description of two new species. *Cryptogamie, Bryologie* 25: 3-17.
- SCHUETTE S. W. & STOTLER R. E., 2005 — A conspectus of the liverwort genus *Jensenia* in Latin America. *Journal of the Hattori botanical laboratory* 97: 299-308.
- SCHUSTER R. M., 1996 — Studies on Lejeuneaceae, II. Neotropical taxa of *Drepanolejeunea* (Spr.) Schiffn. *Nova Hedwigia* 62: 1-46.
- SCHUSTER R. M., 1999 — *Harpalejeunea* (Spr.) Schiffn. I. Studies on a new Andean species of *Harpalejeunea* *Journal of the Hattori botanical laboratory* 87: 287-294.
- SO M. L., 2005 — *Porella* (Porellaceae, Marchantiophyta) in Latin America. *New Zealand journal of botany* 43: 301-321.

- STOTLER R.E., 1969 — The genus *Frullania* subgenus *Frullania* in Latin America. *Nova Hedwigia* 18: 397-555, pls. 1-38.
- SWOFFORD D.L., 2000 — PAUP*: Phylogenetic analysis using Parsimony (*and other methods). Sinauer Associates, Sunderland, Massachusetts.
- URIBE M.J. & GRADSTEIN S.R., 1998 — Catalogue of the Hepaticae and Anthocerotae of Colombia. *Bryophytorum bibliotheca* 53: 1-99.
- VÁÑA J., 2003 — Notes on Gymnomitriaceae (subf. Gymnomitrioideae) in Latin America. *Acta academicae paedagogicae agriensis, Sect. Biol.* 24: 109-128.

APPENDIX 1

Geographic origins, voucher numbers and GenBank/EMBL accession numbers of the taxa included in the molecular investigation. *Plagiochila* vouchers are deposited at GOET, *Chiastocaulon* and *Plagiochilion* at HIRO.

Chiastocaulon dendroides (Nees) Carl, Japan, *Kurita 84* (AY438232), *Plagiochila adiantoides* (Sw.) Lindenb., Costa Rica, *Heinrichs et al. 4314* (AJ422027), *P. aerea* Taylor, Costa Rica, *Heinrichs et al. 4321* (AJ422028), *P. alternans* Lindenb. & Gottsche, Costa Rica, *Heinrichs et al. 4317* (AJ422029), *P. amicta* Steph., Costa Rica, *Heinrichs et al. 4178* (AJ422022), *P. bifaria* (Sw.) Lindenb. Ecuador, *Holz EC-01-416* (AJ422010), *P. buchtiniana* Steph., Bolivia, *Groth s.n.* (AJ413306), *P. buchtiniana*, Ecuador, *Heinrichs et al. 4485* (AM087670), *P. cristata* (Sw.) Lindenb., Costa Rica, *Heinrichs et al. 4192* (AJ422015), *P. cucullifolia* Jack & Steph., Ecuador, *Schmidt-Lebuhn 384* (AJ620671), *P. cucullifolia* var. *anomala* J.Heinrichs & Gradst., Ecuador, *Holz EC-01-558* (AY330711), *P. deflexa* Mont. & Gottsche, *Heinrichs et al. 4160* (AJ416083), *P. deflexirama* Taylor, Costa Rica, *Heinrichs et al. 4163* (AJ413310), *P. dimorpha* var. *ecuadorica* (Inoue) J.Heinrichs, Costa Rica, *Holz CR-00-499* (AJ422013), *P. diversifolia* Lindenb. & Gottsche, Ecuador, *Holz EC-01-17* (AJ413308), *P. fuscolutea* Taylor, Costa Rica, *Heinrichs et al. 4400* (AJ416086), *P. longispina* Lindenb. & Gottsche, Costa Rica, *Heinrichs et al. 4148* (AJ413307), *P. ovata* Lindenb. & Gottsche, Costa Rica, *Heinrichs et al. 4148* (AJ413307), *P. punctata* (Taylor) Taylor, Ecuador, *Holz EC-01-389* (AJ422018), *P. rutilans* Lindenb., Bolivia, *Groth 101* (AJ416081), *P. subplana* Lindenb., French Guiana, *Holz FG-00-32* (AY275174), *P. stricta* Lindenb., Ecuador, *Holz EC-01-478* (AJ416647), *P. tocarema* Gottsche, Costa Rica, *Heinrichs et al. CR199* (AJ413309), *P. vincentina* Lindenb., Costa Rica, *Heinrichs et al. 4331* (AY275175), *Plagiochilion mayebarae* S.Hatt., Japan, *Ohnishi 5588* (AY438238).