



Myxomycete diversity in Costa Rica

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Abstract

An updated analysis of myxomycete diversity in Costa Rica is provided herein as a product of an extensive data mining-based study intended to normalize the information on myxomycetes from that country. Within the context of the Mesoamerican Biodiversity Hotspot, the 242 species of myxomycetes are reported herein demonstrated the potential of this area for diversity-based studies. For the construction of the updated species list, a thorough analysis that included examination of vouchers and a literature review has been carried out, and some species previously included in other works have been rejected due to inconsistencies or misidentification. The present contribution is essential to address the Wallacean shortfall within Mesoamerica and important for providing updated data on microorganisms in the context of regional biodiversity monitoring.

Key words – Amoebozoa – biogeography – Central America – checklist – distribution – myxogastrids – Myxomycetes – plasmodial slime moulds

Introduction

The myxomycetes of Costa Rica have been the subject of recent small-scale analyses (e.g., Rojas & Doss, 2013, Rojas & Valverde 2015, Lado & Rojas, in rev.) and the last overall assessment of the diversity in this country, based on morphospecies, reported 208 species for the entire territory (Rojas et al. 2010a). This value represented about 48% of the total myxomycete diversity in the Neotropics at that time (see Lado & Wrigley de Basanta 2008) and demonstrated that for this group of organisms, a small country can have a high number of species. In fact, a posterior analysis of myxomycete diversity in one well-studied 1500 ha patch of land in the same country yielded 85 species (Walker et al. 2015b), providing more support for such idea.

Costa Rica is one the jurisdictions with high myxomycete diversity within the Mesoamerican Biodiversity Hotspot, a region located between Southern Mexico and Northern Colombia. This result is a consequence of uneven efforts to study myxomycetes across the region and it does not show actual distributional patterns. However, it demonstrates the regional potential for comparative purposes. For instance, it has been acknowledged that this hotspot may contain up to 10% of the global biodiversity and just in the case of myxomycetes, understudied at the regional level, results have shown the region to have up to 24% of the accepted species worldwide (see Lado & Eliasson 2017).

In this sense, the systematic ongoing effort to study myxomycetes in Costa Rica during the last decade, which has increased the number of species in the country (Rojas 2017), has been an important contribution towards understanding myxomycete distribution in Mesoamerica. However, a review of the reported myxomycetes for the country had not been carried out yet due to inconsistencies in the information associated with records. As a strategy to address this problem, the present study has been designed within the framework of updating data on biological species for biodiversity conservation purposes (see Margules et al. 2002). As such, the main objective of the study presented herein was to generate an updated list of myxomycete species known from Costa Rica and to provide an overview of the documented diversity within administrative and bioclimatic regions. These analyses can show the accomplishments and shortcomings of myxomycete research within a spatial and temporal context.

Materials & Methods

This study was carried out in the Royal Botanical Gardens of Madrid and the Engineering Research Institute at the University of Costa Rica during the years 2016 and 2017. As part of an initiative of the Myxotropic project (www.myxotropic.org), a creation and standardization of a database containing basic information on Costa Rican myxomycetes was carried out. For this, records were retrieved from the database created by Rojas et al. (2010a) and updated with information from the Farlow Herbarium (F) at Harvard University (USA), the Mycological Herbarium (UARKM) of the University of Arkansas (USA), the Botanische Staatssammlung München – Herbarium (M) from Germany where the collection of Martin Schnittler is deposited, the National Herbarium (CR) of Costa Rica, the herbarium of the University of Costa Rica (USJ), and the Myxogastrid Biorepository at the Engineering Research Institute (INII, University of Costa Rica).

After standardization of information, all records in the database were cross-checked with external databases such as GBIF (www.gbif.org) and the Neotropical myxomycete bibliographic database maintained, at the Real Jardín Botánico (CSIC), by the Myxotropic project. Vouchers deposited in the National Herbarium of Costa Rica, the University of Costa Rica Herbarium and the Myxogastrid Biorepository, which accounted for about 70% of all records in the database, were physically checked for information confirmation. After this process, a preliminary list of myxomycetes following the nomenclatural treatment of Lado (2006–2017) was generated and species were revised for inconsistencies. When records and species were flagged due to anomalous information, they were reviewed more thoroughly either by 1) physically revising the vouchers or 2) reviewing the literature where primary information was retrieved from. After this process, seven previously reported species for Costa Rica were excluded from the list provided herein, and a consolidated checklist was generated.

Collecting information for all species has been updated in the present study and included as annotations to the species list. In this manner, province, substrate type and forest type where all records have been found were incorporated after the species name. Provinces of Costa Rica are San José (coded with number 1), Alajuela (2), Cartago (3), Heredia (4), Puntarenas (5), Guanacaste (6) and Limón (7). Substrates were classified based on Rojas et al. (2014) as bark and wood (abbreviated as BW), ground litter (GL), aerial litter (AL), flowers and inflorescences (FI), fruits (FR), lianas (LI), living cryptogams (LC), living plants (LP), twigs (TW) and dung (DU). Forest type classification used the Holdridge system (Holdridge 1967) as Tropical Dry Forest (abbreviated as TDF), Tropical Moist Forest (TMF), Premontane Moist Forest (PMF), Lower Montane Moist Forest (LMF), Tropical Wet Forest (TWF), Premontane Wet Forest (PWF), Lower Montane Wet Forest (LWF), Montane Wet Forest (MWF), Premontane Rain Forest (PRF), Lower Montane Rain Forest (LRF), Montane Rain Forest (MRF) and Subalpine Rain Paramo (SRP). In addition, herbaria or collection where vouchers were deposited has been indicated using the acronym of the institution (see above).

The distribution of species within the Mesoamerican and Caribbean bioregions, arranged by countries, was generated. For practical purposes, the entire territories of Mexico, Colombia and

Venezuela were included, since sections of those countries are located within such biogeographical regions (Fig. 1). The geographical criteria on small Caribbean islands provided by Lado & Wrigley de Basanta (2008) in their review of Neotropical myxomycetes was also followed in the present study. The latter publication and a series of subsequent reports published by different authors on the regional countries considered herein (see Estrada-Torres et al. 2009, Izarduy et al. 2009, Montes 2009, Moreno et al. 2009, 2010, Rojas et al. 2010a, b, c, d, 2012, 2013, 2015a, b, c, 2017, Poulain et al. 2011, Agra et al. 2014, Leontyev et al. 2014, 2015, Rojas & Calvo 2014, Rojas & Doss 2014, Salazar-Márquez et al. 2014, Walker et al. 2014, 2015a, b, Lizárraga et al. 2015a, b, c, Rojas & Valverde 2015, Dagamac et al. 2017) has been used to update the distribution of all species.



Figure 1 – Map of Mesoamerican and Caribbean countries. Mexico (MEX), Belize (BLZ), Guatemala (GUA), Honduras (HON), El Salvador (ELS), Nicaragua (NIC), Costa Rica (COS), Panama (PAN), Colombia (CLM), Venezuela (VEN), Trinidad and Tobago (TRT), Windward Islands (WIN), Leeward Islands (LEE), Puerto Rico (PUE), Dominican Republic (DOM), Haiti (HAI), Jamaica (JAM), Cuba (CUB), Bahamas (BAH).

Other annotations were provided for selected species whose vouchers were not found but for which reliable information was available, or for species not previously included in Rojas et al. (2010a). In the first case, comments on vouchers and collection information that was not easily available were included. In the second, in addition to the information provided for all species, a reference to the publication listing the species was added at the end.

A spatial analysis of diversity and collecting effort, based on species richness, relative abundance of collections and the Shannon-Wiener Diversity Index was generated for both 1) the province and canton-level administrative units of Costa Rica and 2) the climatic zones and Holdridge forest types of this country. With such analysis, a series of maps was generated in QGIS, v 2.18 (QGIS Development Team 2004–2014) for quick visual interpretation. Finally, a series of β -diversity calculations were carried out using Whittaker's Species Turnover Estimator (Whittaker 1960), defined by $\beta = (S/\bar{\alpha}) - 1$, where S is total species richness and $\bar{\alpha}$ is the average number of species.

Results

A total of 242 species of myxomycetes within 40 genera were recognized in Costa Rica according with a database of more than 7800 records compiled during this study. Seven species previously reported for this country have been rejected as not present in its territory due to lack of verifiable information or misidentifications. The comments on these species are provided below, in a different item section.

The province with the most myxomycete records was Puntarenas, and the one with the lowest number was Alajuela (see Table 1). Despite this, the average rate of species accumulation was 0.12 species per record in the latter and just 0.07 species per record in the former. Only weak correlations between province size and any of the estimators calculated herein were calculated,

Table 1 Calculated Costa Rican myxomycete diversity and collecting effort estimators arranged by province, based on the general database created as part of the present investigation.

Province	Species richness	Number of records	Shannon-Wiener Diversity Index	Province size (km ²)
Alajuela	46	386	2.95	9757
Cartago	90	1179	3.45	3125
Guanacaste	118	1269	3.96	10141
Heredia	111	1226	3.65	2657
Limón	78	859	3.55	9189
Puntarenas	127	1762	3.65	11265
San José	128	1181	4.15	4966

suggesting that sampling had not been homogeneous across provinces. This was particularly clear in the case of the province of Alajuela, one of the largest in area, where only 46 myxomycetes have been recorded. The highest Shannon-Wiener Index of Diversity was associated with San José and the lowest with Alajuela in a similar manner to species richness (Fig. 2).

When the analysis was performed by cantons, Sarapiquí and La Cruz showed the highest species richness, whereas the lowest recorded richness was existed for Montes de Oro y Vásquez de Coronado. The highest average rate of species accumulation was found in Santa Cruz and León Cortez. No correlations between canton size and the calculated estimators were found, suggesting one more time that the effort to study these administrative units has not been homogeneous. The highest values for the Shannon-Wiener Index of Diversity were found in La Cruz, Perez Zeledón, Puntarenas and Sarapiquí (Fig. 3).

When the analyses were performed by climatic zone and forest type (life zones) results showed that the wet zone of the Southern Pacific, the temperate Talamanca Mountains and the northern Isla Calero zone (Fig. 4) had the highest average value for the Shannon-Wiener Index of Diversity. In a similar manner, when the analysis was carried out using the Holdridge life zone classification, the highest average values for Shannon's Index were associated with the same areas in addition to some locations in the Northern Plains and the Guanacaste Mountain Range (Fig. 5). In this case, wet forests at the basal, premontane and lower montane elevational belts were identified to have the highest diversity. Interestingly, in both cases, the lowest average values were found in areas of the southern portion of the Alajuela Province, suggesting that under sampling was responsible for this result.

An analysis of β -diversity carried out among all provinces in the country showed that the two pairs of provinces with the most similar regional-to-local ratios of species richness were Guanacaste and Puntarenas ($\beta=0.29$) along with Guanacaste and Heredia ($\beta=0.31$). In this case, the overall β -diversity for the entire country was 1.31. Similarly, when this analysis was carried out by cantons, the three units with the highest ratio of species richness were Jiménez and Puriscal ($\beta=0.20$), Acosta and Puriscal ($\beta=0.26$) and Bagaces and Sarapiquí ($\beta=0.29$). The overall β -

diversity for cantons was calculated in 10.22, due to the rather low numbers of species for most of these administrative units.

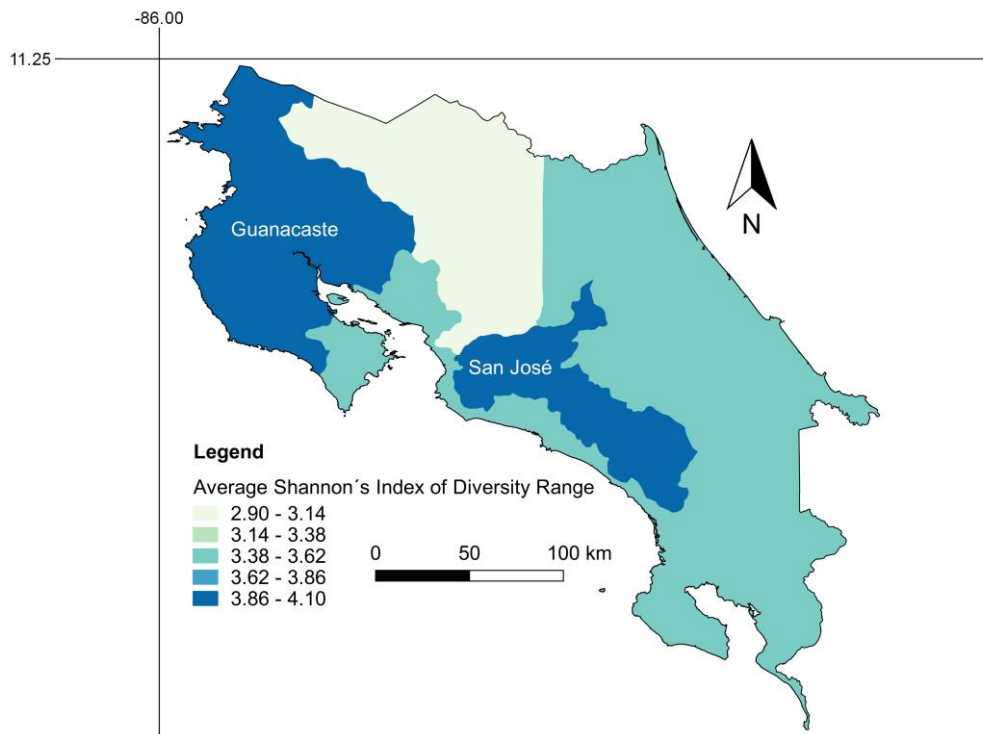


Figure 2 – Map of Costa Rica showing the spatial arrangement of provinces colored according to the average values of the Shannon-Wiener Index of Diversity using the myxomycete information of the present study. The two provinces with the highest values are shown.

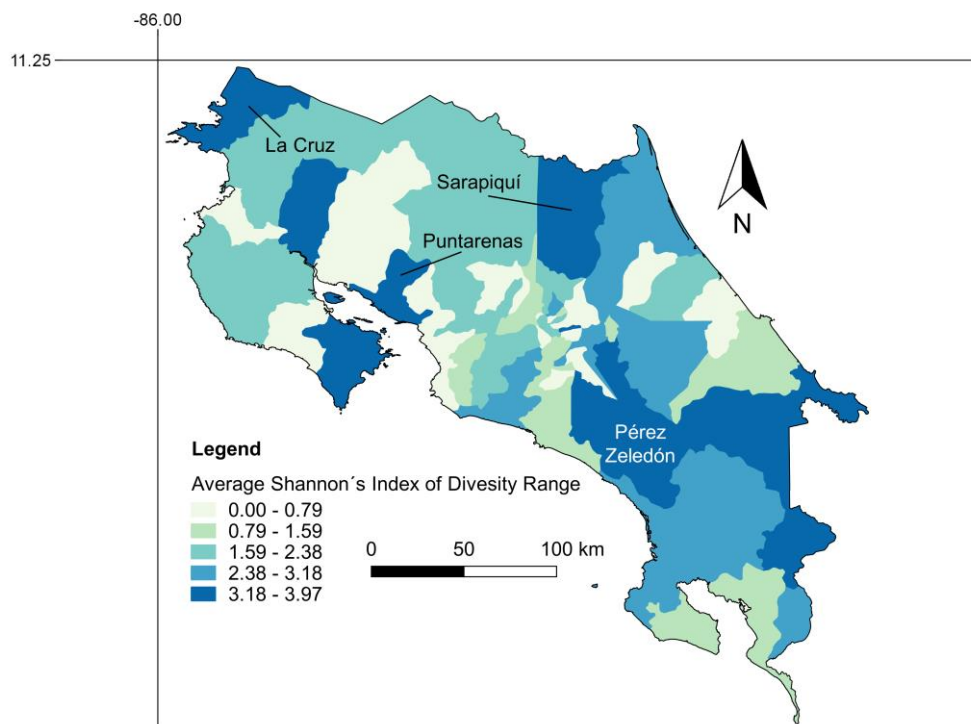


Figure 3 – Map of Costa Rica showing the spatial arrangement of cantons according to the Shannon-Wiener Index of Diversity using the myxomycete information of the present study. The four cantons with the highest values are shown.

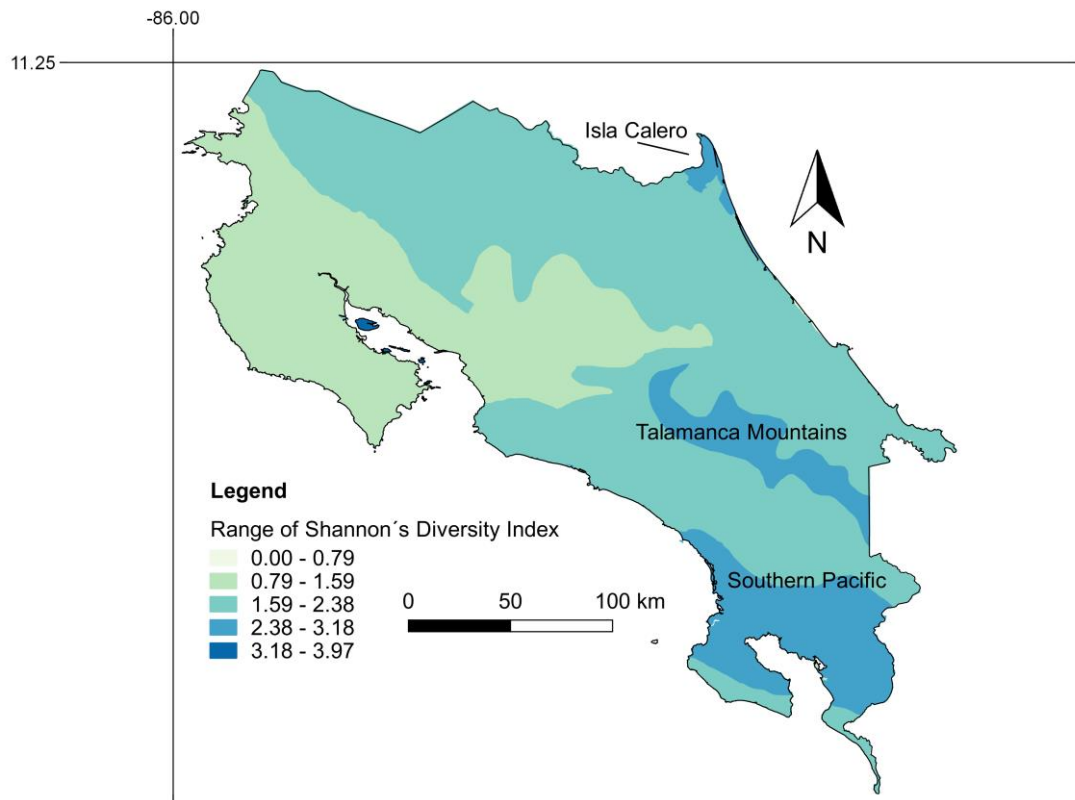


Figure 4 – Map of Costa Rica showing the spatial arrangement of the Shannon-Wiener Index of Diversity according to the natural borders defined by climate regions.

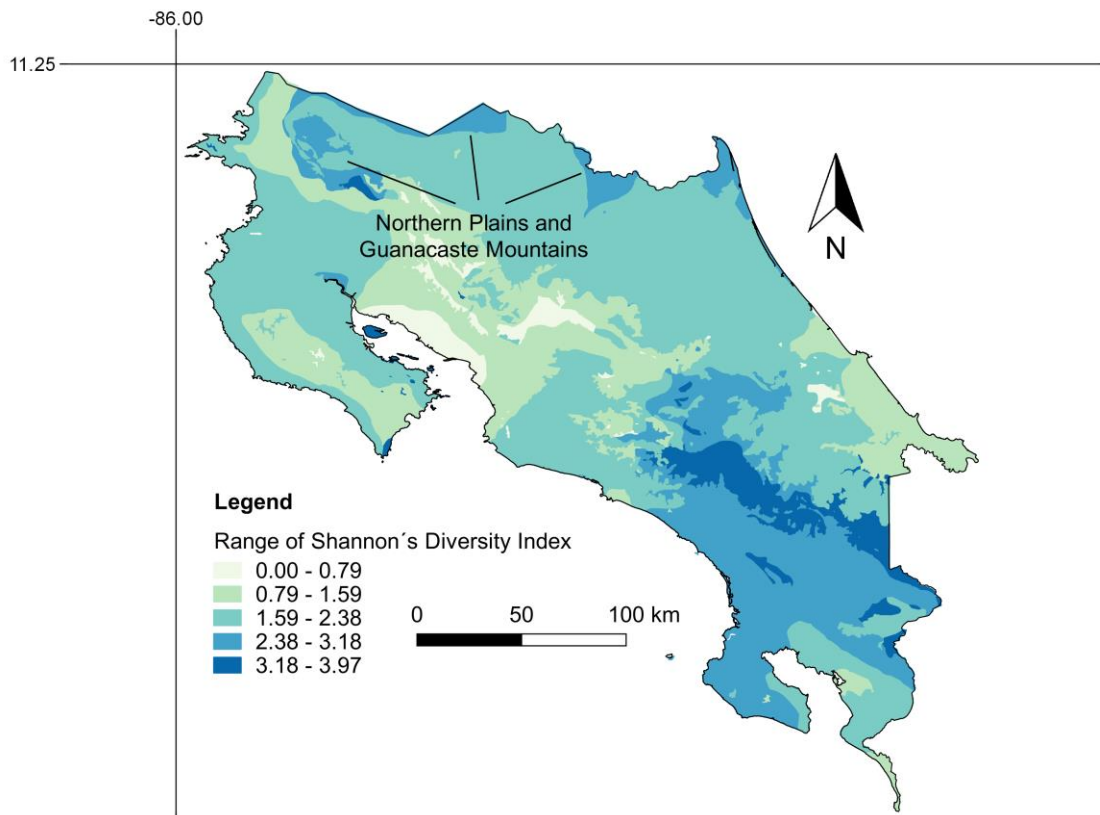


Figure 5 – Map of Costa Rica showing the spatial arrangement of the Shannon-Wiener Index of Diversity according to the natural borders defined by the Holdridge Life Zones.

The complete depurated list of myxomycetes, with the information and criteria mentioned above, and in a synthetic format, is provided below.

Annotated list of myxomycetes known from Costa Rica

1. *Alwisia bombardata* Berk. & Broome, 1873
Recorded in 4 and 5. On GL, DU. In PWF, PRF, LRF. Vouchers in M, USJ. Distribution: Costa Rica, Jamaica, Puerto Rico and Venezuela.
2. *Alwisia morula* G. Moreno, Leontyev, D.W. Mitch., S.L. Stephenson, C. Rojas & Schnittler, 2014
Recorded in 1. On BW. In LRF. Vouchers in M and USJ. Not known from other areas in Mesoamerica and the Caribbean. Reported from Costa Rica by Leontyev et al. (2014).
3. *Arcyria afroalpina* Rammeloo, 1981
Recorded in all provinces. On GL, AL. In TDF, TMF, PMF, LMF, TWF, PWF, PRF, SRP. Vouchers in M, UARKM, CR, USJ, INII. Distribution: Costa Rica, Cuba, El Salvador, Guatemala, Honduras, Mexico, Panama, Puerto Rico.
4. *Arcyria cinerea* (Bull.) Pers., 1801
Recorded in all provinces. On BW, GL, AL, FI, LC, TW. In TDF, TMF, PMF, LMF, TWF, PWF, LWF, PRF, LRF, MRF, SRP. Vouchers in F, M, UARKM, CR, USJ, INII. Distribution: Bahamas, Costa Rica, Cuba, Dominican Republic, Guatemala, Haiti, Honduras, Jamaica, Leeward Islands, Mexico, Nicaragua, Panama, Puerto Rico, El Salvador, Trinidad and Tobago, Venezuela, Windward Islands.
5. *Arcyria denudata* (L.) Wettst., 1886
Recorded in all provinces. On BW, GL, LC, DU. In TDF, TMF, PMF, LMF, TWF, PWF, LWF, PRF, LRF, MRF. Vouchers in F, M, UARKM, CR, USJ, INII. Distribution: Bahamas, Belize, Colombia, Costa Rica, Cuba, Dominican Republic, Honduras, Jamaica, Leeward Islands, Mexico, Nicaragua, Panama, Puerto Rico, El Salvador, Trinidad and Tobago, Venezuela, Windward Islands.
6. *Arcyria globosa* Schwein., 1822
Recorded in 3. On GL, In PWF. Vouchers in INII. Distribution: Colombia, Costa Rica, Cuba, Mexico, Puerto Rico. Reported from Costa Rica by Rojas et al. (2017).
7. *Arcyria incarnata* (Pers. ex J.F. Gmel.) Pers., 1902
Recorded in 1, 2, 5 and 6. On BW, GL, TW. In TDF, TMF, PMF, PWF, MRF, SRP. Vouchers in F, UARKM, CR, USJ, INI. Distribution: Colombia, Costa Rica, Cuba, Haiti, Jamaica, Leeward Islands, Mexico, Puerto Rico, Trinidad and Tobago, Venezuela, Windward Islands.
8. *Arcyria insignis* Kalchbr. & Cooke, 1882
Recorded in all provinces. On BW, GL, AL, FI, LP. In TDF, TMF, PMF, TWF, PWF, LRF. Vouchers in M, UARKM, CR, USJ, INII. Distribution: Colombia, Costa Rica, Cuba, Honduras, Jamaica, Leeward Islands, Mexico, Panama, Puerto Rico, Trinidad and Tobago, Venezuela.
9. *Arcyria magna* Rex, 1893
Recorded in 1. On BW. In PFM. Vouchers in UARKM, CR, USJ. Distribution: Costa Rica, Cuba, Mexico, Panama, Windward Islands.
10. *Arcyria minuta* Buchet, 1927
Recorded in 4 and 5. On BW, TW. In PRF, LRF. Vouchers in M, CR. Distribution: Costa Rica, Mexico, Panama.
11. *Arcyria obvelata* (Oeder) Onsberg., 1979
Recorded in 6. On BW. In TDF. Vouchers in CR. Distribution: Colombia, Cuba, Costa Rica, Jamaica, Leeward Islands, Mexico, Panama, Trinidad and Tobago, Venezuela.
12. *Arcyria pomiformis* (Leers) Rostaf., 1875
Recorded in 1, 3 and 5. On BW, GL, AL. In PMF, TWF. Vouchers in UARKM, CR, INII. Distribution: Colombia, Costa Rica, Jamaica, Mexico, Panama, Puerto Rico, Venezuela.

13. *Badhamia utricularis* (Bull.) Berk., 1852
Recorded in 4. On BW. In LRF. Vouchers in M. Distribution: Costa Rica, Mexico.
14. *Barbeyella minutissima* Meyl., 1914
Recorded in 1. On BW. In SRP. Vouchers in CR. Distribution: Costa Rica, Mexico.
15. *Calonema aureum* Morgan, 1893
Recorded in 4. On BW, In TWF. Vouchers in UARKM. Not known from other areas in Mesoamerica and the Caribbean. Reported from Costa Rica by Walker et al. (2015b).
16. *Ceratiomyxa fruticulosa* (O.F. Müll.) T. Macbr., 1899
Recorded in all provinces. On BW, GL, FR, LI, LC, TW. In TDF, TMF, PMF, LMF, TWF, PWF, LWF, PRF, LRF, MRF. Vouchers in M, UARKM, CR, USJ. Distribution: Colombia, Costa Rica, Cuba, Dominican Republic, El Salvador, Guatemala, Haiti, Honduras, Jamaica, Leeward Islands, Mexico, Nicaragua, Panama, Puerto Rico, Trinidad and Tobago, Venezuela, Windward Islands.
17. *Ceratiomyxa morchella* A.L. Welden, 1954
Recorded in 3, 5, 6 and 7. On BW, GL. In TDF, TWF, PRF. Vouchers in M, CR, USJ. Distribution: Costa Rica, Honduras, Jamaica, Mexico, Panama, Puerto Rico, Trinidad and Tobago, Venezuela, Windward Islands.
18. *Ceratiomyxa sphaerosperma* Boedijn, 1927
Recorded in 3 and 7. On GL. In TWF. Vouchers in M, USJ, INII. Distribution: Colombia, Costa Rica, Cuba, Jamaica, Mexico, Panama, Puerto Rico, Venezuela, Windward Islands.
19. *Clastoderma debaryanum* A. Blytt, 1880
Recorded in all provinces except for 4. On BW, GL, AL, TW. In TDF, TMF, PMF, TWF, PWF, PRF, MRF, SRP. Vouchers in M, UARKM, CR, USJ, INII. Distribution: Colombia, Costa Rica, Cuba, El Salvador, Honduras, Jamaica, Leeward Islands, Mexico, Panama, Puerto Rico, Trinidad and Tobago, Venezuela, Windward Islands.
20. *Clastoderma pachypus* Nann.-Bremek., 1968
Recorded in 5 and 6. On BW, AL. In TDF, PRF. Vouchers in M, CR. Distribution: Costa Rica, Mexico.
21. *Collaria arcyronema* (Rostaf.) Nann.-Bremek. ex Lado, 1991
Recorded in 1, 3, 5, 6 and 7. On BW, GL, AL, FI, LI, LP, TW. In TDF, TMF, PMF, LMF, TWF, PWF, LWF, PRF, LRF. Vouchers in M, UARKM, CR, USJ, INII. Distribution: Belize, Costa Rica, Cuba, Dominican Republic, El Salvador, Haiti, Honduras, Jamaica, Leeward Islands, Mexico, Nicaragua, Panama, Puerto Rico, Windward Islands.
22. *Collaria lurida* (Lister) Nann.-Bremek., 1975
Recorded in 3, 5, 6 and 7. On BW, GL, AL. In TDF, TMF, TWF, PWF, PRF. Vouchers in M, UARKM, CR, USJ, INII. Distribution: Colombia, Costa Rica, Cuba, Mexico, Panama, Puerto Rico.
23. *Collaria rubens* (Lister) Nann.-Bremek., 1975
Recorded in 6 and 7. On GL. In TMF, PRF. Vouchers in UARKM. Distribution: Costa Rica, Mexico.
24. *Colloderma oculatum* (C. Lippert) G. Lister, 1910
Recorded in 1. On BW. In LWF. Vouchers in INII. Not known from other areas in Mesoamerica and the Caribbean. Reported from Costa Rica by Rojas et al. (2015b).
25. *Comatricha alta* Preuss, 1851
Recorded in 4. On BW. In TWF. Vouchers in UARKM. Not known from other areas in Mesoamerica and the Caribbean. Reported from Costa Rica by Walker et al. (2015b).
26. *Comatricha elegans* (Racib.) G. Lister, 1909
Recorded in 4 and 5. On BW, GL, AL, TW. In LWF, PRF. Vouchers in CR, INII. Distribution: Colombia, Costa Rica, Cuba, Haiti, Jamaica, Mexico, Puerto Rico, Trinidad and Tobago, Venezuela, Windward Islands.
27. *Comatricha laxa* Rostaf., 1874

- Recorded in 3, 5 and 6. On BW, GL, AL. In TMF, TWF, PWF, PRF. Vouchers in UARKM, CR, USJ, INII. Distribution: Colombia, Costa Rica, Cuba, El Salvador, Guatemala, Leeward Islands, Mexico, Panama, Puerto Rico, Venezuela.
28. *Comatricha laxifila* R.K. Chopra & T.N. Lakh., 1992
Recorded in 6. On BW. In TDF. Vouchers in M. Not known from other areas in Mesoamerica and the Caribbean. Reported from Costa Rica by Rojas et al. (2010a).
29. *Comatricha nigra* (Pers. ex J.F. Gmel.) J. Schröt., 1885
Recorded in all provinces. On BW, AL, GL, FI, TW. In TDF, TMF, PMF, TWF, PWF, LWF, PRF, LRF, MRF, SRP. Vouchers in M, UARKM, CR, USJ, INII. Distribution: Costa Rica, Cuba, El Salvador, Guatemala, Honduras, Jamaica, Leeward Islands, Mexico, Panama.
30. *Comatricha pulchella* (C. Bab.) Rostaf., 1876
Recorded in all provinces except for 2. On BW, GL, AL, LC, TW. In TDF, TMF, TWF, PWF, LWF, PRF, MRF, SRP. Vouchers in M, UARKM, CR, USJ, INII. Distribution: Colombia, Costa Rica, El Salvador, Honduras, Jamaica, Leeward Islands, Mexico, Panama, Puerto Rico, Venezuela.
31. *Comatricha tenerrima* (M.A. Curtis) G. Lister, 1919
Recorded in all provinces. On BW, GL, AL, FI, LC, TW. In TDF, TMF, PMF, TWF, PWF, LWF, PRF, MRF, SRP. Vouchers in M, UARKM, CR, USJ, INII. Distribution: Colombia, Costa Rica, Cuba, El Salvador, Honduras, Jamaica, Leeward Islands, Mexico, Panama, Puerto Rico, Venezuela.
32. *Cornuvia serpula* (Wigand) Rostaf., 1873
Recorded in 6. On GL. In LWF. Vouchers in INII. Distribution: Costa Rica, Mexico.
33. *Craterium aureum* (Schumach.) Rostaf., 1874
Recorded in 3, 5 and 6. On GL, AL. In TDF, TWF, PRF. Vouchers in UARKM, CR, USJ. Distribution: Colombia, Costa Rica, Dominican Republic, Jamaica, Mexico, Panama, Puerto Rico, Venezuela, Windward Islands.
34. *Craterium concinnum* Rex, 1893
Recorded in 1 and 5. On BW, GL, AL, FI. In PWF, LWF, MRF, SRP. Vouchers in M, CR, USJ. Distribution: Colombia, Costa Rica, Cuba, Jamaica, El Salvador.
35. *Craterium leucocephalum* (Pers. ex J.F. Gmel.) Ditmar, 1813
Recorded in all provinces except for 4. On GL, AL. In TDF, TMF, PMF, TWF, PWF, PRF, LRF. Vouchers in M, UARKM, CR, USJ. Distribution: Colombia, Costa Rica, Cuba, El Salvador, Guatemala, Jamaica, Leeward Islands, Mexico, Panama, Puerto Rico, Trinidad and Tobago, Venezuela, Windward Islands.
36. *Craterium minutum* (Leers) Fr., 1829
Recorded in 1. On GL. In LMF, MWF. Vouchers in USJ. Distribution: Colombia, Costa Rica, Cuba, Mexico.
37. *Craterium muscorum* Ing, 1982
Recorded in 1. On BW. In LWF. Vouchers in MA. Not known from other areas in Mesoamerica and the Caribbean. Reported from Costa Rica by Lado et al. (2018).
38. *Craterium paraguayense* (Speg.) G. Lister, 1911
Recorded in 1 and 5. On GL, LP. In PWF. Vouchers in M, USJ. Distribution: Colombia, Costa Rica, Cuba, Mexico, Panama, Puerto Rico, Venezuela.
39. *Cribraria aurantiaca* Schrad., 1797
Recorded in 4. On GL. In LRF. Vouchers in M. Distribution: Costa Rica, Jamaica, Mexico, Panama, Venezuela.
40. *Cribraria cancellata* (Batsch) Nann.-Bremek., 1975
Recorded in 1, 3, 4, 6 and 7. On BW, GL. In TDF, PMF, TWF, PRF. Vouchers in M, UARKM, CR, USJ, INII. Distribution: Bahamas, Belize, Colombia, Costa Rica, Cuba, Guatemala, Honduras, Jamaica, Leeward Islands, Mexico, Nicaragua, Panama, Puerto Rico, Trinidad and Tobago, Venezuela, Windward Islands.
41. *Cribraria confusa* Nann.-Bremek. & Y. Yamam., 1893

- Recorded in 6. On BW. In TDF. Vouchers in M. Distribution: Costa Rica, Cuba, Mexico, Windward Islands.
42. *Cribraria costata* Dhillon & Nann.-Bremek., 1978
Recorded in 4. On BW, GL, DU. In LRF. Vouchers in M. Not known from other areas in Mesoamerica and the Caribbean. Reported from Costa Rica by Rojas et al. (2010a).
43. *Cribraria intricata* Schrad., 1797
Recorded in 1, 3, 4, 5 and 6. On BW, GL. In TDF, TMF, PMF, TWF, PWF, PRF, LRF, MRF. Vouchers in M, CR, USJ, INII. Distribution: Colombia, Costa Rica, Cuba, Jamaica, Leeward Islands, Mexico, Panama, Puerto Rico, Trinidad and Tobago, Venezuela, Windward Islands.
44. *Cribraria languescens* Rex, 1891
Recorded in 1, 3, 6 and 7. On BW, GL. In TDF, TMF, PMF, LMF. Vouchers in M, UARKM, USJ. Distribution: Costa Rica, Guatemala, Honduras, Jamaica, Leeward Islands, Mexico, Panama, Puerto Rico, Trinidad and Tobago, Venezuela, Windward Islands.
45. *Cribraria macrocarpa* Schrad., 1797
Recorded in 4. On BW. In LRF. Vouchers in M. Distribution: Colombia, Costa Rica, Cuba, Mexico.
46. *Cribraria microcarpa* (Schrad.) Pers., 1801
Recorded in 2, 3, 5, 6 and 7. On BW, GL, AL, TW. In TDF, TMF, PMF, TWF, PWF, LWF, PRF. Vouchers in M, UARKM, CR, USJ, INII. Distribution: Belize, Colombia, Costa Rica, Cuba, El Salvador, Honduras, Jamaica, Leeward Islands, Mexico, Panama, Puerto Rico, Trinidad and Tobago, Venezuela, Windward Islands.
47. *Cribraria mirabilis* (Rostaf.) Masee, 1892
Recorded in 1. On BW, TW. In MRF, SRP. Vouchers in CR, USJ. Distribution: Costa Rica, Mexico.
48. *Cribraria oregana* H.C. Gilbert, 1932
Recorded in 5. On BW. In TDF. Vouchers in M. Distribution: Costa Rica, Guatemala, Mexico. Reported from Costa Rica by Schnittler & Stephenson (2000) as *Cribraria vulgaris* var. *oregana*.
49. *Cribraria piriformis* Schrad., 1797
Recorded in 1. On BW. In MRF, SRP. Vouchers in CR. Distribution: Costa Rica, Guatemala, Mexico, Panama.
50. *Cribraria purpurea* Schrad., 1797
Recorded in 1 and 5. On BW. In PWF, MRF. Vouchers in M, USJ. Distribution: Costa Rica, Mexico, Venezuela.
51. *Cribraria splendens* (Schrad.) Pers., 1801
Recorded in 1 and 3. On BW. In PMF, LMF, TWF, LRF. Vouchers in USJ. Distribution: Costa Rica, Jamaica, Leeward Islands, Mexico, Venezuela.
52. *Cribraria tenella* Schrad., 1797
Recorded in all provinces except 7. On BW, GL. In TDF, TMF, PMF, TWF, PWF, LWF, PRF. Vouchers in M, CR, USJ, INII. Distribution: Colombia, Costa Rica, Cuba, Dominican Republic, El Salvador, Haiti, Honduras, Jamaica, Leeward Islands, Mexico, Panama, Puerto Rico, Venezuela, Windward Islands.
53. *Cribraria violacea* Rex, 1891
Recorded in 1, 3, 5, 6 and 7. On BW, GL, AL, LC, TW. In TDF, TMF, PMF, TWF, PWF, LWF, PRF. Vouchers in M, UARKM, CR, USJ, INII. Distribution: Costa Rica, Cuba, El Salvador, Honduras, Jamaica, Leeward Islands, Mexico, Panama, Puerto Rico, Trinidad and Tobago, Venezuela, Windward Islands.
54. *Cribraria vulgaris* Schrad., 1797
Recorded in 1, 4, 5 and 6. On BW, GL, LC, TW. In PWF, PRF, LRF, MRF, SRP. Vouchers in M, UARK, CR, USJ. Distribution: Costa Rica, Guatemala, Mexico.
55. *Diachea bulbilosa* (Berk. & Broome) Lister, 1898

- Recorded in 5 and 6. On BW, GL, LP. In TDF, TMF, PWF. Vouchers in M, USJ, INII. Distribution: Colombia, Costa Rica, Cuba, El Salvador, Honduras, Jamaica, Mexico, Panama, Puerto Rico, Venezuela, Windward Islands.
56. *Diachea leucopodia* (Bull.) Rostaf., 1874
Recorded in all provinces except 2. On BW, GL, TW. In TDF, TMF, PMF, LMF, TWF, PWF, LWF, PRF, LRF. Vouchers in F, M, UARKM, CR, USJ, INII. Distribution: Colombia, Costa Rica, Cuba, Dominican Republic, El Salvador, Guatemala, Honduras, Jamaica, Leeward Islands, Mexico, Panama, Puerto Rico, Trinidad and Tobago, Venezuela, Windward Islands.
57. *Dictydiaethalium plumbeum* (Schumach.) Rostaf., 1894
Recorded in 3 and 4. On LP. In LMF, MRF. Vouchers in USJ. Distribution: Colombia, Costa Rica, Cuba, Dominican Republic, Leeward Islands, Mexico, Nicaragua, Panama, Puerto Rico, Venezuela.
58. *Dictydiaethalium dictyosporum* Nann.-Bremek., 1966
Recorded in 2. On BW. In TWF. Vouchers in MA. Not known from other areas in Mesoamerica and the Caribbean. Reported from Costa Rica by Lado et al. (2018).
59. *Diderma chondrioderma* (de Bary & Rostaf.) Kuntze, 1898
Recorded in 5. On BW, GL, LC. In PWF, MRF. Vouchers in UARKM, CR, USJ. Distribution: Belize, Costa Rica, Jamaica, Mexico, Panama, Puerto Rico, Windward Islands.
60. *Diderma corrugatum* T.E. Brooks & H.W. Keller, 1977
Recorded in 6. On BW, LI. In TDF. Vouchers in M. Distribution: Costa Rica, Cuba.
61. *Diderma deplanatum* Fr., 1829
Recorded in 6. On BW, GL. In TDF, LWF, PRF. Vouchers in M. Distribution: Costa Rica, Mexico.
62. *Diderma effusum* (Schwein.) Morgan, 1894
Recorded in all provinces except 2. On BW, GL, AL, FI, LI, LC. In TDF, TMF, PMF, TWF, PWF, LWF, PRF, LRF. Vouchers in M, UARKM, CR, USJ, INII. Distribution: Belize, Colombia, Costa Rica, Cuba, El Salvador, Honduras, Jamaica, Leeward Islands, Mexico, Panama, Puerto Rico, Trinidad and Tobago, Venezuela, Windward Islands.
63. *Diderma globosum* Pers., 1794
Recorded in 5. On BW. In PWF. Vouchers in M. Distribution: Costa Rica, Venezuela.
64. *Diderma hemisphaericum* (Bull.) Hornem., 1829
Recorded in all provinces. On BW, GL, AL, FI, LI, LC. In TDF, TMF, PMF, LMF, TWF, PWF, LWF, PRF, MRF, SRP. Vouchers in M, UARKM, CR, USJ, INII. Distribution: Colombia, Costa Rica, Cuba, El Salvador, Guatemala, Haiti, Honduras, Jamaica, Leeward Islands, Mexico, Panama, Puerto Rico, Trinidad and Tobago, Venezuela, Windward Islands.
65. *Diderma indicum* K.S. Thind & H.S. Sehgal, 1964
Recorded in 1. On LP. In PMF. Vouchers in USJ. Not known from other areas in Mesoamerica and the Caribbean. Reported by Rojas et al. (2010a)
66. *Diderma montanum* (Meyl.) Meyl., 1913
Recorded in 1. On GL. In MRF. Vouchers in M. Distribution: Costa Rica, Venezuela.
67. *Diderma ochraceum* Hoffm., 1796
Recorded in 1. On LC. In MRF. Vouchers in UARKM. Distribution: Colombia, Costa Rica.
68. *Diderma rimosum* Eliasson & Nann.-Bremek., 1983
Recorded in 4. On BW, GL. In TWF. Vouchers in UARKM and INII. Distribution: Costa Rica, Mexico. Reported from Costa Rica by Walker et al. (2015b).
69. *Diderma rugosum* (Rex) T. Macbr., 1899
Recorded in 6 and 7. On GL. In TMF, PRF. Vouchers in M. Distribution: Costa Rica, El Salvador, Jamaica, Leeward Islands, Mexico, Panama, Trinidad and Tobago, Windward Islands.
70. *Diderma saundersii* (Berk. & Broome ex Masee) E. Sheld., 1895
Recorded in 3. On GL. In TWF. Vouchers in M. Distribution: Costa Rica, Mexico.

71. *Diderma sauteri* (Rostaf.) E. Sheld., 1895
Recorded in 1. On GL. In PMF, PWF. Vouchers in CR, USJ. Distribution: Costa Rica, Mexico, Venezuela.
72. *Diderma spumarioides* (Fr. & Palmquist) Fr., 1829
Recorded in 5. On GL, LP. In TWF. Vouchers in M, USJ and INII. Distribution: Costa Rica, Cuba, Guatemala, Jamaica, Leeward Islands, Mexico, Panama, Puerto Rico, Venezuela, Windward Islands.
73. *Diderma subdictyospermum* (Rostaf.) E. Sheld., 1895
Recorded in 5. On GL. In PWF. Vouchers in M, UARKM. Distribution: Costa Rica, Mexico, Venezuela.
74. *Diderma subincarnatum* Kowalski, 1967
Cited by Rojas et al. (2010a). The specimen corresponds with collection BPI 815232 (US National Fungus Collection) collected by CJ Alexopoulos and JA Sáenz on October 16, 1964 and identified by GW Martin. Record information also on GBIF (<https://www.gbif.org/occurrence/78586863>). Distribution: Costa Rica, Mexico.
75. *Diderma testaceum* (Schrad.) Pers., 1801
Recorded in 1, 5 and 6. On GL, AL, FI. In TMF, TWF, PWF, PRF, MRF. Vouchers in M, UARKM, CR, USJ. Distribution: Costa Rica, Cuba, Dominican Republic, Jamaica, Leeward Islands, Mexico.
76. *Didymium anellus* Morgan, 1894
Recorded in 3, 4, 5 and 6. On GL, AL. In TDF, TMF, TWF, PWF, PRF. Vouchers in M, UARKM, INII. Distribution: Colombia, Costa Rica, Guatemala, Jamaica, Mexico, Panama, Puerto Rico, Trinidad and Tobago.
77. *Didymium bahiense* Gottsb., 1968
Recorded in all provinces except 7. On GL, AL, FI. In TDF, TMF, PMF, LMF, TWF, PWF, LWF, PRF, MRF, SRP. Vouchers in M, UARKM, CR, USJ, INII. Distribution: Colombia, Costa Rica, Cuba, El Salvador, Guatemala, Honduras, Mexico, Panama, Venezuela.
78. *Didymium clavus* (Alb. & Schwein.) Rabenh., 1844
Recorded in all provinces except 2. On BW, GL, AL, FI. In TDF, TMF, PMF, LMF, TWF, PWF, LWF, PRF, LRF, MRF, SRP. Vouchers in M, UARKM, CR, USJ, INII. Distribution: Belize, Colombia, Costa Rica, Cuba, El Salvador, Guatemala, Haiti, Honduras, Jamaica, Leeward Islands, Mexico, Puerto Rico, Trinidad and Tobago, Venezuela, Windward Islands.
79. *Didymium comatum* (Lister) Nann.-Bremek., 1966
Recorded in 5. On GL. In PWF. Vouchers in M. Distribution: Costa Rica, Windward Islands.
80. *Didymium crustaceum* Fr., 1829
Recorded in 1 and 4. On BW. In MRF. Vouchers in USJ. Distribution: Costa Rica, Cuba, Mexico, Windward Islands.
81. *Didymium difforme* (Pers.) Gray, 1821
Recorded in all provinces. On BW, GL, AL, FI. In TMF, PMF, LMF, TWF, PWF, LWF, PRF, LRF, MRF, SRP. Vouchers in M, UARKM, CR, USJ, INII. Distribution: Colombia, Costa Rica, Cuba, El Salvador, Guatemala, Haiti, Honduras, Jamaica, Mexico, Panama, Venezuela, Windward Islands.
82. *Didymium dubium* Rostaf., 1874
Recorded in all provinces except 2. On BW, GL, FR, DU. In TDF, TMF, PMF, TWF, PWF, LWF. Vouchers in M, USJ, INII. Distribution: Colombia, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Venezuela.
83. *Didymium floccosum* G.W. Martin, K.S. Thind & Rehill, 1959
Recorded in 6. On GL. In TDF. Vouchers in M. Distribution: Costa Rica, Mexico, Venezuela.
84. *Didymium iridis* (Ditmar) Fr., 1829
Recorded in all provinces. On BW, GL, AL, FI, FR, LC. In TDF, TMF, PMF, LMF, TWF, PWF, LWF, PRF, LRF, MRF, SRP. Vouchers in M, UARKM, CR, USJ, INII. Distribution: Colombia, Costa Rica, Cuba, Dominica, El Salvador, Guatemala, Haiti, Honduras, Jamaica,

- Leeward Islands, Mexico, Nicaragua, Panama, Puerto Rico, Trinidad and Tobago, Venezuela, Windward Islands
85. *Didymium laxifilum* G. Lister & J. Ross, 1945
Recorded in 1. On GL. In PMF. Vouchers in USJ. Distribution: Costa Rica, Mexico.
 86. *Didymium listeri* Masee, 1892
Recorded in 5. On GL. In PWF. Vouchers in M. Distribution: Costa Rica, Mexico.
 87. *Didymium megalosporum* Berk. & M.A. Curtis, 1873
Cited by Clark (2004). The species was identified with material isolated in laboratory conditions and identified by J Clark. Distribution: Costa Rica, Mexico, Venezuela.
 88. *Didymium melanospermum* (Pers.) T. Macbr., 1899
Recorded in 1. On GL. In SRP. Vouchers in CR, USJ. Distribution: Costa Rica, Cuba, Dominican Republic, Honduras, Jamaica, Leeward Islands, Mexico, Venezuela, Windward Islands. Reported in Rojas et al. (2015b).
 89. *Didymium minus* (Lister) Morgan, 1894
Recorded in all provinces. On BW, GL, AL, LC. In TDF, TMF, PMF, LMF, TWF, PWF, LWF, PRF, MRF, SRP. Vouchers in M, UARKM, CR, USJ, INII. Distribution: Colombia, Costa Rica, El Salvador, Guatemala, Honduras, Jamaica, Leeward Islands, Mexico, Windward Islands.
 90. *Didymium nigripes* (Link) Fr., 1829
Recorded in all provinces. On BW, GL, AL, FI, LP. In TDF, TMF, PMF, LMF, TWF, PWF, LWF, PRF, LRF, MRF, SRP. Vouchers in M, UARKM, CR, USJ, INII. Distribution: Colombia, Costa Rica, Cuba, Dominican Republic, El Salvador, Guatemala, Haiti, Honduras, Jamaica Leeward Islands, Mexico, Panama, Puerto Rico, Trinidad and Tobago, Venezuela, Windward Islands.
 91. *Didymium ochroideum* G. Lister, 1931
Recorded in 1, 4, 5, 6 and 7. On BW, GL, AL, FR. In TDF, TMF, PMF, TWF, PWF, PRF. Vouchers in M, UARKM, CR. Distribution: Costa Rica, Mexico, Panama, Puerto Rico.
 92. *Didymium ovoideum* Nann.-Bremek., 1958
Recorded in 4. On GL. In LMF. Vouchers in CR. Distribution: Costa Rica, Mexico.
 93. *Didymium serpula* Fr., 1829
Recorded in 2 and 6. On GL, LP. In LWF, TWF. Vouchers in M, INII. Distribution: Belize, Costa Rica, Mexico. Reported in Rojas et al. (2015b).
 94. *Didymium squamulosum* (Alb. & Schwein.) Fr. & Palmquist, 1818
Recorded in all provinces. On BW, GL, AL, FI, LC, LP, DU. In TDF, TMF, PMF, LMF, TWF, PWF, LWF, PRF, LRF, MRF, SRP. Vouchers in F, M, UARKM, CR, USJ, INII. Distribution: Bahamas, Colombia, Costa Rica, Cuba, Dominican Republic, El Salvador, Guatemala, Haiti, Honduras, Jamaica Leeward Islands, Mexico, Nicaragua, Panama, Puerto Rico, Trinidad and Tobago, Venezuela, Windward Islands.
 95. *Didymium sturgisii* Hagelst., 1937
Cited by Rojas et al. (2010a). The specimens correspond with collections 13725 and 13726 from Martin Schnittler. Distribution: Costa Rica, Mexico.
 96. *Echinostelium apitectum* K.D. Whitney, 1980
Recorded in 6. On BW. In TDF. Vouchers in UARKM. Distribution: Costa Rica, Mexico.
 97. *Echinostelium bisporum* (L.S. Olive & Stoian.) K.D. Whitney & L.S. Olive, 1982
Cited by Moore & Stephenson (2003). Voucher information of this collection could not be retrieved. Information was recorded during research. Distribution: Costa Rica, Cuba.
 98. *Echinostelium minutum* de Bary, 1829
Recorded in 3, 5 and 6. On BW, AL. In TDF, TMF, TWF, PWF, PRF. Vouchers in M, UARKM, CR. Distribution: Colombia, Costa Rica, Cuba, El Salvador, Guatemala, Jamaica, Leeward Islands, Mexico, Panama, Puerto Rico, Trinidad and Tobago, Windward Islands.
 99. *Enerthenema papillatum* (Pers.) Rostaf., 1876
Recorded in 1. On TW. In MRF. Vouchers in CR. Distribution: Costa Rica, Mexico, Panama.

100. *Fuligo cinerea* (Schwein.) Morgan, 1896
Cited by Schnittler & Stephenson (2000). There is no voucher of this collection deposited anywhere but information was recorded during research. Distribution: Costa Rica, Cuba, Jamaica, Leeward Islands, Mexico, Windward Islands
101. *Fuligo intermedia* T. Macbr., 1922
Cited by Rojas et al. (2010a). The specimen corresponds with collection BPI 746184 (US National Fungus Collection) collected by CJ Alexopoulos and JA Sáenz in 1963 and identified by the former. Distribution: Costa Rica, Mexico.
102. *Fuligo megaspora* Sturgis, 1913
Recorded in 3 and 4. On LP. In LMF, PWF. Vouchers in USJ. Distribution: Costa Rica, Guatemala, Mexico.
103. *Fuligo septica* (L.) F.H. Wigg., 1780
Recorded in all provinces. On BW, GL. In TDF, TMF, PMF, LMF, TWF, PWF, LWF, LRF. Vouchers in F, M, CR, USJ. Distribution: Costa Rica, Cuba, Dominican Republic, El Salvador, Guatemala, Jamaica Leeward Islands, Mexico, Nicaragua, Panama, Puerto Rico, Trinidad and Tobago, Venezuela, Windward Islands.
104. *Hemitrichia calyculata* (Speg.) M.L. Farr, 1974
Recorded in all provinces. On BW, GL, FI, LI, LP, TW. In TDF, TMF, PMF, TWF, PWF, LWF, MWF, PRF, LRF, MRF, SRP Vouchers in F, M, CR, UARKM, USJ, INII. Distribution: Colombia, Costa Rica, Cuba, Dominican Republic, El Salvador, Guatemala, Honduras, Jamaica Leeward Islands, Mexico, Nicaragua, Panama, Puerto Rico, Trinidad and Tobago, Venezuela, Windward Islands.
105. *Hemitrichia clavata* (Pers.) Rostaf, 1873
Recorded in 4. On BW. In TWF. Vouchers deposited in F (FH 00276789 by CW Dodge). Distribution: Bahamas, Colombia, Costa Rica, Cuba, Dominican Republic, Jamaica Leeward Islands, Mexico, Puerto Rico, Trinidad and Tobago, Venezuela, Windward Islands.
106. *Hemitrichia leiocarpa* (Cooke) Lister, 1894
Recorded in 1 and 5. On BW, GL, TW. In TWF, MRF. Vouchers in M, UARJ. Distribution: Belize, Colombia, Costa Rica, Cuba, Mexico, Panama, Windward Islands.
107. *Hemitrichia minor* G. Lister, 1911
Recorded in all provinces except 2. On BW, GL, AL. In TDF, TMF, PMF, LMF, TWF, PWF, LWF, PRF. Vouchers in M, UARKM, CR, INII. Distribution: Belize, Costa Rica, Mexico, Panama, Windward Islands.
108. *Hemitrichia pardina* (Minakata) Ing, 1999
Recorded in 1, 3, 4 and 5. On BW, GL, AL, LI, LC. In TMF, PMF, TWF, PWF, PRF. Vouchers in UARKM, CR, INII. Distribution: Colombia, Costa Rica, Cuba, El Salvador, Honduras, Mexico, Panama, Puerto Rico.
109. *Hemitrichia serpula* (Scop.) Rostaf. ex Lister, 1894
Recorded in all provinces. On BW, GL, AL, LI, LP, TW. In TDF, TMF, PMF, TWF, PWF, LWF, PRF, LRF, MRF. Vouchers in M, CR, UARKM, USJ, INII. Distribution: Colombia, Costa Rica, Cuba, Dominican Republic, El Salvador, Guatemala, Jamaica, Leeward Islands, Mexico, Nicaragua, Panama, Puerto Rico, Trinidad and Tobago, Venezuela, Windward Islands.
110. *Lamproderma arcyrroides* (Sommerf.) Rostaf., 1874
Recorded in 4 and 5. On GL. In PRF, LRF. Vouchers in M, CR. Distribution: Costa Rica, Dominican Republic, El Salvador, Jamaica, Mexico, Puerto Rico.
111. *Lamproderma columbinum* (Pers.) Rostaf., 1873
Recorded in 1. On BW, LC. In MRF. Vouchers in UARKM, CR, USJ. Distribution: Costa Rica, Mexico.
112. *Lamproderma echinulatum* (Berk.) Rostaf., 1876
Recorded in 1. On BW, LC. In MRF. Vouchers in USJ. Distribution: Costa Rica, Mexico.
113. *Lamproderma magniretisporum* G. Moreno, C. Rojas, S.L. Stephenson & H. Singer, 2009

- Recorded in 1. On BW. In SRP. Vouchers in UARKM. Not known from other areas in Mesoamerica and the Caribbean. Reported from Costa Rica by Moreno et al (2009) and Rojas et al. (2010a).
114. *Lamproderma muscorum* (Lév.) Hagelst., 1935
Recorded in 5. On BW. In PWF. Vouchers in M. Distribution: Colombia, Costa Rica, El Salvador, Mexico, Venezuela.
115. *Lamproderma sauteri* Rostaf., 1874
Recorded in 1. On BW. In MRF. Vouchers in CR. Not known from other areas in Mesoamerica and the Caribbean. Reported from Costa Rica by Rojas & Stephenson (2007) and Rojas et al. (2010a)
116. *Lamproderma scintillans* (Berk. & Broome) Morgan, 1894
Recorded in all provinces. On BW, GL, AL, FI, LC, TW. In TDF, TMF, PMF, LMF, TWF, PWF, LWF, MWF, PRF, LRF, MRF. Vouchers in M, CR, UARKM, USJ, INII. Distribution: Colombia, Costa Rica, Cuba, El Salvador, Guatemala, Haiti, Honduras, Jamaica Leeward Islands, Mexico, Panama, Puerto Rico, Venezuela, Windward Islands.
117. *Leocarpus fragilis* (Dicks.) Rostaf., 1874
Recorded in 1. On BW, GL, TW. In LRF, MRF, SRP. Vouchers in M, UARKM, USJ. Distribution: Colombia, Costa Rica, Mexico.
118. *Lepidoderma trevelyanii* (Grev.) Poulain & Mar. Mey., 2002
Recorded in 5. On BW. In PWF. Vouchers in M. Not known from other areas in Mesoamerica and the Caribbean. Reported from Costa Rica by Rojas et al. (2010a).
119. *Licea belmontiana* Nann.-Bremek., 1966
Recorded in 1. On TW. In MRF. Vouchers in CR. Distribution: Costa Rica, Guatemala, Mexico, Panama. Reported from Costa Rica by Rojas et al. (2017).
120. *Licea biforis* Morgan, 1893
Recorded in 3. On AL. In TWF. Vouchers in UARKM. Distribution: Belize, Colombia, Costa Rica, Cuba, Jamaica, Mexico, Panama.
121. *Licea castanea* G. Lister, 1911
Recorded in 6. On GL. In LWF. Vouchers in USJ, INII. Distribution: Costa Rica, Mexico. Reported from Costa Rica by Rojas et al. (2015b).
122. *Licea denudescens* H.W. Keller & T.E. Brooks, 1977
Recorded in 7. On BW. In TMF. Vouchers in M. Distribution: Belize, Costa Rica, Mexico.
123. *Licea erecta* K.S. Thind & Dhillon, 1967
Recorded in 5. On GL. In PWF. Vouchers in M. Distribution: Belize, Costa Rica, Cuba.
124. *Licea minima* Fr., 1829
Recorded in 1, 2, 5 and 7. On BW, GL, AL, FI, TW. In LWF, MRF, SRP. Vouchers in M, UARK, CR, USJ. Distribution: Colombia, Costa Rica, Guatemala, Mexico, Panama.
125. *Licea operculata* (Wingate) G.W. Martin, 1942
Recorded in 3, 4, 6 and 7. On BW, AL. In TDF, TMF, PMF, TWF. Vouchers in M, UARKM, CR. Distribution: Costa Rica, Mexico, Panama, Puerto Rico, Venezuela, Windward Islands.
126. *Licea pedicellata* (H.C. Gilbert) H.C. Gilbert, 1942
Recorded in 6. On BW. In TDF. Vouchers in M. Distribution: Costa Rica, Cuba, Mexico, Panama, Puerto Rico, Windward Islands.
127. *Licea perexigua* T.E. Brooks & H.W. Keller, 1977
Recorded in 6. On GL. In TDF. Vouchers in M. Distribution: Belize, Costa Rica, Mexico.
128. *Licea pusilla* Schrad., 1797
Recorded in 2 and 5. On BW. In TMF, PWF. Vouchers in USJ, INII. Distribution: Colombia, Costa Rica, El Salvador, Guatemala, Jamaica, Mexico, Panama.
129. *Licea testudinacea* Nann.-Bremek., 1965
Recorded in 1 and 4. On GL. In SRP. Vouchers in UARKM. Distribution: Costa Rica, Guatemala, Mexico.
130. *Lycogala conicum* Pers., 1801

- Recorded in 1, 3 and 6. On BW. In TDF, PMF, TWF. Vouchers in M, CR, USJ. Distribution: Costa Rica, Cuba, Jamaica, Leeward Islands, Mexico, Nicaragua, Panama.
131. *Lycogala epidendrum* (L.) Fr., 1829
Recorded in all provinces except 2. On BW, GL, AL, LC. In TDF, TMF, PMF, TWF, PWF, MWF, PRF, LRF, MRF, SRP. Vouchers in M, UARKM, CR, USJ. Distribution: Bahamas, Colombia, Costa Rica, Cuba, Dominican Republic, El Salvador, Guatemala, Honduras, Jamaica, Leeward Islands, Mexico, Nicaragua, Panama, Puerto Rico, Trinidad and Tobago, Venezuela, Windward Islands.
 132. *Lycogala exiguum* Morgan, 1893
Recorded in 1, 5 and 6. On BW, GL. In TDF, PMF, TWF, PRF. Vouchers in M, USJ. Distribution: Colombia, Costa Rica, Cuba, El Salvador, Jamaica, Leeward Islands, Mexico, Panama, Puerto Rico, Venezuela, Windward Islands.
 133. *Macbrideola cornea* (G. Lister & Cran) Alexop., 1967
Recorded in 6. On BW. In TDF. Vouchers in M. Distribution: Costa Rica, Cuba, Mexico.
 134. *Macbrideola decapillata* H.C. Gilbert, 1934
Cited by Farr (1976). The specimen corresponds with slide CRmc2 made by CJ Alexopoulos and documented in Alexopoulos (1967). Distribution: Costa Rica, Mexico, Panama.
 135. *Macbrideola martinii* (Alexop. & Beneke) Alexop., 1967
Recorded in 5 and 6. On BW, GL, LI. In TDF, PWF. Vouchers in M, UARKM. Distribution: Belize, Costa Rica, Jamaica, Mexico, Windward Islands.
 136. *Macbrideola scintillans* H.C. Gilbert, 1934
Recorded in 5 and 6. On BW, GL, AL. In TDF, PWF, PRF. Vouchers in M, CR. Distribution: Belize, Costa Rica, Mexico.
 137. *Macbrideola spinospora* L.M. Walker, G. Moreno & S.L. Stephenson, 2014
Recorded in 4. On GL. In TWF. Vouchers in UARKM. Not known from other areas in Mesoamerica and the Caribbean. Reported from Costa Rica by Walker et al. (2014).
 138. *Meriderma cribrarioides* (Fr.) Mar. Mey. & Poulain, in Poulain, Meyer & Bozonnet, 2011
Recorded in 1. On BW. In MRF. Vouchers in UARKM. Not known from other areas in Mesoamerica and the Caribbean. Reported from Costa Rica by Rojas et al. (2010a) as *Lamproderma cribrarioides*.
 139. *Metatrichia floriformis* (Schwein.) Nann.-Bremek., 1985
Recorded in all provinces. On BW, GL, LI, LC, TW, DU. In TMF, PMF, LMF, TWF, PWF, PRF, LRF, MRF, SRP. Vouchers in M, UARKM, CR, USJ. Distribution: Colombia, Costa Rica, Jamaica, Mexico, Puerto Rico, Venezuela.
 140. *Metatrichia vesparia* (Batsch) Nann.-Bremek. ex G.W. Martin & Alexop., 1969
Recorded in 1, 3, 4, 6 and 7. On BW, GL, LP. In TDF, TMF, PMF, TWF, PWF. Vouchers in M, UARKM, CR, USJ, INII. Distribution: Costa Rica, Cuba, Dominican Republic, Jamaica, Leeward Islands, Mexico, Nicaragua, Panama, Puerto Rico, Trinidad and Tobago, Venezuela, Windward Islands.
 141. *Paradiacheopsis acanthodes* (Alexop.) Nann.-Bremek., 1986
Recorded in 5 and 6. On GL. In TDF, LWF. Vouchers in M, INII. Not known from other areas in Mesoamerica and the Caribbean. Reported from Costa Rica by Rojas et al. (2010a).
 142. *Paradiacheopsis longipes* Hooff & Nann.-Bremek., 1996
Recorded in 5. On GL. In TMF, LWF. Vouchers in INII. Not known from other areas in Mesoamerica and the Caribbean. Reported from Costa Rica by Rojas et al. (2010a).
 143. *Paradiacheopsis rigida* (Brândza) Nann.-Bremek., 1969
Recorded in 1. On GL. In SRP. Vouchers in UARKM. Distribution: Belize, Costa Rica.
 144. *Paradiacheopsis solitaria* (Nann.-Bremek.) Nann.-Bremek., 1975
Recorded in 6. On GL. In LWF. Vouchers in INII. Distribution: Costa Rica, Mexico. Reported from Costa Rica by Rojas et al. (2015b).
 145. *Perichaena chrysosperma* (Curr.) Lister, 1894

- Recorded in all provinces. On BW, GL, AL, FI, TW. In TDF, TMF, PMF, LMF, TWF, PWF, LWF, PRF, LRF, MRF, SRP. Vouchers in M, UARKM, CR, USJ, INII. Distribution: Belize, Colombia, Costa Rica, Cuba, Dominican Republic, El Salvador, Guatemala, Honduras, Jamaica, Leeward Islands, Mexico, Nicaragua, Panama, Puerto Rico, Trinidad and Tobago, Venezuela, Windward Islands.
146. *Perichaena corticalis* (Batsch) Rostaf., 1875
Recorded in 2, 3, 4, 5 and 7. On GL, AL, FI. In TMF, PMF, LMF, TWF, PWF, LWF, SRP. Vouchers in UARKM, CR, USJ, INII. Distribution: Costa Rica, Cuba, Dominican Republic, Guatemala, Mexico, Panama.
147. *Perichaena depressa* Lib., 1837
Recorded in all provinces. On BW, GL, AL, FI, LP, TW. In TDF, TMF, PMF, TWF, PWF, LWF, PRF, MRF, SRP. Vouchers in M, UARKM, CR, USJ, INII. Distribution: Colombia, Costa Rica, Cuba, El Salvador, Guatemala, Honduras, Jamaica, Leeward Islands, Mexico, Nicaragua, Panama, Puerto Rico, Trinidad and Tobago, Venezuela, Windward Islands.
148. *Perichaena dictyonema* Rammeloo, 1981
Recorded in 3, 5 and 7. On BW, GL, FI. In TMF, TWF, PWF. Vouchers in M. Distribution: Costa Rica, Mexico, Puerto Rico.
149. *Perichaena longipes* L.M. Walker, Leontyev & S.L. Stephenson, 2015
Recorded in 4. On GL. In TWF. Vouchers in UARKM. Distribution: Costa Rica, Panama. Reported from Costa Rica by Walker et al. (2015a).
150. *Perichaena microspora* Penz. & Lister, 1898
Recorded in 6. On GL. In TDF. Vouchers in M. Distribution: Costa Rica, Cuba.
151. *Perichaena pedata* (Lister & G. Lister) Lister ex E. Jahn, 1919
Recorded in all provinces except 2. On BW, GL. In TDF, TMF, PMF, TWF, PWF, PRF, SRP. Vouchers in M, UARKM, CR, USJ, INII. Distribution: Costa Rica, El Salvador, Honduras, Mexico, Panama.
152. *Perichaena quadrata* T. Macbr., 1899
Recorded in 1 and 6. On GL. In PWF, LWF. Vouchers in INII. Distribution: Costa Rica, Mexico.
153. *Perichaena tessellata* G. Lister, 1931
Recorded in 6. On GL. In LWF. Vouchers in INII. Distribution: Costa Rica, El Salvador. Reported from Costa Rica by Rojas et al. (2017).
154. *Perichaena vermicularis* (Schwein.) Rostaf., 1876
Recorded in all provinces except 2. On BW, GL, AL, FI, LP. In TDF, TMF, PMF, TWF, PWF, PRF, SRP. Vouchers in M, UARKM, CR, USJ, INII. Distribution: Costa Rica, Cuba, El Salvador, Leeward Islands, Mexico, Panama, Windward Islands.
155. *Physarella oblonga* (Berk. & M.A. Curtis) Morgan, 1896
Recorded in all provinces except 2. On BW, GL, LP, TW. In TDF, TMF; PMF, TWF, PWF, LWF. Vouchers in M, UARKM, CR, USJ. Distribution: Colombia, Costa Rica, Cuba, El Salvador, Jamaica, Leeward Islands, Mexico, Nicaragua, Panama, Puerto Rico, Trinidad and Tobago, Venezuela, Windward Islands.
156. *Physarina echinocephala* Höhn., 1909
Recorded in 3. On AL. In PWF. Vouchers in MA. Not known from other areas in Mesoamerica and the Caribbean. Reported from Costa Rica by Lado et al. (2018).
157. *Physarum aeneum* (Lister) R.E. Fr., 1903
Recorded in 6. On GL. In PWF. Vouchers in INII. Distribution: Costa Rica, Leeward Islands, Mexico, Panama, Puerto Rico, Windward Islands. Reported from Costa Rica by Rojas et al. (2017).
158. *Physarum album* (Bull.) Chevall., 1826
Recorded in all provinces except 2. On BW; GL, AL. In TDF, TMF, PMF, LMF, TWF, PWF, LRF, MRF. Vouchers in M, UARKM, CR, USJ, INII. Distribution: Belize, Colombia, Costa

- Rica, Cuba, Dominican Republic, Guatemala, Jamaica, Mexico, Panama, Puerto Rico, Trinidad and Tobago, Venezuela, Windward Islands.
159. *Physarum auriscalpium* Cooke, 1877
Recorded in 3 and 5. On GL, FI. In TWF. Vouchers in M, USJ. Distribution: Belize, Costa Rica, Leeward Islands, Mexico, Panama, Puerto Rico, Venezuela, Windward Islands.
160. *Physarum bitectum* G. Lister, 1911
Recorded in 1 and 5. On BW, GL. In PMF; PWF; MRF. Vouchers in UARKM, USJ. Distribution: Colombia, Costa Rica, Jamaica, Mexico, Puerto Rico, Venezuela.
161. *Physarum bivalve* Pers., 1795
Recorded in all province except 7. On BW, GL, TW. In TDF, TMF, PMF; TWF, LRF, MRF, SRP. Vouchers in M, UARKM, CR, USJ, INII. Distribution: Colombia, Costa Rica, Cuba, El Salvador, Guatemala, Haiti, Leeward Islands, Mexico, Panama, Venezuela.
162. *Physarum bogoriense* Racib., 1898
Recorded in all province except for 7. On BW, GL, LP. In TDF, PMF, TWF, PWF, LWF, PRF. Vouchers in M, UARKM, CR, USJ, INII. Distribution: Colombia, Costa Rica, Cuba, Honduras, Jamaica, Leeward Islands, Mexico, Panama, Puerto Rico, Trinidad and Tobago, Venezuela, Windward Islands.
163. *Physarum brunneolum* (W. Phillips) Masee, 1892
Recorded in 1. On BW. In MRF. Vouchers in USJ. Distribution: Colombia, Costa Rica, Mexico.
164. *Physarum cinereum* (Batsch) Pers., 1794
Recorded in all provinces. On BW, GL, LP. In TDF, TMF, PMF, LMF, TWF, PWF, LWF, PRF, MRF. Vouchers in M, UARKM, CR, USJ, INII. Distribution: Colombia, Costa Rica, Cuba, Dominican Republic, El Salvador, Haiti, Honduras, Jamaica, Leeward Islands, Mexico, Nicaragua, Panama, Puerto Rico, Trinidad and Tobago, Venezuela, Windward Islands.
165. *Physarum citrinum* Schumach., 1803
Recorded in 1 and 2. On LC. In TMF; TWF, PWF. Vouchers in UARKM, USJ. Distribution: Colombia, Costa Rica, El Salvador, Leeward Islands, Mexico, Panama, Venezuela, Windward Islands.
166. *Physarum compressum* Alb. & Schwein., 1805
Recorded in all provinces. On BW, GL, AL, FI, LC, LP, TW. In TDF, TMF, PMF, LMF, TWF, PWF, LWF, PRF, LRF, MRF, SRP. Vouchers in M, UARKM, CR, USJ, INII. Distribution: Bahamas, Belize, Colombia, Costa Rica, Cuba, Dominican Republic, El Salvador, Guatemala, Haiti, Honduras, Jamaica, Leeward Islands, Mexico, Panama, Puerto Rico, Trinidad and Tobago, Venezuela, Windward Islands.
167. *Physarum contextum* (Pers.) Pers., 1801
Recorded in 1. On BW. In MRF. Vouchers in USJ. Distribution: Costa Rica, Mexico, Nicaragua.
168. *Physarum crateriforme* Petch, 1909
Recorded in 6. On BW. In TDF. Vouchers in M. Distribution: Belize, Costa Rica, Cuba, Leeward Islands, Mexico, Panama, Puerto Rico, Windward Islands.
169. *Physarum decipiens* M.A. Curtis, 1848
Recorded in 3, 4, 5, 6, and 7. On BW, GL, LP. In TDF, TMF, TWF, PRF. Vouchers in M, USJ. Distribution: Costa Rica, Cuba, Mexico, Panama.
170. *Physarum dictyosporum* G.W. Martin, 1962
Recorded in 1 and 6. On GL. In TMF, LRF. Vouchers in USJ. Distribution: Colombia, Costa Rica, Mexico.
171. *Physarum didermoides* (Pers.) Rostaf., 1874
Recorded in all provinces. On BW, GL, AL, FI, LP. In TDF, TMF, PMF, LMF, TWF, PWF, LWF, PRF, LRF, SRP. Vouchers in F, M, UARKM, CR, USJ, INII. Distribution: Colombia, Costa Rica, Cuba, Dominican Republic, El Salvador, Guatemala, Jamaica, Mexico, Panama, Puerto Rico, Trinidad and Tobago, Windward Island.

172. *Physarum echinosporum* Lister, 1899
Recorded in 1 and 2. On TW. In TWF, MRF. Vouchers in CR, USJ. Distribution: Colombia, Costa Rica, Guatemala, Jamaica, Leeward Islands, Mexico, Panama, Windward Islands.
173. *Physarum flavicomum* Berk., 1845
Recorded in 3, 4, 5 and 6. On BW, GL. In TDF, TWF, PWF, LWF, LRF. Vouchers in M, CR, USJ. Distribution: Belize, Colombia, Costa Rica, Cuba, Leeward Islands, Mexico, Trinidad and Tobago.
174. *Physarum flavidum* (Peck) Peck, 1878
Recorded in 2. On LP. In TMF. Vouchers in USJ. Not known from other areas in Mesoamerica and the Caribbean.
175. *Physarum galbeum* Wingate, 1899
Recorded in 4. On BW, GL. In PWF. Vouchers in UARKM, INII. Distribution: Colombia, Costa Rica, Cuba, Honduras, Jamaica, Mexico, Nicaragua, Panama, Windward Islands. Reported in Rojas et al. (2015b).
176. *Physarum globuliferum* (Bull.) Pers., 1801
Recorded in all provinces except 5. On BW, GL. In TDF, TMF, PMF, TWF, LRF. Vouchers in M, UARKM, CR, USJ. Distribution: Bahamas, Colombia, Costa Rica, Cuba, Jamaica, Leeward Islands, Mexico, Panama, Trinidad and Tobago, Venezuela.
177. *Physarum gyrosum* Rostaf., 1874
Recorded in 6. On LP. In TMF, PRF. Vouchers in UARKM, USJ. Distribution: Colombia, Costa Rica, Cuba, Mexico, Puerto Rico.
178. *Physarum javanicum* Racib., 1898
Recorded in 2, 5, 6 and 7. On BW, GL, AL, LP. In TDF, TMF, PWF, LWF, PRF. Vouchers in M, CR, USJ, INII. Distribution: Colombia, Costa Rica, Cuba, Jamaica, Mexico, Panama, Puerto Rico, Trinidad and Tobago, Venezuela.
179. *Physarum lateritium* (Berk. & Ravenel) Morgan, 1896
Recorded in 3. On GL. In PWF. Vouchers in INII. Distribution: Costa Rica, Leeward Islands, Mexico, Panama, Windward Islands. Reported in Rojas et al. (2015b).
180. *Physarum leucophaeum* Fr. & Palmquist, 1818
Recorded in 3 and 6. On GL. In TDF, TWF. Vouchers in CR, INII. Distribution: Costa Rica, Cuba, Dominican Republic, Jamaica, Leeward Islands, Mexico, Windward Islands.
181. *Physarum leucopus* Link, 1809
Recorded in 1 and 2. On BW. In TMF; LRF, MRF. Vouchers in USJ. Distribution: Colombia, Costa Rica, Cuba, Guatemala, Jamaica, Mexico, Panama, Windward Islands.
182. *Physarum melleum* (Berk. & Broome) Masee, 1892
Recorded in all provinces. On BW, GL, AL, LI, LP, TW. In TDF, TMF, PMF, LMF, TWF, PWF, PRF, MRF. Vouchers in M, UARKM, CR, USJ, INII. Distribution: Colombia, Costa Rica, Cuba, Dominican Republic, Guatemala, Honduras, Jamaica, Leeward Islands, Mexico, Panama, Puerto Rico, Trinidad and Tobago, Venezuela, Windward Islands.
183. *Physarum murinum* Lister, 1894
Cited by Alexopoulos & Sáenz (1975). The specimen corresponds with collection USJ151 (cited as UCR151) with original duplicate in the TEX herbarium (TEX1969). However, collections were transferred several times and the current location could not be retrieved. Distribution: Costa Rica, Mexico.
184. *Physarum mutabile* (Rostaf.) G. Lister, 1911
Recorded in 1 and 6. On GL. In TDF, PMF. Vouchers in USJ, INII. Distribution: Costa Rica, Cuba, Mexico, Venezuela.
185. *Physarum nicaraguense* T. Macbr., 1893
Recorded in 1. On LP. In PMF. Vouchers in USJ. Distribution: Belize, Costa Rica, Cuba, Haiti, Jamaica, Mexico, Nicaragua, Puerto Rico, Trinidad and Tobago. Hagelstein (1944) cited *Physarum reniforme* for Costa Rica. However, Farr (1976) considered it to be, in part, a synonym of *P. nicaraguense*.

186. *Physarum notabile* T. Macbr., 1922
Recorded in 1, 2, 6 and 7. On BW, GL, AL, FI. In TDF, TMF, LRF. Vouchers in M, UARKM, USJ, INII. Distribution: Colombia, Costa Rica, Jamaica, Mexico, Windward Islands.
187. *Physarum nucleatum* Rex, 1891
Recorded in 3, 5, 6 and 7. On BW, GL, AL. In TDF, TMF, TWF, PWF, LWF, PRF. Vouchers in M, CR, USJ, INII. Distribution: Costa Rica, Cuba, Jamaica, Leeward Islands, Mexico, Nicaragua, Panama, Puerto Rico, Trinidad and Tobago, Venezuela, Windward Islands.
188. *Physarum oblatum* T. Macbr., 1893
Recorded in 3, 4, 5, 6 and 7. On GL, AL, FI. In TDF, TMF, PMF, TWF, PWF, PRF. Vouchers in M, UARKM, USJ, INII. Distribution: Belize, Colombia, Costa Rica, Cuba, Dominican Republic, El Salvador, Jamaica, Mexico, Panama, Venezuela, Windward Islands.
189. *Physarum penetrale* Rex, 1891
Recorded in 5 and 6. On BW, TW. In PWF, PRF. Vouchers in M. Distribution: Costa Rica, Jamaica, Mexico, Panama, Venezuela, Windward Islands.
190. *Physarum pezizoideum* (Jungh.) Pavill. & Lagarde, 1903
Recorded in 3. On BW. In TWF. Vouchers in UARKM, CR. Distribution: Costa Rica, Cuba, Mexico.
191. *Physarum polycephalum* Schwein., 1822
Recorded in 1, 3, 4 and 5. On GL, TW. In TMF, PMF, LMF, TWF, PWF. Vouchers in UARKM, USJ. Distribution: Costa Rica, Cuba, Jamaica, Leeward Islands, Mexico, Nicaragua, Puerto Rico, Trinidad and Tobago, Windward Islands.
192. *Physarum pulcherripes* Peck, 1873
Recorded in 1, 5 and 7. On BW, GL. In TMF, TWF, PWF. Vouchers in UARKM, USJ. Distribution: Costa Rica, Jamaica, Mexico, Panama, Trinidad and Tobago, Venezuela, Windward Islands.
193. *Physarum pusillum* (Berk. & M.A. Curtis) G. Lister, 1911
Recorded in all provinces. On BW, GL, AL, FI, LP, LC, TW. In TDF, TMF, PMF, LMF, TWF, PWF, LWF, PRF, LRF, MRF, SRP. Vouchers in M, UARKM, CR, USJ, INII. Distribution: Belize, Colombia, Costa Rica, Cuba, Dominican Republic, El Salvador, Guatemala, Haiti, Jamaica, Leeward Islands, Mexico, Panama, Puerto Rico, Windward Islands.
194. *Physarum rigidum* (G. Lister) G. Lister, 1925
Recorded in 1 and 4. On BW. In PWF, MRF. Vouchers in USJ. Distribution: Costa Rica, Cuba, Jamaica, Leeward Islands, Puerto Rico, Trinidad and Tobago.
195. *Physarum robustum* (Lister) Nann.-Bremek., 1973
Recorded in 1. On BW. In SRP. Vouchers in UARKM. Distribution: Costa Rica, Mexico.
196. *Physarum roseum* Berk. & Broome, 1873
Recorded in 3, 5, 6 and 7. On BW, GL, AL. In TDF, TWF, PWF. Vouchers in M, UARKM, CR, USJ, INII. Distribution: Colombia, Costa Rica, Cuba, El Salvador, Jamaica, Mexico, Panama, Windward Islands.
197. *Physarum serpula* Morgan, 1896
Recorded in 5, 6 and 7. On BW, GL, TW. In TDF, TMF, PWF, PRF. Vouchers in M, CR. Distribution: Costa Rica, Cuba, Jamaica, Mexico, Panama, Trinidad and Tobago.
198. *Physarum stellatum* (Masse) G.W. Martin, 1947
Recorded in all provinces except 2. On BW, GL, TW. In TDF, TMF, TWF, PWF, LWF, PRF, LRF. Vouchers in M, UARKM, CR, USJ, INII. Distribution: Colombia, Costa Rica, Cuba, El Salvador, Jamaica, Leeward Islands, Mexico, Nicaragua, Panama, Puerto Rico, Trinidad and Tobago, Venezuela, Windward Islands.
199. *Physarum straminipes* Lister, 1898
Recorded in 1. On GL. In SRP. Vouchers in UARKM. Distribution: Costa Rica, Mexico.

200. *Physarum sulphureum* Alb. & Schwein., 1805
Recorded in 4. On GL. In TWF. Vouchers in UARKM. Distribution: Costa Rica, Jamaica, Leeward Islands, Mexico, Puerto Rico, Venezuela. Reported from Costa Rica by Walker et al. (2015b).
201. *Physarum superbum* Hagelst., 1940
Recorded in all provinces except 2. On BW, GL, AL, FI. In TDF; TMF, TWF, PWF, PRF. Vouchers in M, CR, USJ, INII. Distribution: Costa Rica, Haiti, Mexico, Panama, Puerto Rico, Venezuela.
202. *Physarum tenerum* Rex, 1890
Recorded in 1, 3, 5, 6 and 7. On BW, GL. In TDF, TMF, PMF, LMF, TWF, PWF, PRF, LRF. Vouchers in F, M, UARKM, CR, USJ, INII. Distribution: Colombia, Costa Rica, Honduras, Jamaica, Leeward Islands, Mexico, Nicaragua, Panama, Puerto Rico, Trinidad and Tobago, Windward Islands.
203. *Physarum vernum* Sommerf., 1829
Cited by Alexopoulos & Sáenz (1975). Recorded in 2. On BW. In TWF. Distribution: Colombia, Costa Rica, Cuba, Guatemala, Mexico, Venezuela?
204. *Physarum virescens* Ditmar, 1817
Recorded in 4. On GL. In TDF, TWF. Vouchers in INII. Distribution: Costa Rica, Mexico, Panama, Venezuela. Reported in Rojas et al. (2017).
205. *Physarum viride* (Bull.) Pers., 1795
Recorded in all provinces except 7. On BW, GL. In TDF, PMF, LMF, TWF, PWF, LWF, LRF, MRF. Vouchers in M, UARKM, CR, USJ, INII. Distribution: Bahamas, Colombia, Costa Rica, Cuba, El Salvador, Honduras, Jamaica, Leeward Islands, Mexico, Nicaragua, Panama, Puerto Rico, Trinidad and Tobago, Venezuela, Windward Islands.
206. *Reticularia lycoperdon* Bull., 1790
Recorded in 4. On BW. In TWF. Vouchers in F. Distribution: Colombia, Costa Rica, Dominican Republic, Jamaica, Mexico, Panama, Puerto Rico, Windward Islands.
207. *Reticularia splendens* Morgan, 1893
Recorded in 5. On BW. In PWF. Vouchers in M. Distribution: Costa Rica, Mexico, Panama.
208. *Stemonaria gracilis* Nann.-Bremek. & Y. Yamam., 1984
Recorded in 7. On BW. In TMF. Vouchers in M. Not known from other areas in Mesoamerica and the Caribbean. Reported from Costa Rica by Rojas et al. (2010a).
209. *Stemonaria longa* (Peck) Nann.-Bremek., R. Sharma & Y. Yamam., 1984
Recorded in all province except 2. On BW, LP. In TMF, PMF, TWF, PWF, LWF, PRF. Vouchers in M, UARKM, CR, USJ. Distribution: Costa Rica, Cuba, El Salvador, Jamaica, Leeward Islands, Mexico, Nicaragua, Panama, Puerto Rico, Trinidad and Tobago, Windward Islands.
210. *Stemonaria rufipes* Nann.-Bremek. & Y. Yamam., 1984
Recorded in 1. On GL. In PWF. Vouchers in INII. Not known from other areas in Mesoamerica and the Caribbean. Reported from Costa Rica by Lado et al. (2018).
211. *Stemonitis axifera* (Bull.) T. Macbr., 1899
Recorded in 1, 3, 4, 5 and 6. On BW, GL, LC. In TDF, TMF, PMF, TWF, PWF, LWF, PRF, LRF, MRF. Vouchers in M, UARKM, CR, USJ, INII. Distribution: Colombia, Costa Rica, Cuba, Dominican Republic, El Salvador, Haiti, Honduras, Jamaica, Leeward Islands, Mexico, Nicaragua, Panama, Puerto Rico, Trinidad and Tobago, Venezuela, Windward Islands.
212. *Stemonitis capillitionodosa* G. Moreno, D. W. Mitch., C. Rojas & S. L. Stephenson, 2010
This species was recorded during the spring of 1922. Vouchers are deposited in the F herbarium at Harvard University and the AH Herbarium. Reported from Costa Rica by Moreno et al. (2010). Not known from other areas in Mesoamerica and the Caribbean.
213. *Stemonitis flavogenita* E. Jahn, 1904

- Recorded in 1, 3, 5 and 7. On BW, AL, TW. In TWF, PRF, MRF. Vouchers in F, UARKM, CR. Distribution: Costa Rica, Cuba, Guatemala, Jamaica, Mexico, Panama, Puerto Rico, Trinidad and Tobago, Venezuela, Windward Islands.
214. *Stemonitis foliicola* Ing, 1967
Recorded in 3. On GL. In TWF. Vouchers in UARKM. Distribution: Costa Rica, Mexico.
215. *Stemonitis fusca* Roth, 1787
Recorded in all provinces. On BW, GL, AL, FI, LC, LP, TW. In TDF, TMF, PMF, LMF, TWF, PWF, LWF, MWF, PRF, LRF, MRF, SRP. Vouchers in M, UARKM, CR, USJ, INII. Distribution: Costa Rica, Cuba, Dominican Republic, El Salvador, Guatemala, Honduras, Jamaica, Leeward Islands, Mexico, Nicaragua, Panama, Puerto Rico, Venezuela, Windward Islands.
216. *Stemonitis herbatica* Peck, 1873
Recorded in 1 and 5. On GL. In TMF, PWF. Vouchers in UARKM, CR. Distribution: Bahamas, Belize, Colombia, Costa Rica, Cuba, Dominican Republic, Guatemala, Jamaica, Leeward Islands, Mexico, Panama, Puerto Rico, Venezuela, Windward Islands.
217. *Stemonitis mussooriensis* G.W. Martin, K.S. Thind & Sohi, 1957
Recorded in 1. On GL. In SRP. Vouchers in UARKM. Distribution: Costa Rica, Mexico. Reported from Costa Rica by Rojas et al. (2017).
218. *Stemonitis pallida* Wingate, 1899
Recorded in 6. On BW. In PRF. Vouchers in M. Distribution: Costa Rica, Cuba, Jamaica, Mexico, Panama, Puerto Rico, Trinidad and Tobago, Venezuela.
219. *Stemonitis splendens* Rostaf., 1874
Recorded in 1, 3, 4, 5 and 6. On BW, GL, AL. In TDF, PMF, TWF, PWF, PRF, MRF, SRP. Vouchers in M, UARKM, CR, USJ, INII. Distribution: Belize, Colombia, Costa Rica, Cuba, Guatemala, Jamaica, Leeward Islands, Mexico, Nicaragua, Panama, Puerto Rico, Trinidad and Tobago, Venezuela, Windward Islands.
220. *Stemonitopsis aequalis* (Peck) Y. Yamam., 1998
Recorded in 2, 3, 4 and 6. On GL, FI. In TDF, PMF, LWF. Vouchers in USJ, INII. Distribution: Costa Rica, Honduras, Jamaica, Panama, Windward Islands.
221. *Stemonitopsis amoena* (Nann.-Bremek.) Nann.-Bremek., 1975
Recorded in 7. On BW, GL; FI, LP. In TMF, PMF. Vouchers in M, USJ, INII. Not know from other areas in Mesoamerica and the Caribbean. Reported from Costa Rica by Rojas et al. (2010a).
222. *Stemonitopsis gracilis* (G. Lister) Nann.-Bremek., 1975
Recorded in 6. On BW. In PRF. Vouchers in M. Distribution: Costa Rica, Cuba, Mexico.
223. *Stemonitopsis hyperopta* (Meyl.) Nann.-Bremek., 1975
Recorded in 1, 3, 4, 5 and 6. On BW, GL, TW. In TDF, TMF, TWF, PWF, PRF, LRF, MRF. Vouchers in M, CR, USJ, INII. Distribution: Costa Rica, Cuba, El Salvador, Guatemala, Jamaica, Mexico, Panama, Puerto Rico, Windward Islands.
224. *Stemonitopsis subcaespitosa* (Peck) Nann.-Bremek., 1975
Recorded in 3, 5 and 6. On BW, GL. In TDF, TMF, TWF, PWF, LWF, PRF. Vouchers in UARKM, USJ, INII. Distribution: Costa Rica, El Salvador, Honduras, Leeward Islands, Mexico, Windward Islands.
225. *Stemonitopsis typhina* (F.H. Wigg.) Nann.-Bremek., 1975
Recorded in all province except 2. On BW, GL. In TDF, TMF, PMF, TWF, PWF, LWF, PRF, LRF. Vouchers in M, UARKM, CR, USJ, INII. Distribution: Colombia, Costa Rica, Cuba, Dominican Republic, Guatemala, Jamaica, Leeward Islands, Mexico, Nicaragua, Panama, Puerto Rico, Trinidad and Tobago, Venezuela, Windward Islands.
226. *Symphytocarpus herbaticus* Ing, 1967
Recorded in 3, 5 and 7. On BW, GL. In TMF, TWF, PWF. Vouchers in M, UARKM, USJ. Not know from other areas in Mesoamerica and the Caribbean. Reported from Costa Rica by Rojas et al. (2010a).

227. *Trichia affinis* de Bary, 1870
Recorded in 5 and 6. On BW. In TDF, PWF. Vouchers in M. Distribution: Costa Rica, Cuba, Mexico, Panama, Trinidad and Tobago.
228. *Trichia botrytis* (J.F. Gmel.) Pers., 1794
Recorded in 1, 3 and 4. On BW, GL, TW. In LMF, TWF, LRF, MRF. Vouchers in CR, USJ, INII. Distribution: Costa Rica, Dominican Republic, Guatemala, Jamaica, Mexico.
229. *Trichia contorta* (Ditmar) Rostaf., 1875
Recorded in 1 and 5. On BW. In PWF, SRP. Vouchers in M. Distribution: Costa Rica, Guatemala, Mexico.
230. *Trichia decipiens* (Pers.) T. Macbr., 1899
Recorded in 1, 4 and 6. On BW, GL, LC, DU. In TDF, LRF, MRF. Vouchers in M, CR, USJ, INII. Distribution: Costa Rica, Cuba, Guatemala, Jamaica, Mexico, Puerto Rico, Venezuela.
231. *Trichia favoginea* (Batsch) Pers., 1794
Recorded in 1, 3 and 4. On BW, GL, LC. In TWF, MWF, LRF, MRF. Vouchers in M, UARKM, CR, USJ, INII. Distribution: Colombia, Costa Rica, Cuba, Dominican Republic, Jamaica, Leeward Islands, Mexico, Panama, Puerto Rico, Trinidad and Tobago, Venezuela, Windward Islands.
232. *Trichia flavicoma* (Lister) Ing, 1967
Recorded in 6. On GL. In TDF. Vouchers in M. Distribution: Costa Rica, Dominican Republic, Mexico.
233. *Trichia lutescens* (Lister) Lister, 1897
Recorded in 4. On BW. In LWF. Vouchers in USJ. Distribution: Costa Rica, Mexico.
234. *Trichia persimilis* P. Karst., 1868
Recorded in 1 and 4. On BW, GL, DU. In LRF, MRF. Vouchers in M, USJ. Distribution: Costa Rica, Mexico, Panama.
235. *Trichia scabra* Rostaf., 1875
Recorded in 1 and 4. On BW, GL. In LRF, MRF. Vouchers in M, CR. Distribution: Colombia, Costa Rica, Jamaica, Mexico, Venezuela.
236. *Trichia varia* (Pers. ex J.F. Gmel.) Pers., 1794
Recorded in 3. On BW. In TWF. Vouchers in UARKM. Distribution: Costa Rica, Cuba, Jamaica, Mexico, Venezuela.
237. *Trichia verrucosa* Berk., 1859
Recorded in 1, 3 and 4. On BW, GL. In LWF, LRF, MRF, SRP. Vouchers in F, M, UARKM, CR, USJ. Distribution: Colombia, Costa Rica, Cuba, Jamaica, Mexico, Windward Islands.
238. *Tubifera casparyi* (Rostaf.) T. Macbr., 1899
Recorded in 2 and 3. On GL, LC. In TWF, PWF. Vouchers in UARKM, INII. Distribution: Costa Rica, Mexico.
239. *Tubifera corymbosa* Leontyev, Schnittler, S.L. Stephenson & L.M. Walker, 2015
Recorded in 4. On GL. In TWF. Vouchers in UARKM. Distribution: Costa Rica, Mexico. Reported from Costa Rica by Leontyev et al. (2015).
240. *Tubifera ferruginosa* (Batsch) J.F. Gmel., 1792
Recorded in 1, 3 and 6. On BW, GL. In TMF, PMF, TWF, PRF, MRF, SRP. Vouchers in M, UARKM, USJ, INII. Distribution: Costa Rica, Dominican Republic, Jamaica, Leeward Islands, Mexico, Panama, Puerto Rico, Windward Islands.
241. *Tubifera microsperma* (Berk. & M.A. Curtis) G.W. Martin, 1947
Recorded in 1, 5, 6 and 7. On BW, GL. In TDF, TMF, PWF. Vouchers in M, UARKM, USJ, INII. Distribution: Colombia, Costa Rica, Cuba, Jamaica, Leeward Islands, Mexico, Nicaragua, Panama, Puerto Rico, Trinidad and Tobago, Venezuela, Windward Islands.
242. *Willkommangea reticulata* (Alb. & Schwein.) Kuntze, 1891
Recorded in 1, 3 and 5. On GL. In TMF, PMF, TWF, PWF. Vouchers in INII. Distribution: Belize, Costa Rica, El Salvador, Honduras, Mexico, Panama, Venezuela.

Myxomycetes previously included in the list of species of Costa Rica and excluded in the present paper.

1. *Arcyria oerstedii* Rostaf., 1875

This species had been reported by ML Farr (1976) based on collection USJ187 (also written as CR187). However, the collection seems to be missing from the TEX herbarium after several transfers. Identification was originally considered doubtful.

2. *Badhamia cinerascens* G.W. Martin, 1932

This species had been reported by ML Farr (1976) based on collection USJ13 (also written as CR13) with duplicate voucher in University of Texas at Austin number TEX2105. The vouchers seemed to have disappeared after several transfers. Identification was considered doubtful by ML Farr.

3. *Cribraria minutissima* Schwein., 1832

This species had been reported by CJ Alexopoulos (1975) based on collection USJ91 (also written as CR91) with duplicate vouchers in University of Texas at Austin number TEX852. The vouchers seemed to have disappeared after several transfers. Identification was considered doubtful by CJ Alexopoulos.

4. *Comatricha suksdorfii* Ellis & Everh., 1884

This species had been reported by Rojas et al. (2017) based on collections made in Bagaces. However, after later revision of vouchers, errors were observed on specimen identifications, which corresponded to *C. tenerrima* and *Stemonitopsis hyperopta* instead of *C. suksdorfii*. Corrections were made.

5. *Diderma niveum* (Rostaf.) E. Sheld., 1895

This species had been reported, as *Chondrioderma niveum* Rostaf., based on a collection identified by C.L. Spegazzini (1919) from Turrialba (Tuis), and deposited in the LP herbarium. However, based on the description of the material and the bioclimatic characteristics of the area of Turrialba, this case was considered a misidentification.

6. *Physarum albescens* Ellis ex T. Macbr., 1922

This species had been reported by Rojas et al. (2017) based on collections made in Palo Verde National Park. However, after later revision of all vouchers, errors were observed on specimen identifications, which corresponded to *Ph. album* instead. Corrections were made.

7. *Physarum tessellatum* G.W. Martin & M.L. Farr

This species had been reported by Farr (1976) based on a collection deposited in the BPI herbarium (BPI 810391). However, the deposited voucher has been revised and identified as *Ph. didermoides* by ML. Farr.

8. *Reticularia jurana* Meyl., 1908

This species had been reported by Rojas et al. (2010a) based on a collection identified by M Schnittler and apparently deposited in the M herbarium. However, primary information was missing, and the collection does not appear in current databases.

Discussion

It is remarkable to observe that 242 species of myxomycetes have been reported from Costa Rica, a territory encompassing 51 100 km². As a comparison, 123 species have been reported for Cuba, a country about double the size of Costa Rica (Camino et al. 2008, Lado & Wrigley de Basanta 2008). Even though relative numbers of species present in selected territories vary with effort and sampling techniques, documented species richness is always valuable to understand the effect of local surveys on regional assessments. For instance, both the Mesoamerican and the Caribbean Biodiversity Hotspots, where Costa Rica and Cuba are located have been unevenly studied and yet the high numbers of species of myxomycetes present in these areas are based on geographically-centered efforts in these countries.

In this sense, the work presented herein directly addressed the Wallacean shortfall (see Hortal et al. 2015) and contributes to the regional assessment of myxomycete distribution within a biodiversity hotspot. For management purposes, this information is relevant to understand the

dynamics of microbial diversity in ecosystems (i.e., Mittal et al. 1990), with direct implications on subsequent regional species monitoring, for example. Within this context, updated checklists, particularly of microbial groups, have the potential to be used in ecosystem service and ecological dynamics applications.

Interestingly, the important lesson from the province and canton-based analyses carried out in this study is that the utility of scale and survey effort to quantify myxomycete diversity, still fall short for biologically meaningful analyses in Costa Rica. These two concepts should be methodologically addressed in future ecological design of experiments on myxomycetes for this country. These organisms clearly move across human-made borders and distributional analyses based on administrative jurisdictions are superfluous. Despite that, this type of result is also very relevant to define future research lines, unified conservation approaches and human-nature integration, which in the Costa Rican case, are carried out at the canton level. In this sense, the lesson from this analysis is that the integration between biological data and administrative policies should be addressed to avoid traditional shortcomings of political disconnection of research (see Cantú-Salazar & Gastón 2013) and make data useful for functional assessment purposes. For this reason, even though analyses within administrative boundaries may not be useful for biological purposes, they are highly relevant for management reasons.

The absence of high correlations between province and canton size and the diversity estimators calculated in this study simply demonstrated that the effort has not been standard across those administrative areas. This was also observed in the Shannon's Diversity Index values, which were higher in the provinces of San José and Guanacaste as well as in the cantons of La Cruz, Pérez Zeledón, Puntarenas and Sarapiquí. All those administrative areas are among the most studied at their respective level with the previous works of Schnittler & Stephenson (2000), Rojas & Stephenson (2007) and Walker et al. (2015b). In this sense, even though some of these results were easy to conclude without a numerical analysis, they also showed (Figs 2–3), where the informational gaps are in Costa Rica, and indicated where to place collecting efforts in the future.

One particularly interesting result was observed in Figs 4–5, where the highest average values of the calculated Shannon's Index of Diversity were associated with the Southern Pacific region, the Talamanca or Guanacaste Mountains and smaller locations along the northern border of Costa Rica. In a similar manner to the previous administrative level-based analysis, these results are likely skewed by survey locations and effort. For instance, in both cases, the seasonal forests of the Nicoya Peninsula and the northern coastline of the Nicoya Gulf, as well as the inner sections of land entering the Central Valley yielded low values of the Shannon's Index of Diversity. Based on results from other heavily seasonal locations (i.e., Estrada-Torres 2015 et al.), this result may simply reflect lack of surveys in the seasonal forests of Costa Rica. As mentioned before, the southern portion of the Alajuela province as well as the locations surrounding the Nicoya Peninsula and Gulf are undersampled (see Fig. 3). Interestingly, even though some areas in the Caribbean are similarly undersampled, results from the Shannon's Index of Diversity analysis at bioclimatic level (Figs 4–5) reflect this result in a different manner.

The β -diversity analyses showed a similar pattern of survey effort association. The most similar regional-to-local ratios of species richness were found for province or canton pairs with even species richness within the same probability group. This result suggests that the sampling scheme used to generate the data may be responsible for these results and that they do not represent objective comparisons. For instance, the provinces of Limón and Alajuela were in a second-tier probability level simply due to their low documented species richness and more limited number of records. As such, they did not have the same objective probability to form pairs in a β -diversity analysis with well-studied provinces and the results, as expected, did not show these associations. However, since this observation does not really have to do with biological affinity for selected ecosystems or climate zones and it is more related with survey effort, this is another indication that methodologically sound protocols are still necessary for objective comparisons of myxomycete distribution in Costa Rica.

The same pattern was observed at the canton level analysis. In this case, Puriscal was found to have strong similarity at the regional-to-local ratio of species richness with both Acosta and Jiménez cantons. Interestingly, these three counties are poorly studied (same tier) and mainly represented by common tropical species such as *Diderma hemisphaericum*, *Didymium squamulosum*, *Lamproderma scintillans* and *Stemonitis fusca*. In this manner, even though the affinity shown in the β -diversity analysis was backed up by the data, this result is likely more related to survey effort and methodological approaches to study myxomycetes in these cantons, rather than to real biological affinities. A similar pattern was observed for the pair Bagaces-Sarapiquí, two of the best studied cantons in the country and, in this case, within the same tier of probability level due to their high number of species reported.

Despite all the results showing the shortcomings for ecological analysis of the sampling carried out in Costa Rica, the results provided herein also showed a very interesting list of species. As could have been noted in the references provided with the comments to selected species, Costa Rica has been a territory where five new species of myxomycetes have been described in the last seven years (see Leontyev et al. 2014, Leontyev et al. 2015, Moreno et al. 2010, Walker et al. 2014, 2015a). Also, with the recent reports of *Craterium muscorum*, *Dictydiaethalium dictyosporum*, *Physarina echinocephala* and *Stemonaria rufipes* (Lado et al. 2018), these elusive species were fully documented, and their distributional range largely widened to encompass the Neotropical area. Similarly, the reports of rare higher elevation species such as *Cornuvia serpula*, *Colloderma oculatum* and *Leocarpus fragilis* have been relevant in the last decades. Within the Mesoamerican Biodiversity Hotspot, the presence of these species is interesting from a biogeographical point of view (see Schnittler et al. 2017).

The remarkable characteristic of the updated checklist of Costa Rican myxomycetes has been the detailed examination of records used to generate the primary information. This exercise of information retrieval and standardization has not been a common practice in tropical regions, albeit its importance for distributional analyses and protocol evaluation. In this sense, the information presented herein has been generated to serve as a reference point for regional assessments within the Mesoamerican region and for comparative purposes across biological regions. However, in general, it also shows the potential of tropical areas to host high diversity of myxomycetes.

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