

A Checklist of the Hepatics and Anthocerotes of Panamá

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Abstract. A brief account of the geography and floristic regions of Panamá is complemented with an historical account of the liverwort studies of this country. This is followed by an annotated checklist of 289 taxa, including 93 new for Panamá. Among these are four hornwort taxa that represent the first anthocerotes reported. Each checklist entry comprises proper taxon citation, collection data and/or bibliographic references.

Resumen. Una revisión de la geografía y regiones florísticas de Panamá es complementada con una nota histórica de los estudios sobre hepáticas de este país. Esto es seguido por una lista anotada de 289 taxa, incluyendo 93 que son nuevos para Panamá. Entre éstos se encuentran cuatro antocerotes que representan las primeras comunicaciones en esta División. Cada taxon ingresado contiene la citación apropiada, datos de colecta y/o referencias bibliográficas.

INTRODUCTION

Our knowledge of the liverwort and hornwort flora of Central America remains very incomplete with the exception of Costa Rica (and Mexico which is often considered along with these countries since it constitutes a part of Latin America). In their conspectus of bryological taxonomic literature, which includes all pertinent literature through 1987 and into 1988, Greene

and Harrington (1989) provide the following - GUATEMALA: "No basic list references found for hepatics or anthocerotes."; BELIZE: "Apparently the only paper on the hepatics is a list of 30 taxa by M. Fulford (1938)"; EL SALVADOR: is referenced only by a list including 65 species of hepatics (Winkler 1967); HONDURAS: "the longest list of hepatics so far published

. . . 54 taxa listed by Herzog (1951)"; NICARAGUA: "No references found for hepatics or anthocerotus."; PANAMA: the only reference included for hepatics is an abstract by Salazar Allen et al. (1988) reporting the occurrence of 20 species from Barro Colorado Island. Obviously, scattered literature reports of taxa exist for all these countries and there have been contributions dealing with these plants since the closing date of this conspectus. For example, in 1996 Whittemore and Allen published a liverwort/hornwort list of 65 species in 49 genera for Belize. But the fact remains, we have presently a paucity of information regarding the hepatic and anthocerote floristic richness that occurs in Central America. The general underdevelopment of our bryological knowledge for not only Central America, but for all Latin America, has been nicely documented by Matteri (1985).

As we are all aware, survey studies are especially crucial now that the tropical floras are being decimated, primarily by expanding agriculture, throughout much of Latin America. In Panamá, for instance, in 1950 only 15% of the territory was being utilized in one way or another for human activities. This area increased to 27% by 1970 and by 1980 the area exceeded 40% of the territory (Jaén 1985). It is in the forest habitats, of course, where the greatest diversity and biomass of bryophytes occur. Gradstein (1992a) discussed the impact of deforestation and showed pictorially, the changing status of lowland and tropical montane rain forests in all Central America. A discussion on the conservation efforts in the Panamanian premontane and montane rain forests of the Fortuna area is included in his paper on this vanishing habitat (Gradstein 1992b). Presently protected forested areas in Panamá are shown in Figure 1. However, on this map of the National System of Protected Forested Areas

some of the areas shown are presently in the process of being delimited while others not shown are being considered for conservation.

The purpose of this account is twofold. First, to provide a complete list of the Panamanian hepatics and anthocerotus that have been collected and reported in the literature and, second, to authenticate, whenever possible, and to

add to this list, new taxon reports for the country. The following account has been greatly enhanced by the efforts of the participants of the "Seminario Taller las Briofitas, Indicadoras de Biodiversidad" in March, 1996 at the Universidad de Panamá and the Smithsonian Tropical Research Institute (STRI). Further, it is hoped that this composition will be a stimulus for forthcoming

reports on the bryophyte flora of both Panamá and Latin America. With the recent upsurge to catalogue our biodiversity, especially in the American tropics, this important plant component is finally receiving attention.

GEOGRAPHY

A long, narrow, east-west oriented country, Panamá is bordered on the east by Colombia, on the west by Costa Rica, on the north by the Caribbean Sea and on the south by the Pacific Ocean. It is located between 7° 12' 08" and 9° 38' 46" north latitude and 77° 09' 24" and 83° 03' 07" west longitude, has an area of 75,517 Km², and is divided into nine political provinces and the San Blas region (Comarca Kuna Yala) (Fig. 1). On the northern side of the country there are mountain chains of various heights. On the eastern end the mountain range extends from Colombia to the area of the Canal. On the western side the mountain chain is a continuation of the Cordillera of Talamanca. The Cordillera Central, on the western side of the Isthmus is of higher elevation than the mountain ranges (Serranías) of San Blas and Darién except for Cerro Tacarcuna (1,875 m) on the northeastern side. Volcán Barú to the west, close to the Costa Rican border, has an elevation of 3,475 m and is the highest point in the country. On either side of the mountain chain are coastal plains with those of the southern or Pacific side being much more expansive than the coastal plains of the Caribbean side. This difference likewise extends out onto the continental shelf (Terry, 1956). Several isolated mountain systems are also present on the Pacific side, located in the Península de Las Palmas and the Península de Azuero on the west and the mountain ranges of Majé, Sapo and Pirre in southeastern Panamá. According to Rubio (1961) about 87% of Panamá consists of land below 700 m altitude, with about 10% between

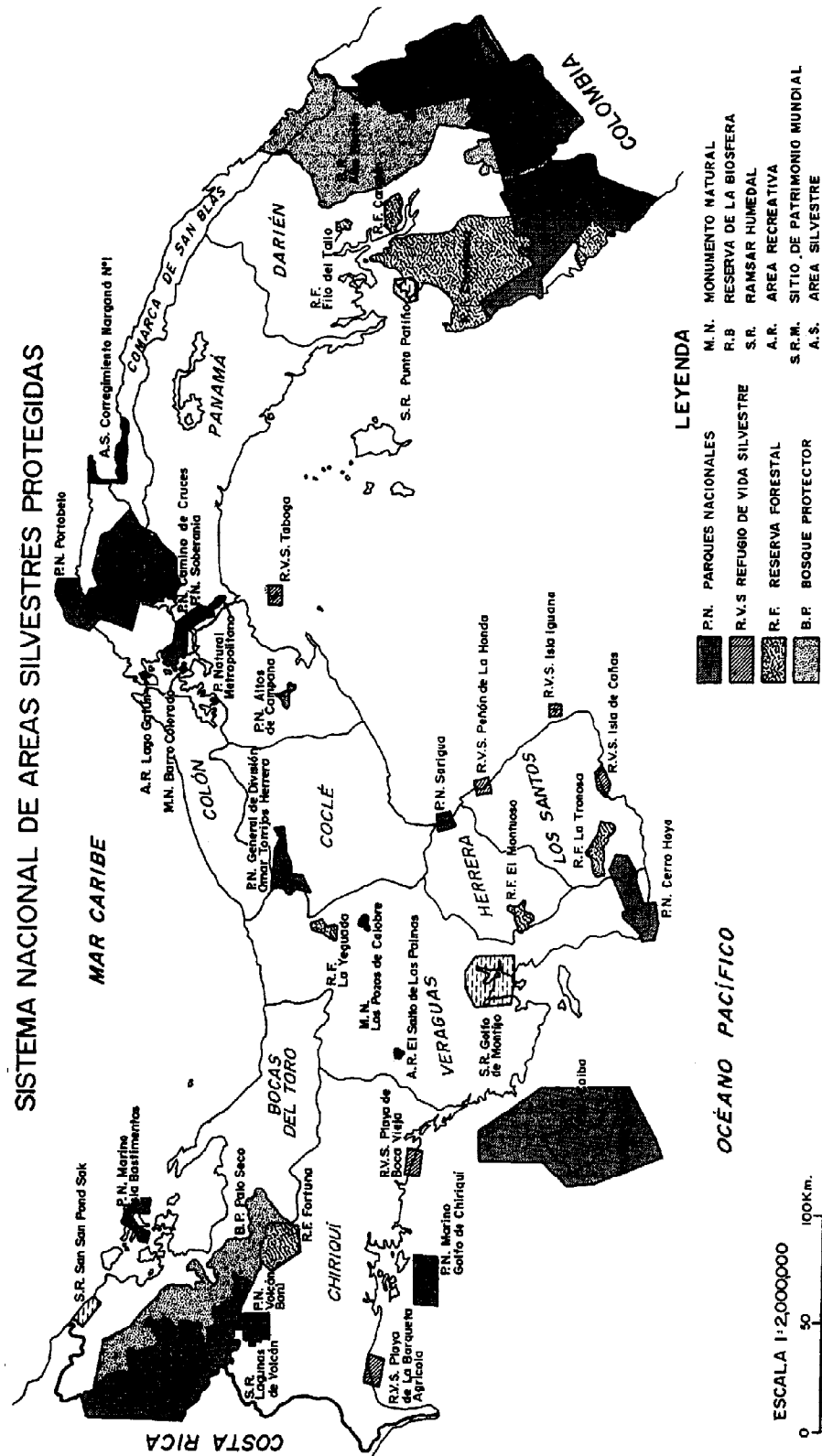


Figure 1. Map of Panamá showing the National System of Protected Forested Areas, the 9 Provinces and the San Blas Region (Comarca Kuna Yala) (INRENARE).

700 m and 1500 m, and 3% of the total land area above 1500 m. The mountainous land above 2500 m is typically of steep slopes and cliffs. The annual temperatures here range between 12° and 14° C and rainfall is between 3000 and 4000 mm, without a definite dry season; the soils are dark. Between 1500 and 2500 m the topography is similar to that above 2500 m, but temperatures are between 14° and 16° C and rainfall ranges from 2500 to 4500 mm yearly with the Atlantic face receiving more than the Pacific. There is no set dry season here and the soils are reddish brown clays. In the regions between 700 and 1500 m, the topography is more complicated with variable slopes and a few high plateaus. Temperatures are more moderate, being between 18° and 24° C with rainfall between 2200 and 4000 mm. Such areas on the Pacific side are drier with a definite dry season occurring during the months of January to April; the soils are dark-red clays. Areas below 700 m can be divided into two regions: a tropical wet region and a tropical dry region. The tropical wet region, which includes the coastal plains on the Caribbean side and most of the eastern half of Panamá, is the most extensive in area with temperatures fluctuating between 20° and 27° C and rainfall from 2000 to above 4000 mm. The soils, formed by igneous materials and sediments, are deep-red clays of low fertility (latosoles or in the process of laterization). The tropical dry region is located on the Pacific coast concentric to the Bay of Parita and extends west toward the border with Costa Rica. The temperatures here are more uniform, ranging between 25° and 27° C and the rainfall is much lower, being between 1000 and 2000 mm with a definite dry season from January to April. The soils are mostly clays of medium to low fertility (Chumico series).

HISTORY OF LIVERWORT / HORNWORT STUDIES IN PANAMA

According to Dwyer (1985), the number of botanists or naturalists having collected plants in Panamá, which were deposited in herbaria, approximates 750. From these collectors the total number of specimens reaches about half a million (not including duplicates) of which roughly half are housed at the Missouri Botanical Garden. Obviously, the most intensive collecting

has been in the past few decades. While the earliest plant collector is credited to be G. F. de Oviedo in 1520 (Barnhart 1928), as far as we are aware, the first specimens of bryophytes were gathered between 1845 and 1851 by Berthold Seemann, naturalist to the expedition of the H. M. S. Herald. These were worked up by Mitten (1854) and constitute the first published report for bryophytes from Panamá. Accounts in the literature since then that have included hepatics number only 84 publications with 34 of these appearing in the past fifteen years. These can be divided into four basic categories. First, over the years, Panamanian specimens have been incorporated into monographic and revisionary studies of various hepatic genera. At the same time, collections from Panamá have likewise been included in various broad based floristic studies, such as Fulford's "Manual of leafy Hepaticae of Latin America" series (1963-1976). A third category consists simply of reports, which list taxa from Panamá exclusively. These range in scope from single taxon reports, exemplified by Clark (1955a), to multiple taxon reports such as the Mitten 1854 publication mentioned above. Finally, one finds mention of Panamanian taxa in ancillary literature, sometimes in rather unlikely places such as the only published report of *Ricciocarpos natans* (L.) Corda for Panamá in the journal *Environmental Entomology* (Balciunas & Center 1981).

As mentioned above, there are nine provinces and the San Blas region (Comarca Kuna Yala) in the Republic of Panamá (Fig. 1). Of these, there have been no published reports specifying an hepatic or anthocerotale taxon from either the Comarca Kuna Yala or the Province of Herrera. Only two hepatics have been published for the Provinces of Bocas del Toro and Veraguas. Three taxa have literature reports from the Province of Los Santos with four for the Province of Colón. There have been just six published taxa for Coclé. Although there are additions for the provinces of Bocas del Toro, Coclé, Colón, Darién, and Veraguas in the following list, until recently collectors of bryophytes very much restricted their activities to the Provinces of Panamá and Chiriquí. A cursory scan through the taxon list reveals that the great majority of the reports are from the

western Province of Chiriquí. Were it not for the recent paper by Gradstein & Salazar Allen (1992) on bryophyte diversity along an altitudinal gradient in Darién National Park there would have been very few taxa recorded from this easternmost province. In fact, in that study 40 of the 89 taxa encountered represented species new to Panamá. Obviously, collecting in other of the neglected provinces will greatly increase our knowledge of the diversity of these plants in a country with high habitat diversity.

METHODOLOGY

Compilation of previous studies can serve as a foundation for future collectors to use in specimen identifications and as a record of floristic changes from past to present and from present to future times. This study was initially based on collections from Panamá reported in the literature, with nearly 200 publications on bryophyte literature having been searched. Of these, well over half were generic revisions or monographs, followed by reports which numbered over 40, while over 20 floras were canvassed. For each taxon encountered from Panamá, the reference source and other available information such as locality, associations and substrate are also recorded and incorporated into the annotated list of taxa. Unfortunately, in many of the articles, these latter data were not provided but only the inclusion "PANAMA" as part of a distribution listing. The taxon list is comprised of information gleaned from published accounts as well as new taxon and specimen records. It is these new reports that, in essence, provide verification for a taxon. While it is realized that most of the taxa in the list are common Central American species, several others warrant such verification. For example, the published report of *Plagiochila asplenioides* (L.) Dumort. by Haynes (1933) is not that species and hence does not appear in this list (*vide* Thiers annotation, *in sched.*). Other literature reports such as that of the holarctic taxa *Metzgeria furcata* (L.) Corda by Mitten (1854) and *Riccardia latifrons* (Lindenb.) Lindenb. by Crum & Arzeni (1953) are in doubt. Moreover, the various *Plagiochila* species records published by Dugas (1929) are also in need of verification or rejection. Likewise, the report of *Preissia quadrata* by Svihla (1942)

is surely an erroneous determination in light of the discussions by Grolle (1980) and Schuster (1992c).

Province localities, when known, are given in upper case. Coordinates for select locations are as follows: Altos de Cerro Azul, 9° 10' N, 79° 25' W; Altos de Campana National Park, 8° 39-44' N, 79° 49-57' W; Barro Colorado Island, 9° 6-11' N, 79° 48-50' W; Boca de Cupe, 7° 24' N, 77° 37' W; Boquete, Palo Alto, 8° 48' N, 82° 24' W; Cerro Jefe, 9° 13' N, 79° 23' W; Cerro Pirre, 7° 56' N, 77° 43' W; Cerro Punta, 8° 51' N, 82° 34' W; El Copé, 8° 26' N, 80° 41' W; El Valle de Antón, 8° 37' N, 80° 8' N; Fortuna, 8° 45' N, 82° 15' W; P.I.L.A., 8° 53' N, 82° 36' W. The herbarium of deposit of specimens, when known, is indicated parenthetically by the standard herbarium acronym. Reports of taxa new to Panamá are marked with an asterisk *. Publications containing reports of hepatics in the literature cited section are given in bold text to differentiate those citations from other general entries, which are in plain text. All author abbreviations follow Brummitt and Powell (1992). The following Latin abbreviations are employed: cf. for *confer*, compare, in the sense of the alignment of a specimen with the probable species name; et al. for *et alii*, and others; p.p. for *pro parte*, in part; s.c. for *sine collecte*, without collector; s.d. for *sine die*, without day, in the sense of calendar date; s.l. for *sine loco*, without place or location; s.n. for *sine numero*, without number; t. for *teste*, on the evidence of, in the sense of identified by. The abbreviation C. Z. = Canal Zone and P.I.L.A. = Parque Internacional La Amistad. Additionally, the following English abbreviations are utilized: Is. for Island, nr for near, and m for meter(s).

GENERAL DISCUSSION

This following checklist includes only 289 taxa; 196 from literature reports and 93 reported here as new to Panamá. Obviously, this does not approximate the extent of the hepatic/anthocerotite flora for this political region. As pointed out above, however, collecting in Panamá has been quite localized. In comparison, Morales (1991) recently published 426 taxa from Costa Rica bordering to the west of Panamá. This, of course, represents a tremendous increase for that country

over the 150 species published in compilations similar to ours about 15 years ago by Cole (1983, 1984) for Costa Rica. Given the habitat diversity, realistic estimates for the Panamanian hepatic/anthocerotite flora should approximate, if not surpass, the number of taxa present in Costa Rica. In contrast, one would never expect the diversity that is seen to the east in Colombia because of sheer area discrepancies and the greater habitat diversity within that country where Gradstein reported 819 taxa in 1979. Regardless, the following list finally brings together scattered records into a single working checklist, updates, corrects, questions and verifies many of the reports to the flora, includes new taxon reports, and is indicative of our knowledge of these plants in Panamá; it represents a new beginning.

AN ANNOTATED LIST OF THE HEPATICS AND ANTHOCEROTES OF PANAMA

- Acrolejeunea emergens* (Mitt.) Steph. var. *emergens* DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; trail El Real-Pirre, Salazar A. & Gradstein 9197, (PMA, U), Gradstein 1994; PANAMA: Madden Dam & nr Alahuela, Dodge 16872 (Fulford ex MO), Gradstein 1975, 1994; Cerro Pirre, Salazar A. & Gradstein 9205, 9197 (PMA)
- **Adelanthus crossii* Spruce BOCAS DEL TORO: P.I.L.A., páramo of Cerro Fábrega, 3150-3353 m, Dauphin 1569 (GOET, INBIO, PMA, U)
- **Adelanthus decipiens* (Hook.) Mitt. CHIRIQUI: Boquete, Palo Alto, 1300-1400 m, on decomposing log, Salazar A. et al. 751 p.p. (PMA)
- **Alobiellopsis dominicensis* (Spruce) Fulford CHIRIQUI: Fortuna, Hornito, 1170 m, on roadside soil bank, Stotler & Crandall-Stotler 3494 (ABSH, PMA)
- Anastrophyllum tubulosum* (Nees) Grolle s.l., s.c., Váña 1984
- **Andrewsianthus jamesonii* (Mont.) Váña CHIRIQUI: on top of Volcán Barú, Allen 9077 (MO)
- Aneura pinguis* (L.) Dumort. PANAMA: C. Jefe, Spörle 1990; Cerro Jefe behind San Pablo Creek of Río Pequení, Chagres National Park, 200 m, on decomposing log, Salazar A. & Chung 5224 (PMA); Cerro Jefe, Spörle 0.9 (PMA)
- Anoplolejeunea conferta* (C. F. W. Meissn.) A. Evans CHIRIQUI: P.I.L.A., Sendero El Retoño, 2460 m, Gradstein 9764 (GOET); Fortuna, 1000 m, on decomposing log, Salazar A. et al. 616a (PMA); DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992
- Aphanolejeunea sicaefolia* (Gottsche) A. Evans s.l., Marino & Salazar Allen 1991 as *Aphanolejeunea* sp.; PANAMA (CANAL ZONE): Barro Colorado Is., Caminos Armour, Wheeler & Zetek, epiphyllous on *Hybanthus prunifolia* and *Psychotria horizontalis*, Marino 14, 15, 16, 19, 20, 21, 22, 23, 24, 25, 26, 29 (PMA)
- **Archilejeunea auberiana* (Mont.) A. Evans PANAMA (CANAL ZONE): Barro Colorado Is., at forest edge nr plantation, Salazar A. & Gradstein 15099 (PMA)
- Archilejeunea fuscescens* (Hampe ex Lehm.) Fulford s.l., Stephani 1912 (Sp. Hep., Vol. V) as *Ptychocoleus juliformis* (Nees) Trevis.
- Archilejeunea ludoviciana* (De Not. ex Lehm.) P. Geissler & Gradst. ssp. *ludoviciana* DARIEN: ridge trail above Cana to Pirre Massif, 800-900 m, Allen 8970 (MO); VERAGUAS: slopes of Cerro Tute, Gentry 6272A (MO, NY, PMA, U), Gradstein 1994
- Archilejeunea parviflora* (Nees) Schiffn. DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; base of Cerro Pirre, Salazar A. & Gradstein 9227 (PMA, U), Gradstein 1994; PANAMA (CANAL ZONE): Barro Colorado Is., Chung & Aranda 238, 243 (PMA, NY), Gradstein 1994; Barro Colorado Is., Sendero T. Barbour 27-28, on rocks and tree trunk bases and twigs along rivulets, Salazar A. 4424, 4426 (PMA)
- Asterella lateralis* M. Howe CHIRIQUI: Boquete, Svihla 40429, 40432, 40434, Svihla 1942
- **Bazzania arcuata* (Lindenb. & Gottsche) Trevis. CHIRIQUI: Cerro Pando, on the Costa Rican border 16 km NW of El Hato del Volcán, 2000-2482 m, Mori & Bolten 7316 (MO, PMA); DARIEN: Summit of Pirre Massif, 1200-1350 m, Allen 8864 (MO); PANAMA: nr Cerro Campana,

Stimson 5407 (MO)

Bazzania bidens (Nees) Trevis. CHIRIQUI: El Volcán, *Chickering s.n.* (MICH), Crum & Arzeni 1953

Bazzania breuteliana (Lindenb. & Gottsche) Trevis. s.l., Jovet-Ast 1957; CHIRIQUI: El Volcán, *Chickering s.n.* (MICH), Crum & Arzeni 1953; PANAMA: C. Jefe, Spörle 1990; Cerro Pirre, 800-1150 m, on bark of tree, *Salazar A. & Gradstein 9302* (PMA)

**Bazzania gracilis* (Hampe & Gottsche) Steph. PANAMA: Altos de Campana National Park, Sendero de Interpretación, 850 m, *Salazar A., Gradstein & Chung 9447* (PMA)

**Bazzania heterostipa* (Steph.) Fulford DARIEN: Summit of Pirre Massif, 1200-1350 m, *Allen 8898* (MO)

Bazzania hookeri (Lindenb.) Trevis. CHIRIQUI: Fortuna, Spörle 1990; Fortuna, Hornito, *Spörle 1.18* (PMA); Valle de la Sierpe along Quebrada Bonita heading SE, 1050 m, on decomposing tree, *Salazar A. et al. 5079* (PMA); DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992 as *Bazzania robusta* Spruce; PANAMA: Cerro Jefe, ca 1000 m, on bark of trees, *Salazar A. et al. 9447* (PMA)

**Bazzania longa* (Nees) Trevis. CHIRIQUI: Fortuna, 1000 m, on decomposing log, *Salazar A. et al. 616a, 628*, (PMA); Fortuna, Hornito, 1000-1200 m, on decomposing log, *Salazar A. 698* (PMA); COCLE: ca 2 km W of Cerro Pilón, *Croat 37464* (MO); above El Potroso, *Sytsma 1776* (MO)

**Bazzania longistipula* (Lindenb.) Trevis. PANAMA: Cerro Jefe, creek on lateral road to INTEL tower, 900 m, on bark, *Salazar A. & Gradstein 9416* (PMA)

Bazzania spruceana Steph. PANAMA: C. Jefe, Spörle 1990; Cerro Jefe, 900-1000 m, on bark, *Salazar A. et al. 5201* (PMA)

Bazzania stolonifera (Sw.) Trevis. CHIRIQUI: Holcomb Trail, *Cornman 3139, 3158* (MO), Fulford 1963; Fortuna, Hornito, *Spörle 1.18.2* (PMA); nr Cerro Colorado Copper Mine, *Croat 33223* (MO); Cerro Pando on the Continental Divide, 2000-2482 m, on tree trunk, *Mori & Bolten 7313* (MO, PMA); COCLE: Above El Potroso sawmill at Continental Divide, premontane forest,

1200-1300 m, *Sytsma 1789* (MO, PMA); DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro Pirre, *Salazar A. & Gradstein 9303* (PMA); Serranía de Pirre, *Croat 37853* (MO); PANAMA: C. Jefe, Spörle 1990; Cerro Jefe, 900-1000 m, on bark of tree, *Salazar A. et al. 5236* (PMA); nr Cerro Jefe, *Lewis & Dressler 7606* (MO); Cerro Jefe, *Knapp 3514* (MO); VERAGUAS: Slopes of Cerro Tute, 1200-1400 m, on fallen tree, *Gentry 6272B* (MO, PMA)

**Bazzania teretiuscula* (Lindenb. & Gottsche) Trevis. CHIRIQUI: Boquete, Palo Alto, 1300-1400 m, on soil, *Salazar A. et al. 757* (PMA); Fortuna, NW of camping site, 1000-1200 m, on decomposing log, *Salazar A. 628* (PMA)

**Bryopteris diffusa* (Sw.) Nees DARIEN: 1.5 mi along trail to Boca de Cupe from Cana, *Allen 8927A, 8938* (MO)

⁶*Bryopteris flaccida* Lindenb. & Hampe COCLE: Antón, El Valle, along Río Indio, 500-700 m, *Dodge & Hunter 413* (MO), Stotler & Crandall-Stotler 1974; PANAMA: Sabana, nr Chepo, 30 m, *Dodge & Hunter 416* (MO); PANAMA (CANAL ZONE): Colorado Is., *Willis 5d-3* (F)

Bryopteris fruticulosa Taylor ssp. *fruticulosa* s.l., Nagashima et al. 1994 as *B. filicina*; s.l., Taylor 1104-1106 (hb. Fulford); Quebrada "Bonita," *Steyermark & Allen 172044* (MO); Dexter's trail to the divide, *Cornman 3095* (MO); "Calovébora," *Nodenskiold s.n.* (SPA), Stotler & Crandall-Stotler 1974; CHIRIQUI: Río David, Bois de Boquete, *Fr. Héllion s.n.* (NY, PR); nr Boquete, "Holcomb," *Cornman 3136* (MO); "Holcomb trail," *Cornman 3178* (MO), Stotler & Crandall-Stotler 1974; nr David, *Héllion s.n.* (NY); N of Audubon Cabin, *Croat 13616A* (MO, U), Gradstein 1994 as *B. filicina*; Fortuna, epiphyte, *Spörle & Aranda 1.39* (PMA); COCLE: road Llano

⁶ In addition to *B. diffusa*, one of us (RS) recognizes four species of *Bryopteris* in Panamá (*B. filicina* excluded) while another (SRG) recognizes these four - *B. flaccida*, *B. fruticulosa*, *B. liebmanniana*, and *B. trinitensis*, to be synonyms of *Bryopteris filicina*.

Grande-Coclesito km 7, *Antonio 1385, 1401* (MO, U), Gradstein 1994 as *B. filicina*; Antón, El Valle, Río Antón, ca 500 m, *Dodge & Hunter 421* (MO); El Valle de Antón, *Brako 8435* (NY); El Copé, cloud forest, epiphyte on living tree, *Salazar A. et al. 1491* (PMA); DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992 as *B. filicina* (Sw.) Nees; SW of Boca de Cupe, *Allen 8689* (MO, NY, U); Cruce de Mono, *Allen 8634* (MO); Cerro Pirre, *Salazar A. & Gradstein 9211, 9244* (PMA, U); Cerro Sapo, *Hammel 1247, 7296* (MO, U), Gradstein 1994 as *B. filicina*; s.l., *Gentry M-9* (MO); PANAMA: Cerro Campana, *Stimson 5395, 5417* (US), *Salazar A. & Gradstein s.n.* (PMA, U), Gradstein 1994 as *B. filicina*; *Lewis et al. 3273* (MO); PANAMA (CANAL ZONE): Colorado Is. *Willis 5a, 5b, 5c* (F); Barro Colorado Is. in Gatún Lake, ca. 120 m, *Standley 40883* (F); Pedro Miguel, *Cornman 3031* (F); Las Cascadas, *Dodge & Hunter s.n.* (MO); vicinity of Juan Mina, Chagres River, *Bartlett & Lasser 16870* (MICH), Stotler & Crandall-Stotler 1974; VERAGUAS: Cerro Tute W of Santa Fé, *Knapp & Sytsma 2477* (MO, U), Gradstein 1994 as *B. filicina* [NOTE: according to one of us (RS) it is assumed that the *B. filicina* reports (with the exception of Mendoza and Troll (see *B. liebmanniana* and *B. trinitensis* below) are likely *B. fructiculosa* since it is the species of common occurrence in Central America, *B. filicina* s. str. being restricted to the West Indies and Brazil.]

Bryopteris liebmanniana Lindenb. & Gottsche
CHIRIQUI: nr Dexter's Brook, *Cornman 3081* (MO), Stotler & Crandall-Stotler 1974; BOCAS DEL TORO: s.l., *Mendoza 1610* (PMA, NY), Gradstein 1994 as *B. filicina*; Hydroelectric Project Teribe, Cloud forest, 2000 m, *Mendoza 1610* (PMA); COCLE: above El Valle, *Gentry 5673* (MO); DARIEN: ca 20 km SSW of Boca de Cupe, ca 200 m, *Allen 8656, 8689* (MO)

Bryopteris trinitensis (Lehm. & Lindenb.) Lehm. & Lindenb. s.l., *Willis 134* (F); CHIRIQUI: Dexter's trail to the divide, *Cornman 3093* (MO); Plateau above Boquete, *Cornman 3162* (MO); COCLE: nr El Copé, *Knapp &*

Dressler 3475 (MO); LOS SANTOS: Península de Azuero, Cerro Canajagua, 950 m, *Troll s.n.* (C, F, MO, NY, PR, S-PA, US, W, hb. Fulford), Stotler & Crandall-Stotler 1974; *Troll s.n. Hepaticae Sel. et Crit. (ed. Verdoorn) 47* (NY, U), Gradstein 1994 as *B. filicina*; PANAMA: Cerro Campana, on banks of creek, on rock, *Garibaldi 140* (PMA); Cerro Campana, *Crosby 4359* (MO); PANAMA (CANAL ZONE): Quebrada Salamanca, 70 m, *Dodge et al. 17023, 17027* (MO); Nuevo Limón, *Maxon 6869* (US), Stotler & Crandall-Stotler 1974

Calypogeia caespitosa (Spruce) Steph.
DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992

**Calypogeia cyclostipa* (Spruce) Steph.
CHIRIQUI: Fortuna, Hornito, 1000-1200 m, on decomposing log, *Salazar A. 698* (PMA); DARIEN: Cerro Pirre, 1200-1300 m, on bark of trees, *Salazar A. & Gradstein 9272* (PMA)

**Calypogeia grandistipula* (Steph.) Steph.
VERAGUAS: Close to river Calovébora, area of El Guabal, on decomposing log along creek, *Salazar A. 380* (PMA)

Calypogeia lechleri (Steph.) Steph. DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro Pirre, 1200-1300 m, on bark of tree, *Salazar A. & Gradstein 9273, 9274* (PMA)

Calypogeia miquelii Mont. DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro Pirre, 400-500 m, on soil, *Salazar A. & Gradstein 9231* (PMA)

Calypogeia peruviana Nees & Mont.
CHIRIQUI: Fortuna, Hornito, 1000 m, on decomposing log, *Salazar A. et al. 615b* (PMA); on stump, *Stotler & Crandall-Stotler 3498* (ABSH); Fortuna Dam site, *Folsom et al. 5405C* (MO); DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro Pirre, 1200-1300 m, on bark of tree, *Salazar A. & Gradstein 9304, 9305* (PMA); ridge trail above Cana to Pirre Massif, 800-900 m, *Allen 8986* (MO)

**Calypogeia subintegra* (Gottsche, Lindenb. & Nees) Bischl. CHIRIQUI: P.I.L.A., 2462 m, on log along trail to Cerro Punta, *Stotler & Crandall-Stotler 3496* (ABSH)

Caudalejeunea lehmanniana (Gottsche) A. Evans
COCLE: El Copé epiphyte, *Meijer*

- 173 (PMA); DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro Pirre between Pirre 1 and Pirre 2, 50 m, on bark of tree, *Salazar A. & Gradstein 9208* (PMA); Cerro Pirre, 1200-1300 m, on bark, *Salazar A. & Gradstein 208* (PMA); PANAMA (CANAL ZONE): Barro Colorado Is., Machado 32 (NY), Gradstein 1994; Barro Colorado Is., Wetmore trail 15-16, on branch, *Salazar A. et al. 5959* (PMA); Barro Colorado Is., Camino Balboa, *Salazar A. 4346a* (PMA); Barro Colorado Is., Camino Wheeler 4-5, *Salazar A. 4741* (PMA)
- Cephalozia crassifolia*** (Lindenb. & Gottsche) Fulford CHIRIQUI: Fortuna, Hornito, rotten wood, *Gradstein 9775* (GOET); DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro Pirre, 1200-1300 m, on bark of tree, *Salazar A. & Gradstein 9275, 9276* (PMA); Summit of Pirre Massif, 1200-1350 m, *Allen 8886* (MO)
- ****Cephaloziella granatensis*** (J. B. Jack) Fulford BOCAS DEL TORO: P.I.L.A., páramo of Cerro Fábrega, 3150-3353 m, *Dauphin 1548* (GOET, INBIO, PMA, U), *Dauphin 1550* (PMA)
- Ceratolejeunea cornuta*** (Lindenb.) Schiffn. CHIRIQUI: Santa Marta, Bugaba, on palm tree, *Vinda 1517* (PMA); COCLE: La Mesa, El Valle de Antón, epiphyte, *Salazar A. et al. 1379* (PMA); DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro Pirre, 400-500 m, on fallen tree, *Salazar A. & Gradstein 9233* (PMA); PANAMA: Altos de Campana National Park, Sendero de Interpretación, premontane forest, 800-900 m, *Salazar A. et al. 6842* (PMA); PANAMA (CANAL ZONE): Barro Colorado Is., Quebrada R. Shannon, epiphyll on *Hybanthus prunifolius* and *Psychotria horizontalis*, *Marino 9, 32* (PMA); Barro Colorado Is., Camino Lutz, *Shattuck 568 p.p.* (F)
- Ceratolejeunea cubensis*** (Mont.) Schiffn. s.l., Schuster 1980; COCLE: River Antón, *Hunter & Allen s.n.* (MO), Fulford 1945; PANAMA (CANAL ZONE): C. Z. Experimental Gardens, Summit, *Chickering s.n.* (MICH), Crum & Arzeni 1953; Barro Colorado Is., Brook 2 and 3, AVA and Zetek, on vine and bark, *Willis 5d, 7c, 30d, 54c, 54f* (MO)
- Ceratolejeunea dentato-cornuta*** Steph. DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro Pirre, 1200-1300 m, on bark of tree, *Salazar A. & Gradstein 9279* (PMA)
- Ceratolejeunea fallax*** (Lehm. & Lindenb.) Bonner s.l., Fulford & Sharp 1990
- Ceratolejeunea fastigiata*** (Spruce) Steph. DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro Pirre, 1000-1100 m, epiphyll, *Salazar A. & Gradstein 9246* (PMA)
- ****Ceratolejeunea flagelliformis*** (Steph.) Fulford CHIRIQUI: Fortuna, Hornito, 1000-1200 m, on bark of trees, *Salazar A. 2544* (PMA)
- Ceratolejeunea guianensis*** (Nees & Mont.) Steph. PANAMA (CANAL ZONE): C. Z. Experimental Gardens, Summit, *Chickering s.n.* (MICH), Crum & Arzeni 1953 [This is likely misidentified *C. laetefusca* (Austin) R. M. Schust.]
- Ceratolejeunea laetefusca*** (Austin) R. M. Schust. DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro Pirre, 900 m, on bark of tree, *Salazar A. & Gradstein 9245, 9212* (PMA); PANAMA (CANAL ZONE): Barro Colorado Is., *Shattuck 568 p.p.*, Haynes 1933 as *C. integrifolia* A. Evans; Barro Colorado Is., *Shattuck 568*, Fulford 1945 as *C. guianensis* (Nees & Mont.) Steph.; Barro Colorado Is., *Shattuck 4 CH* (F)
- Ceratolejeunea maritima*** (Spruce) Steph. s.l., Jovet-Ast 1957; s.l., Gradstein 1993; CHIRIQUI: Fortuna, Hornito, 1000 m, on decomposing log, *Salazar A. et al. 595, 615b, 616a, 662* (PMA); nr town of El Hato, *Stern & Chambers 70, 71* (PMA); COLON: Chico Trail, Río Indio, *Steyermark & Allen 17451* (MO), Fulford 1945; DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992 as *C. cf. maritima*; Cerro Pirre, 1200-1300 m, on bark of tree, *Salazar A. & Gradstein 9277* (PMA); Guayabo Chiquita, *Stern & Chambers 200* (MO); Punta Guayabo Grande y Punta Guayabo Chiquita, *Stern & Chambers 206* (MO); PANAMA: Cerro Jefe, 2 km towards the top of Cerro Jefe, on the south side, epiphyte on tree, *Martinez 880* (PMA); Cerro

- Jefe, Salazar A. & Gradstein 9405 (PMA); PANAMA (CANAL ZONE): Barro Colorado Is., s.c., Haynes 1933 as *C. schwaneckeii* Steph.; Barro Colorado Is., Shattuck 2CH (F)
- **Ceratolejeunea megalophysa* (Spruce) Steph. CHIRIQUI: Boquete, Palo Alto, 1300-1400 m, on decomposing log, Salazar A. et al. 751 (PMA); PANAMA: W of Quebrada Salamanca, 70 m, Dodge, Steyermark & Allen 17092 (MO)
- Ceratolejeunea spinosa* (Gottsche) Steph. CHIRIQUI: Fortuna, Hornito, Spörle s.n. (PMA); DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992
- Ceratolejeunea variabilis* (Lindenb.) Schiffn. CHIRIQUI: s.d., Miliou 424 (G), Bonner 1953
- Ceratolejeunea* sp. DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992 as *C. patentissima* (Hampe & Gottsche) A. Evans (according to one of us, SRG, the determination of this sterile collection remains unresolved); PANAMA: Cerro Jefe, Spörle 1990
- **Cheilolejeunea acutangula* (Nees) Grolle CHIRIQUI: Fortuna, Hornito, 1000-1200 m, on decomposing log, Salazar A. et al. 560 p.p. (PMA); COLON: Playa Langosta, on decomposing log of Combretaceae, Salazar A. 868 (PMA)
- Cheilolejeunea adnata* (Kunze ex Lehm.) Grolle s.l., Jovet-Ast 1957 as *C. decidua* (Spruce) A. Evans; PANAMA: Bayano, Maje Is., on bark of Myrcinaceae, Salazar A. 733 (PMA); PANAMA (CANAL ZONE): Barro Colorado, Chickering s.n. (MICH), Crum & Arzeni 1953 as *C. decidua*; Barro Colorado Is., nr laboratory, on trunk of tree, Salazar A. & Chung 4728 (PMA); Barro Colorado Is., Camino F. Miller 24-25, on bark of tree, Salazar A. & Chung 4508 (PMA)
- Cheilolejeunea clausa* (Nees & Mont.) R. M. Schust. CHIRIQUI: El Volcán, Chickering s.n. (MICH), Crum & Arzeni 1953 as *Euosmolejeunea clausa* (Nees & Mont.) A. Evans
- Cheilolejeunea decurviloba* (Steph.) X.-L. He PANAMA: Cerro Jefe, ca. 1000 m, Salazar A. & Gradstein 9385 (573682 B, G-417124), nr Panama City, on smooth bark of small trees in open, ca. 1000 m, 1994 Gradstein, He 1996; above Altos de Cerro Azul down towards Río Chagres, 700-850 m, Allen 9035 (MO)
- **Cheilolejeunea inflexa* (Hampe ex Lehm.) Grolle CHIRIQUI: Fortuna, NE of camping site, 1000-1200 m, on rock, Salazar A. 700 p.p. (PMA)
- Cheilolejeunea rigidula* (Nees & Mont.) R. M. Schust. s.l., Gradstein 1993; CHIRIQUI: El Volcán, Chickering s.n. (MICH), Crum & Arzeni 1953 as *Euosmolejeunea duriuscula* (Nees) Steph.; DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro Pirre, trail to Pirre 2, 50 m, on bark of palm, Salazar A. & Gradstein 9200 (PMA); PANAMA (CANAL ZONE): Barro Colorado Is., Shattuck 568 p.p., Haynes 1933 as *E. duriuscula*; Barro Colorado Is., Shattuck 4CH p.p. (F); Barro Colorado Is., Camino F. Miller, on tree trunks ca 1.5 m from base, Salazar A. & Chung 4538 (PMA); Camino J. van Tyne-Big Trees, on "giant tree," Salazar A. & Chung 4627b (PMA); Camino Fairchild 1 & 17-18, on tree bark, Salazar A., Chung & Santamaría 6035, 6079 (PMA); Panama City, Gradstein 7886 (MO)
- **Cheilolejeunea trifaria* (Reinw., Blume & Nees) Mizut. DARIEN: ca 20 km SSW of Boca de Cupe, ca 200 m, Allen 8651 (MO); Cruce de Mono, Allen 8782 (MO); PANAMA: Altos de Campana National Park, Sendero de Interpretación, Salazar A. & Gradstein 9454 (PMA)
- **Cololejeunea cardiocarpa* (Mont.) A. Evans PANAMA (CANAL ZONE): Barro Colorado Is., Quebrada R. Shannon, epiphyll on *Hybanthus prunifolius* and *Psychotria horizontalis*, Marino 7, 29 p.p. (PMA); Poachers Peninsula, irrigation plot 1, Salazar A. & Chung 7279 (PMA)
- **Cololejeunea obliqua* (Nees & Mont.) Schiffn. PANAMA (CANAL ZONE): Barro Colorado Is., Quebrada R. Shannon, epiphyll on *Hybanthus prunifolius* and *Psychotria horizontalis*, Marino 4, 37, 38 (PMA)
- **Cololejeunea planifolia* (A. Evans) R. M. Schust. PANAMA (CANAL ZONE): Barro Colorado Is., Caminos Armour, Wheeler & Zetek, epiphyll on *Hybanthus prunifolius*

- and *Psychotria horizontalis*, Marino 14, 17, 24, 29 p.p. (PMA); Barro Colorado Is., Camino F. Miller, epiphyll, Salazar A. & Chung 4530 (PMA)
- Cololejeunea verwimpia*** P. Tixier PANAMA (CANAL ZONE): Barro Colorado Is., Zetek, s.c. (F), Tixier 1991
- Cololejeunea*** sp. PANAMA (CANAL ZONE): Barro Colorado Is., s.c., Haynes 1933 as *Leptocolea* sp. growing on an orange leaf
- Colura tortifolia*** (Mont. & Nees) Trevis. DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; PANAMA (CANAL ZONE): Barro Colorado Is., Caminos Armour, Wheeler & Zetek, epiphyll on *Hybanthus prunifolius* and *Psychotria horizontalis*, Marino 18, 33 (PMA)
- ****Cryptochila grandiflora*** (Lindenb. & Gottsche) Grolle BOCAS DEL TORO: P.I.L.A., páramo of Cerro Fábrega, 3150-3353 m, Dauphin 1575 (GOET, INBIO, PMA, U)
- Cyathodium cavernarum*** Kunze ex Lehm. s.l., Salazar Allen 1994; VERAGUAS: Isla Coiba, tail from hot springs into hills, 200 ft., on wet slopes at edge of small stream, Antonio 2366 (PMA)
- Cyathodium*** cf. *spruceanum* Prosk. s.l., Salazar Allen 1994
- Cyclolejeunea chitonia*** (Taylor) A. Evans DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro Pirre, 800-1150 m, epiphyll on palm, Salazar A. & Gradstein 9252 p.p., 9247 (PMA)
- Cyclolejeunea convexistipa*** (Lehm. & Lindenb.) A. Evans DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro Pirre, 400-500 m, epiphyll on palm, Salazar A. & Gradstein 9234 (PMA); PANAMA: Chagres National Park, Altos de Cerro Azul, 800 m, on bark, Gradstein 9783b (GOET); Altos de Campana National Park, Sendero de Interpretación, 850 m, on branches of trees, Salazar A. et al 9431 (PMA)
- Cyclolejeunea peruviana*** (Lehm. & Lindenb.) A. Evans PANAMA: C. Jefe, Spörle 1990; Cerro Jefe, epiphyll on trees along creek of Río San Cristóbal, Salazar A. et al. 5243 (PMA); DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro Pirre, 400-500 m, epiphyll, Salazar A. & Gradstein 9235, 9236 (PMA)
- ****Cyrtolejeunea holostipa*** (Spruce) A. Evans PANAMA: Altos de Campana National Park, Sendero de Interpretación, 850 m, Salazar A. et al. 9447 (PMA)
- Cystolejeunea lineata*** (Lehm. & Lindenb.) A. Evans DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; PANAMA: Cerro Jefe, NE of the INTEL tower, 900-1000 m, on bark and petiole of palm frond and branches of trees 5 feet from ground, Valdespino & Aranda 160a, Salazar A. et al. 4027, 4030, 4031 (PMA)
- ****Dendroceros crispus*** (Sw.) Nees PANAMA: Altos de Campana National Park, on tree, Salazar A. et al. 9435 (PMA)
- Dicranolejeunea axillaris*** (Nees & Mont.) Schiffn. s.l., *Hélion s.n.* 1906 (NY); CHIRIQUI: *Hélion 434*, s.d. (G 22640), *Hélion 119 bis* (G 22639), Kruijt 1988; David, *Hélion 119*, 434 (G), Cerro Punta, Salazar A. 5253 (PMA, U), Gradstein 1994; Cerro Punta, on route to Las Nubes, 1500 m, on fern rhizome, Salazar A. 515 (PMA)
- Diplasiolejeunea brunnea*** Steph. DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992
- Diplasiolejeunea cavifolia*** Steph. DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro Pirre, 100 m, epiphyll, Salazar A. & Gradstein 9253 (PMA)
- Diplasiolejeunea pellucida*** (C. F. W. Meissn.) Schiffn. var. *pellucida* s.l., Jovet-Ast 1957; DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro Pirre, between Pirre 1 and Pirre 2, Salazar A. & Gradstein 9235 p.p. (PMA); PANAMA (CANAL ZONE): Barro Colorado, on leaves, *Chickering s.n.* (MICH), Crum & Arzeni 1953
- Diplasiolejeunea pellucida*** (C. F. W. Meissn.) Schiffn. var. *malleiformis* A. Evans PANAMA (CANAL ZONE): Barro Colorado, on leaves, *Chickering s.n.* (MICH), Crum & Arzeni 1953
- Diplasiolejeunea rudolphiana*** Steph. s.l., Stephani 1916; s.l., Schuster 1980; s.l., s.c., (G 19385), Reyes 1982; DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro Pirre, between Pirre 1 and Pirre 2, 50 m, on bark of tree, Salazar A. & Gradstein 9204 (PMA); PANAMA (CANAL ZONE): C. Z.

- Forest Preserve, on tree, *Chickering s.n.* (MICH), Crum & Arzeni 1953
- **Diplasiolejeunea unidentata* (Lehm. & Lindenb.) Schiffn. PANAMA (CANAL ZONE): Barro Colorado Is., Quebrada R. Shannon, epiphyll on *Hybanthus prunifolius* and *Psychotria horizontalis*, Marino 2, 8, 36 (PMA)
- Drepanolejeunea bidens* Steph. DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro Pirre, 800-1150 m, Salazar A. & Gradstein 9249 (PMA); PANAMA (CANAL ZONE): Barro Colorado, *Chickering s.n.* (MICH), Crum & Arzeni 1953 [According to Bischler (1967) this species occurs at altitudes of 500-3000 m. This BCI record is therefore most likely an error.]
- Drepanolejeunea cf. crucianella* (Taylor) A. Evans PANAMA: C. Jefe, Spörle 1990; Cerro Jefe, epiphyll on trees along creek of Río San Cristóbal, Salazar A. et al. 5243 (PMA)
- Drepanolejeunea dissitifolia* A. Evans DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro Pirre, 400-500 m, Salazar A. & Gradstein 9236 (PMA)
- Drepanolejeunea inchoata* (C. F. W. Meissn.) Steph. DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro Pirre, 1200-1300 m, Salazar A. & Gradstein 9284 (PMA)
- Drepanolejeunea lichenicola* (Spruce) Steph. CHIRIQUI: Palo Alto, Boquete, on decomposing log, Salazar A. et al. 767 (PMA); DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992
- Drepanolejeunea mosenii* (Steph.) Bischl. s.l., s.d., s.c., 29 et 31 (PR), Bischler 1967
- Drepanolejeunea pinnatiloba* Schiffn. DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro Pirre, 1200-1300 m, Salazar A. & Gradstein 9281 (PMA)
- Dumortiera hirsuta* (Sw.) Nees ssp. *hirsuta* s.l., Mitten 1854; s.l., Evans 1919; s.l., Schuster 1992b; BOCAS DEL TORO: lower Changuinola River, Lewis et al. 900 (MO); CHIRIQUI: nr Boquete, Holcomb Trail, Cornman 3134 (F, MO), 3135 (F); Boquete, Svihla 40403, Svihla 1942; Fortuna, 1000 m, on soil banks of creek, Salazar A. et al. 609 (PMA); Volcán, El Aguacatal, 2100 m, on rock in Caldera River, Salazar A. 1175 (PMA); COCLE: La Mesa, El Valle de Antón, Salazar A. et al. 1388 (PMA); PANAMA (CANAL ZONE): Barro Colorado, *Chickering s.n.* (MICH), Crum & Arzeni 1953; Culebra Island, Welch 19682 (PMA)
- Dumortiera hirsuta* (Sw.) Nees ssp. *nepalensis* (Taylor) R. M. Schust. BOCAS DEL TORO: 15 km S of Changuinola, Antonio 3109 (MO); COCLE: El Valle de Antón, Río Las Mozas, 500 m, on rocks along river, Salazar A. et al. 13478 p.p. 13484 (PMA); DARIEN: Trail from Cana to Cruce de Mono, 160-300 m, Allen 9016 (MO); PANAMA (CANAL ZONE): Barro Colorado, *Chickering s.n.* (MICH), Crum & Arzeni 1953 as *D. nepalensis* (Taylor) Nees
- Echinocolea asperrima* (Spruce) R. M. Schust. CHIRIQUI: Fortuna, 1000 m, on decomposing log, Salazar A. et al. 577 (PMA); DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro Pirre, forest around INRENARE station at foothills of Cerro Pirre, 100 m, base of trunk, Salazar A. & Gradstein 9213 p.p. (PMA)
- Echinocolea dilatata* (A. Evans) R. M. Schust. DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro Pirre, above Rancho Mojado, 1000 m, on *Cephaelis*, Salazar A. & Gradstein 9259 p.p. (PMA)
- **Fossombronia brasiliensis* Steph. PANAMA: Altos de Cerro Azul, Sendero El Cantar, on exposed soil bank intermixed with mowed grass, Stotler & Crandall-Stotler 3482 (ABSH, PMA)
- **Frullania apiculata* (Reinw., Blume & Nees) Nees CHIRIQUI: Fortuna, SW of camping site, 1000-1270 m, on decomposing trunk, Salazar A. et al. 645 (PMA)
- Frullania arecae* (Spreng.) Gottsche s.l., amongst *F. cucullata* Lindenb. & Gottsche, Mitten 1854 as *F. hians* Lehm. & Lindenb.; CHIRIQUI: Cerro Punta, Guadalupe, Vinda 1566 (NY), Yuzawa 1991
- Frullania bicornistipula* Spruce CHIRIQUI: Fortuna, Spörle 1990; Fortuna, Hornito, Spörle 1.17, 1.42 (PMA); Fortuna, Hornito, 1150-1245 m, on dead tree branch, Salazar A. et al. 6338 (PMA)
- Frullania brasiliensis* Raddi s.l., Stephani 1911

- as *F. panamana* Steph. [Type: Panamá]; s.l., Wagner (G), Stotler 1970; s.l., Clark & Svihla 1948; CHIRIQUI: Boquete, *Svihla 40446*, Clark & Svihla 1944; Dexter's Brook, *Cornman 3077* (F); Watson's Indian country, *Cornman 3063* (F); Las Cumbres, Cerro Punta, 8000-8250 ft., on decomposing log, *Salazar A. 1055b* (PMA); PANAMA: Taboga, *Seemann s.n.* (NY), Stotler 1970; nr the village of Cruces, growing with *F. cucullata* Lindenb. & Gottsche, Mitten 1854; PANAMA (CANAL ZONE): C. Z. Experimental Gardens, on trunk of royal palm, *Meyer 124* (TENN), Crum & Arzeni 1953
- **Frullania caulisequa* (Nees) Nees PANAMA (CANAL ZONE): Barro Colorado Is., Camino Wheeler 5-6, on decaying logs and branches, *Salazar A. & Chung 4737b* (PMA)
- Frullania confertifolia* Steph. s.l., Stephani 1910 [Syntype: Panamá]
- Frullania convoluta* Lindenb. & Hampe s.l., Stephani 1911; s.l., Clark & Svihla 1948; BOCAS DEL TORO: P.I.L.A., páramo of Cerro Fábrega, 3150-3353 m, *Dauphin 1546* (GOET, INBIO, PMA, U)
- Frullania cucullata* Lindenb. & Gottsche s.l., Clark & Svihla 1948; s.l., Schuster 1992a; CHIRIQUI: Boquete, *Svihla 40-402, 40-411, 40-416, 40-424, 40-438, 40-444*, Clark & Frye 1945; PANAMA: nr the village of Cruces, on trees, growing intermixed with *F. thuilleri* Nees (see *F. nodulosa*), Mitten 1854; PANAMA (CANAL ZONE): Juan Mina, on trunks of grapefruit trees, *Meyer 98, 221* (TENN), Crum & Arzeni 1953
- Frullania ecuadorensis* Steph. PANAMA: nr Juan Diaz, *Cornman 3022* (MO), Stotler 1970
- **Frullania ericoides* (Nees) Mont. PANAMA: Paraíso recreation park, on bark of tree, *Vinda 311* (PMA)
- Frullania falciloba* (Hook. & Taylor) Lehm. PANAMA: nr the village of Cruces, on trees, Mitten 1854 [This is surely misidentified; *F. falciloba* is an Australasian species and there are no modern reports from the neotropics.]
- Frullania gibbosa* Nees s.l., Arnell 1959; DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro Pirre, between Pirre 1 and Pirre 2, 50 m, on bark of tree, *Salazar A. & Gradstein 9203* (PMA); ca 20 km SSW of Boca de Cupe, ca 200 m, *Allen 8667* (MO); Cruce de Mono, *Allen 9176* (MO); Pirre Massif, *Allen 8770* (MO); PANAMA (CANAL ZONE): Barro Colorado Is., *Shattuck 569 p.p.*, Haynes 1933; Barro Colorado Is., *Shattuck 569*, Clark 1956; Barro Colorado Is., Lutz trail, *Shattuck 569 p.p.* (F)
- **Frullania gymnotis* Nees & Mont. DARIEN: ridge trail above Cana to Pirre Massif, 800-900 m, *Allen 8984* (MO)
- Frullania intumescens* (Lehm. & Lindenb.) Lehm. & Lindenb. s.l., s. c. (F), Stotler 1970; CHIRIQUI: Caldera, on bark of tree, *Salazar A. et al. 881* (PMA); Boquete, Palo Alto, 1300-1400 m, on decomposing log, *Salazar A. et al. 770, 757 p.p.* (PMA); Volcán, 500 m, N of Hotel Dos Ríos, on bark of tree, *Salazar A. 5286b* (PMA); PANAMA: Cerro Jefe, 2 km before the top of Cerro Jefe on the south side, epiphyte on living tree, *Martínez 880* (PMA)
- Frullania macrocephala* (Lehm. & Lindenb.) Lehm. & Lindenb. s.l., Stephani 1911 as *F. strobilantha* Spruce; s.l., Clark 1955b as *F. strobilantha*; s.l., *Hélion s.n., p.p.* (NY), Stotler 1970; CHIRIQUI: Fortuna, Hornito, 1000-1270 m, on decomposing log, *Salazar A. et al. 646, 647* (PMA)
- Frullania microcephala* Gottsche s.l., Fulford & Sharp 1990
- Frullania microrhyncha* Clark & Svihla PANAMA: nr Cruces, on branches of trees mixed with *F. cucullata*, Clark & Svihla 1950a [Type: Panamá]
- Frullania mucronata* (Lehm. & Lindenb.) Lehm. & Lindenb. CHIRIQUI: s.l., *Hélion s.n.*, Stephani 1911 as *F. lacouturei* Steph. [Type: Panamá], Stotler 1970; Fortuna, Hornito, 1000-1200 m, on soil, *Salazar A. et al. 521* (PMA); Lawler's coffee tile and woods, *Cornman 3070* (F)
- Frullania nodulosa* (Reinw., Blume & Nees) Nees s.l., Clark & Svihla 1948; PANAMA: nr the village of Cruces, on trees, Mitten 1854 as *F. thuilleri* Nees; Río Tapa, *Standley 32094*, Clark & Svihla 1947

- Frullania parasitica* Hampe ex Lehm. & Lindenb. PANAMA (CANAL ZONE): C. Z. Experimental Gardens, on royal palm, Meyer 131 (TENN), Crum & Arzeni 1953
- **Frullania pittieri* Steph. CHIRIQUI: Fortuna, Hornito, 1000-1200 m, on decomposing log, Salazar A. et al. 560 p.p. (PMA); PANAMA: Altos de Campana National Park, Sendero de Interpretación, 850 m, on bark of tree, Salazar A. 9436, 9437 (PMA)
- Frullania riojaneirensis* (Raddi) Ångstr. s.l., Clark & Svihla 1948; s.l., Schuster 1992a; CHIRIQUI: Boquete, Palo Alto, 1300-1400 m, on decomposing log, Salazar A. et al. 751 p.p., 757 (PMA); Guadalupe, Cerro Punta, 1500 m, epiphyte on branch with accumulated soil, Vinda 1566 p.p. (PMA); COCLE: La Mesa, El Valle de Antón, on branch of tree, Salazar A. et al. 1378 (NY, PMA), Yuzawa 1991; PANAMA (CANAL ZONE): C. Z. Experimental Gardens, on royal palm, Meyer 44, 129 (TENN), Crum & Arzeni 1953
- Frullania semivillosa* Lindenb. & Gottsche s.l., with *F. hians* Lehm. & Lindenb. (= *F. arecae* (Spreng.) Gottsche), Mitten 1854; s.l., Seemann s.n. (NY), Clark 1955a; PANAMA: Taboga Is., Seemann (NY), Clark 1955a
- Frullania spiniloba* Steph. s.l., Stephani 1910 [Syntype Panamá]; s.l., Clark & Svihla 1950b
- Frullania subtruncata* Steph. s.l., Stephani 1910 [Type Panamá]
- Frullanoides corticalis* (Lehm. & Lindenb.) Van Slageren CHIRIQUI: El Volcán, Chickering s.n. (MICH), Crum & Arzeni 1953 as *B. corticalis*; COLON (CANAL ZONE): "Howe 1909"; Gatún, "Howe 1910", Schuster 1980 as *Brachiolejeunea corticalis* Lehm. & Lindenb.; Lake Gatún, Howe s.n. (NY, YU), Gradstein 1994; Gatún, Howe s.n. (NY, YU), Slageren 1985; PANAMA: Playa Langosta, Salazar A. 870 (hb. Fulford, PMA), Slageren 1985
- Frullanoides densifolia* Raddi ssp. *densifolia* s.l., Fulford & Sharp 1990; CHIRIQUI: Volcán, Salazar A. 5279 (PMA, U), Gradstein 1994; PANAMA: amongst *Plagiochila hypnoides* Willd. ex Lindenb. (= *P. disticha* Lehm. & Lindenb.), nr the village of Cruces, Mitten 1854 as *Lejeunea bicolor* Mont.
- Frullanoides liebmanniana* (Lindenb. & Gottsche) Van Slageren DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; trail El Real-Pirre, Salazar A. & Gradstein 9199 (PMA), Gradstein 1994, Cerro Pirre, between Pirre 1 and Pirre 2, on bark of tree, Salazar A. & Gradstein 9198 (PMA); Pirre massif, Allen 8707 (MO)
- Frullanoides tristis* (Steph.) Van Slageren CHIRIQUI: *Hélion* 497 (G 20160), Slageren 1985; *Hélion* 497 (G), Gradstein 1994
- Fulfordianthus evansii* (Fulford) Gradst. s.l., Tan et al. 1993 [one of 26 hepatics on a World Red List]; DARIEN: Cerro Pirre, 400-500 m, nr Rancho Mojado, base of shrub, Salazar A. & Gradstein 9242 - on bark, Salazar A. & Gradstein 9243, 9265 (PMA); PANAMA (CANAL ZONE): Barro Colorado Is., Shannon Creek, on SW side of tree 1.2 m from the base, Salazar A. 4300 (PMA), Salazar 1993
- Fulfordianthus pterobryoides* (Spruce) Gradst. s.l., Gradstein 1992c; CHIRIQUI: Fortuna, Spörle 1990 as *Thysananthus pterobryoides* (Spruce) Schiffn.; Fortuna, Spörle & Aranda 1.39 (NY, PMA, U), Gradstein 1994; COCLE: El Copé cloud forest, Salazar A. et al. 1491, 1503 (NY, PMA), Gradstein 1994; DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro Pirre, Salazar A. & Gradstein (PMA, U); PANAMA: Cerro Jefe, Salazar A. & Chung 5226 (PMA, U); Cañazas Mts., above Tortí Arriba, Folsom et al. 6705 (MO, U); Coiba Is., Seemann s.n. (NY), Gradstein 1994; Is. of Coiba, Seemann (NY, YU), Fulford 1941 as *T. pterobryoides*; Cerro Jefe, forest behind INTEL tower, 900-1000 m, on bark of tree on bank of creek, Salazar A. & Chung 5226 (PMA); Cerro Jefe, Gentry & Dwyer 5597 (MO)
- **Gongylanthus liebmannianus* (Lindenb. & Gottsche) Steph. BOCAS DEL TORO: P.I.L.A., páramo of Cerro Fábrega, 3150-3353 m, Dauphin 1566 (GOET, INBIO, PMA, U)
- Harpalejeunea stricta* (Lindenb. & Gottsche) Steph. DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; PANAMA: Altos de

Campana National Park, Sendero de Interpretación, 850 m, *Salazar A. et al 9445* (PMA)

Harpalejeunea uncinata Steph. PANAMA (CANAL ZONE): Barro Colorado Is., *Shattuck 568 p.p.*, Haynes 1933; C. Z. Forest Preserve, *Chickering s.n.* (MICH), Crum & Arzeni 1953; Barro Colorado Is., Lutz trail, *Shattuck 568 p.p.* (F, PMA)

Herbertus divergens (Steph.) Herzog s.l., Gradstein 1993; CHIRIQUI: Fortuna, Hornito, 1170 m, *Stotler & Crandall-Stotler 3503* (ABSH, PMA); Cerro Azul, *Croat 26895*; Cerro Colorado, *Allen 5416* (MO); COCLE: N of El Copé, *Croat 44693b, 44711* (MO); El Copé, on bark of tree, *Vinda 344, 356* (PMA); DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro Pirre, 1200-1300 m, epiphyte, *Salazar A. & Gradstein 9280* (PMA, U), *9286* (MO, PMA, U); PANAMA: C. Jefe, Spörle 1990; Cerro Jefe, 900-1000 m, *Spörle 0.1* (PMA); Cerro Jefe, forest behind INTEL tower towards north, 900-1000 m, on fallen tree, *Salazar A. et al. 5199* (PMA); Cerro Jefe, *Stimson 5415* (MO); VERAGUAS: Cerro Tute, *Moran 4017* (MO)

****Herbertus grossispinus*** (Steph.) Fulford COCLE: above Copé, *McPherson 7694G* (MO)

****Herbertus juniperoideus*** (Sw.) Grolle BOCAS DEL TORO: P.I.L.A., páramo of Cerro Fábrega, 3150-3353 m, *Dauphin 1553* (GOET, INBIO, PMA, U); CHIRIQUI: Cerro Azul, *Croat 26823* (MO); nr Cerro Colorado Copper Mine, *Croat 33231A* (MO); nr Cerro Punta, *D'Arcy et al. 13306E* (MO); between Concepción and Volcán, *D'Arcy s.n.* (MO); COCLE: N of El Copé, *Antonio 3266* (MO); 4 mi N of Llano Grande, *Antonio 3567* (MO); N of El Copé, *Croat 44690b* (MO); N of El Copé, *Knapp & Dressler 3411* (MO, PMA); nr El Potroso, *Sytsma 1798, Croat 44712a* (MO); DARIEN: nr Cerro Pirre, *Folsom 6391* (MO); Summit of Pirre Massif, 1200-1350 m, *Allen 8850, 8874, 8881* (MO); Cerro Sapo, *Hammel 1246* (MO); Cerro Tacarcuna, *Hammel et al. 16563* (MO); S of El Real, *McPherson 11623C* (MO); PANAMA:

Cerro Jefe, *Sytsma 1991, Croat 13103, 35930* (MO); nr Cerro Jefe, *Lewis & Dressler 7588, Croat 13102B, Gentry 6169, Nee & Mori 14212, D'Arcy 11380A* (MO); VERAGUAS: nr Escuela Agrícola Alto Piedra, *Croat & Folsom 33933, 33936* (MO)

Herbertus pensilis (Taylor) Spruce CHIRIQUI: Fortuna, Spörle 1990; Fortuna, *Spörle 1.26* (PMA); Fortuna, Hornito, 1000-1200 m, on decomposing log, *Salazar A. 698* (PMA); nr Cerro Punta, *McPherson 9375* (MO); nr Cerro Colorado Copper Mine, *Croat 33232, 33231B* (MO); nr Fortuna Dam, *McPherson 13595H* (MO); Cerro Pando, *Mori & Bolten 7314* (MO); COCLE: N of El Valle, *Knapp & Dressler 4921* (MO); PANAMA: Cerro Jefe, forest behind INTEL tower towards north, 900-1000 m, on branch, *Salazar A. et al. 5206* (PMA); Cerro Jefe, *Knapp 3510* (MO)

****Herbertus serratus*** Spruce CHIRIQUI: N of San Felix, *Mori & Kallunki 5850* (MO)

****Herbertus subdentatus*** (Steph.) Fulford BOCAS DEL TORO: P.I.L.A., páramo of Cerro Fábrega, 3150-3353 m, *Dauphin 1576 p.p.* (GOET, INBIO, PMA, U); CHIRIQUI: Volcán Barú, *Mori & Bolten 7349, 7448* (MO)

Heteroscyphus combinatus (Nees) Schiffn. s.l., Mitten 1854 as *Chiloscyphus combinatus* Nees; s.l. *Seemann* (NY), Fulford 1976

****Heteroscyphus marginatus*** (Steph.) Fulford CHIRIQUI: Boquete, Palo Alto, 1300-1400 m, on decomposing log, *Salazar A. et al. 751 p.p.* (PMA)

****Hygrolejeunea cordifissa*** (Taylor) Steph. CHIRIQUI: Fortuna, Hornito, 1000-1200 m, on soil, decomposing log and rocks, *Salazar A. et al. 521, 583, 601, 647, 726 p.p.*, (PMA)

****Isotachis multiceps*** (Lindenb. & Gottsche) Gottsche CHIRIQUI: Fortuna, Hornito, 1000-1200 m, on decomposing log, *Salazar A. 698* (PMA); P.I.L.A., 2462 m, trail to Cerro Punta, *Stotler & Crandall-Stotler 3478* (ABSH)

****Isotachis serrulata*** (Sw.) Gottsche CHIRIQUI: P.I.L.A., 2462 m, on soil bank along trail to Cerro Punta, *Stotler & Crandall-Stotler 3483* (ABSH, PMA)

****Jamesoniella rubricaulis*** (Nees) Grolle

- BOCAS DEL TORO: P.I.L.A., páramo of Cerro Fábrega, 3150-3353 m, *Dauphin 1557, 1568, 1576 p.p.* (GOET, INBIO, PMA, U)
- **Jensenia erythropus* (Gottsche) Grolle BOCAS DEL TORO: P.I.L.A., páramo of Cerro Fábrega, 3150-3353 m, *Dauphin 1572, 1781* (GOET, INBIO, PMA, U)
- **Jungermannia callithrix* Lindenb. & Gottsche CHIRIQUI: P.I.L.A., 2462 m, on soil bank along trail to Cerro Punta, *Stotler & Crandall-Stotler 3506* (ABSH, PMA, hb. VáÁa)
- **Kurzia capillaris* (Sw.) Grolle CHIRIQUI: Fortuna, Hornito, 1000-1200 m, on bark of tree, *Salazar A. 5499 p.p.* (PMA); DARIEN: 1.5 mi along trail to Boca de Cupe from Cana, *Allen 8946* (MO); PANAMA: Cerro Jefe, behind INTEL on protruding roots and bark of tree, *Valdespino & Aranda 222a* (PMA)
- Lejeunea cladogyna* A. Evans DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; around INRENARE's station, foothills of Cerro Pirre, 100 m, *Salazar A. & Gradstein 9222b* (PMA)
- Lejeunea flava* (Sw.) Nees s.l., Schuster 1980; CHIRIQUI: El Volcán, on bark of palm, *Chickering s.n.* (MICH), Crum & Arzeni 1953; DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro Pirre, 400-500 m, epiphyll, *Salazar A. & Gradstein 9241* (PMA); PANAMA: between Arraiján and La Chorrera, on tree trunk in roadside woods, *Richards 2049* (F, PMA)
- Lejeunea laetevirens* Nees & Mont. COCLE: Restaurant India Dormida, on cement blocks, *Salazar A. et al. 953* (PMA); DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; around INRENARE's station, foothills of Cerro Pirre, 100 m, *Salazar A. & Gradstein 9215* (PMA); PANAMA (CANAL ZONE): Barro Colorado Is., *Shattuck 569 p.p.*, Haynes 1933 as *Microlejeunea laetevirens* (Nees & Mont.) A. Evans; Barro Colorado, *Chickering s.n.* (MICH), Crum & Arzeni 1953 as *M. laetevirens*; Barro Colorado Is., Camino F. Miller 24, on tree bark 1.3-1.5 m above ground, *Salazar A. & Chung 4519* (PMA), Barro Colorado Is., Camino F. Miller 25-26, on bark of palm, *Salazar A. & Chung 4503* (PMA)
- Lejeunea maxonii* (A. Evans) X.-L. He DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992 as *Rectolejeunea* sp.; Cerro Pirre, 800 m, *Salazar A. & Gradstein 9299 p.p.* (PMA); PANAMA (CANAL ZONE): Barro Colorado Is., Camino F. Drayton 15, on tree bark 1-2 m above ground, *Salazar A. & Chung 4656* (PMA)
- **Lejeunea minutiloba* A. Evans PANAMA (CANAL ZONE): Barro Colorado Is., Quebrada R. Shannon, epiphyll on *Hybanthus prunifolius* and *Psychotria horizontalis*, *Marino 4, 5, 34* (PMA); Barro Colorado Is., Camino Wetmore 21, *Salazar A., Chung & Santamaría 5943* (PMA)
- Lejeunea oerstediana* Lindenb. & Hampe ex Hampe s.l., on *Frullania cucullata* Lindenb. & Gottsche, Mitten 1854
- Lejeunea phyllobola* Nees & Mont. CHIRIQUI: Boquete, *Chickering s.n.* (MICH), Crum & Arzeni 1953 as *Rectolejeunea phyllobola* (Nees & Mont.) A. Evans; DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992 as *R. phyllobola*; between Pirre 1 and Pirre 2, on bark of tree, *Salazar A. & Gradstein 9198* (PMA); INRENARE's station, on bark of tree, *Salazar A. & Gradstein 9223* (PMA)
- Lejeunea ulicina* (Taylor) Gottsche, Lindenb. & Nees ssp. *bullata* (Taylor) R. M. Schust. DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992 as *Microlejeunea bullata* (Taylor) Steph.; Cerro Pirre, 400-500 m, on bark of tree, *Salazar A. & Gradstein 9293* (PMA); above Rancho Mojado, 900 m, on bark of tree, *Salazar A. & Gradstein 9245* (PMA); PANAMA (CANAL ZONE): Barro Colorado Is., *Shattuck 569 p.p.*, Haynes 1933 as *M. bullata*
- **Lepicolea pruinosa* (Taylor) Spruce CHIRIQUI: Cerro Punta, *Mori & Bolten 7312* (MO, PMA); Cerro Hornitos, *Mori & Bolten 7458* (MO, PMA); P.I.L.A., 2462 m, along trail to Cerro Punta, *Stotler & Crandall-Stotler 3490* (ABSH)
- Lepidolejeunea involuta* (Gottsche) Grolle DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro Pirre, 1200-1300 m, on bark of tree, *Salazar A. & Gradstein 9281*

- (PMA); PANAMA: Altos de Campana National Park, Sendero de Interpretación, *Lara 1462* (PMA)
- **Lepidolejeunea ornata* (Robins.) R. M. Schust. CHIRIQUI: Fortuna, Hornito, 1000-1200 m, on decomposing log, *Salazar A. 726* (PMA)
- Lepidozia armata* Steph. s.l., *Hélión*, Stephani 1909 (Sp. Hep., Vol. III) [Syntype: Panamá]; s.l., *Fr. Hélión* (NY), Fulford 1966; CHIRIQUI: s.l., *Fr. Hélión* (G), Fulford 1966; Las Nubes, *Croat 26467* (MO); VERAGUAS: Cerro Tute, *Mori et al. 7602* (MO)
- **Lepidozia brasiliensis* Steph. CHIRIQUI: Cerro Hornitos, *Mori & Bolten 7456* (MO)
- **Lepidozia cupressina* (Sw.) Lindenb. BOCAS DEL TORO: P.I.L.A., páramo of Cerro Fábrega, 3150-3353 m, *Dauphin 1580* (GOET, INBIO, PMA, U)
- **Lepidozia muenchiana* Steph. CHIRIQUI: Cerro Punta, *Croat 26374* (MO); along Boquete trail to Paso Respingo, 2000-2500 m, on ground, *Gentry 6042* (MO, PMA); DARIEN: Summit of Pirre Massif, 1200-1350 m, *Allen 8852* (MO)
- Lepidozia patens* Lindenb. DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro Pirre, 1200-1300 m, on bark of tree, *Salazar A. & Gradstein 9282* (PMA) PANAMA: C. Jefe, Spörle 1990; Cerro Jefe, *Spörle 0.6* (PMA); Cerro Jefe, forest behind INTEL tower towards north, 900-1000 m, on bark of tree along creek, *Salazar A. et al. 5221* (PMA)
- Leptolejeunea elliptica* (Lehm. & Lindenb.) Schiffn. ssp. *elliptica* s.l., 1832, s.c., 29 (S-PA, W 6853), Bischler 1969; s.l., Schuster 1980; s.l., Marino & Salazar Allen 1991; COCLE: El Copé, epiphyte, *Meijer 165* (PMA); DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; PANAMA (CANAL ZONE): C. Z. Forest Preserve, *Chickering s.n.* (MICH), Crum & Arzeni 1953; Barro Colorado Is., Camino Wetmore, epiphyll on Palmae and other angiosperm leaves, *Salazar A. et al. 5943, 5965* (PMA); on Zetek, epiphyll, *Salazar A. et al. 5890, 5906, 5922* (PMA);
- Leptolejeunea exocellata* (Spruce) A. Evans PANAMA (CANAL ZONE): Las Cascadas Plantation, nr summit, *Standley 25691* (JE, P, US), Bischler 1969
- **Leptolejeunea moniliata* Steph. PANAMA (CANAL ZONE): Barro Colorado Is., Quebrada Shannon, epiphyll on *Hybanthus prunifolius*, *Marino 10* (PMA); Barro Colorado Is., epiphyll on palm blade, *Salazar A., Chung & Santamaría 5965* (PMA)
- Leptolejeunea radicata* (Nees & Mont.) Grolle PANAMA (CANAL ZONE): Vicinity of Fort Sherman, *Standley 31004* (S-PA, US), Bischler 1969 as *L. obovata* Bischl.; Barro Colorado Is., Quebrada R. Shannon, epiphyll on *Hybanthus prunifolius* and *Psychotria horizontalis*, *Marino 10, 12, 13, 14, 25, 28 30* (PMA)
- **Leptoscyphus amphibolius* (Nees) Grolle BOCAS DEL TORO: P.I.L.A., páramo of Cerro Fábrega, 3150-3353 m, *Dauphin 1578* (GOET, INBIO, PMA, U); CHIRIQUI: P.I.L.A., Sendero "El Retoño," 2460 m, on soil, *Gradstein 9762* (GOET)
- **Leptoscyphus gibbosus* (Taylor) Mitt. CHIRIQUI: Fortuna, 1000 m, on decomposing log, *Salazar A. et al., 616a, 698, 662* (PMA); PANAMA: Cerro Jefe, behind INTEL tower, on fallen *Clusia*, *Salazar A. et al. 6773* (PMA)
- Leptoscyphus ovatus* (Spruce) Grolle CHIRIQUI: s.l., *D'Arcy 2* (MO), Fulford 1976
- Lophocolea bidentata* (L.) Dumort. CHIRIQUI: nr Cerro Punta, *Stern & Chambers 92 p.p.* (YU), Fulford 1976 as *L. coadunata* (Sw.) Nees; PANAMA: Altos de Campana National Park, Sendero de Interpretación, on decomposing log, *Salazar A. et al. 6773* (PMA); PANAMA (CANAL ZONE): Quebrada Ancha, *Steyermark & Allen s.n.* (MO); Quebrada Culebra, *Steyermark 17218 p.p.* (MO); Quebrada Bonita, *Steyermark & Allen 17189, 17190* (MO)
- **Lophocolea connata* (Sw.) Nees CHIRIQUI: Fortuna, Hornito, 1000-1200 m, on decomposing tree and rock in river, *Salazar A. et al. 615b p.p., 704 p.p., 724* (PMA)
- **Lophocolea liebmanniana* Gottsche CHIRIQUI: Fortuna, Hornito, 1000 m, on soil and decomposing log, *Salazar A. et al. 582 p.p.* (PMA)

- Lophocolea martiana* Nees DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro Pirre, from Rancho Mojado, 800-1150 m, on fallen tree, *Salazar A. & Gradstein 9250* (PMA)
- Lophocolea muricata* (Lehm.) Nees s.l., creeping upon *Dumortiera hirsuta* (Sw.) Nees, Mitten 1854; Volcán Barú, 7500 ft., base of *Quercus*, *Salazar A. et al. 8422* (PMA)
- Lopholejeunea nigricans* (Lindenb.) Schiffn. CHIRIQUI: Boquete, Finca La Fortuna, 1500-1600 m, on bark of tree, *Salazar A. 773* (PMA); DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992 as *L. muelleriana* (Gottsche) Schiffn.; Cerro Pirre, 1000 m, on branch of tree, *Salazar A. & Gradstein 9407, 9421, 9454 p.p.* (PMA); PANAMA: Parque Nacional Altos de Campana, *Salazar A. & Gradstein 9454* (PMA, U); Cerro Jefe, *Salazar A. & Gradstein 9407* (PMA, U), Gradstein 1994
- Lopholejeunea subfusca* (Nees) Schiffn. s.l., *Steyrmark & Allen 16946* (MO), Fulford 1942b as *L. sagraeana* (Mont.) Schiffn.; DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro Pirre, El Real from Pirre 1 to Pirre 2, on bark of tree, *Salazar A. & Gradstein 9207* (PMA); PANAMA (CANAL ZONE): Barro Colorado Is., s.c., Haynes 1933 as *L. sagraeana*
- Luteolejeunea herzogii* (Buchloh) Piippo PANAMA: La Eneida, Cerro Jefe region, 750 m, on dead log in low forest, *Maas & Dressler 691* (JE, U), Piippo 1986, Gradstein 1985 as *Lepidolejeunea herzogii* (Buchloh) Grolle & Gradst.; DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro Pirre, from camping site of Rancho Mojado to 1150 m, on bark of tree, *Salazar A. & Gradstein 9251* (PMA)
- **Macrocolura lyrata* (Steph.) R. M. Schust. PANAMA: Altos de Cerro Azul, Sendero El Cantar, on exposed small trees along upper trail, *Stotler & Crandall-Stotler 3486* (ABSH, PMA)
- Macrolejeunea cerina* (Lehm. & Lindenb.) Gradst. DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro Pirre, 1200-1300 m, on bark of tree, *Salazar A. & Gradstein 9283 p.p.* (PMA)
- Marchantia chenopoda* L. s.l., *Seemann* (NY), Evans 1917; s.l., Evans 1923; s.l., Hässel de Menéndez 1962[1963]; s.l. Bischler 1984; BOCAS DEL TORO: Continental Division at guard post, on soil, *Valdespino 868, 870a* (PMA); camping site of Changuinola 1, on stones along river shores, *Salazar A. 1693a* (PMA); SW of camping site, Técnicos Forestales, above Quebrada Chica, on moist soil on banks of river, *Salazar A. 1873* (PMA); CHIRIQUI: Boquete, *Svihla 40418, 40433, 40439, 40445*, Svihla 1942; Fortuna, Spörle 1990; Fortuna, Hornito, along Quebrada Arena, on soil on banks of creek, *Spörle 1.16* (PMA); nr Fortuna Dam, *Hammel 2109, 2110* (MO); COCLE: El Valle de Antón, La Mesa, on soil & rock, *Salazar A. 1377* (PMA); El Valle de Antón, terrestrial, *Castillo 131* (PMA); DARIEN: s.l., *Williams 1083, 1084* (NY, YU), Evans 1917; Tres Bocas, *Kirkbride & Duke 1368* (MO); PANAMA: Cerro Azul, on road to Lago Goofy, *Valdespino & Spörle 752* (PMA)
- Marchantia inflexa* Nees & Mont. s.l., Bischler 1984; PANAMA: Rio Chagres, *Lewis et al. 3528* (MO)
- **Marchantia plicata* Nees & Mont. CHIRIQUI: nr Nueva Suiza, *D'Arcy 5315* (MO)
- Marchantia polymorpha* L. s.l., Bischler 1984; CHIRIQUI: Volcán, above Chorro, on soil, *Salazar A. & Béliz 1224* (PMA); Alto de Pineda, Cerro Punta, 8000-8400 feet, terrestrial, *Salazar A. 1108, 1124* (PMA); Cerro Punta, Las Cumbres, 1500 m, terrestrial, *Salazar A. 1034, 1045* (PMA); Las Nubes, *Mori & Bolten 7264* (MO); Boquete, Finca Lérida, Palo Alto, 1700-1800 m, *Salazar A. 798* (PMA); El Aguacatal, Volcán, *Salazar A. 1178* (PMA)
- Marchesinia brachiata* (Sw.) Schiffn. s.l., s.c., Fulford & Sharp 1990 as *M. trollii* Herzog; CHIRIQUI: s.l., Stephani 1912 (Sp. Hep., Vol. V), as *M. denticulata* Steph. [Type: Panamá]; Fortuna, 1000-1200 m, on rock, *Salazar A. et al. 685* (PMA); LOS SANTOS: Cerro Canajagua, Halbinsel Azuero, ca 950 m, *Troll s.n.*, Herzog 1932 as *M. trollii* [type: Panamá]; PANAMA: summit Garden, *Salazar A. & Gradstein 9496* (PMA), Grad-

- stein 1994; PANAMA (CANAL ZONE): Barro Colorado Is., *Standley 40789* (F, YU)
- Mastigolejeunea auriculata*** (Wilson) Schiffn. s.l., creeping over ***Frullania cucullata*** Lindenb. & Gottsche, Mitten 1854 as ***Lejeunea versicolor*** (Lehm. & Lindenb.) Mitt.; CHIRIQUI: El Volcán, *Chickering s.n.* (MICH), Crum & Arzeni 1953; Fortuna, Hornito, 1000-1200 m, on rock in river, *Salazar A. 709* (PMA); DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; trail El Real to Pirre, *Salazar A. & Gradstein 9216* (PMA, U); ca 20 km SSW of Boca de Cupe, ca 200-700 m, *Allen 8721, 8722* (MO); PANAMA: Summit Garden, *Salazar A. & Gradstein 9497* (PMA, U), Gradstein 1994; PANAMA (CANAL ZONE): Barro Colorado Is., on cement behind laboratory, *Salazar A. & Chung 4725* (PMA)
- ****Megaceros vincentianus*** (Lehm. & Lindenb.) Campb. CHIRIQUI: P.I.L.A., 2462 m, on decaying log along trail to Cerro Punta, *Stotler & Crandall-Stotler 3495* (ABSH)
- Metzgeria albinea*** Spruce CHIRIQUI: Fortuna, quadrat 1-4 of J. Cavalier, 1200 m, on petiole of tree fern, *Valdespino et al. 802* (PMA); DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro Pirre, 1200-1300 m, on bark of tree, *Salazar A. & Gradstein 9287* (PMA)
- ****Metzgeria decipiens*** (C. Massal.) Schiffn. DARIEN: Top of Cerro Sapo, cloud forest, 1090 m, epiphyte, *Hammel 1252* (PMA); PANAMA: Cerro Jefe, road behind INTEL tower, 900 m, on compositae, *Salazar A. & Gradstein 9374* (PMA)
- Metzgeria furcata*** (L.) Corda s.l., creeping upon ***Frullania cucullata*** Lindenb. & Gottsche, Mitten 1854 [This dubious record may prove to be *M. decipiens* (C. Massal.) Schiffn.]
- Metzgeria leptoneura*** Spruce CHIRIQUI: Fortuna, Spörle 1990; Fortuna, *Spörle 1.31* (PMA)
- ****Microlejeunea capillaris*** (Gottsche) Steph. PANAMA (CANAL ZONE): Barro Colorado Is., *Salazar A. 4501b* (PMA)
- ****Microlejeunea epiphylla*** Bischl. PANAMA: Chagres National Park, Altos de Cerro Azul, Sendero El Cantar, 800 m, on bark creeping over other Lejeuneaceae, *Gradstein 9783a* (GOET)
- Micropterygium pterygophyllum*** (Nees) Trevis. DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro Pirre, 400-500 m, on bark of tree, *Salazar A. & Gradstein 9237* (PMA)
- Micropterygium trachyphyllum*** Reimers COCLE: N of El Valle de Antón, base of Cerro Pilón, *Crosby 4395* (MO), Crosby 1971; COLON: Santa Rita Ridge, *Crosby 4444* (MO), Crosby 1971; PANAMA: Cerro Campana, *Crosby 4495* (MO); Cerro Jefe, *Crosby 4535, Lewis & Dressler 7603* (MO), Crosby 1971; C. Jefe, Spörle 1990; Cerro Jefe, *Spörle 0.7* (PMA); Cerro Jefe, forest behind INTEL tower towards north, 900-1000 m, on bark, *Salazar A. & Chung 5204* (PMA); Cerro Jefe, on clay soil, *Salazar A. et al. 4033* (PMA); Cerro Jefe, on bark of tree ca 10 cm from ground, *Valdespino & Aranda s.n.* (PMA); above Altos de Cerro Azul down towards Río Chagres, 700-850 m, *Allen 9053* (MO); Cerro Jefe, *Hammel 4833* (MO)
- ****Mytilopsis albifrons*** Spruce CHIRIQUI: Fortuna, on road to Quebrada Hornito, premontane forest, *Dauphin s.n.* (GOET, PMA)
- Monoclea gottschei*** Lindb. subsp. ***elongata*** Gradst. & Mues s.l., Gradstein et al. 1992; CHIRIQUI: Fortuna, Spörle 1990 as ***Monoclea forsteri*** Hook.; “western Panamá,” Spörle et al. 1991 as ***Monoclea gottschei*** subsp. ***neotropica*** (nom. nud.); nr Fortuna Dam, *Hammel 2105* (MO); s.l., *Antonio 2605, Hammel 2101, Kirkbride & Duke 860* (MO); DARIEN: ca 20 km SSW of Boca de Cupe, ca 200 m, *Allen 8664* (MO); VERAGUAS: s.l., *Antonio 2045* (MO)
- ****Nardia succulenta*** (Rich. ex Lehm.) Spruce CHIRIQUI: nr Cerro Colorado Copper Mine, *Croat 33185* (MO)
- ****Neesioscyphus argillaceus*** (Nees) Grolle CHIRIQUI: Fortuna, Hornito, 1170 m, exposed soil on roadside, *Stotler & Crandall-Stotler 3502* (ABSH, PMA)
- ****Neurolejeunea breutelii*** (Gottsche) A. Evans CHIRIQUI: Fortuna, Hornito, on rock in the Chiriqui River, *Salazar A. et al. 577* (PMA); PANAMA (CANAL ZONE): Barro Colo-

- rado Is., Zetek 4, on tree, *Willis 56* (PMA)
- Odontolejeunea lunulata*** (Weber) Schiffn. DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro Pirre, 1200-1300 m, on bark of tree, *Salazar A. & Gradstein 9284* (PMA); PANAMA: Altos de Campana National Park, 850 m, epiphyll, *Salazar A. & Gradstein 9254* (PMA)
- Odontoschisma denudatum*** (Mart.) Dumort. DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992
- ****Odontoschisma longiflorum*** (Taylor) Steph. COLON: Santa Rita Ridge, 5 mi from highway, *Croat 13207* (MO - t. VáÁa)
- ****Omphalanthus filiformis*** (Sw.) Nees CHIRIQUI: Fortuna, 1000 m, on rocks, *Salazar A. et al. 522, 525* (PMA); Fortuna, Hornito, 1000-1200 m, on bark of tree, *Salazar A. 2445* (PMA); on route to Soledad, 1100 m, on bark of tree, *Salazar A. et al. 2104* (PMA); nr San Felix, *Croat 33064* (MO)
- ****Omphalanthus ovalis*** (Lindenb. & Gottsche) Gradst. LOS SANTOS: Cerro Canajagua, ca 950 m, add arborum truncos ramosque, copiosa, subphotophila, *Troll 157* (F, PMA)
- ****Pallavicinia lyellii*** (Hook.) Carruth. DARIEN: Summit of Pirre Massif, 1200-1350 m, *Allen 8863* (MO)
- ****Paracromastigum bifidum*** (Steph.) R. M. Schust. DARIEN: 1.5 mi along trail to Boca de Cupe from Cana, *Allen 8949* (MO); PANAMA: Altos de Cerro Azul, Sendero El Cantar, on vertical soil erosion cut along stream, *Stotler & Crandall-Stotler 3500* (ABSH, PMA)
- ****Phaeoceros fimbriatus*** (Gottsche) Gradst. CHIRIQUI: Fortuna, Hornito, 1170 m, on roadside soil bank, *Stotler & Crandall-Stotler 3476* (ABSH, PMA)
- ****Phaeoceros* cf. *mohrii*** (Austin) Hässel CHIRIQUI: P.I.L.A., 2462 m, on soil along trail to Cerro Punta, *Stotler & Crandall-Stotler 3497* (ABSH, PMA)
- Pictolejeunea picta*** (Gottsche ex Steph.) Grolle DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro Pirre, from camping site of Rancho Mojado to 1000 m, on *Cephaelis*, *Salazar A. & Gradstein 9259 p.p.* (PMA)
- Plagiochasma rupestre*** (J. Forst. & G. Forst. Steph. CHIRIQUI: Boquete, *Svihla 41404*, nr Boquete on trail to Bajo Mono, *Svihla 40414*, Svihla 1942
- Plagiochila adiantoides*** (Sw.) Lindenb. DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro Pirre, 1200-1300 m, on bark of tree, *Salazar A. & Gradstein 9293* (PMA); PANAMA: C. Jefe, Spörle 1990; along creek by road to Pacora, 800 m, epiphyte, *Spörle & Aranda 0.12* (PMA - t. Inoue)
- Plagiochila aerea*** Taylor [this is the correct name for *P. bursata* (Desv.) Lindenb. (R. Grolle & J. Heinrichs, pers. comm.)] CHIRIQUI: Fortuna, Spörle 1990 as *P. bursata*; Fortuna, 1000-1200 m, on decomposing log, *Salazar A. et al. 672* (PMA); COCLE: s.l., *Spellman et al. B114a* (MO - t. Inoue)
- Plagiochila angustisedens*** Steph. PANAMA: C. Jefe, Spörle 1990; Cerro Jefe, forest behind INTEL tower towards north, 900-1000 m, on boulder in creek, *Salazar A. & Chung 5225* (PMA)
- Plagiochila breuteliana*** Lindenb. CHIRIQUI: El Volcán, *Chickering s.n.* (MICH), Crum & Arzeni 1953; nr Boquete, Holcomb Trail, *Cornman 3064* (F); Lawler's coffee tile, *Cornman 3084* (F); COCLE: s.l., *Knapp 3759* (MO)
- Plagiochila confundens*** Lindenb. ex Hampe & Gottsche var. *alpinoides* Herzog s.l., Herzog, 1931 [Type: Panamá]; LOS SANTOS: Península de Azuero, Cerro Canajagua, 950 m, *Troll s.n.* (isotype, MO)
- Plagiochila contorta*** Lindenb. & Hampe CHIRIQUI: Fortuna, Spörle 1990; Fortuna, 1150 m, on bark, *Spörle & Aranda 1.37* (PMA)
- Plagiochila costariensis*** Horik. s.l., *f. Hélicon s.n.*, Dugas 1929 as *P. pinnata* Steph. [non Spruce]
- Plagiochila disticha*** Lehm. & Lindenb. s.l., *Wagner s.n.*, Stephani 1905 as *P. florida* Spruce; s.l., Herzog 1938 as *P. hypnoides* Willd. ex Lindenb.; s.l., Schuster 1980 as *P. hypnoides*; s.l., Gradstein 1993; CHIRIQUI: Fortuna, Spörle 1990 as *P. hypnoides*; Plateau above Boquete, Holcomb Trail, *Cornman 3179* (F); PANAMA: village of Cruces, on the branches of trees, Mitten 1854

- as *P. hypnoides*; C. Camp., Spörle 1990; Campana National Park, 800 m, on shrub, Salazar A. et al. 6560, 6562, 6565 (PMA), on tree 1.5 m from ground, Salazar A. et al. 6429 (PMA); Altos de Campana National Park, Salazar A. & Gradstein 9470 (MO, PMA); PANAMA (CANAL ZONE): Barro Colorado Is., Lake 2-3 and Big Tree Trail, on bark of Bombacaceae, Salazar A. 4390, 4627 (PMA)
- **Plagiochila diversispina* Steph. CHIRIQUI: nr Cerro Punta, Croat 13782c (PMA - t. Inoue)
- **Plagiochila dominicensis* Taylor PANAMA: On road to Pacora, 800 m, on bark, Valdespino et al. 765 (PMA - t. Inoue)
- Plagiochila dubia* Lindenb. & Gottsche DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro Pirre, from camping site of Rancho Mojado, 800-1150 m, on bark of tree, Salazar A. & Gradstein 9257 (PMA, U); PANAMA (CANAL ZONE): Barro Colorado Is., Camino Drayton 18-19, on tree trunk 1.4 m above ground, Salazar A. & Chung 4635 (PMA)
- Plagiochila exesa* Lindenb. & Gottsche DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro Pirre, 400-500 m, Salazar A. & Gradstein 9239 (PMA)
- Plagiochila geniculata* Lindenb. PANAMA: C. Jefe, Spörle 1990; Cerro Jefe, Spörle 0.5 (PMA); Cerro Jefe, forest behind INTEL tower, 900-1000 m, on rock along trail, Salazar A. & Chung 5223 (PMA), on rock in river, Salazar A. & Chung 5215 (PMA)
- Plagiochila gibbosa* Lindenb. & Gottsche ex Hampe CHIRIQUI: Fortuna, Spörle 1990; Fortuna, on bark, Spörle & Aranda 1.35, 1.36 (PMA); nr Cerro Punta, Croat 13748 (MO)
- Plagiochila laetevirens* Lindenb. DARIEN: INRENARE station, foothills of Cerro Pirre, on bark of tree, Salazar A. & Gradstein 9217 (PMA); CHIRIQUI: Fortuna, Spörle 1990 as *P. hondurensis* Herzog; Fortuna, on bark, Spörle & Aranda 1.2 (PMA)
- **Plagiochila longispina* Lindenb. & Gottsche PANAMA: Nature's Trail, Altos de Campana National Park, on bark, Salazar A. & Johnson 6550 (PMA - t. Inoue)
- Plagiochila ludoviciana* Sull. s.l., Schuster 1980; s.l., 1906 & 1907, *Héliion s.n.*, Dugas 1929 as *P. subcristata* Gottsche [Schuster (1960: 89) wrote "Material from Panama has been seen (NYBG), sub '*P. crispula* Lindb.' (leg. W. Seeman [sic]) which appears inseparable from *P. ludoviciana*." This specimen, in part, is probably the *P. crispula* Nees reported by Mitten "Amongst *Frullania cucullata* Lindenb. & Gottsche" in 1854 (but see also *P. undata* Sull. ssp. *crispata* (Gottsche) R. M. Schust. below)]; CHIRIQUI: Plateau above Boquete, Holcomb Trail, Cornman 3189 (F), DARIEN: Parque Nacional de Darien, ca 20 km SSW of Boca de Cupe, ca 200 m, Allen 8639 (MO); PANAMA (CANAL ZONE): Pedro Miguel, Cornman 3040 (F), Alajuela, Cornman 3002 (F)
- Plagiochila moritziana* Gottsche & Lindenb. ex Hampe "Central Panama," Spörle et al. 1989; CHIRIQUI: Fortuna, Quebrada Arena, 1100 m, on bark, Spörle & Aranda 1.27 (PMA - t. Inoue); PANAMA: C. Camp., Spörle 1990; Cerro Campana, Spörle 2.1 (PMA)
- Plagiochila panamensis* Inoue CHIRIQUI: Fortuna, alt. 1150 m, on living tree in forest, Spörle & Aranda 1.33, Inoue 1989 [Type: Panamá]; Fortuna, Spörle 1990
- Plagiochila patula* (Sw.) Lindenb. s.l., 1906 *Héliion s.n.*, Dugas 1929; CHIRIQUI: nr Monnick's, Cornman 3057 (F); nr Dexter's Brook, Cornman 3088 (F)
- Plagiochila quelchii* Steph. CHIRIQUI: Fortuna, Spörle 1990; Fortuna, 1040 m, on bark, Spörle & Aranda 1.38 (PMA - t. Inoue)
- **Plagiochila raddiana* Lindenb. CHIRIQUI: 2 mi N of El Hato de Volcán, Croat 10647 (MO - t. Inoue, as *P. guilleminiana* Mont.); PANAMA: Cerro Campana, Porter et al. 4173A (MO - t. Inoue); 4 km from Cerro Punta, behind Florida State Camp, epiphyte on tree, Correa A. 1270 (MO - t. Inoue, as *P. guilleminiana* Mont.); PANAMA (CANAL ZONE): Barro Colorado Island, Fairchild 12-13, TVT-Big Tree, on buttresses, Salazar A. et al. 4629, 6047 (PMA); PANAMA:
- Plagiochila rudischusteri* H. Rob. DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992;

- Cerro Pirre, 1200-1300 m, *Salazar A. & Gradstein 9290 p.p.* (PMA, U); PANAMA: C. Jefe, Spörle 1990; Cerro Jefe, forest behind INTEL tower towards north, 900-1000 m, on fallen tree, *Salazar A. & Chung 5200* (PMA)
- Plagiochila rutilans*** Lindenb. CHIRIQUI: Fortuna, Spörle 1990; Fortuna, on bark, *Spörle & Aranda 1.34* (PMA); DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro Pirre, 1200-1300 m, *Salazar A. & Gradstein 9290* (PMA, U)
- Plagiochila salazarii*** Inoue CHIRIQUI: Fortuna, Hornito, Palo Seco trail, on the Continental Divide, 30 m from the guard post, 1150-1245 m, on branch of tree, *Salazar A. et al. 6414*, Inoue 1989 [Type: Panamá]
- Plagiochila spinifera*** Ångstr. PANAMA: C. Jefe, Spörle 1990; Cerro Jefe, *Spörle 0.3* (PMA); Campana National Park, 800 m, on shrub, *Salazar A. et al. 6430* (PMA), on fallen Melastomataceae shrub, *Salazar A. et al. 6431a, 6431b* (PMA); Cerro Jefe, forest behind INTEL tower, 900-1000 m, on base of tree, *Salazar A. & Chung 5194a, 5194b* (PMA)
- ****Plagiochila silvatica*** Gottsche PANAMA: Campana National Park, 800 m, on bark of tree, *Salazar A. et al. 6429* (PMA)
- ****Plagiochila truncata*** Gottsche PANAMA: Nature's Trail, Altos de Campana National Park, 850 m, on bark of trees and shrubs, *Spörle s.n.* (PMA - t. Inoue)
- Plagiochila tuerckheimii*** Steph. s.l., 1906 *Héliion s.n.*, Dugas 1929
- Plagiochila undata*** Sull. ssp. *crispata* (Gottsche) R. M. Schust. Schuster (1960: 122) stated “. . . I have also seen a specimen [of *P. undata* ssp. *crispata*] from Panama (labelled ‘*crispula*’ on the packet), in the Mitten Collection (NYBG).” This specimen must represent, in part, *P. crispula* Nees reported by Mitten in 1854 (see also *P. ludoviciana* Sull. above)
- Plagiochila vincentina*** Lindenb. CHIRIQUI: nr Boquete, Holcomb Trail, *Cornman 3137* (PMA); DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro Pirre, above Rancho Mojado, 800-1150 m, on tree trunk, *Salazar A. & Gradstein 9256* (PMA, U)
- Plagiochila*** spp. DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992
- Porella complanata*** (Steph.) Swails CHIRIQUI: David, *Héliion* (NY), Swails 1970; Alto Pineda, Cerro Punta, in cloud forest, 8000-8400 ft., on decomposing log, *Salazar A. 1091* (PMA); Camino Los Indios, between Estrella Arriba and La Hacienda, on bark of tree, *Salazar A. & Wilson 1259, 1261* (PMA)
- Porella crispata*** (Hook.) Trevis. var. *crispata* s.l., *Svihla 40423* (NY); CHIRIQUI: David, *Héliion* (NY), Swails 1970
- Porella swartziana*** (Weber) Trevis. s.l., Stephani 1910 as *Madotheca swartziana* (Weber) Lehm. & Lindenb.; s.l., Schuster 1980; CHIRIQUI: nr Cerro Punta, *Croat 16133* (MO)
- Preissia quadrata*** (Scop.) Nees CHIRIQUI: Boquete, *Svihla 40447*, Svihla 1942: “although previously reported on this continent ‘from Greenland to Mexico’ this appears to be the first record from south of Mexico.” [This report needs verification or rejection; *vide* Grolle 1980, Schuster 1992c]
- Prionolejeunea aemula*** (Gottsche) A. Evans DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro Pirre, 1200-1300 m, on bark of tree, *Salazar A. & Gradstein 9294* (PMA); PANAMA: Cerro Jefe, entering Las Nubes, 1000 m, on bark of tree, *Salazar A. & Gradstein 9403* (PMA)
- Prionolejeunea macrocardia*** (Spruce) Steph. DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro Pirre, on tree, *Salazar A. & Gradstein 9225* (PMA); PANAMA: Barro Colorado Island, on rotten, flaky bark, *Salazar A. & Gradstein 15086* (PMA)
- Prionolejeunea muricato-serrulata*** (Spruce) Steph. DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992
- Prionolejeunea trachyodes*** (Spruce) Steph. DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro Pirre, 800-1150 m, on bark of trees, *Salazar A. & Gradstein 9267* (PMA); INRENARE's station, foothills of Cerro Pirre, 100 m, on bark of tree, *Salazar A. & Gradstein 9267* (PMA)
- ****Pycnolejeunea macroloba*** (Nees & Mont.) Schiffn. PANAMA: Altos de Cerro Azul,

Sendero El Cantar, on exposed small tree along upper trail, *Stotler & Crandall-Stotler 3508* (ABSH)

Radula episcia Spruce CHIRIQUI: Fortuna, Spörle 1990 (as *R. cornucopiae* Spruce); Fortuna, *Spörle 1.43* (PMA); NE of camping site of Fortuna, site of dam, on rock and decomposing logs, *Salazar A. et al. 543, 581, 582, 583* (PMA); Las Mellizas, trail along banks of river, on bark of tree, *Salazar A. et al. 6179, 6240* (PMA)

Radula flaccida Lindenb. & Gottsche DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; INRENARE's station, foothills of Cerro Pirre, 100 m, on tree trunk, *Salazar A. & Gradstein 9220, 9240* (PMA); above Rancho Mojado, 800-1150 m, *Salazar A. & Gradstein 9252* (PMA); PANAMA (CANAL ZONE): Barro Colorado Is., Quebrada R. Shannon, epiphyll on *Hybanthus prunifolius*, *Marino 5, 6, 35, 36* (PMA); Barro Colorado Is., *Salazar A. & Gradstein 15145* (MO)

Radula gottscheana Taylor CHIRIQUI: Fortuna, Spörle 1990 (as *R. boryana* (Weber) Nees ex Mont.); Cerro Pinola, *Spörle 1.1* (PMA)

Radula kegelii Gottsche ex Steph. DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; PANAMA: Altos de Campana National Park, on stone, 800-900 m, *Salazar A. et al. 6794* (PMA)

Radula laxiramea Steph. CHIRIQUI: s.l., Stephani 1910 [Type: Panamá]; Rois de Boquete, nr David, *Fr. Hélicon 412* (YU), s.n. (BM, YU), Castle 1959; *F. Hélicon 412*, Yamada 1991

Radula macrostachya Lindenb. & Gottsche CHIRIQUI: s.l., Stephani 1910 as *R. elegans* Steph. [Type: Panamá]; s.l., *Frère Hélicon*, Castle 1966 as *R. elegans*; s.l., *Frère Hélicon*, Yamada 1991 as *R. surinamensis* Steph.; PANAMA (CANAL ZONE): Barro Colorado Is., Miller 5-6, on rocks, *Salazar A. 4414a* (PMA)

Radula quadrata Gottsche s.l., Schuster 1980 as *R. mollis* Lindenb. & Gottsche; s.l., Yamada 1993; CHIRIQUI: s.d., *Frère Hélicon 417*, Castle 1965 as *R. mollis*

Radula saccatiloba Steph. DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro

Pirre, 800-1150 m, on bark of tree, *Salazar A. & Gradstein 9260* (PMA)

Rectolejeunea berteroa (Gottsche ex Steph.) A. Evans CHIRIQUI: Boquete, *Chickering s.n.* (MICH), Crum & Arzeni 1953; DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro Pirre, above Rancho Mojado, 800-1150 m, epiphyll, *Salazar A. & Gradstein 9247 p.p.* (PMA); PANAMA (CANAL ZONE): Barro Colorado Is., Camino F. Miller, on tree trunk 1.5 m above ground, *Salazar A. & Chung 4529* (PMA)

****Rectolejeunea flagelliformis*** A. Evans PANAMA: Chagres National Park, Altos de Cerro Azul, Sendero El Cantar, 800 m, on bark, *Gradstein 9783* (GOET)

Riccardia andina (Spruce) Herzog CHIRIQUI: Fortuna, Spörle 1990; Fortuna, *Spörle 1.3* (PMA)

Riccardia cervicornis (Spruce) Herzog ex Gradst. & Hekking CHIRIQUI: Fortuna, Spörle 1990; Fortuna, *Spörle 1.29* (PMA); DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro Pirre, 1300 m, *Salazar A. & Gradstein 9307* (PMA)

Riccardia fucoidea (Sw.) Schiffn. CHIRIQUI: El Volcán, *Chickering s.n.* (MICH), Crum & Arzeni 1953; Fortuna, 1000 m, on soil along banks of creek, *Salazar A. et al. 610* (PMA); on rock, *Salazar A. et al. 670, 717* (PMA); DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro Pirre, 1300 m, *Salazar A. & Gradstein 9306* (PMA)

Riccardia latifrons (Lindb.) Lindb. CHIRIQUI: El Volcán, *Chickering s.n.* (MICH), Crum & Arzeni 1953 [doubtful; needs verification]

Riccardia sprucei (Steph.) Meenks & de Jong PANAMA: C. Jefe, Spörle 1990; Cerro Jefe, forest behind INTEL tower, 900-1000 m, on rock in creek from San Cristobal River, *Salazar A. & Chung 5220* (PMA)

Riccia stenophylla Spruce COCLE: El Valle de Antón, on soil, 500 m, *Salazar A. et al. 13498*, Jovet-Ast 1993

Riccia weinionis Steph. PANAMA (CANAL ZONE): Isla de Barro Colorado, entre los rieles des transportador a la entrada de Donato, terrestre, *Chung, Aranda & Vergara 205*, Jovet-Ast 1991

Ricciocarpos natans (L.) Corda PANAMA:

- Lago Gatún, *Vergara & Mendoza s.n.* (PMA); PANAMA (CANAL ZONE): s.l., Balciunas & Center 1981
- **Scapania portoricensis* Hampe & Gottsche CHIRIQUI: Fortuna, Hornito, 1200-1300 m, on branch of tree, *Spörle s.n.* (PMA); P.I.L.A., 2462 m, on log along trail to Cerro Punta, *Stotler & Crandall-Stotler 3505* (ABSH)
- Schiffneriolejeunea polycarpa* (Nees) Gradst. CHIRIQUI: El Volcán, *Chickering s.n.* (MICH), Crum & Arzeni 1953 as *Ptychocoleus polycarpus* (Nees) Trevis. [doubtful; needs verification]
- **Stephaniella paraphyllina* J. B. Jack CHIRIQUI: along road from summit of Volcán Barú to the middle of the Oak zone, *Allen 9104C* (MO)
- **Stictolejeunea balfourii* (Mitt.) E. W. Jones PANAMA: Parque Nacional Soberanía, Sendero "Camino de Cruces," on earth and rocks in rivulet, *Gradstein 9761* (GOET), *Stotler & Crandall-Stotler 3508* (ABSH); *Reiner-Drehwald 60030* (PMA)
- Stictolejeunea squamata* (Willd. ex Weber) Schiffn. s.l., Jovet-Ast 1957; CHIRIQUI: David, *Hélion s.n.* (L, S, U), Gradstein 1985, 1994; Fortuna, Hornito, 1000-1200 m, on *Lycopodium* sp., *Salazar A. 2405* (PMA); DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Marragantí, *Williams 1082* (NY), Gradstein 1994; base of Cerro Pirre, on shrub, *Salazar A. & Gradstein 9219* (PMA, U); ca 20 km SSW of Boca de Cupe, ca 200 m, *Allen 8685* (MO); PANAMA: Campana National Park, 800 m, corticolous and on decomposing log, *Salazar A. et al. 6563, 6571, 6624* (PMA); PANAMA (CANAL ZONE): Barro Colorado Is., s.c., Haynes 1933; Barro Colorado, *Chickering s.n.* (MICH), Crum & Arzeni 1953; Barro Colorado Is., *Shattuck 4CH p.p.* (F), various trails, corticolous and on rocks, *Salazar A. et al. 4384, 4391, 4409, 4440, 4457, 4641, 4713, 5898, 5899, 5902, 5903, 5918* (PMA)
- Symbiezidium barbiflorum* (Lindenb. & Gottsche) A. Evans s.l., Jovet-Ast 1957; CHIRIQUI: El Volcán, on log, *Chickering s.n.* (MICH), Crum & Arzeni 1953; DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992, Gradstein 1994; Cerro Pirre, between Pirre 1 and Pirre 2, *Salazar A. & Gradstein 9222 p.p.* (PMA); PANAMA (CANAL ZONE): Barro Colorado Is., on rocks and bark of trees, *Salazar A. et al. 4375, 4383, 4391, 4417, 4298, 5912, 5961, 5963, 5980* (PMA)
- **Symbiezidium transversale* (Sw.) Trevis. var. *hookerianum* (Gottsche) Gradst. & van Beek PANAMA (CANAL ZONE): drowned forest of Quebrada Culebra, *Dodge & Allen 17076* (MO)
- Symbiezidium transversale* (Sw.) Trevis. var. *transversale* s.l., Stephani 1912 (Sp. Hep., Vol. V) as *S. subrotundum* (Hook.) Trevis.; s.l., Arnell 1959 as *S. subrotundum*; s.l. Gradstein & van Beek 1985; s.l., *Mannee & Gorgone s.n.* (YU), Gradstein 1994; COLON: s.l., *Dodge, Steyermark & Allen 16959* (MO), Fulford 1942a as *S. subrotundum*; DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro Pirre, 800 m, on tree trunk, *Salazar A. & Gradstein 9264* (PMA); PANAMA (CANAL ZONE): C. Z. Experiment Garden, *Chickering s.n.* (MICH), Crum & Arzeni 1953; s.l., *Dodge & Allen 8847a, 8879, 8879* (MO), Fulford 1942a as *S. subrotundum*; Barro Colorado Is., Camino Snyder-Molino, on rocks, *Chung & Aranda B. 237 (R7C3)* (PMA)
- Symphogyna brasiliensis* Nees & Mont. s.l., B. Seemann (NY) (this specimen, in the Mitten herbarium, was listed as *S. circinata* Nees & Mont. by Mitten 1854 but was misidentified, *vide* Evans 1927); CHIRIQUI: Fortuna, 1000-1270 m, on soil, *Salazar A. et al. 605, 692* (PMA); DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro Pirre, 1200-1300 m, *Salazar A. & Gradstein 9295* (PMA); PANAMA: C. Jefe, Spörle 1990; Cerro Jefe, forest behind INTEL tower, 900-1000 m, terrestrial along creek, *Salazar A. 5217, Spörle 0.8* (PMA); Cerro Jefe, *Hammel & deNevers 13579* (MO)
- Symphogyna brongniartii* Mont. CHIRIQUI: Fortuna, Spörle 1990; Fortuna, *Spörle 1.28* (PMA); Cerro Pata de Macho, *Antonio 2662* (MO); PANAMA: Cerro Jefe, forest behind INTEL tower, 900-1000 m, on decomposing log, *Salazar A. & Chung 5212* (PMA)

- Szygiella bilobata* Inoue CHIRIQUI: *Hélion s.n.*, Inoue 1966, 1987 [Type Panamá]
- **Szygiella macrocalyx* (Mont.) Spruce PANAMA: Cerro Jefe, behind INTEL tower, 900 m, on bark of tree, *Salazar A. & Gradstein 9393* (PMA)
- Szweykowskia cucullifolia* (J. B. Jack & Steph.) Gradst. & Reiner-Drehw. BOCAS DEL TORO: Headwaters of Río Colubre, 2400-2550 m, epiphytic, *Gómez et al. 22420* (CR, MO, U), Gradstein & Reiner-Drehwald 1995; CHIRIQUI: P.I.L.A., Sendero Valle Libre, alt. 2470 m, on tree trunk, *Salazar A. P123* (PMA), Gradstein & Reiner-Drehwald 1995; P.I.L.A., 2462 m, on tree along trail to Cerro Punta, 2 m above ground, *Stotler & Crandall-Stotler 3405* (ABSH); Cerro Punta, *van der Werff 6290* (MO)
- Taxilejeunea debilis* (Lehm. & Lindenb.) Steph. [*non* Schiffn.] CHIRIQUI: Boquete, *Chickering s.n.* (MICH), Crum & Arzeni 1953
- Taxilejeunea obtusangula* (Spruce) A. Evans DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro Pirre, 100 m, on bark of tree, *Salazar A. & Gradstein 9357* (PMA); PANAMA (CANAL ZONE): Barro Colorado Is., Camino Snider-Molino 4, on tree bark, *Salazar A. & Chung 4732* (PMA)
- **Taxilejeunea sulphurea* (Lehm. & Lindenb.) Schiffn. CHIRIQUI: Fortuna, 1000-1270 m, on decomposing log, *Salazar A. et al. 666, 726* (PMA); Fortuna, Hornito, *Gradstein 9774* (GOET)
- Telaranea nematodes* (Gottsche ex Austin) M. Howe CHIRIQUI: Fortuna, Hornito, on rotten wood, *Gradstein 9775b* (GOET); Fortuna, Hornito, on log, *Stotler & Crandall-Stotler 3499* (ABSH); DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro Pirre, above Rancho Mojado, 800-1150 m, on tree trunk, *Salazar A. & Gradstein 9270, 9271* (PMA); Summit of Pirre Massif, 1200-1350 m, *Allen 8851B* (MO); PANAMA: Altos de Cerro Azul, Sendero El Cantar, on small twigs over soil, *Stotler & Crandall-Stotler 3501* (ABSH); VERAGUAS: N of Santa Fe, *Mori & Kallunki 2644* (MO)
- **Triandrophyllum subtrifidum* (Hook. & Taylor) Fulford & Hatcher BOCAS DEL TORO: P.I.L.A., páramo of Cerro Fábrega, 3150-3353 m, *Dauphin 1582* (GOET, INBIO, PMA, U)
- **Trichocolea elliotii* Steph. BOCAS DEL TORO: Fábrega Massif, *Gomez et al. 22515* (MO); CHIRIQUI: Cerro Respingo, *Gentry 5917* (MO, PMA); PANAMA: nr El Llano, *Kennedy et al. 3125* (MO)
- Trichocolea flaccida* (Spruce) J. B. Jack & Steph. CHIRIQUI: Fortuna, 1000-1270 m, on soil and on rocks, *Salazar A. et al. 693, 705* (PMA); PANAMA: Cerro Jefe, Spörle 1990; Cerro Jefe, forest behind the INTEL tower, 900-1000 m, on bark of tree, *Salazar A. 5210, 5241, Spörle 0.11* (PMA)
- Trichocolea tomentosa* (Sw.) Gottsche BOCAS DEL TORO: P.I.L.A., páramo of Cerro Fábrega, 3150-3353 m, *Dauphin 1549* (GOET, INBIO, PMA, U); CHIRIQUI: nr El Hato, *Stern & Chambers 68* (YU), Fulford 1963; Fortuna, Spörle 1990; Fortuna, *Spörle 1.41* (PMA); COCLE: La Mesa, El Valle de Antón, on bark of tree, *Salazar A. & Béliz 1381* (PMA); DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro Pirre, 1300 m, *Salazar A. & Gradstein 9308, 9309, 9310* (PMA)
- Tylimanthus approximatus* (Lindenb.) Besch. DARIEN: Cerro Pirre, Gradstein & Salazar Allen 1992; Cerro Pirre, 800-1150 m, on bark of tree, *Salazar A. & Gradstein 9269* (PMA)
- **Zoopsisidella integrifolia* (Spruce) R. M. Schust. CHIRIQUI: Fortuna, Hornito, ca 1100 m, on rotten wood with *Cephalozia crassifolia* (Lindenb. & Gottsche) Fulford and *Telaranea nematodes* (Gottsche ex Austin) M. Howe, *Gradstein 9775a* (GOET); Fortuna, Hornito, 1170 m, on highly decayed stump, *Stotler & Crandall-Stotler 3487* (ABSH, PMA)

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