



# Conserving the *Magnolia* diversity of the Caribbean islands: progress and prospects

Emily Veltjen, Alejandro Palmarola Bejerano, Pieter Asselman, Majela Hernández Rodríguez, Luis Roberto Gonzalez Torres, Isabel Larridon, Marie-Stéphanie Samain & Paul Goetghebeur



OUTLINE

QUESTIONS

PHYLOGENY

CONSERVATION

PROSPECTS



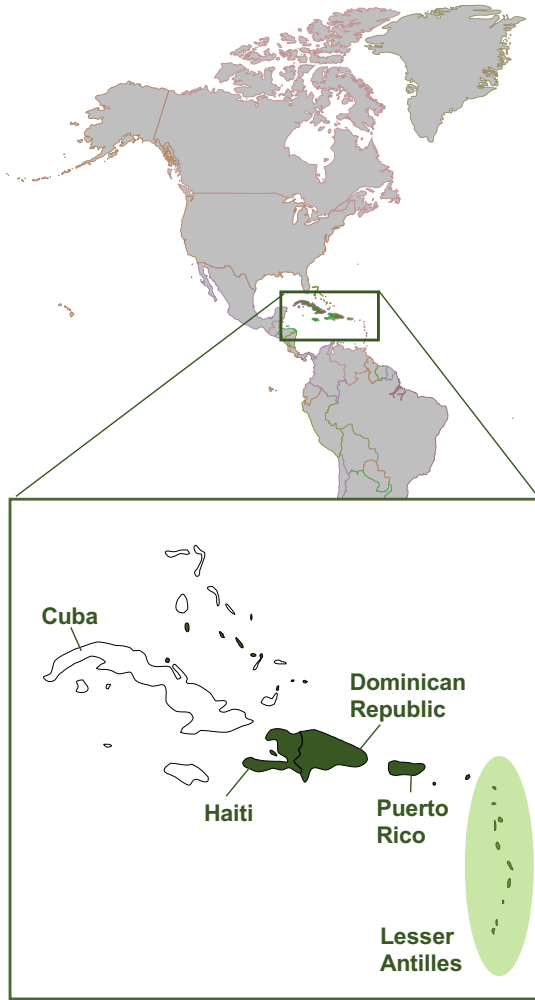
## PROJECT OUTLINE

Photo: *Magnolia hamorii* (DR)



THE MORPHOLOGY AND SYSTEMATICS OF THE  
 WEST INDIAN MAGNOLIACEAE

RICHARD A. HOWARD



*Magnolia ekmanii* (Haiti)



*Magnolia domingensis* (Haiti & Dominican Rep.)



*Magnolia emarginata* (Haiti)



*Magnolia splendens* (Puerto Rico)



*Magnolia pallescens* (Dominican Rep.)



*Magnolia portoricensis* (Puerto Rico)



*Magnolia hamorii* (Dominican Rep.)

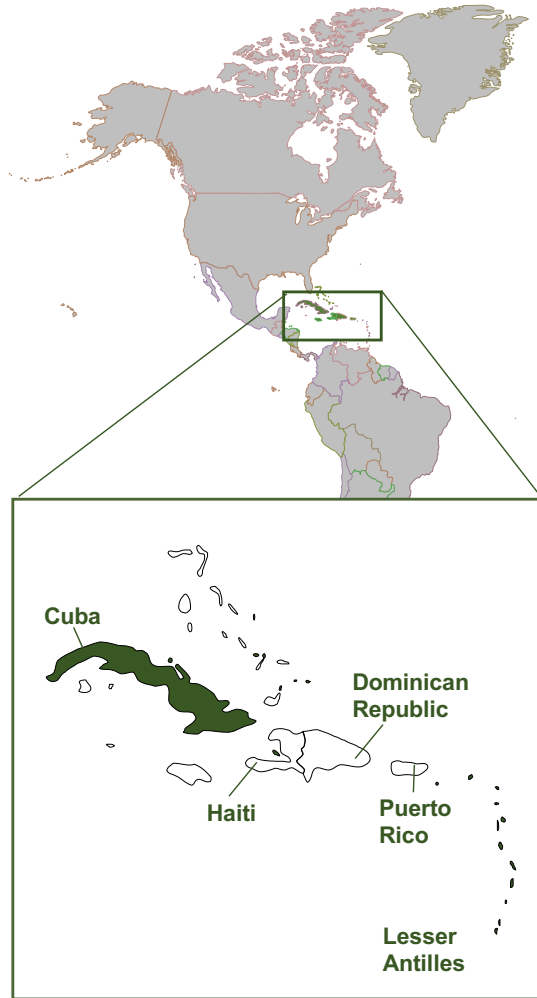


*Magnolia dodecapetala* (Lesser Antilles)



**Las magnolias de Cuba: *Talauma* – taxonomía y nomenclatura**  
**Cuban magnolias: *Talauma* – taxonomy and nomenclature**

Alejandro Palmarola <sup>1\*</sup>, Mikhail S. Romanov <sup>2</sup>, Alexey V.F.Ch. Bobrov <sup>3</sup> y Luis R. González-Torres <sup>4</sup>



*Magnolia cubensis* subsp. *acunae*




*Magnolia cubensis* subsp. *cubensis*



*Magnolia orbiculata*



*Magnolia virginiana* subsp. *oviedoae*



## RESEARCH QUESTIONS

Photo: *Magnolia dodecapetala* (M)



Photo: follicle cores of *Magnolia dodecapetala* (SV, SL, M, D, G)

## SPECIES DELIMITATION

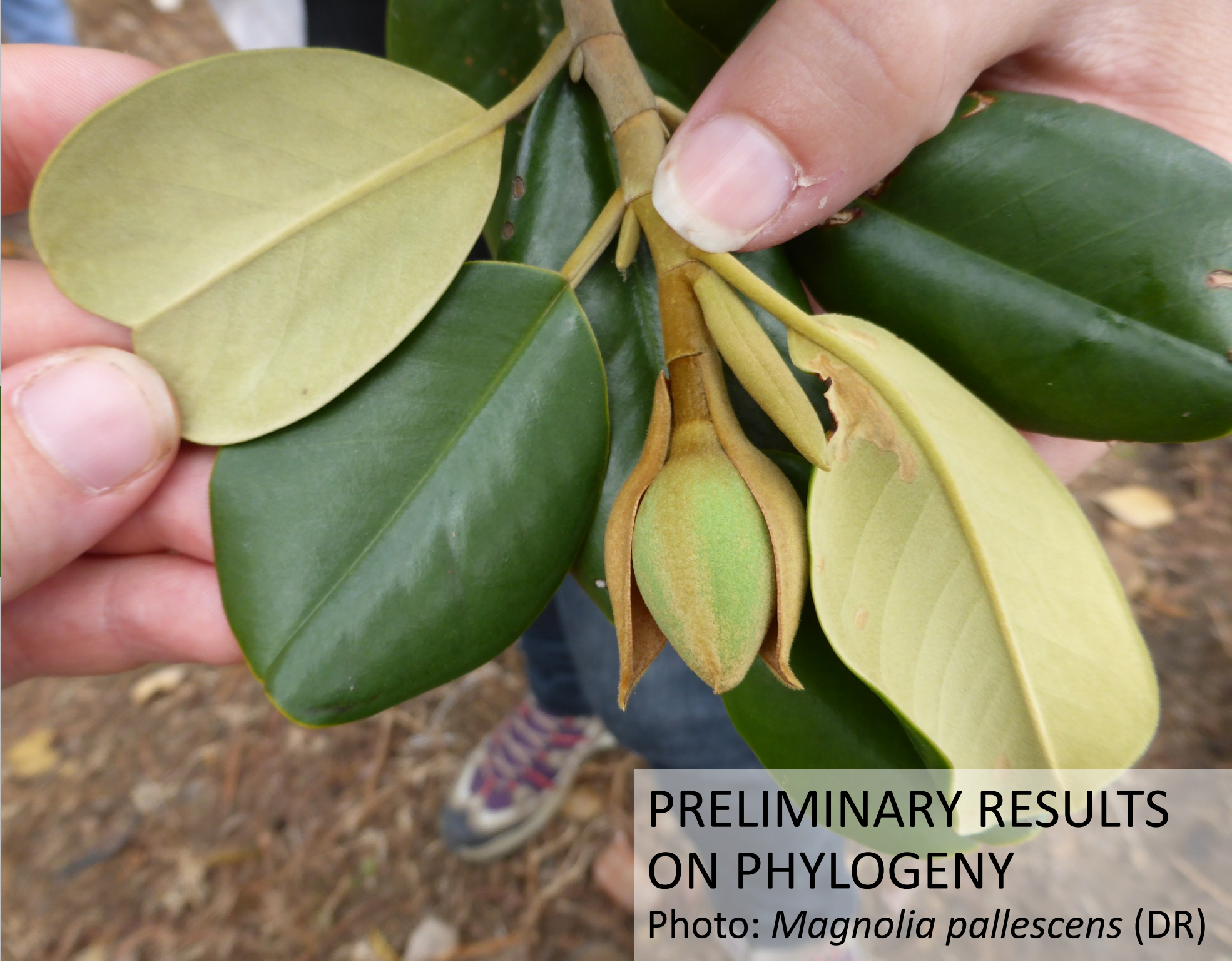
1. Are the species described by Howard (1948) and Palmarola (2016 + in press.) phylogenetically supported?
2. Do all the Caribbean Magnoliaceae cluster together in a monophyletic group?
3. Do the Caribbean Magnoliaceae of the subsection Talauma and the subsection Cubenses form monophyletic clusters?
4. Does the phylogenetic hypothesis support a single or multiple colonization of the Magnoliaceae in the Caribbean islands?
5. Do we find genetic and/or morphological proof for ongoing speciation of *M. dodecapetala* in the Lesser Antilles?



Photo: *ex situ* seedlings of *Magnolia portoricensis*

## CONSERVATION

1. What is the Extent of Occurrence (EOO) and Area of Occupancy (AOO) of the species based on the field surveys?
2. Can we advise explorations in other forest(s) (patches) with a high possibility of finding more populations?
3. Do the studied species have a clear population structure and hence limited past gene flow?
4. Can we confirm or detect (ongoing) speciation based on the nSSR loci?
5. Do the different sampled populations show a healthy amount of genetic diversity in their neutral nuclear DNA?
6. Do genetic analysis on the populations show signs of inbreeding?
7. Can we advise any of the following conservation measurements: translocation, reinforcement, boost cross-species pollination, bring in *ex situ*,...?



## PRELIMINARY RESULTS ON PHYLOGENY

Photo: *Magnolia pallescens* (DR)



Phylogenetic and biogeographic complexity of Magnoliaceae in the Northern Hemisphere inferred from three nuclear data sets

Ze-Long Nie<sup>a,b</sup>, Jun Wen<sup>a,c,d</sup>, Hiroshi Azuma<sup>e</sup>, Yin-Long Qiu<sup>f</sup>, Hang Sun<sup>a,\*</sup>, Ying Meng<sup>a,g</sup>, Wei-Bang Sun<sup>a</sup>, Elizabeth A. Zimmer<sup>c</sup>

Molecular phylogeny of Magnoliaceae based on plastid DNA sequences with special emphasis on some species from continental Southeast Asia

HIROSHI AZUMA\*, PIYA CHALERMGLIN\*\* & HANS PETER NOOTEBOOM\*\*\*

	PHYA	LFY	atpB-rbcL	ndhf	ndhF-rpL32	psbA-trnH	rbcL	trnK
Caribbean	15 (28)	15 (33)	15 (40)	15 (35)	15 (30)	15 (40)	15 (31)	15 (31)
American	20 (25)	20 (30)	23 (26)	27 (47)	5 (5)	21 (43)	20 (26)	25 (31)
Length (bp)	1086	526	818	3064	1212	485	1519	2519
Indels	0	3	1	5	2	7-3	1	3
Subst	102 (-34)	92 (-33)	6	104	34	40 (-14)	47 (-23)	59 (-18)
Total IC	102	105	7	109	36	11 (47)	48	62
% var	9,39%	19,96%	0,86%	3,56%	2,97%	9,69%	3,16%	2,46%

American Journal of Botany 92(1): 142–166. 2005.

**THE TORTOISE AND THE HARE II: RELATIVE UTILITY OF 21 NONCODING CHLOROPLAST DNA SEQUENCES FOR PHYLOGENETIC ANALYSIS<sup>1</sup>**

JOEY SHAW,<sup>2</sup> EDGAR B. LICKEY, JOHN T. BECK, SUSAN B. FARMER, WUSHENG LIU, JERMEY MILLER, KUNSIRI C. SIRIPUN, CHARLES T. WINDER, EDWARD E. SCHILLING, AND RANDALL L. SMALL

Department of Botany, 437 Hesler Biology, University of Tennessee, Knoxville, Tennessee 37996 USA

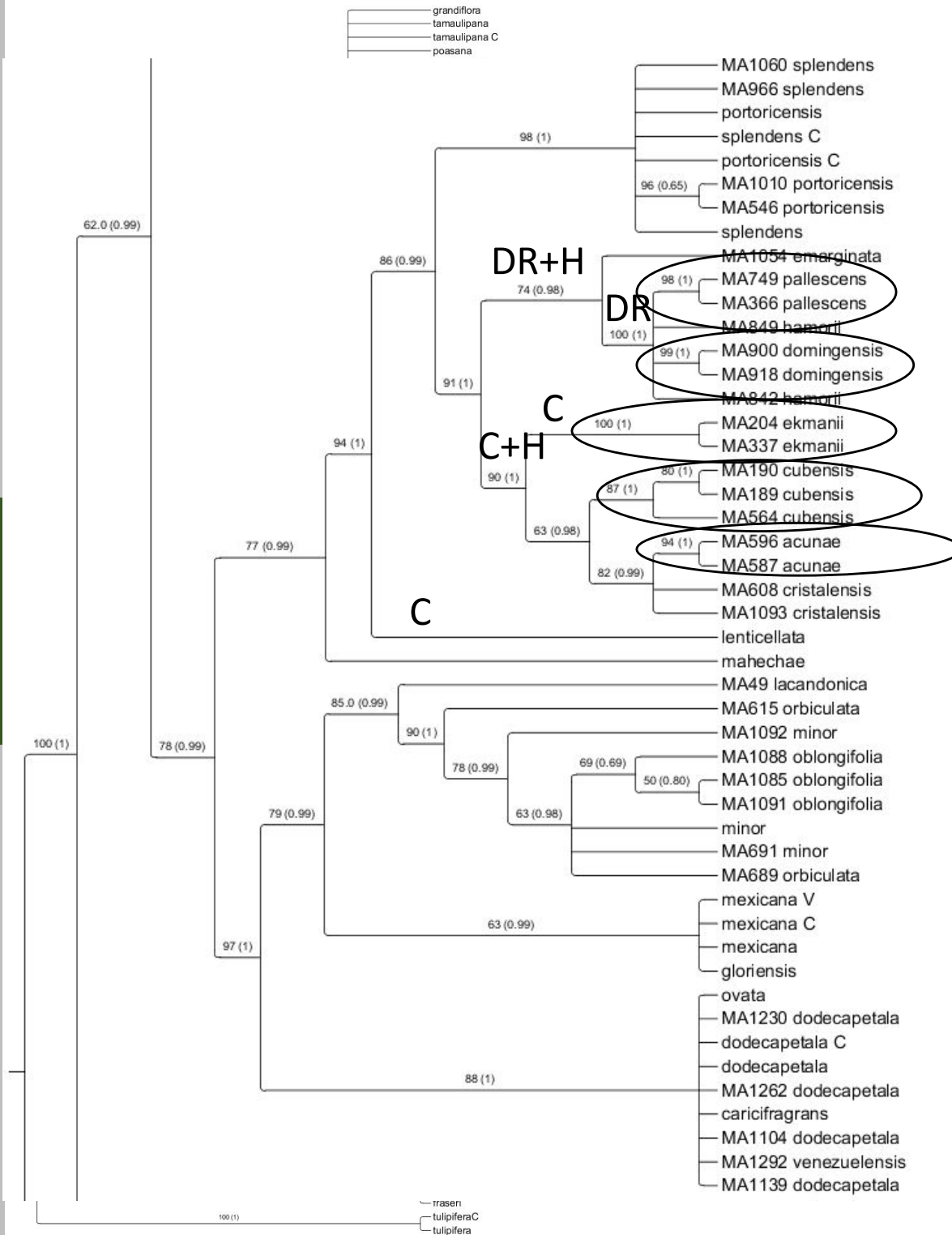
**Anchored Phylogenomics of Angiosperms I:**

**Assessing the Robustness of Phylogenetic Estimates**

Chris Buddenhagen<sup>\*1,16</sup>, Alan R. Lemmon<sup>\*2,17</sup>, Emily Moriarty Lemmon<sup>1,18</sup>, Jeremy Bruhl<sup>3,19</sup>, Jennifer Cappa<sup>4,20</sup>, Wendy L. Clement<sup>5,21</sup>, Michael J. Donoghue<sup>6,22</sup>, Erika J. Edwards<sup>7,23</sup>, Andrew L. Hipp<sup>8,24</sup>, Michelle Kortyna<sup>1,25</sup>, Nora Mitchell<sup>9,26</sup>, Abigail Moore<sup>10,27</sup>, Christina J. Prychid<sup>3,11,28</sup>, Maria C. Segovia-Salcedo<sup>12,29</sup>, Mark P. Simmons<sup>13,30</sup>, Pamela S. Soltis<sup>14,31</sup>, Stefan Wanke<sup>15,32</sup>,

and Austin Mast<sup>1,33</sup>

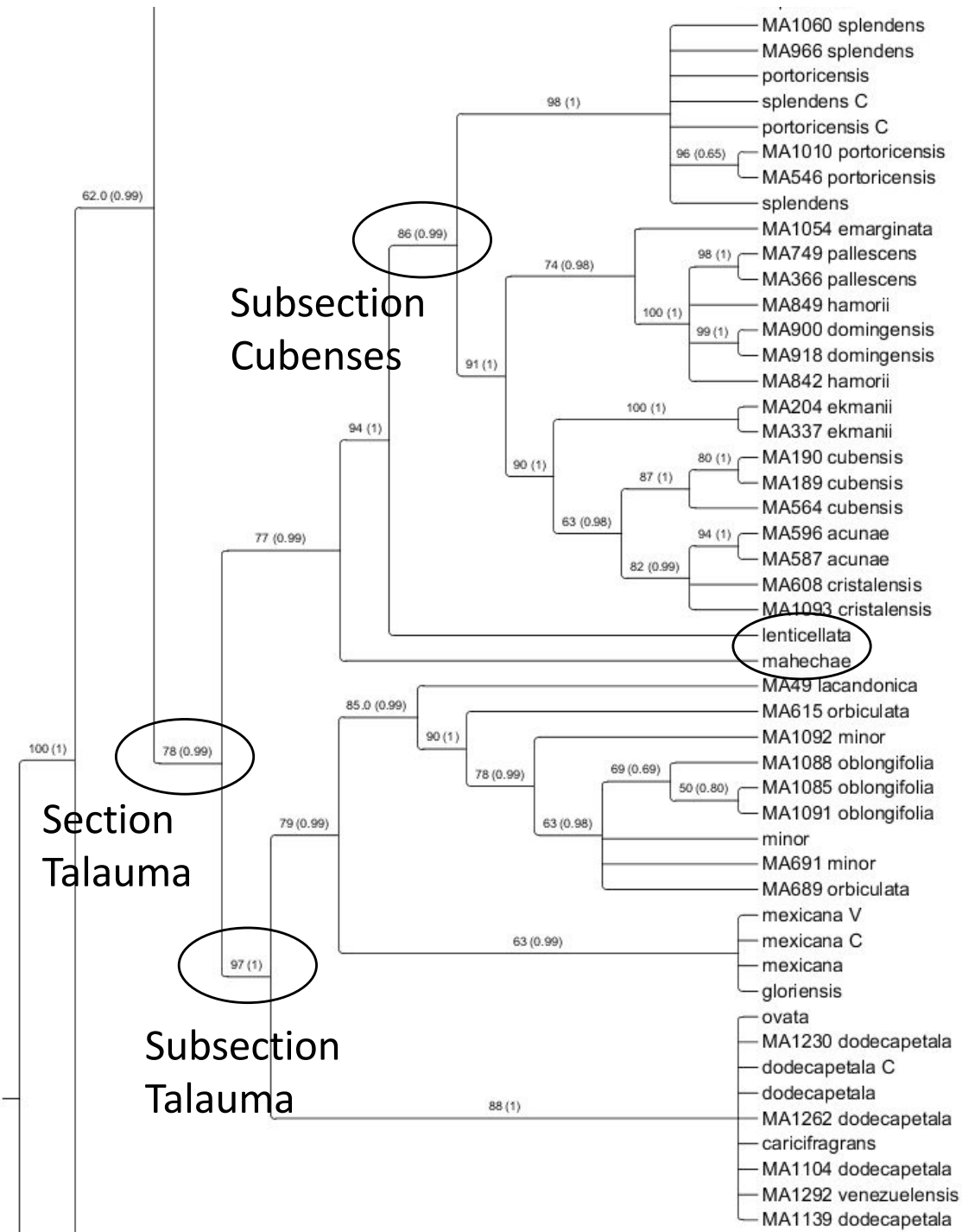
\*Co-first authors



## SPECIES DELIMITATION

1. Are the species described by Howard (1948) and Palmarola (2016 + in press.) phylogenetically supported?
2. Do all the Caribbean Magnoliaceae cluster together in a monophyletic group?
3. Do the Caribbean Magnoliaceae of the subsection Talauma and the subsection Cubenses form monophyletic clusters?
4. Does the phylogenetic hypothesis support a single or multiple colonization of the Magnoliaceae in the Caribbean?
5. Do we find genetic and/or morphological proof for ongoing speciation of *M. dodecapetala* in the Lesser Antilles?

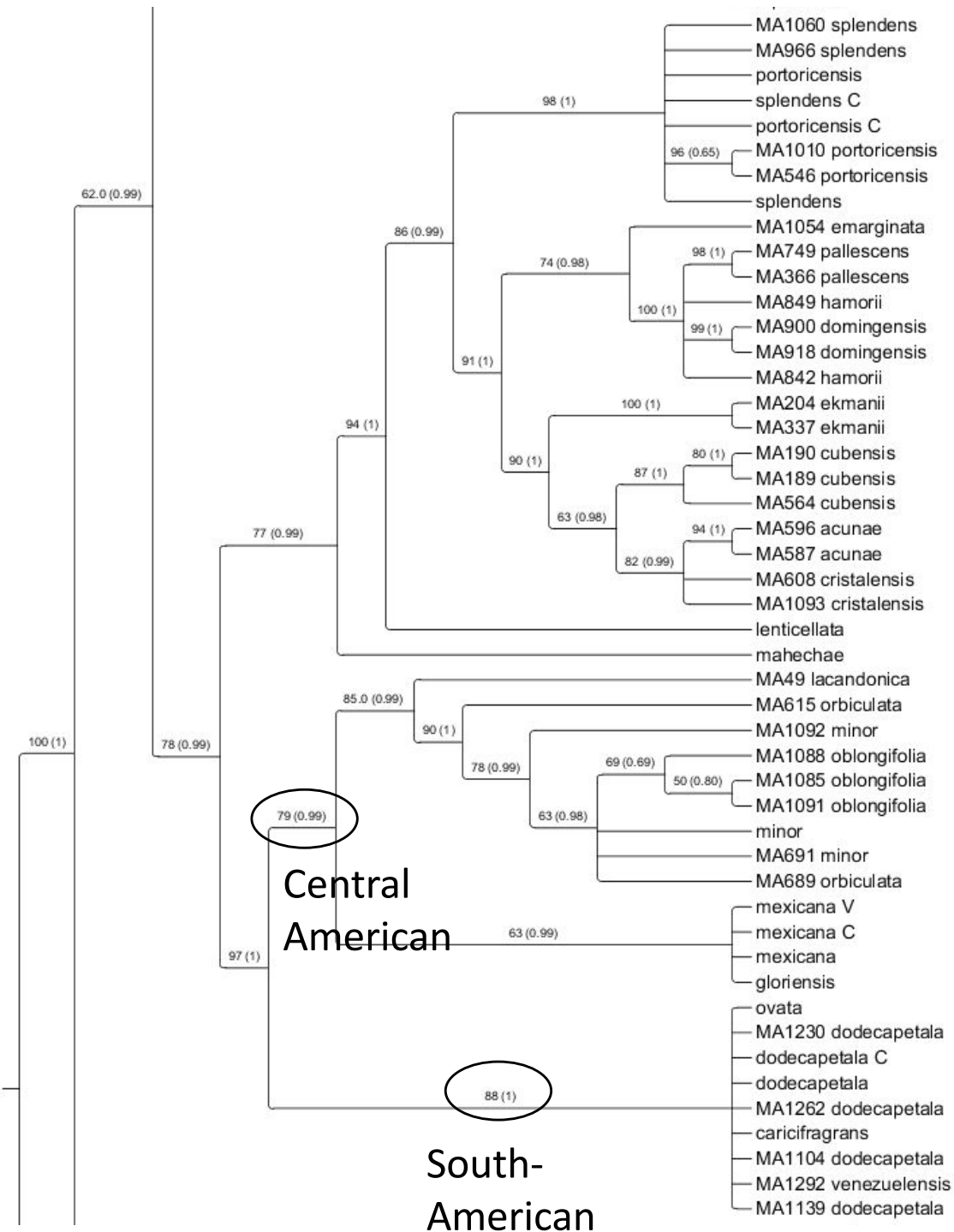
## SPECIES DELIMITATION



1. Are the species described by Howard (1948) and Palmarola (2016 + in press.) phylogenetically supported?
2. Do all the Caribbean Magnolias cluster together in a monophyletic group?
3. Do the Caribbean Magnoliaceae of the subsection Talauma and the subsection Cubenses form monophyletic clusters?
4. Does the phylogenetic hypothesis support a single or multiple colonization of the Magnoliaceae in the Caribbean?
5. morphological proof for ongoing speciation of *M. dodecapetala* in the Lesser Antilles?

## SPECIES DELIMITATION

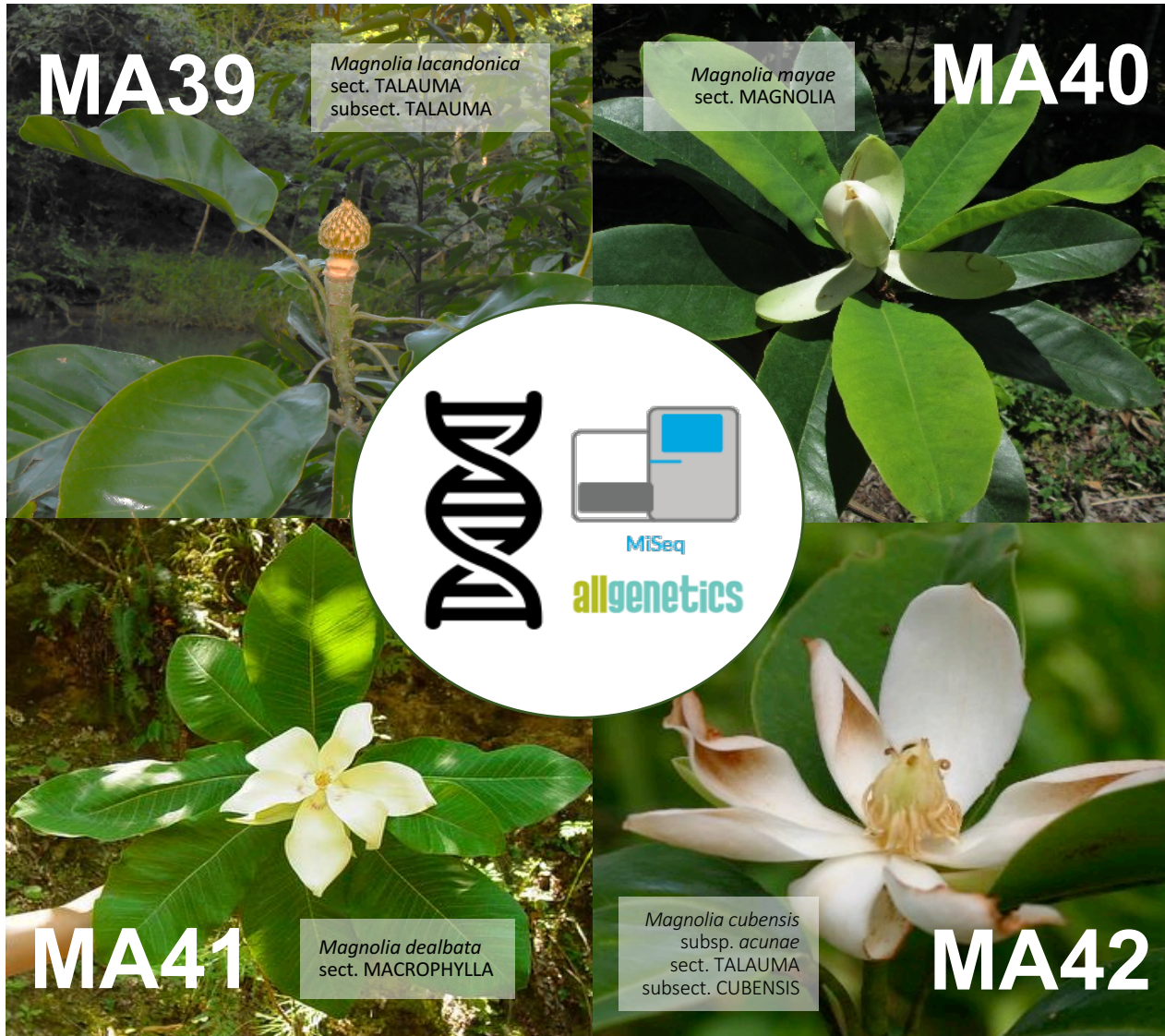
1. Are the species described by Howard (1948) and Palmarola (2016 + in press.) phylogenetically supported?
2. Do all the Caribbean Magnoliaceae cluster together in a monophyletic group?
3. Do the Caribbean Magnoliaceae of the subsection Talauma and the subsection Cubenses form monophyletic clusters?
4. Does the phylogenetic hypothesis support a single or multiple colonization of the Magnoliaceae in the Caribbean?
5. Do we find genetic and/or morphological proof for ongoing speciation of *M. dodecapetala* in the Lesser Antilles?



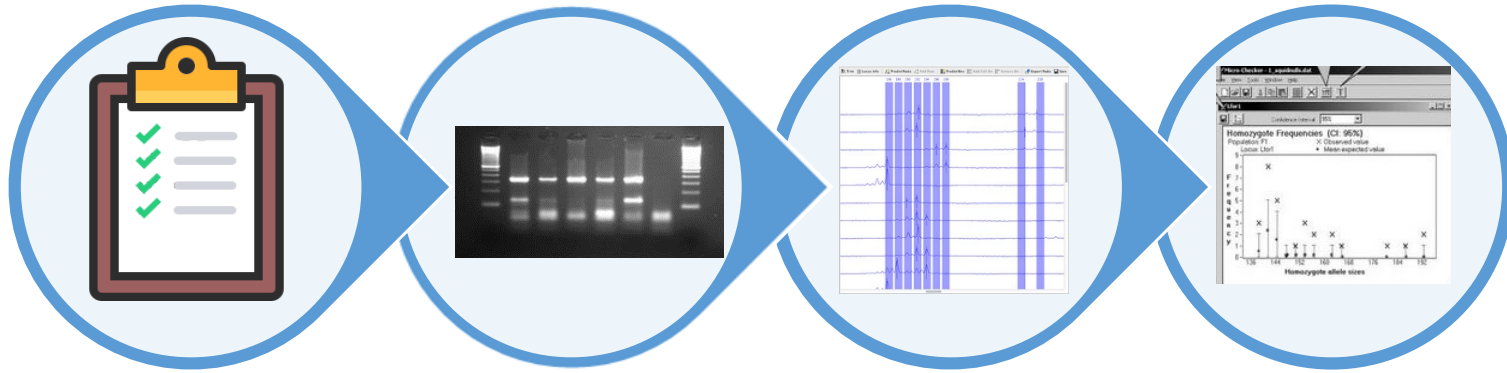



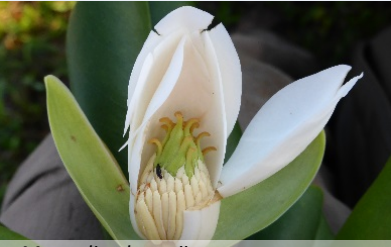

# PRELIMINARY RESULTS ON CONSERVATION

Photo: *Magnolia domingensis* (DR)



- 4x500 possible SSR markers
- 177 primers ordered
  - 50 MA39
  - 20 MA40
  - 20 MA41
  - 87 MA42
- Testing ongoing
- **Cross-species amplicability?**



 <p><i>Magnolia cubensis subsp. acunae</i></p>	<p>Tested: 51 Resulting: 24</p>	<p>Tested: 24 Resulting: 17</p>	<p>Tested: 17 Resulting: 12</p>
 <p><i>Magnolia ekmanii</i></p>	<p>Tested: 142 Resulting: 87</p>	<p>Tested: 87 Resulting: 24</p>	
 <p><i>Magnolia dodecapetala</i></p>	<p>Tested: 91 Resulting: 39</p>	<p>Tested: 39 Resulting: 9</p>	



## PROSPECTS & OUTREACH

Photo: *Magnolia ekmanii* (H)



## SPECIES DELIMITATION: PROSPECTS

Study unexpected outcomes in current tree.  
 Add two – three nuclear genes for better low resolution phylogenetic results.  
 Add more sequenced Magnolias, other than the Caribbean set.  
 Try to add herbarium (type-) sequences of previously, (and erroneously?) defined (sub-)species.  
 Date tree.

## SPECIES DELIMITATION: OUTREACH

Advice on which species to include?



THIRD INTERNATIONAL SYMPOSIUM ON THE FAMILY  
 MAGNOLIACEAE, CUBA 2016

## CONSERVATION: PROSPECTS

Further testing of all ordered markers on the Caribbean species.  
 Further testing of amplicability of promising markers for family wide amplicability.  
 Further optimization for genotyping.  
 Genotyping and analysis.

## CONSERVATION: OUTREACH

Experience to exchange?  
 (Related) Species you'd like to run conservation genetic analysis on?  
 Experience in breeding of tropical Magnolias?