A small bryophyte collection made by WILHELM LÖTSCHERT 1952-1953 in El Salvador

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Abstract: Winter, G. & Schäfer-Verwimp, A. (2024): A small bryophyte collection made by Wilhelm Lötschert 1952-1953 in El Salvador. *Frahmia* 40:1-15*.
A small collection of bryophytes made by W. Lötschert in El Salvador in 1952-1953 and kept in the Herbarium Senckenbergianum (hb FR) was re-examined. In 1955, O. Burck had examined only the mosses and described 16 species in detail in an unpublished manuscript. The new study identified a total of 18 mosses and 14 liverworts, of which 1 moss and 12 liverworts are new to El Salvador.

Key words: Central America, liverworts, mosses, cloud forest, Coastal Cordillera, *Frullania*

Fig. 1. Interior of a Central American cloud forest with tree ferns at Miramundo (Lötschert 1961, fig. 3)

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1. Introduction

Wilhelm Lötschert (1923-1984) studied botany, zoology, chemistry and philosophy in Frankfurt am Main in 1945/46. In 1950, immediately after obtaining his doctorate, he became a research assistant there.

From October 1952 to August 1953, Lötschert had the opportunity to visit the Republic of El Salvador with the support of the Deutsche Forschungsgemeinschaft at the invitation of the Instituto Tropical de Investigaciones Científicas of the Universidad de El Salvador, which had been founded in 1950. From 1950 to 1955, in addition to the staff of Salvadoran technicians, 22 scientists from Germany, 13 from the United States of America, 4 from the Netherlands and 1 from France worked at the Institute. Lötschert worked on ecophysiology and vegetation science. Among other things, he collected 94 species of pteridophytes that were new to El Salvador (Lötschert 1954, Morton & Lötschert 1958), raising the number of pteridophytes known from El Salvador at that time to 174 (Lötschert 1954a). From 1955 to 1959 he taught at the University of Frankfurt am Main, then moved to the University of Hamburg, returning again to the University of Frankfurt am Main in 1965. Lötschert died in Frankfurt on June 29 1984 (Gies 1986).

Lötschert's entire herbarium of about 1600 specimens from South and Central America, mainly Pteridophyta is housed in the Herbarium Senckenbergianum (hb FR) in Frankfurt am Main.

Otto BURCK (1873-1966) was a bryologist and teacher in Frankfurt am Main (1898-1934). He identified the mosses of Lötschert and wrote a detailed handwritten and a typewritten manuscript with precise descriptions of the specimens, which remained unpublished (Burck 1955). As literature he used Bartram (1949) and Steere & Chapman (1946), as at that time only the second edition of Calderon & Standley's "Flora Salvadorena" from 1941 was available, which listed only 12 mosses and 8 liverworts for the whole country.

From 1921 to 1956 Burck was in charge of the herbarium of Senckenberg on an honorary basis. He worked with bryophytes for more than 40 years and contributed greatly to the development of the bryological collection of the Senckenberg Institute. For further information see Dressler (2018).

Burck in lit.: "Dr. Lötschert, who visited El Salvador in 1952 and 1953 to study the world of ferns, had the kindness to collect for me numerous samples of the mosses that flourish there, especially those of the cloud forest."

Now, after some 70 years, Lötschert's collection has been rediscovered and re-examined.

2. Collecting sites

Lötschert collected mainly ferns and only brought back bryophytes from the cloud forests at Burck's request. The altitudes of the collecting sites have been added according to Lötschert (1954). The locations of the specimens were taken from the labels and supplemented by notes in Burck's unpublished manuscript. Geographical coordinates have been taken from the Internet.

(1) Miramundo – Departamento Chalatenango
(also mistakenly written as Hieromundo, Hiromundo, Hieramundo on the labels)

Cerro Miramundo is adjacent to Mount El Pital Hill (with 2730 m the highest point in El Salvador) and located on the border with Honduras, about 9 km northeast of La Palma. It is part of a cloud forest and offers one of the coldest climates in the country, with temperatures ranging between 3 and 18 °C.

14°24'58.3"N 89°22'1.9 W

Lötschert's collection: Cloud forest on Cerro Miramundo **2200-2300 m.**

(2) La Palma – Departamento Chalatenango

La Palma is a small city in the north about 82 km from San Salvador, 8 km from the border with Honduras and the starting point for a variety of excursions in the upper part of the Chalatenango region.

14°19'2.4" N 89°19'13.7" W

Lötschert's collections: Shady slopes in pine forest of the *Pinus oocarpa* association in the environs of La Palma, **1000 m.**

The **Coastal Cordillera** is a chain parallel to the coast with 4 major volcanoes: Santa Ana (2364 m), San Salvador (1950 m), San Vicente (2173 m) and San Miguel (2132 m).

(3) Laguna Ranas – Departamento Sonsonate

Laguna de las Ranas situated on the volcano of the same name which is a part of the volcanic group La Cordillera Sierra de Apaneca, in the west of El Salvador between the Santa Ana volcanic complex and the border with Guatemala.

13°54'9" N 89°43'21" W

Lötschert's collections: Cloud forest around Laguna de las Ranas, **1700 m**. (Lötschert 1953, 1954)

(4) **Boquerón Lavafeld** – Departamento La Libertad

The extensive lava field was formed in June 1917 during an eruption at the foot of the north-western slope of the Boquerón (Mertens 1952: 61, 66), part of Volcan San Salvador group (Roy 1957), today part of "Area Natural Protegida Complejo El Playón" near Quezaltepeque.

13°47'53" N 89°18'57" W

Lötschert's collections: Black, sparsely vegetated, desolate slag area with mosses and lichens as the first vegetation pioneers (Lötschert 1959), **about 600 (-800) m**.

(5) **Barraner, Barsaner Wand** – Departamento San Salvador

It is the wall of barranco "Arenal de Mejicanos" near the Instituto Tropical de Investigaciones Científicas at the Universidad El Salvador in San Salvador (Lötschert 1953).

13°43' 30" N 89°12'22" W

Lötscher's collections: On walls of the barranco near the Instituto Tropical, **690 m.**

(6) San Vicente – Departamento San Vicente

Volcán de San Vicente [also called Chichontepec] with 2173 m is the second highest volcano in El Salvador and part of the coastal cordillera.

13°35'50" N 88°50'20" W

Lötscher's collections: Cloud forest on Volcán San Vicente, (1300-1400) **2000-2100 m.**

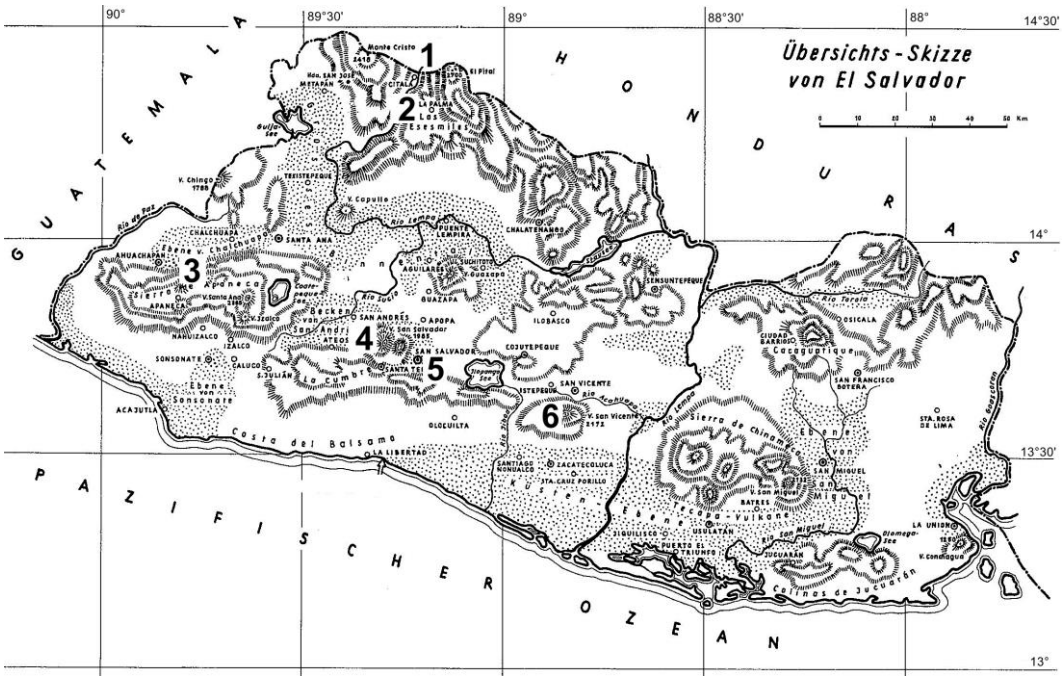

Fig. 2. Topographical map of the Central American Republic of El Salvador: 1 Miramundo, 2 La Palma, 3 Laguna Ranas, 4 Boquerón lava field, 5 Barraner Wand, 6 San Vicente
(Lauer 1956, modified)

3. Preliminary remarks

The nomenclature is following Bryo Nomenclator, accessed June 2024

The bryophytes are arranged in alphabetical order of the families, genera and species.
* = new record for El Salvador

The location of some specimens cannot be identified, as some labels indicate two different locations, e.g. Miramundo and San Vicente.

4. Musci

Bartramiaceae

***Philonotis uncinata* (Schwägr.) Brid. 1827**

Boquerón Lavafeld, 18. Februar 1953 [FR-230857] Burck as *Philonotis glaucescens.*
Widespread and frequent from USA and Mexico to Brazil including the West Indies and all countries of Central America (Allen 2002). First record from El Salvador by Steere & Chapman (1946), followed by Winkler (1965 - 12 collections), both as *P. glaucescens* and *P. gracillima.*

Brachytheciaceae

***Brachythecium ruderale* (Brid.) W.R. Buck 1998**

Miramundo 2300 m, November 1952 – Im Nebelwald an faulenden Baumstümpfen [FR-227066] Burck as *Brachythecium stereopoma;* mixed with *Meteoridium remotifolium* and *Frullania atrata* [FR-0225570]

A common tropical American species, widespread also in Africa (Allen 2018); first mentioned from El Salvador by Steere & Chapman (1946, as *B. stereopoma*).

***Meteoridium remotifolium* (Müll. Hal.) Manuel 1977**

San Vicente - Miramundo, s.d. [FR-230847] Burck as *Orthostichopsis tetragona*, rev. Schäfer-Verwimp 2021.

A widespread and common neotropical species, reported by Manuel (1977) from El Salvador, not mentioned by Allen (2010).

Calymperaceae

***Octoblepharum albidum* Hedw. 1801**

La Palma, 1000 m, s.d. - Baummoos [FR-230844] det. Burck

A common pantropical species; firstly recorded by Steere & Chapman (1946), Winkler (1965) mentioned 12 collections from El Salvador.

Hylocomiaceae

***Elmeriobryum guatemalense* J.R. Rohrer 1986**

San Vicente 2100 m, März 1953 - An Bäumen im Nebelwalde [FR-209024] Burck as *Leptohymenium ehrenbergianum*, rev. Schäfer-Verwimp 2022.

An interesting species known only from Central America (Guatemala, El Salvador, Honduras, and Costa Rica (Allen 2018). The Lötschert specimen appears to be the third from El Salvador. However, the three specimens cited by Winkler (1965) as *Leptohymenium ehrenbergianum* may also turn out to belong to *Elmeriobryum guatemalense*. *Leptohymenium tenue* (Hook.) Schwägr. (synonym: *L. ehrenbergianum*) is primarily a southeast-Asian species with a few occurrences at high elevations in Mexico and a single occurrence in Central America in the extreme western edge of Guatemala (Allen 2018). Compare also Peterson's (1994) note under *L. tenue*: "Most plants so-named from Guatemala and those from Costa Rica [.....] should be referred to *Elmeriobryum guatemalense*".

Lembophyllaceae

***Pilotrichella flexilis* (Hedw.) Ångstr. 1876**

Miramundo - San Vicente, November 1952 - Baummoos, Nebelwald [FR-230848) Burck as *Orthostichidium pentagonum*, rev. Schäfer-Verwimp 2021 - mixed with *Frullania atrata* [FR-0225814] and *Frullania brasiliensis* [FR-0273979]

San Vicente, 2050 m, 12. März 1953 [FR-233992] det. Schäfer-Verwimp 2021.

Widespread and common in tropical America including all countries of Central America, also known from East Tropical Africa and Western Indian Ocean (Allen 2010). Already mentioned by Steere & Chapman (1946) and Winkler (1965 - 16 collections) from El Salvador.

Leucobryaceae

***Campylopus filifolius* (Hornsch.) Spruce 1867**

Miramundo, 2300 m, November 1952 [FR-230738] det. Burck.

Widespread tropical American species, known from Mexico and Central America (Honduras, Guatemala, El Salvador, Costa Rica, Panama) to Bolivia and Brazil, and the West Indies (Frahm 1991); first record for El Salvador by Steere & Chapman (1946), Winkler (1965) mentioned 12 collections.

Following Stech (2004), the species of *Bryohumbertia* are returned to *Campylopus.*

***Campylopus pilifer* Brid. 1819.**

Boquerón Lavafeld, 15. Februar 1953 [FR-230740] - Burck as *C. introflexus.*

Widespread and frequent through the Neotropics from Mexico and Central America (Guatemala, Honduras, El Salvador, Nicaragua, Costa Rica, Panama), the Greater Antilles to northern Argentina and Brazil, also known from W Europe, Africa, India and Sri Lanka (Frahm 1991).

Allen (1994) listed four specimens from El Salvador, among these two Winkler collections, and Frahm (1991) mentioned four specimens of Winkler, Winkler (1965) seven collections as *C. introflexus.*

The name *C. introflexus* has longly been used by European and North American authors incorrectly for *C. pilifer* (Frahm 1994).

Meteoriaceae

***Meteorium deppei* (Hornsch. ex Müll. Hal.) Mitt. 1869**

San Vicente - Miramundo, November 1952 - An Bäumen des Nebelwaldes [FR-230845] Burck as *Papillaria deppei.*

Widespread and common tropical American species, known from Mexico and the Caribbean down to Bolivia and Brazil; from Central America mentioned from Belize, Guatemala, El Salvador, Nicaragua, Costa Rica, and Panama (Allen 2010); Winkler (1965) cited 10 collection numbers of this species from El Salvador, as *Papillaria deppei.*

***Toloxis imponderosa* (Taylor) W.R. Buck 1994**

San Vicente 2100 m, Nebelwald, s.d. – an Bäumen [FR-230846] Burck as *Papillaria imponderosa*.

A common tropical American species known from Mexico to Bolivia and Brazil including the West Indies and all countries of Central America (Allen 2010). First record by Winkler (1965) as *Papillaria imponderosa.*

Neckeraceae

***Alleniella urnigera* (Müll. Hal.) S.Olsson, Enroth & D.Quandt 2011**

Laguna Ranas 1700 m, Januar 1953 - An Baumstämmen [FR-0389019], separated from *Porotrichum korthalsianum* [FR-0230860], det. Schäfer-Verwimp 2024 (one sporophyte seen).

A widespread tropical American species, known from Mexico to northern Argentina and Brazil including Hispaniola of the West Indies (Buck 1998). Previously reported from El Salvador by Steere & Chapman (1946), Winkler (1965 - 14 collections), and Allen (2010), all as *Neckera urnigera*).

***Porotrichum korthalsianum* (Dozy & Molk.) Mitt. 1869**

Miramundo, November 1952 [FR-230859] Burck as *Homaliodendron mohrianum*, rev. Schäfer-Verwimp 2021.

Laguna Ranas 1700 m, Januar 1953 - An Baumstämmen [FR-230860] Burck as *Homaliodendron mohrianum*, rev. Schäfer-Verwimp 2021.

San Vicente, 2050 m, Nebelwald, an *Trichomanes radicans* (Lötschert 244a) [FR-233993] det. Schäfer-Verwimp 2021.

Widespread in the Neotropics, known from Mexico, Central America, the Caribbean down to Bolivia and Brazil (Allen 2010); Evans (1941) first reported this species as *P. cobanense* from El Salvador, Winkler (1965) mentioned 16 collections from El Salvador, and Steere & Chapman (1946) six (both as *P. cobanense*).

Phyllogoniaceae

***Phyllogonium fulgens* (Hedw.) Brid. 1827**

San Vicente, März 1953 [FR-230861] Burck as *Homaliodendron mohrianum*, rev. Schäfer-Verwimp 2021.

San Vicente, März 1953 – Baummoos [FR-230858], det. Schäfer-Verwimp 2021. A tropical American species, known from Mexico, all countries of Central America, the Caribbean, Western and Northern South America and Brazil (Allen 2010). First record for El Salvador by Steere & Chapman (1946), followed by six collections of Winkler (1965).

Polytrichaceae

***Pogonatum procerum* (Lindb.) Schimp. 1875**

Miramundo 2300 m, s.d. - Erdmoos, an Wegeinschnitten [FR-230743] Burck as *Pogonatum robustum.*

Pogonatum procerrum is a high elevation moss, and the largest (acrocarpous) moss in Central America where it is widespread and frequent. It is further known from Mexico, the Caribbean and Western South America (Allen 2018). First record for El Salvador by Winkler (1965) as *Pogonatum robustum.*

Pottiaceae

****Weisiopsis oblonga* Thér. 1933**

Barsaner Wand, 27. Oktober 1952 – Auf trockenem Boden [FR-231387] det. Burck.

Known only from Mexico, Honduras and Guatemala (Allen 2002). It represents also a new generic record for El Salvador (Búcaro et al. 2019).

Prionodontaceae

***Prionodon densus* (Sw. ex Hedw.) Müll. Hal. 1844**

Miramundo, November 1952 [FR-230862] det. Burck.

San Vicente, 2100 m, März 1953 – Baummoos, Nebelwald [FR-230863] det. Burck.

A common tropical American species, known also from Southern Africa and Western Indian Ocean (Allen 2010). Firstly recorded from El Salvador by Steere & Chapman (1946), and Winkler (1965) collected 32 specimens there.

Pylaisiadelphaceae

***Platygyriella densa* (Hook.) W.R. Buck 1984**

San Vicente 13-1400 m, November 1952 - Rindenmoos [FR-230843] Burck as *Pterogonidium pulchellum*, rev. Schäfer-Verwimp 2021.

Widespread in tropical America, known also from Macaronesia and Africa (Allen 2018); first record for El Salvador by Steere & Chapman (1946), Winkler (1965) mentioned 14 specimens from the country, both as *Erythrodontium densum.*

Taxiphyllaceae

***Taxiphyllum taxirameum* (Mitt.) M. Fleisch. 1922**

Barraner Wand 690 m, 23. Oktober 1952 [FR-228985] Burck as *Plagiothecium planissimum.*

Widely distributed from USA southwards to Brazil (including the West Indies), Asia (from Russia Far East to Malesia and India), Australasia and the Pacific; in Central America known from Belize, Guatemala, El Salvador, Honduras, Nicaragua and Costa Rica (Allen 2018). A single specimen mentioned by Winkler (1965) from El Salvador, as *Plagiothecium planissimum.*

5. Liverworts

Frullaniaceae

Apart from the seven species of *Frullania* listed below, all new to El Salvador, only one epiphyllous specimen of *Frullania intumescens* var. *closterantha* (Spruce) Gradst. & Pócs was known from the Hacienda Montecristo on the SE slope of Cerro Miramundo (Winkler 1967: 313). Unfortunately, this specimen could not be traced in any herbarium for re-examination.

It was not surprising that all seven species were found, as they are widespread in Central and South America and fill a gap in their distribution.

The specimens were mostly found intermingled within other bryophytes and separated.

****Frullania atrata* (Sw.) Nees ex Mont. 1839**

Miramundo, November 1952 [FR-0225570] det. Winter 2021, separated from *Brachythecium ruderale* [FR-0227006]

San Vicente - Miramundo, November 1952 [FR-0225814] det. G. Winter 2021, separated from *Pilotrichella flexilis* [FR-0230848]

Wide spread in tropical America incl. Galapagos, with distribution in Central America: Belize (Whittemore & Allen 1996), Guatemala, Costa Rica (Clark & Svihla 1948).

****Frullania brasiliensis* Raddi 1822**

Miramundo, 25. Juni 1953, [FR-0273715] det. Winter 2021.

San Vicente, November 1952, c. per. [FR-0226192] det. Winter 2017.

San Vicente - Miramundo, November 1952 November 1952 [FR-0273979] det. Winter 2021, separated from *Pilotrichella flexilis* [FR-0230848]

Very common in tropical America incl. Galapagos Islands, with distribution in Central America: Guatemala, Costa Rica, Panama (Stotler 1969).

***Frullania convoluta* Lindenb. & Hampe 1851**

Miramundo, 25. Juni 1953 [FR-0226191] det. Winter 2021.

Widespread in tropical America from Mexico to Bolivia incl. Galapagos Islands (Uribe 2008), with distribution in Central America: Guatemala, Honduras, Costa Rica, Panama (Uribe 2008).

***Frullania ericoides* (Nees) Mont. 1839**

San Vicente, März 1953 [FR-0234993] det. Winter 2017, separated from *Frullania montagnei* [FR-0226195]

A pantropical polymorphous species, with distribution in Central America: Guatemala (Hale 1980 as *Fr. squarrosa*), Costa Rica (Dauphin 2005), Panama (Stotler et al. 1998).

***Frullania gibbosa* Nees 1840**

San Vicente, März 1953 [FR-0389020] det. Winter 2024, separated from *Frullania montagnei* [FR-0226195]

A widespread species from Florida to South America (Clark & Svihla 1948) incl. Galapagos, from sea level to 2300 m (Gradstein 2021b), with distribution in Central America: Costa Rica (Dauphin 2005), Panama (Stotler et al. 1998).

***Frullania montagnei* Gottsche 1845**

San Vicente, März 1953 [FR-0226195] det. Winter 2024, mixed with *Frullania ericoides* [FR-0234933] and *Frullania gibbosa* [FR-0389020]

A widespread species from Mexico to Brazil, with distribution in Central America: Guatemala, Costa Rica (Stotler 1969).

***Frullania peruviana* Gottsche 1846**

San Vicente, März1953 [FR-0226193] det. Winter 2021, separated from *Cheilolejeunea ovalis* [FR-0243019]

Widespread from Mexico to Bolivia incl. Galapagos Islands (Uribe 2008), with distribution in Central America: Guatemala, Honduras, Costa Rica (Uribe 2008), Panama (Schäfer-Verwimp (2014).

Herbertaceae

***Herbertus juniperoideus* (Sw.) Grolle 1961 (s. str.)**

Miramundo, November 1952 [FR-0230919] det. Schäfer-Verwimp 2024.

Widespread but scattered in the Neotropics from Central America (Costa Rica) and the West Indies to Bolivia and Brazil (Feldberg & Heinrichs 2006; Schäfer-Verwimp & Pócs 2009). The new record from El Salvador constitutes a considerable northward extension of the range of the species.

Lejeuneaceae

***Bryopteris filicina* (Sw.) Nees 1845**

Miramundo, November 1952 [FR-0226197] det. Schäfer-Verwimp 2021, mixed with *Cheilolejeunea filiformis* [FR-0153917]

Miramundo, November 1952 [FR-0226198] det. Schäfer-Verwimp 2021.

San Vicente, 9. Juli 1953 [FR-0226196] det. Schäfer-Verwimp 2021.

A common neotropical species, known from Mexico and the West Indies to Argentina and Brazil, from El Salvador reported by Evans (1941, as *B. fruticulosa*) and Gradstein (1994).

***Ceratolejeunea fallax* (Lehm. & Lindenb.) Bonner 1953**

Miramundo, November 1952 [FR-0226194] det. Schäfer-Verwimp 2021.

Widespread Neotropical species, known from Mexico to South-East Brazil, from Central America so far reported from Costa Rica and Panama (Dauphin 2003). New to El Salvador.

***Cheilolejeunea filiformis* (Sw.) W. Ye, R.L. Zhu & Gradst. 2015**

Miramundo, November 1952 [FR-0153917] det. Schäfer-Verwimp 2021, separated from *Bryopteris filicina* [FR-0226197]

Widespread in the Neotropics, already mentioned from El Salvador by Winkler (1967, as *Omphalanthus filiformis).*

***Cheilolejeunea ovalis* (Lindenb. & Gottsche) W. Ye, R.L. Zhu & Gradst. 2015**

San Vicente, März 1953 [FR-0243019] det. Schäfer-Verwimp 2021, mixed with *Frullania peruviana* [FR-0226193]

Cheilolejeunea ovalis is a neotropical species known from Central America (Guatemala, Costa Rica, Panama), the northern Andes from Venezuela, Colombia, Ecuador (incl. Galapagos Islands) and Peru, and is rather rare in Brazil and the West Indies (Gradstein 2016; Schäfer-Verwimp & van Melick 2016). First record for El Salvador.

***Lejeunea caripensis* Lindenb. & Gottsche 1847**

San Vicente, März 1953 [FR-0233994, FR-0233995] both det. Schäfer-Verwimp 2024.

A widespread but little-known Neotropical species which has been confused with the common *Lejeunea cerina* (Gradstein 2021a). It has become known so far from Mexico, Costa Rica, Panama, the West Indies (Dominican Republic and Guadeloupe) and Northern South America (Venezuela, Colombia, Bolivia, the Guayanas and Brazil); first record for El Salvador.

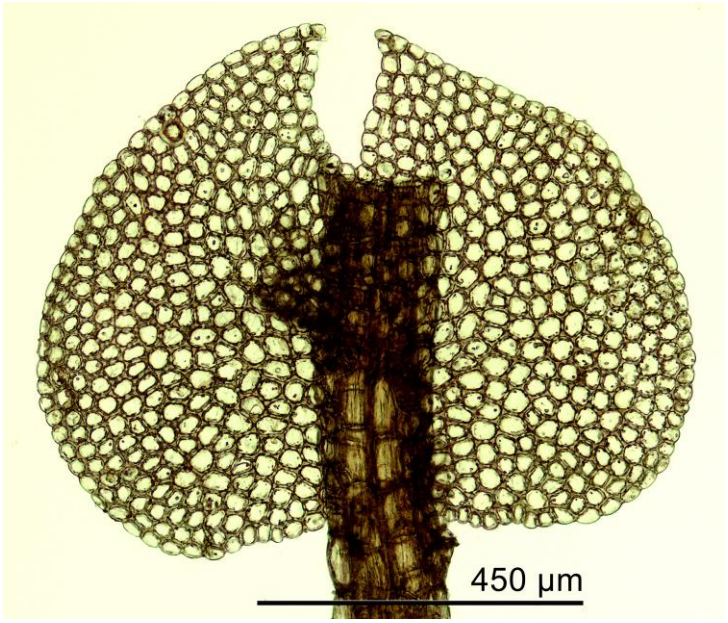

Fig. 3. Underleaf of *Lejeunea caripensis* [FR-0233994]

Plagiochilaceae

***Plagiochila diversifolia* Lindenb. & Gottsche 1847**

Miramundo, November 1952 [FR-0226199] det. Schäfer-Verwimp 2024.

Plagiochila diversifolia is widespread from Mexico to northern Argentina and the high mountains of South-East Brazil, and known also from the Galapagos islands (Heinrichs et al. 2000). First record for El Salvador.

6. Discussion

The very limited number of bryophyte collections made by W. Lötschert and the fact that, more than 70 years after their collection by a non-bryologist, one moss species and 12 species of liverworts can still be reported as new to the country, clearly shows that the bryoflora of El Salvador is still greatly under-collected, and especially the liverworts are rather poorly known.

Currently, 277 moss species are known from El Salvador (including this study) exceeding the number reported from Honduras, Nicaragua, and Belize (Búcaro et al. 2019). Nevertheless, the moss flora of El Salvador appears to be far from complete, as evidenced by Búcaro et al. (2012) who reported 26 new records from 69 identified specimens, and Búcaro et al. (2019), who listed 35 species of Pottiaceae (the most diverse family in El Salvador) eight of which were first recorded for the country. Even the only Pottiaceae collected by Lötschert, *Weisiopsis oblonga*, represents a new species and genus record. Menzel (1991) in his first checklist from El Salvador listed 233 moss species, expecting a number of more than 500. Future fieldwork is necessary to obtain a more complete overview of the bryophyte diversity of the country.

The number of liverworts known from El Salvador, excluding the present study, is about 73 (own compilation based mainly on Evans (1941) and Winkler (1967), besides some scattered records in various literature).

The only country in Central America comparable in size to El Salvador (21,040 km^2) is Belize with 22,966 km^2. Only 65 species of liverworts are known from Belize (Whittemore & Allen 1996). This low number also indicates that Belize is under-collected bryologically, evidenced by the fact that Bruce Allen's liverwort collection from the highest point (1140 m) included 22 genera and 30 species new to Belize, almost doubling the known liverwort flora of the country (Whittemore & Allen 1996). Although much more populous (6.4 million inhabitants) than Belize (400,000), El Salvador should have a greater number of liverworts than Belize because of the great diversity of natural vegetation from mangrove forests, humid lowland forests and semi-humid savannas to cloud forests and high altitude savannas and despite the destruction and alteration of much of the country by land use (Lauer 1954, with vegetation map; Lötschert 1959). Several volcanoes reach heights of more than 2000 m, the highest being the 2730 m Cerro El Pital near the border with Honduras.

Freire et al. (2013) increased the number of liverworts known from Guatemala from 219 (Pérez 2009) to 264 species. With an area of 108,890 km^2, even this considerably higher number of species seems to be too low, as does the number of 293 liverwort taxa found on the internet (Pérez et al. 2024).

From comparably quite better researched Costa Rica (51,100 km^2) which has more than double the size of El Salvador, more than 580 liverwort species are known (Dauphin 2005), from Panama (75,517 km^2) about 485 species (Schäfer-Verwimp 2014; Dauphin et al. 2015, 2022); but even smaller areas such as Dominica (754 km^2 - 300 liverwort and hornwort taxa) or Guadeloupe (1.628

km^2 - 385 liverwort and hornwort species) have much higher numbers of liverwort species (Schäfer-Verwimp 2010; Lavocat Bernard & Schäfer-Verwimp 2011; Lavocat Bernard & Reeb 2016).

At present about 85 species of liverworts are known from El Salvador, but we estimate that there are at least more than 250 or 300 species of liverworts in the country. Even of speciose and widespread neotropical genera as *Bazzania, Lepidozia, Calypogeia, Heteroscyphus, Leptoscyphus, Plagiochila*, etc., none or very few species are mentioned in literature.

7. Acknowledgments

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8. Bibliography

Publications on the bryophytes of El Salvador are rare, in particular on liverworts (Förther 2007).

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