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New records of myxomycetes for Central America and comments on their regional distribution

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ABSTRACT

Several studies on myxomycetes in Central America during the last decade have greatly increased the information on the morphological species present in the different countries of that region. Herein we present a list of 71 new records compiled for four different countries in Central America including 37, 23, 19 and 9 unreported species for Panama, El Salvador, Honduras and Costa Rica, respectively. This newly available information was collected by all authors in different field surveys across the region. Results showed that, as information became available, the distribution of most species extended across Central America, as expected from an ecological point of view. The present effort is an important contribution for the development of baseline data on myxomycete fruiting bodies in Central America for biological monitoring in the context of adverse ecological processes and potential negative effects of climate change on microbial biodiversity.

Key words: Biogeography, El Salvador, Honduras, Mesoamerica, Myxogastrids, Panama.

INTRODUCTION

The study of myxomycetes in Central America has been promoted by key biogeographical research carried out in the region during the first part of this century (e.g. Schnittler & Stephenson 2000, 2002). Most of those studies took place in Costa Rica (see Rojas & Doss 2013) because of the stronger academic sponsorship, better infrastructure and greater logistic research support compared to other countries in the region. Such inequality of available information on myxomycetes for the seven different countries in Central America was also shown by Lado & Wrigley de Basanta (2008) in the number of published articles and reported myxomycete species. Despite this situation, more recent efforts (i.e. Rojas & Calvo 2014) have targeted the understudied Central American countries and increased, albeit modestly, the knowledge on myxomycetes for those territories.

Most of Central America is located within the Mesoamerican Biodiversity Hotspot (Myers et al. 2000) and together encompasses a mosaic of environments, vegetation types and microclimates. One remarkable aspect of the region is its position between the two large land masses of the Americas and the two oceans surrounding the continent. This geographical feature has had historical consequences and strong implications on the evolutionary dynamics of the Central American biota, including myxomycetes (see Dagamac et al. 2017b). However, regional-based analyses are still at a very basic level due the lack of information for most species and important ecosystems in the region.

Within this framework of limited information and interesting regional conditions, the present study compiles the data generated through different efforts to investigate the ecology and evolution of myxomycetes in Central America. In this manner, the primary objective of this paper is to officially record several distinct species for four countries in the region. Except for Costa Rica, the number of myxomycete species reported for other Central American territories is a clear underrepresentation of the myxobiota present, which simply reflects the small number of studies historically carried out in those regions. For this reason, the data generated in the present investigation are relevant for larger scale analyses (i.e. Dagamac et al. 2017a) which are much needed in this biodiversity hotspot under the current global conditions and international agreements for managing biodiversity resources.

MATERIALS AND METHODS

All records included in this work were collected by the three authors in the period between 2012 and 2016 in Central America. In all cases, sampling took place as part of research visits to El Salvador, Honduras, Costa Rica and Panama. Myxomycetes were recorded either by direct collection from the field or by means of laboratory isolation using the moist chamber technique.

With the first method, a common approach for basic biodiversity assessments, myxomycetes were surveyed using the opportunistic protocol (Cannon & Sutton 2004), which consisted of selecting a general area and looking for mature fruiting bodies in microhabitats such as coarse woody debris, flowers or inflorescences and leaf litter. With the moist chamber technique (see Stephenson & Stempen 1994), decomposing plant material was collected, brought back to the laboratory and placed in Petri dishes that were previously lined with filter paper. After 24 hours of water saturation, the pH was determined, excess liquid was poured from the Petri dish and myxomycete activity (including the presence of plasmodia and identification of mature fruiting bodies) was recorded in the moist plant material for a period between two and three months.

With both methods, when myxomycete fruiting bodies were found, they were extracted with fine forceps, glued into pasteboard boxes and assigned a collecting number from one of the authors. The latter allowed for careful identification of morphospecies and permitted the collections to serve as scientific vouchers which were all deposited in either the University of Arkansas Mycological Herbarium collection (UARKM), the University of Costa Rica Herbarium (USJ) or the University of Costa Rica INII Myxogastrid Repository.

The general study areas in El Salvador (abbreviated as ES) were the Municipio San Diego in the Department of La Libertad and the Municipio Santa Ana in the Department of Santa Ana (see Figure 1). In Honduras (HN), the general area surveyed was the town of Yuscaran in the Department of El Paraíso. In Panama (PN), Barro Colorado Island in the Gatun Lake was the selected location. In Costa Rica (CR), several sites were surveyed in the counties of Turrialba, Bagaces, Coto Brus, Paraiso, Sarapiqui, Dota and Pococi.
After studying all of the materials and generating a database of records, the unrecorded species for each of the countries were identified. For the latter, we referenced the Lado & Wrigley de Basanta (2008) compilation of myxomycetes in the Neotropics. For nomenclatural purposes, the treatment of Lado (2005-2017) was followed. In the present study, all records are registered by country, followed by their unique collecting numbers, year of collection, substrate from which they were collected from and the pH associated with the record. Records with collecting numbers starting with the code “LMW” are assigned to Laura M. Walker and those with the code “Ro” are assigned to Carlos Rojas. Substrates are abbreviated as "DW" for decayed wood, "LL" for leaf litter, "FI" for fruits and inflorescences and "BK" for tree bark.

RESULTS AND DISCUSSION

After analyzing the datasets originating from the different research visits to the studied Central American countries, a list of 71 new records were identified including 37, 23, 19 and 9 morphospecies for Panama, El Salvador, Honduras and Costa Rica, respectively. This list of new records for Central America is provided below.

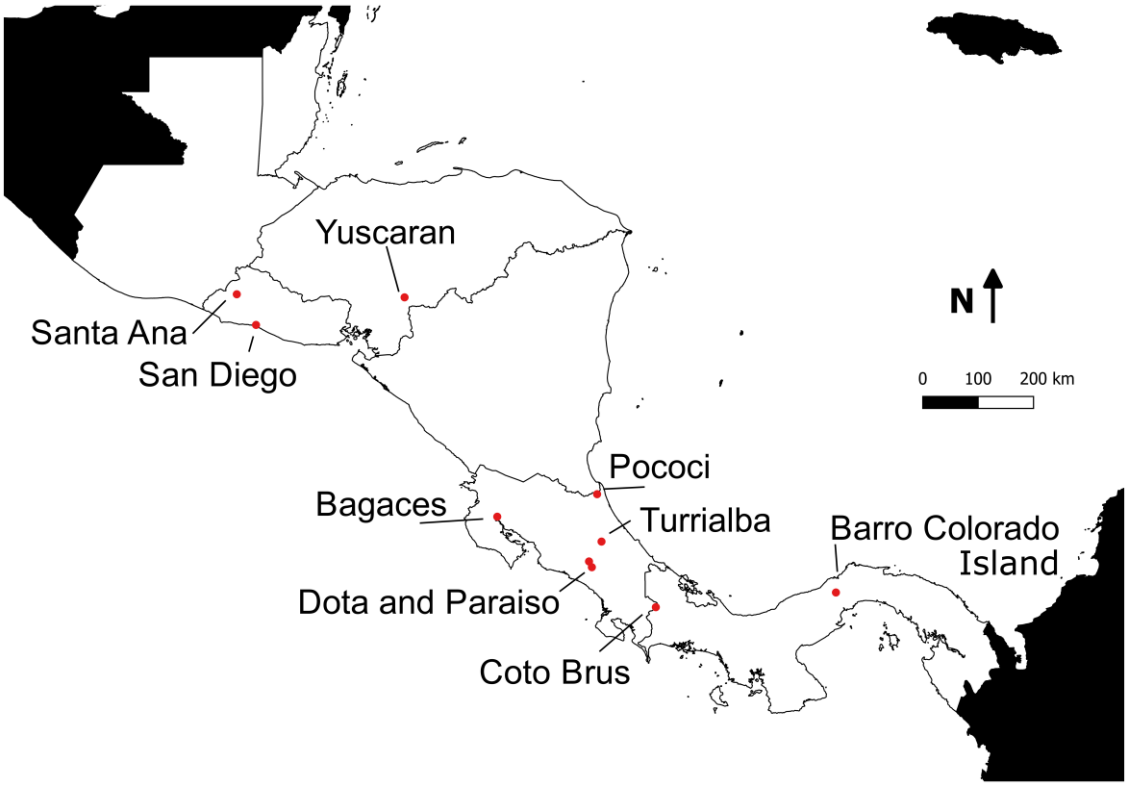

Fig. 1. Map of the Central American region (in white) and neighboring countries (in black) showing the location of the sampling points (red dots) associated with the new records of myxomycetes for the respective countries.

New records of myxomycetes for different countries in Central America

Arcyria afroalpina Rammeloo
HN (not collected but recorded from Yuscaran, 2015, on LL, pH=6.96), **PN** (LMW 591, 789, 1351, 1691, 1822, 1917, 2094, 2106, 2575 from Barro Colorado Island, 2012-2013, on LL, pH=6.46-7.16)

Arcyria insignis Kalchbr. & Cooke
HN (Ro-5597 from Yuscaran, 2015, on TW, pH=6.85)

Arcyria globosa Schwein.
CR (Ro-5342, 5359 from Santa Teresita de Turrialba, 2014, on LL, pH=7.60-7.73)

Arcyria marginoundulata Nann.-Bremek. & Y. Yamam.
PN (LMW 1637, 1725, 1877, 2226, 2623, 2702 from Barro Colorado Island, 2013, on LL, pH=6.12-7.81)

Calomyxa metallica (Berk.) Nieuwl.
PN (LMW 75, 1964, 2055 from Barro Colorado Island, 2013, on DW, pH=5.64-6.65)

Clastoderma debaryanum A. Blytt
ES (Ro-5676 from Municipio San Diego-Dpto. La Libertad, 2015, on LL, pH=7.14

Collaria lurida (Lister) Nann.-Bremek.
PN (LMW 1626 from Barro Colorado Island, 2013, on LL, pH=4.80)

Comatricha ellae Härk.
PN (LWM 240, 274, 2805 from Barro Colorado Island, 2013, on DW and LL, pH=5.85-6.29)

Comatricha nigra (Pers. ex J.F. Gmel.) J. Schröt.
HN (Ro-5519, 5542, 5561, 5562, 5599 from Yuscaran, 2015, on LL and TW, pH=6.20-7.61)

Comatricha pulchella (C. Bab.) Rostaf.
ES (Ro-5774, 5854 from Municipio San Diego-Dpto. La Libertad, 2015, on LL, pH=6.24-6.57)

Comatricha tenerrima (M.A. Curtis) G. Lister
ES (Ro-5772, 5832 from Municipio San Diego-Dpto. La Libertad and Municipio Santa Ana-Dpto Santa Ana, 2015, on TW, pH=6.12-6.73), HN (Ro-5521 from Yuscarán, 2015, on TW, pH=7.09), **PN** (LMW 3, 20, 33, 38, 47, 63, 72, 83, 106, 107, 112, 130, 147, 156, 158, 171, 177, 201. 221, 232, 355, 357, 638, 697, 760, 857, 912, 1322, 1361, 1367, 1388, 1545, 1552, 1575, 1704, 1731, 1798, 1900, 1947, 1954, 2121, 2130, 2290, 2576, 2632, 2663, 2667, 2668, 2678, 2797, 2830, 2834, 2854, 2873,

2972, 3007, 3025, 3097 from Barro Colorado Island, 2012-2013, on DW and LL, pH=5.35-8-36)

Comatricha suksdorfii Ellis & Everh.
CR (Ro-3884, 3886, 3895, 4482, 5179, 5377 from Guayabo de Bagaces, San Vito de Coto Brus, Paraiso de Cartago and La Virgen de Sarapiqui, 2014, on LL, pH=4.73-6.05)

Craterium aureum (Schumach.) Rostaf.
PN (LMW 382 from Barro Colorado Island, 2012, on LL, pH=6.36)

Craterium minutum (Leers) Fr.
CR (Ro-310, 329, 330 from San Gerardo de Dota, 2003, on LL, pH=not determined)

Craterium leucocephalum (Pers. ex J.F. Gmel.) Ditmar
ES (Ro-5682, 5684 from Municipio San Diego-Dpto. La Libertad, 2015, on LL, pH=7.38)

Cribraria violacea Rex
ES (Ro-5831 from Municipio Santa Ana-Dpto Santa Ana, 2015, on LL, pH=7.18)

Diachea bulbillosa (Berk. & Broome) Lister
ES (Ro-5770 from Municipio San Diego-Dpto. La Libertad, 2015, on LL, pH=4.74), **HN** (Ro-5543 from Yuscaran, 2015, on LL, pH=7.61)

Diachea leucopodia (Bull.) Rostaf.
ES (Ro-5777, 5796, 5815, 5824, 6784 from Municipio San Diego-Dpto. La Libertad and Municipio Santa Ana-Dpto Santa Ana, 2015, on LL, pH=5.57-6.35)

Diderma rugosum (Rex) T. Macbr.
ES (Ro-5837 from Municipio San Diego-Dpto. La Libertad, 2015, on LL, pH=6.87)

Didymium anellus Morgan
PN (LMW 985 from Barro Colorado Island, 2012, on LL, pH=7.32)

Didymium bahiense Gottsb.
ES (Ro-5661, 5667, 5668, 5669, 5671, 5672, 5735, 5736, 5804, 5835, 5836, 5846, 5885, 5887 from Municipio San Diego-Dpto. La Libertad and Municipio Santa Ana-Dpto Santa Ana, 2015, on LL, pH=6.22-8.10), **HN** (Ro-5560 from Yuscaran, 2015, on LL, pH=7.00), **PN** (LMW 489 from Barro Colorado Island, 2012, on FI, pH=not determined)

Didymium clavus (Alb. & Schwein.) Rabenh.
ES (Ro-5802 from Municipio San Diego-Dpto. La Libertad, 2015, on LL, pH=6.55), **HN** (Ro-5532, 5555, 5609, 5612, 5617, 5622, 5639 from Yuscaran, 2015, on LL, pH=6.81-7.59)

Didymium difforme (Pers.) Gray
ES (Ro-5674, 5686, 5689, 5696, 5699, 5708, 5723, 5733, 5768, 5795, 5818, 5850, 5859, 5884 from Municipio San Diego-Dpto. La Libertad and Municipio Santa Ana-Dpto Santa Ana, 2015, on LL, pH=4.81-8.11), **HN** (Ro-5527, 5530, 5553, 5568, 5572, 5616, 5624, 5636, 5640 from Yuscaran, 2015, on LL, pH=5.73-7.81), **PN** (LMW 2154 from Barro Colorado Island, 2013, on LL, pH=8.04)

Didymium dubium Rostaf.
ES (Ro-5665, 5703, 5738, 5758, 5789, 5797, 5798, 5799, 5803, 5805, 5806, 5807, 5859 from Municipio San Diego-Dpto. La Libertad and Municipio Santa Ana-Dpto Santa Ana, 2015, on LL, pH=6.16-7.83), **HN** (Ro-5506, 5509, 5538, 5578 from Yuscaran, 2015, on TW and LL, pH=5.73-7.60)

Didymium minus (Lister) Morgan
HN (Ro-5556, 5558, 5581, 5582, 5593, 5600, 5621 from Yuscaran, 2015, on LL, pH=6.38-7.45)

Didymium squamulosum (Alb. & Schwein.) Fr. & Palmquist
ES (Ro-5745, 5754, 5755, 5756, 5760, 5762, 5791, 5793, 5811, 5812, 5813, 5820, 5879 from Municipio San Diego-Dpto. La Libertad and Municipio Santa Ana-Dpto Santa Ana, 2015, on LL, pH=5.98-8.01)

Didymium ochroideum G. Lister
PN (LMW 50, 128, 157, 160, 175, 196, 200, 253, 598, 659, 1509, 1663, 1788 from Barro Colorado Island, 2012-2013, on DW and LL, pH=5.91-7.28)

Didymium trachysporum G. Lister
HN (Ro-5536, 5537, 5539 from Yuscaran, 2015, on LL, pH=7.60)

Enerthenema papillatum (Pers.) Rostaf.
PN (LMW 242 from Barro Colorado Island, 2013, on DW, pH=6.06)

Hemitrichia pardina (Minakata) Ing
ES (Ro-5868, Municipio Santa Ana-Dpto Santa Ana, 2015, on LL, pH=8.40), **PN** (LWM 144, 873, 2125, 2251, 2360, 2379, 2662, 3053, 3069 from Barro Colorado Island, 2012-2013, on DW and LL, pH=5.95-7.57)

Lamproderma scintillans (Berk. & Broome) Morgan
ES (Ro-5672, 5680, 5693, 5695, 5700, 5702, 5761, 5763, 5764, 5765, 5783, 5785, 5787, 5793, 5794, 5844, 5848, 5860, 5862, 5866, 5877 from Municipio San Diego-Dpto. La Libertad and Municipio Santa Ana-Dpto Santa Ana, 2015, on LL, pH=5.61-7.76), **HN** (Ro-5501, 5503, 5513, 5565, 5601, 5626, 5644 from Yuscaran, 2015, on LL and TW, pH=6.81-7.97)

Licea belmontiana Nann.-Bremek.
PN (LMW 1063, 2010 from Barro Colorado Island, 2012, on DW, pH=5.52-5.54), **CR** (Ro-1711 from Cerro Chirripo, 2007, on TW, pH=4.68)

Licea biforis Morgan
PN (LWM 2785, 2924, 2931 from Barro Colorado Island, 2012, on DW and LL, pH=5.77-6.63)

Licea eleanorae Ing
PN (LMW 971 from Barro Colorado Island, 2012, on LL, pH=6.05)

Licea kleistobolus G.W. Martin
PN (LMW 2595 from Barro Colorado Island, 2013, on DW, pH=6.24)

Licea rufocuprea Nann.-Bremek. & Y. Yamam.
PN (LMW 275, 277, 389, 1036, 2355, 2371, 2666, 2691, 2763, 2775, 2775 from Barro Colorado Island, 2012-2013, on DW and LL, pH=5.54-6.85)

Macbrideola decapillata H.C. Gilbert
PN (LMW 246, 1596, 2386, 2855, 3015, 3095 from Barro Colorado Island, 2013, on DW and LL, pH=5.69-6.85)

Macbrideola ovoidea Nann.-Bremek. & Y. Yamam.
PN (LMW 273, 2368, 2616, 2673, 2681, 2874, 3001 from Barro Colorado Island, 2013, on DW and LL, pH=5.68-7.05)

Macbrideola spinosispora L.M. Walker, G. Moreno & S.L. Stephenson
CR (SLS 25655 from Bijagual Ecological Reserve, 2012, on BK (*Pentaclethra macroloba*), pH=5.10)

Macbrideola synsporos (Alexop.) Alexop.
PN (LMW 555, 1040 from Barro Colorado Island, 2012, on DW, pH=5.35-5.42)

Paradiacheopsis fimbrata (G. Lister & Cran) Hertel ex Nann.-Bremek.
PN (LMW 1082 from Barro Colorado Island, 2012, on DW, pH=5.26)

Perichaena depressa Lib.
HN (Ro-5520, 5525 from Yuscaran, 2015, on TW and LL, pH=6.93-7.49)

Perichaena chrysosperma (Curr.) Lister
ES (Ro-5688, 5725, 5780, 5800, 5801, 5855, 5857, 5865, 5873, 5876 from Municipio San Diego-Dpto. La Libertad and Municipio Santa Ana-Dpto Santa Ana, 2015, on LL, pH=5.93-7.93)

Perichaena longipes L.M. Walker, Leontyev & S.L. Stephenson
PN (LMW 74, 85, 105, 132, 141, 175, 182, 217, 225, 252, 268, 887, 1621, 1641, 1642, 1644, 1660, 1672, 1693, 1697, 1738, 1745, 1781, 1850, 1859, 1866, 1873, 1892, 1984, 2007, 2068, 2071, 2087, 2133, 2534, 2574, 2581, 2586, 2754, 2756, 2777, 2869, 2936, 2983, 3061, 3066 from Barro Colorado Island, 2012-2013, on DW and LL, pH=5.52-7.87)

Perichaena pedata (Lister & G. Lister) G. Lister ex E. Jahn
PN (LMW 1236, 1261, 1332, 1481, 1872, 1973, 2183, 2248, 2327, 2332 from Barro Colorado Island, 2012-2013, on LL, pH=5.80-8.11)

Perichaena tessellata G. Lister
CR (Ro-3556 from Las Tablas Protected Zone, 2013, on LL, pH=7.18)

Perichaena vermicularis (Schwein.) Rostaf.
ES (Ro-5715, 5720, 5752, 5767, 5851, 5856, 5861, 5871, 5874, 5881, 5882 from Municipio San Diego-Dpto. La Libertad and Municipio Santa Ana-Dpto Santa Ana, 2015, on LL, pH=6.03-8.71)

Physarum aeneum (Lister) R.E. Fr.
PN (LMW 32, 1163, 1547, 1563, 1566, 1568, 1576, 2123, 2128, 2285 from Barro Colorado Island, 2012-2013, on DW, pH=5.54-7.02)

Physarum albescens Ellis ex T. Macbr.
CR (RO-6874, 6937, 6947, 6948, 6950, 6952, 6954 from Catalina Sector in Palo Verde National Park and Fila de Cal, 2015, on LL, pH=6.20-6.50)

Physarum bivalve Pers.
ES (Ro-5685, 5775, 5776, 5778, 5810 from Municipio San Diego-Dpto. La Libertad and Municipio Santa Ana-Dpto Santa Ana, 2015, on LL, pH=4.81-6.36)

Physarum cinereum (Batsch) Pers.
ES (Ro-5675, 5704, 5706, 5709, 5710, 5711, 5712, 5727, 5867 from Municipio San Diego-Dpto. La Libertad and Municipio Santa Ana-Dpto Santa Ana, 2015, on LL, pH=6.24-8.19)

Physarum citrinum Schumach.
ES (Ro-5863 from Municipio Santa Ana-Dpto Santa Ana, 2015, on LL, pH=6.24), PN (LMW 414 from Barro Colorado Island, 2012, on LL, pH=not determined)

Physarum compressum Alb. & Schwein.
HN (Ro-5548, 5551, 5566 from Yuscaran, 2015, on LL, pH=6.54-6.81)

Physarum crateriforme Petch
PN (LMW 1622 from Barro Colorado Island, 2013, on LL, pH=6.81)

Physarum decipiens M.A. Curtis

PN (LMW 743, 790, 1142, 1177 from Barro Colorado Island, 2012, on DW, pH=6.61-7.25)

Physarum galbeum Wingate
HN (Ro-5603 from Yuscaran, 2015, on TW, pH=6.51), PN (LMW 1808 from Barro Colorado Island, 2013, on DW, pH=6.49)

Physarum javanicum Racib.
PN (LMW 414 from Barro Colorado Island, 2012, on LL, pH=not determined)

Physarum lateritium (Berk. & Ravenel) Morgan
PN (LMW 1259, 1298 from Barro Colorado Island, 2012, on DW and LL, pH=5.84-6.25)

Physarum lakhanpalii Nann.-Bremek. & Y. Yamam.
PN (LMW 203, 231, 367, 1007, 1305, 2637, 2799, 2855 from Barro Colorado Island, 2012-2013, on DW and LL, pH=5.64-7.25)

Physarum nucleatum Rex
PN (LMW 500 from Barro Colorado Island, 2012, on LL, pH=not determined)

Physarum oblatum T. Macbr.
ES (Ro-5692 from Municipio San Diego-Dpto. La Libertad, 2015, on LL, pH=7.23)

Physarum pusillum (Berk. & M.A. Curtis) G. Lister
ES (Ro-5731, from Municipio San Diego-Dpto. La Libertad, 2015, on LL, pH=7.24)

Physarum roseum Berk. & Broome
PN (LMW 635 from Barro Colorado Island, 2012, on DW, pH=5.85)
Physarum superbum Hagelst.
PN (LMW 1071, 1633, 2385 from Barro Colorado Island, 2012-2013, on DW and LL, pH=6.19-7.39)

Physarum virescens Ditmar
PN (LMW 1713 from Barro Colorado Island, 2013, on DW, pH=7.10), CR (Ro-5268, 5269, 7281, 8357 from San Miguel de Sarapiqui, Tucurrique, Isla Calero and Palo Verde, 2014-2016, on LL, pH=6.40-7.55)

Stemonitis fusca Roth
HN (Ro-5546, 5574, 5575, 5576, 5615 from Yuscaran, 2015, on TW, pH=5.94-6.86)

Stemonitis herbatica Peck
PN (LMW 56 from Barro Colorado Island, 2013, on DW, pH=5.10)

Stemonitis mussooriensis G.W. Martin, K.S. Thind & Sohi
CR (Ro-2184 from Cerro de la Muerte, 2008, on LL, pH=4.80)

Stemonitopsis reticulata (H.C. Gilbert) Nann.-Bremek.& Y. Yamam.
HN (Ro-5630 from Yuscaran, 2015, on TW, pH=6.10)

Stemonitopsis subcaespitosa (Peck) Nann.-Bremek.
ES (Ro-5701 from Municipio San Diego-Dpto. La Libertad, 2015, on LL, pH=8.30), **HN** (Ro-5504 from Yuscarán, 2015, on LL, pH=6.67)

Wilkommlangea reticulata (Alb. & Schwein.) Kuntze
HN (Ro-5629 from Yuscaran, 2015, on TW, pH=6.10)

Table 1. Number of morphospecies of myxomycete recorded before and after the present contribution in the countries surveyed with an indication of the number of published studies.

Country	Myxomycete species recorded before and (after) this publication	Number of published studies before this publication
Honduras	32 (51)	5
El Salvador	40 (63)	2
Panama	106 (143)	14
Costa Rica	226 (235)	23

From the list of myxomycetes included herein, there are two important aspects of their distribution that should be discussed. First, contrary to the work of Lado &Wrigley de Basanta (2008), widespread Neotropical species of myxomycetes such as *Comatricha tenerrima*, *Didymium squamulosum*, *Lamproderma scintillans* and *Physarum compressum* were recorded herein for most Central American countries. This incongruence reflects the underrepresentation of the actual distribution of the morphospecies and the lack of information at the time of the publication in 2008 (before the research visits discussed herein were carried out). Second, despite sociopolitical and infrastructural issues in Central America, the effort of local and foreign researchers to continue developing baseline data on Neotropical myxomycetes during the last decade has greatly

expanded the numbers of morphospecies known for this region. These collections, deposited in herbaria, represent an opportunity for future research on myxomycetes in the region.

The underrepresentation of morphospecies in distribution databases is a common problem for all microorganisms which have not been studied with the same intensity as macroscopic organisms (see Heger et. al. 2014). In the case of myxomycetes, recent evidence has even shown that the ratio of ribotypes to morphospecies may oscillate between 2:1 and 10:1 (see Feng & Schnittler 2017) demonstrating that traditional surveys, by default, underestimate biodiversity. Despite the latter, classical surveys and lists of morphospecies still provide interesting information about the distribution of the group. For example, in the present study, the documentation of myxomycetes in Central America such as *Comatricha ellae*, *Didymium trachysporum* and *Licea rufocrupea*, which are not commonly recorded in the Neotropics, provides valuable information for understanding the role of biodiversity hotspots as shelters of microbial and genetic biodiversity on earth (see also Walker et al. 2015 for the description of a new species from Panama). It is exactly for that reason that baseline data is still valuable and validates the importance of generating the present report of new myxomycete morphospecies in Central America (see Table 1 for a comparison of efforts in the Central American countries presented herein).

As mentioned before, the recently increased efforts to document understudied countries in Central America is remarkable as well. The present study has increased the number of recorded myxomycetes for El Salvador and Honduras by 57% and 59%, respectively. Even for Panama, a country that had been moderately studied in the first part of the 20th Century, this report increases the number of known myxomycetes by 35%. Unfortunately, similar efforts to document myxomycetes are still lacking in other Central American countries such as Guatemala and Nicaragua. While at least one recent myxomycete research effort was carried out in Guatemala (Rojas et al. 2010), Nicaragua has not had active myxomycete research since the work of Torrend (1908), more than 100 years ago. Finally, we turn to Belize which is an interesting case because although there are no recently published records of myxomycetes from that country, there are currently active myxomycete research efforts taking place there (A.W. Rollins, *personal communication*).

As such, it is expected that myxomycete research in Central America will continue generating key information about the distribution of this group of organisms. Hopefully, in the coming years, expanded research will close the gap in other regional countries so that a more even effort can be established across Central America. The immediate future will likely continue seeing Costa Rica as the country where most of the myxomycete studies in Central America take place, but it is also likely that researchers will engage with local communities in the development of future myxomycete regional research. For now, the Mesoamerican hotspot, where Central America is located still represents a fantastic opportunity to study such an interesting group of organisms.

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