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Myxomycetes recorded in rapid assessments in Central America and Mexico during 2012-2019

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Abstract: A series of 12 sampling localities in the Central America/central Mexico areas were surveyed for myxomycetes. From these surveys we report 761 records that corresponded to 68 morphospecies within 26 genera. Myxomycetes were recorded in both rural and urban settings and the majority of morphospecies correspond to commonly found taxa. Results pointed that the topics of urban ecology and island biogeography are interesting for myxomycete research. The island of Utila seems an interesting location for future myxomycete research. The importance of communicating the results contained herein resides in the fact that the Central American region has had few dedicated studies on myxomycetes and any piece of information is highly valuable at the moment.

Keywords: biodiversity, Mesoamerica, myxomycetes, regional assessments.

Introduction

During the period between 2012 and 2019 a series of rapid assessments of myxomycetes were carried out by the Engineering Research Institute at the University of Costa Rica. These surveys were part of projects from the Forest Resource Research Unit, which were intended to explore the richness of both biotic and abiotic resources present in Costa Rican forests. Most of the surveys resulted in dedicated publications of biodiversity (Walker et al. 2015, Guyer et al. 2017) or agricultural applications (Sibaja-Matarrita et al. 2018) but data from a few surveys were never consolidated into published research.

From an objective scientific point of view, there was very little reason not to publish those results (Wagner 2021) other than a strategic take to having chosen journals following the business model path. The problem with that position is that most such journals influence the long-term impact of modest scientific datasets because ultimately, data never get published. For those researchers in the biological sciences that focus on taxonomic groups that have historically been understudied, such reality may leave a ton of scientific information in the drawer. The challenge is that in the current scenario of data-centric AI research, for instance, if data are not posted online, data simply do not exist (Zha et al. 2025).

As an approach to alleviate the invisibility of data for future generations and even contribute to the scientific balance of published information, the present study-report has been generated. The main objective is simply to present the data of myxomycete records from those of our surveys that were never published. Perhaps this data will never be used, but there is a chance that the information contained herein will serve as the basis for future research in the geographical region where the surveys took place.

Materials and methods

A series of 12 localities across Central America and Mexico were visited during the period of study (Fig. 1). In all of these except for Diriá, where only field surveys took place, a series of samples of decayed plant material were collected and taken to the laboratory for examination using the moist chamber technique explained by Wrigley de Basanta and Estrada-Torres (2017). In Utila, both field surveys and substrate collection for laboratory examination were used. In all cases, when sporocarps of myxomycetes were discovered in the cultures, they were extracted using fine forceps and glued onto pasteboard boxes that were stored, after the identification of morphospecies, in the USJ Herbarium of the University of Costa Rica.

The field survey in Diriá took place at elevations between 140-210 m asl, along 2 km of the En Medio and Quebrada Brasil rivers during the rainy season (17-26 July 2015). These collections were made opportunistically on fallen trunks situated along the riverbanks, focusing on those with diameters of at least 20 cm and lengths exceeding 10 m. Inspections were carried out along both the length and width of the selected trunks, and sporocarps were preserved for preliminary identification at the station. In Utila, the survey took place in late 2016-early 2017 and myxomycetes were looked for on decayed trunks and twigs located in coastal secondary forest patches, mangrove forests and disturbed areas within the urbanized sections of the island.

For analytical purposes, in the present evaluation, a simple calculation of the Shannon Diversity Index and a ratio of records by species was included along with a Bray-Curtis cluster intended to compare composition across localities.

Sampling localities

From north to south, the 12 sampling localities and ecological settings of the substrates used for examination are included herein. In Mexico, samples of bark from urban trees were collected in the city of Puebla. In Guatemala, samples of ground litter in the semiurban region around the city of Flores were used for examination. In Honduras, samples of ground litter were collected in La Tigra National Park, in the vicinity of the rural town of Yuscarán, in the coastal ecosystems of the island of Utila, and in urban parks of the city of Tegucigalpa.

In Costa Rica, ground litter samples were obtained around the semiurban context of the city of San Ramón, and in the rural parts of the towns of Paquera, Tambor and Cobano. Also, in the Diriá National Park, decayed logs were surveyed for myxomycetes, being this the only case included herein where myxomycetes were surveyed in field conditions. Finally, ground litter samples were collected in the urban context of Panama City, Panama, within the Metropolitano Natural Park.

Results

A total of 761 records of myxomycetes were obtained in the surveys considered herein. Overall, a total of 68 morphospecies of myxomycetes were identified within 26 different genera (Table 1). From these, only 30 records from five morphospecies were found in the bark samples from Puebla, Mexico; only 15 records within six species were found in the ground litter samples from Panama City, and only 16 records from seven species were associated with the ground litter samples from Tegucigalpa, Honduras.

Yuscarán and the Diriá National Park were the localities with the highest number of records with 152 and 143 collections, respectively. However, the highest number of morphospecies was obtained from the former, with 33 reported taxa. In this case, the ratios between the number of records and morphospecies were 4.6 in Yuscarán and 11 in Diriá, indicating that more species per number of records was made in the former. However, the lowest value for the same ratio was obtained in Utila, with only 2.2, suggesting that the survey in this island is far from completion since there was almost one new morphospecies recorded every other collected myxomycete.

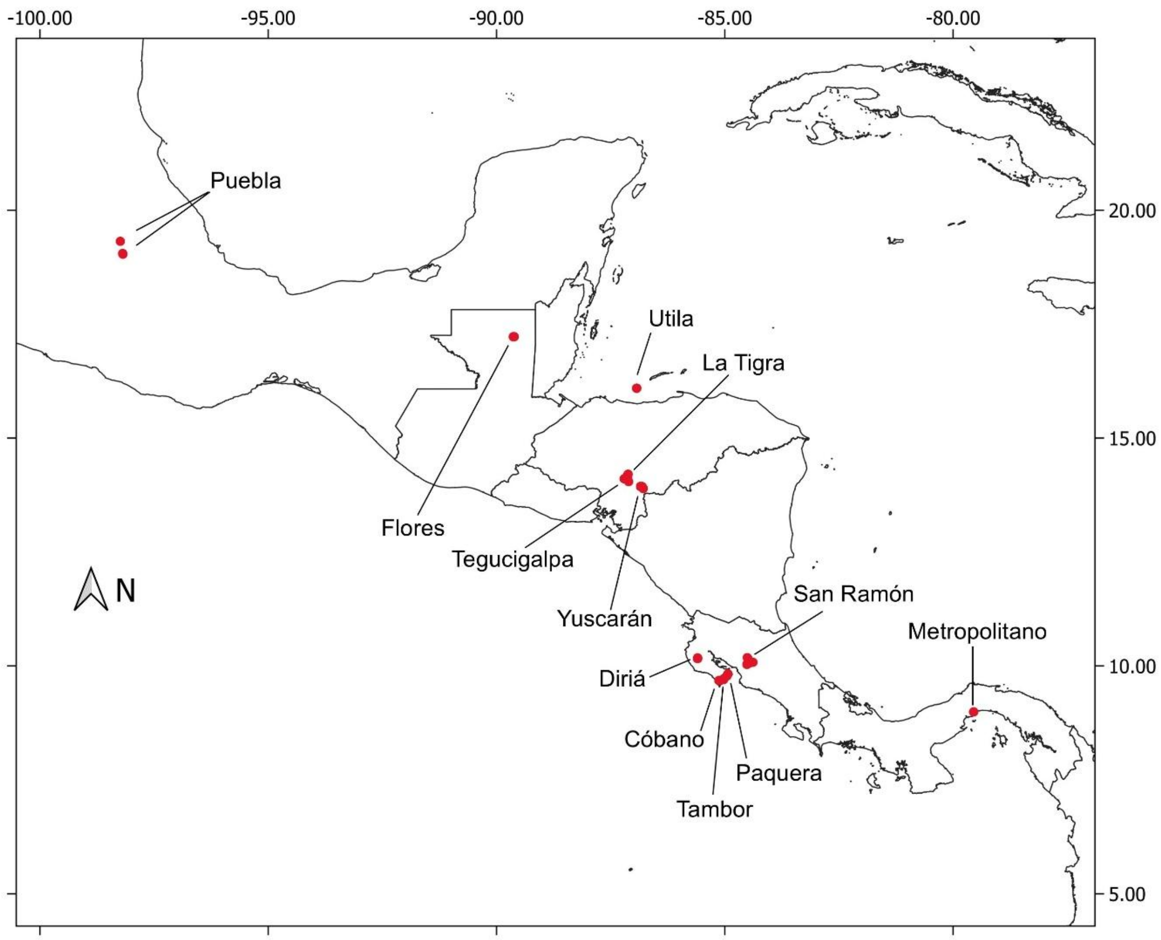

Figure 1. Map of the region of Central America and part of Mexico displaying the 12 sampling localities considered herein.

Table 1. List of myxomycete morphospecies and number of records associated with each location included in the present study. Those morphospecies with an asterisk represent new records for Honduras and the record with two asterisks is new to Central America.

Morphospecies	**Mexico**	**Guatemala**	**Panama**	**Honduras**				**Costa Rica**				
	Puebla	**Flores**	**Metropolitano**	**La Tigra**	**Tegucigalpa**	**Utila**	**Yuscarán**	**Cóbano**	**Paquera**	**Tambor**	**Diriá**	**San Ramón**
Angioridium sinuosum		1							2	2		
Arcyria afroalpina							1					
Arcyria cinerea	2		3	3		8	23	3	7	8	16	3
Arcyria denudata				15		4						
Arcyria incarnata											22	
Arcyria insignis		1					1					
*Arcyria major***						1						
Arcyria minuta												1
Ceratiomyxa fruticulosa						1						
Clastoderma debaryanum				1		1	1					
Claustria didermoides	4							2				1
Collaria arcyrionema						4						
Comatricha nigra							4	3	2	1		2
Comatricha pulchella				1			3					
Comatricha tenerrima						1	3					
*Craterium roseum**						1						
*Cribraria cancellata**						2						
Cribraria intricata											5	
Cribraria microcarpa				2		2						
Cribraria tenella						1						
Cribraria violacea				1	2	1						
Diachea bulbillosa							1					
Diachea leocopodia				1	1	3			8	2		21
Diderma effusum				2								
Diderma hemisphaericum		3	4	1	3	3	6	1	4	1		8
*Didymium anellus**		5		1		1						1
Didymium bahiense		8					1	4	1	2		3
Didymium clavus		1					7					
Didymium difforme					1		14	6		2		6
Didymium dubium							6		1			
Didymium iridis				1			3	5	3	2		
Didymium minus		11					5	9	9	4		
Didymium nigripes				5			1					
Didymium squamulosum			3	3	2		4	2	5	2		4

Didymium trachysporum						1	1					
Fuligo intermedia												2
Fuligo septica											2	
Gulielmina vermicularis							1					
Hemitrichia calyculata						5					40	
Hemitrichia pardina				2				1				
Hemitrichia serpula											3	
Lamproderma scintillans		7	1	1			7	5	13	9		1
Lycogala oncoides											17	
*Metatrichia vesparia**						1						
*Nannengaella globulifera**						1						
Nannengaella mellea				1							1	
Ophiotheca chrysosperma	12			1			7	1	1	3	7	4
Ophiotheca pedata				5			4					
Paradiacheopsis fimbriata	5											
Perichaena corticalis	7									1		
Perichaena depressa					5	3	2	12	9	8	1	
Perichaena quadrata							1					
Physacum cinereum			1	1	2		3	3	1	1		
Physarum bogoriense				1								
Physarum compressum		1					3		6	1		18
Physarum galbeum							1	1				1
Physarum ovisporum			3									
Physarum pusillum						1	29		1			
Physarum superbum		6							1			1
Physarum tenerum				1								
Physarum viride							1					
Stemonitis axifera							1				2	
Stemonitis fusca						2	4	1			6	
Stemonitopsis aequalis				1								
Stemonitopsis reticulata							1					
Stemonitopsis subcaespitosa							2					
*Stemonitopsis typhina**						3						
Tubifera microsperma											21	
	Puebla	**Flores**	**Metropolitano**	**La Tigra**	**Tegucigalpa**	**Utila**	**Yuscarán**	**Cóbano**	**Paquera**	**Tambor**	**Diriá**	**San Ramón**
Morphospecies	**Mexico**	**Guatemala**	**Panama**	**Honduras**				**Costa Rica**				

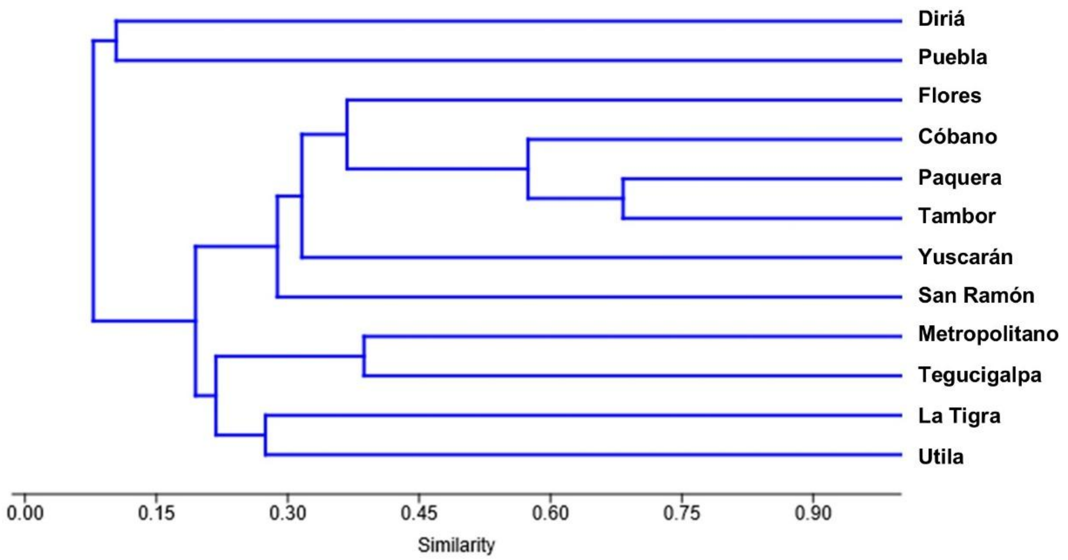

Figure 2. Bray-Curtis based clustering showing the relationships of similarity across the different datasets considered herein.

The Shannon Index of Diversity showed the highest values for Utila and Yuscarán, respectively. The Bray-Curtis clustering (Fig. 2) showed that Diriá and Puebla are different from the rest, which makes sense based on sampling techniques and biogeographical regions, respectively. The rest of the localities all clustered within one large tropical group where moist chambers were used to generate data. In this case, however, Flores, Cóbano, Paquera and Tambor formed a subgroup, with some similarity to Yuscarán and San Ramón. At the same time, the Metropolitano natural park, Tegucigalpa, La Tigra and Utila formed a separate subgroup. Interestingly, of the two large subgroups formed, the first one is composed of localities with a rural/semirural settings, whereas the second one is composed by what could be called "ecological islands," with real examples like Utila, or in a biological sense like the Metropolitano natural park, the urban parks of Tegucigalpa and the La Tigra National Park, located in the context of the Tegucigalpa Metro Area

Discussion

Central American myxomycetes have not been studied as systematically as in other regions of the planet. In this sense, efforts such as the one from the University of Costa Rica in the period between 2012-2019 are remarkable because they were not driven by interests other than the scientific documentation of the region. As mentioned earlier, these efforts also resulted in a few articles comunicating new species for most countries (Rojas et al. 2017), but the raw data were not necessarily published, in the form that it is contained in the present study.

Even though much could be said about the incompleteness of each of the datasets presented herein, the data summarized in this short note are also relevant for the documentation of the biological richness of Central America. In that sense, we did not include many comparisons across datasets due to uneven efforts and methods, but the results presented herein point in the direction of two particular aspects that are moderately documented today. First, taxonomic results from urban areas, using a standard methodology, are different from rural/semirural regions. Second, the concept of ecological islands, in the sense of the Island Biogeography Theory, seem to be visible when sporocarps of myxomycetes are studied using classical methods.

Both of these ideas, have been discussed in the scientific community recently and in the case of the urban dynamics of myxomycetes, a few articles have been developed within the last years (Hosokawa et al. 2019; Rincón-Marín et al. 2021). In this sense, it is noteworthy to observe that results from urban areas in Central America also show the patterns observed in studies dedicated to the issue. A review of the topic of island biogeography on myxomycetes is currently under evaluation for publication (Stephenson and Rojas, unpublished).

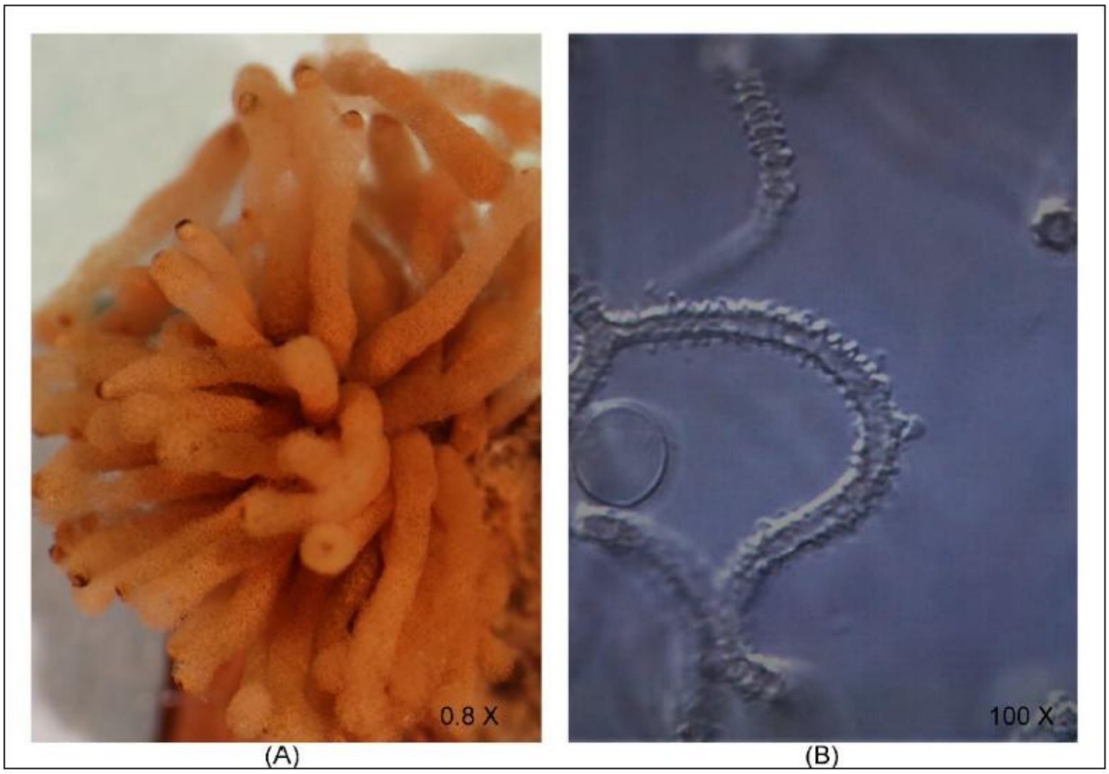

Figure 3. *Arcyria major* from Utila, Honduras in 2018. (A) Macroscopic view and (B) Microscopic view of the capillitium and spores.

The Utila Island case

Before 2015 or so, no systematic survey of myxomycetes had been carried out on the Caribbean island of Utila and only a handful of studies had been conducted in Honduras. From the results presented herein, this island clearly captures the attention for potential future research since not only had the highest Shannon Diversity Index value, but also the smallest records to species ratio.

The thesis work of the first author was dedicated to the documentation of myxomycetes in that island (Díaz-Canales 2018) and results revealed that seven morphospecies (those with asterisks on Table 1) had not been reported for Honduras, and that one of them – *Arcyria major* – was in fact reported for the first time in Central America (Fig. 3). Interestingly, this record was obtained directly in the field during the survey of the island.

Based on those results, it is clear that future visits to Utila and the other caribbean islands of Honduras would be very valuable to continue the documentation of myxomycetes in Central America. However, more importantly, those results support the spirit of publication in the present study. A thesis work stored in a Honduran university library contains all this information, but it is rather innacessible for both local and foreign researchers, who will most likely use popular search engines for research. The Utila Island case observed herein demonstrates that modest datasets can be very valuable for a more complete picture of the biodiversity in a particular geographical context.

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