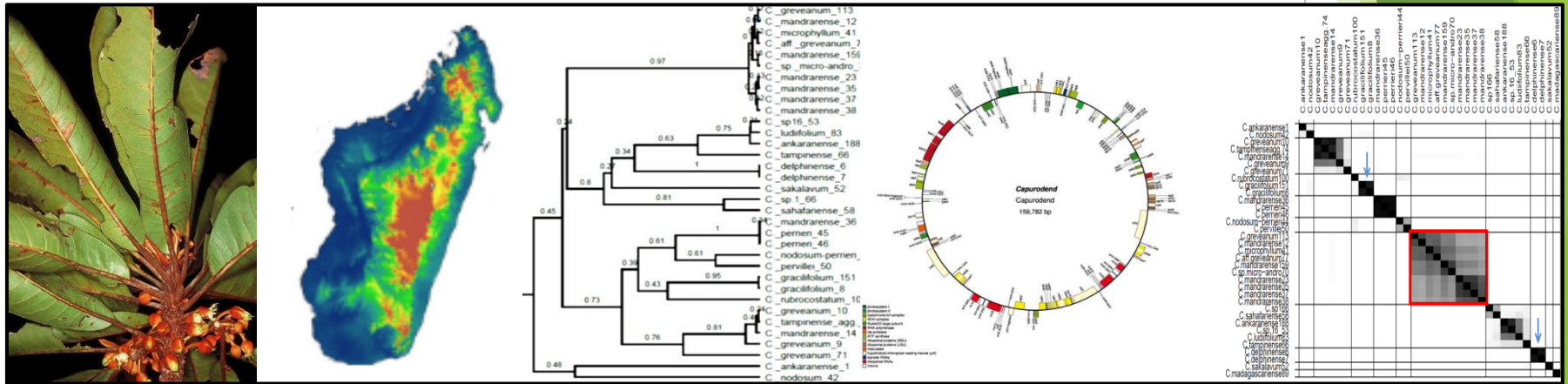# Systematics, species delimitation and conservation in Tseboneae, a Madagascar endemic tribe of Sapotaceae

Carlos G. Boluda, Camille Christe, Laurent Gautier & Yamama Naciri

Conservatoire et Jardin botaniques Genève
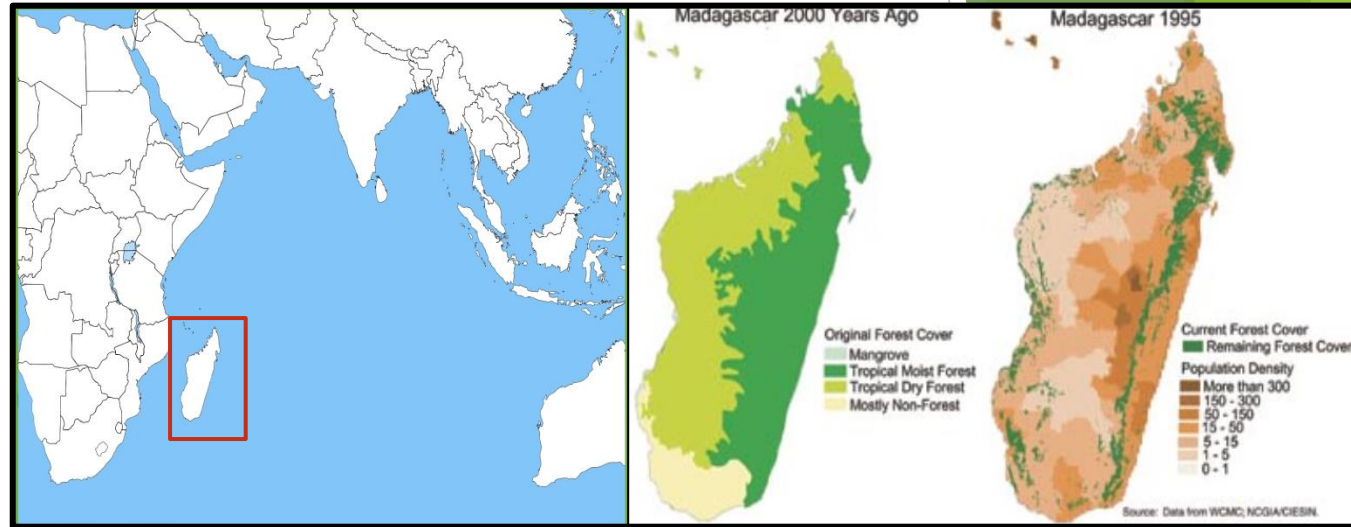
SWISS SYSTEMATICS SOCIETY

Basel, 8-November-2019

Introduction

Madagascar:

-Isolated from India ~ 88 mya. (Upper Cretacic).

- 82% of endemic vascular flora.

The Sapotaceae family:

- Tropical slow growing trees.

- Appreciated wood.

- Highly represented in Madagascar (10% of worldwide species).
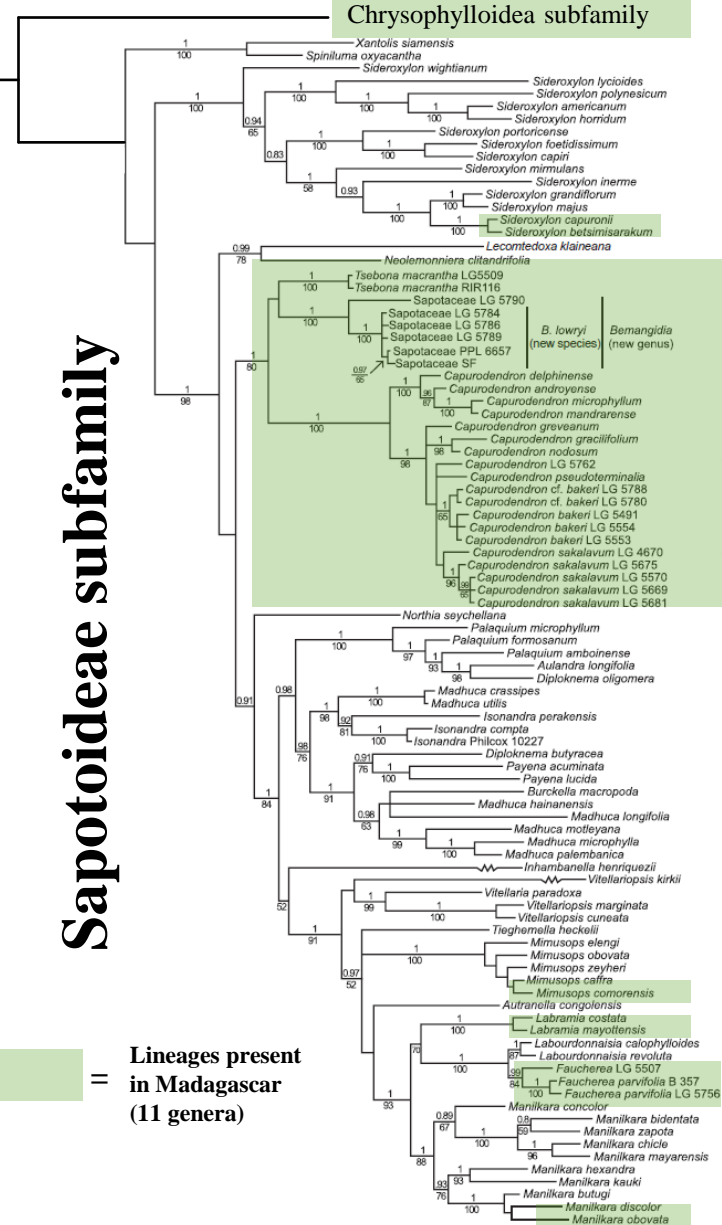
- Understudied and disappearing in Madagascar.

Type species of Sapotaceae: *Manilkara zapota*

Introduction

Chrysophylloidea subfamily

SIDEROXYLEAE
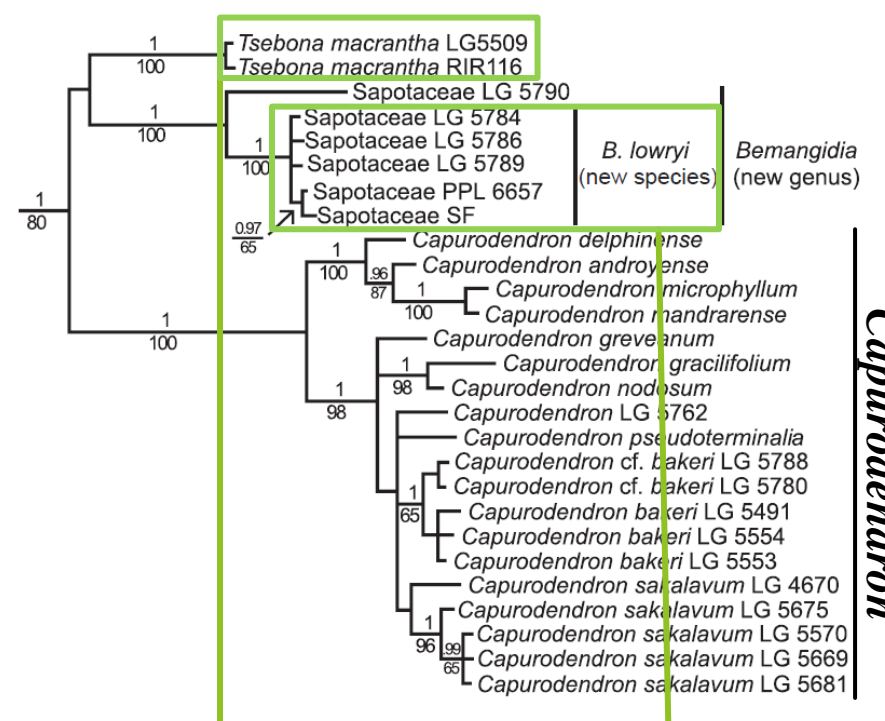
TSEBONEAE (new tribe)

ISONANDREAE

SAPOTEAE

Sapotoideae subfamily

Tribu Tseboneae

Capurodendron

= Lineages present in Madagascar (11 genera)

Gautier *et al.* (2013) Taxon 62:972–983

Tsebona macrantha

Bemangidia lowryi

Introduction

Genus *Capurodendron*:

Undescribed morphologies
Species only known from the type specimen
Intermediate morphologies
Morpho/species complexes

Undescribed species
Extinct species
Hybridization
Current speciation

?

C. sahafariense

C. schatzii

C. greveanum

C. tampinense
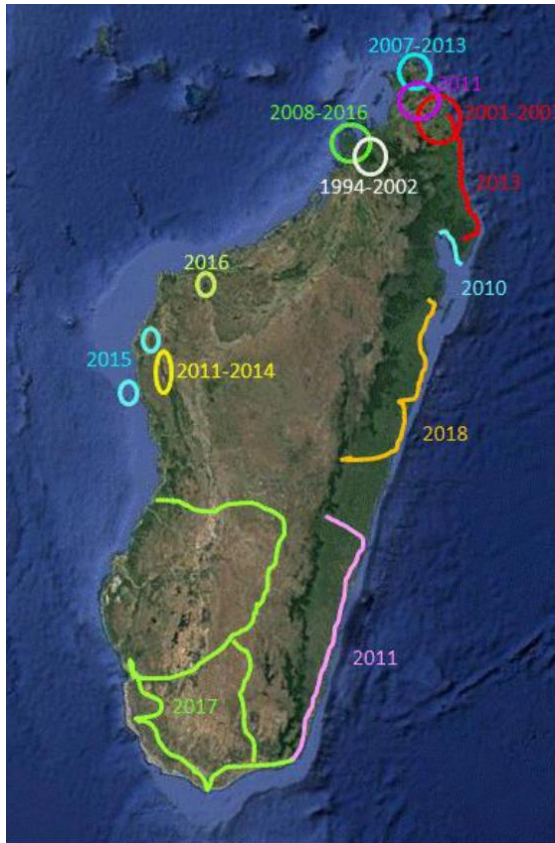
C. delphinense

C. androyense
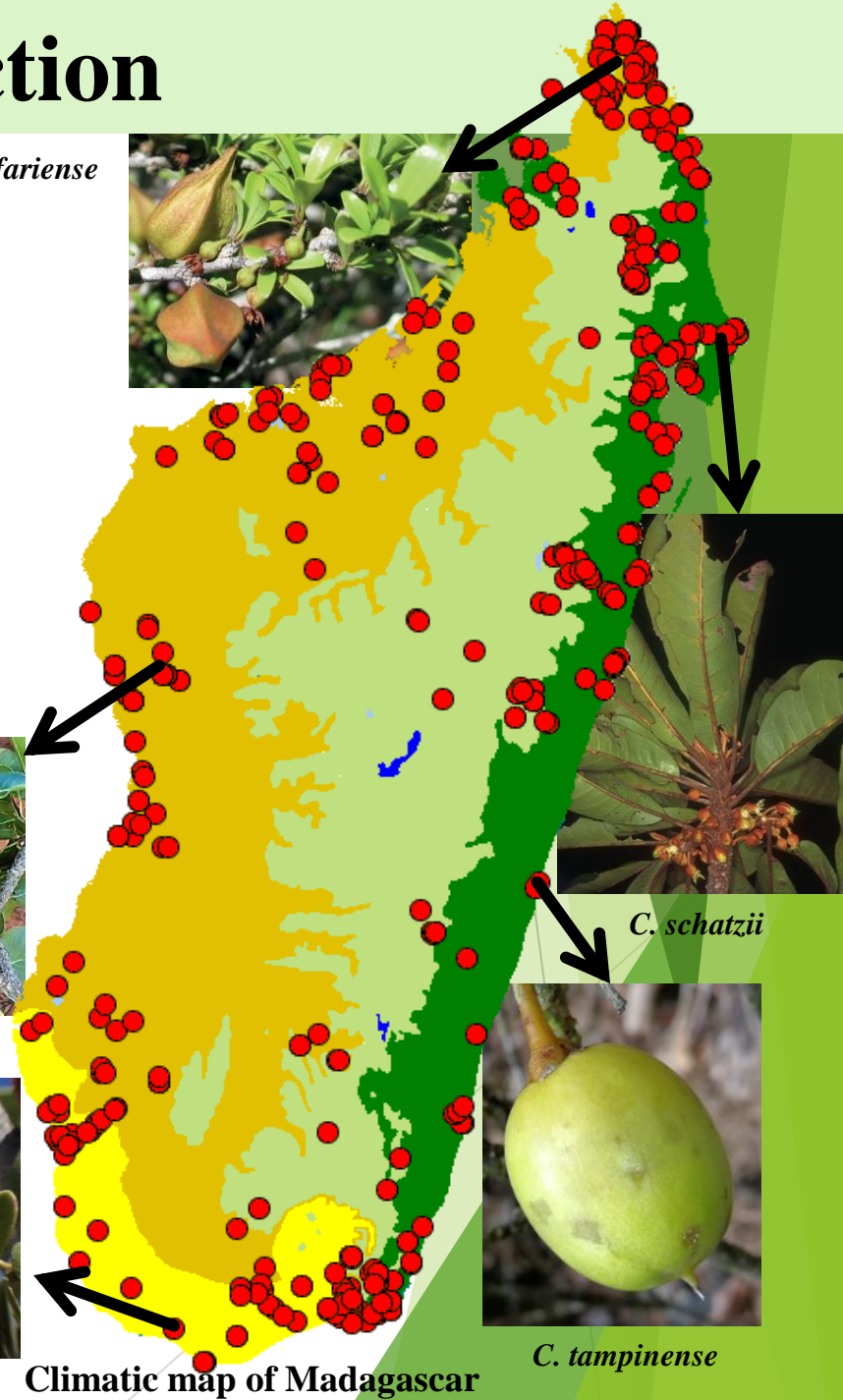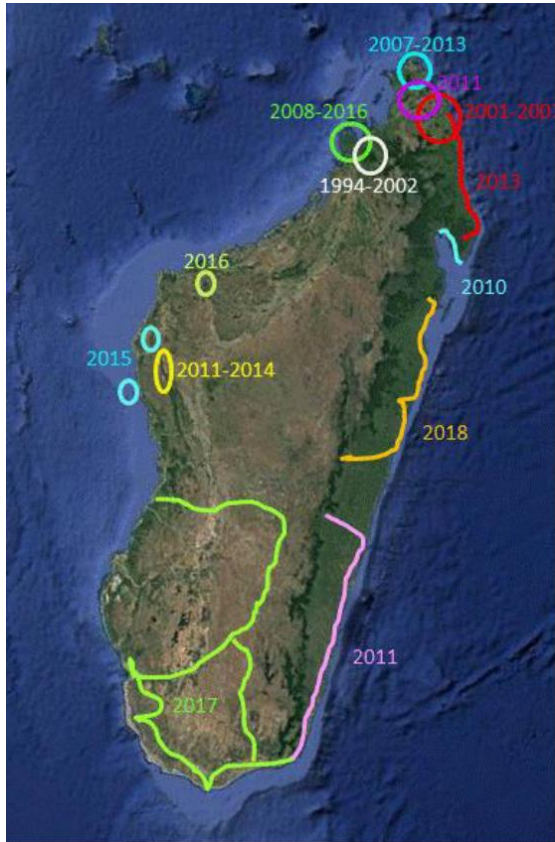
Climatic map of Madagascar

Sampling

Sampled areas:

Sampling

Sampled areas

Materials and methods

Target Region Capture ➡️ Data curation

Design of specific probes for the capture of 1020 loci in 281 specimens

258 specimens
638 loci

Phasing

Silica-gel specimens

Herbarium specimens (up to 86 years old)

281 specimens:
239 ingroup (*Capurodendron*)
42 outgroup

Phylogeny

Coalescence (BEAST):
- Sequences   -34 genes
- 444 OTUs   -110574 bp
- **72576 computing hours**

Same tree topology

Maximum Likelihood (RaxML):
- SNPs   -638 genes
- 444 OTUs   -290000 SNPs
- **4838 computing hours**

Results

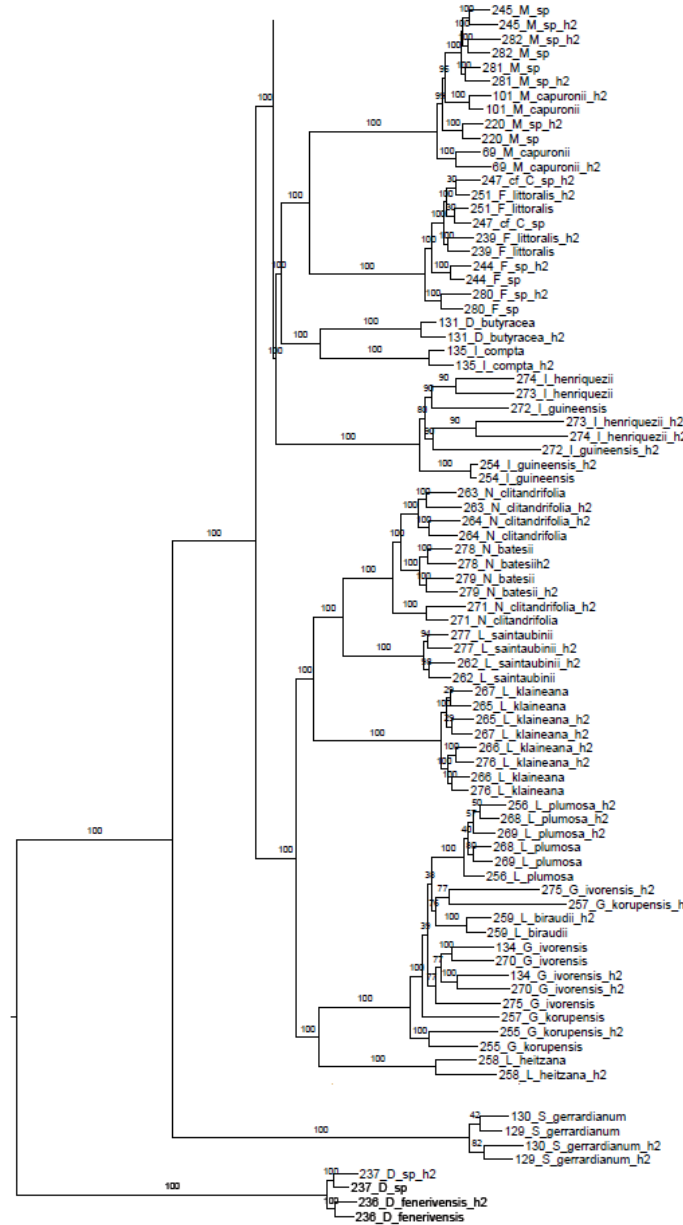Designed probes give an efficient gene capture in all the tribes

New projects has been started using the same probes

New Sapotaceae tribes

* New projects

Phased RaxML tree
638 genes

Tseboneae
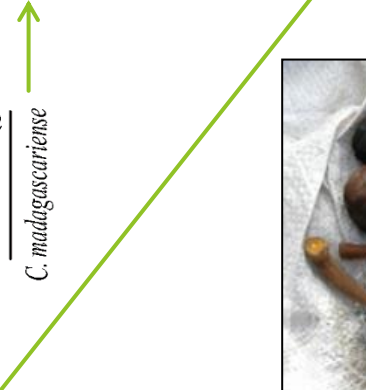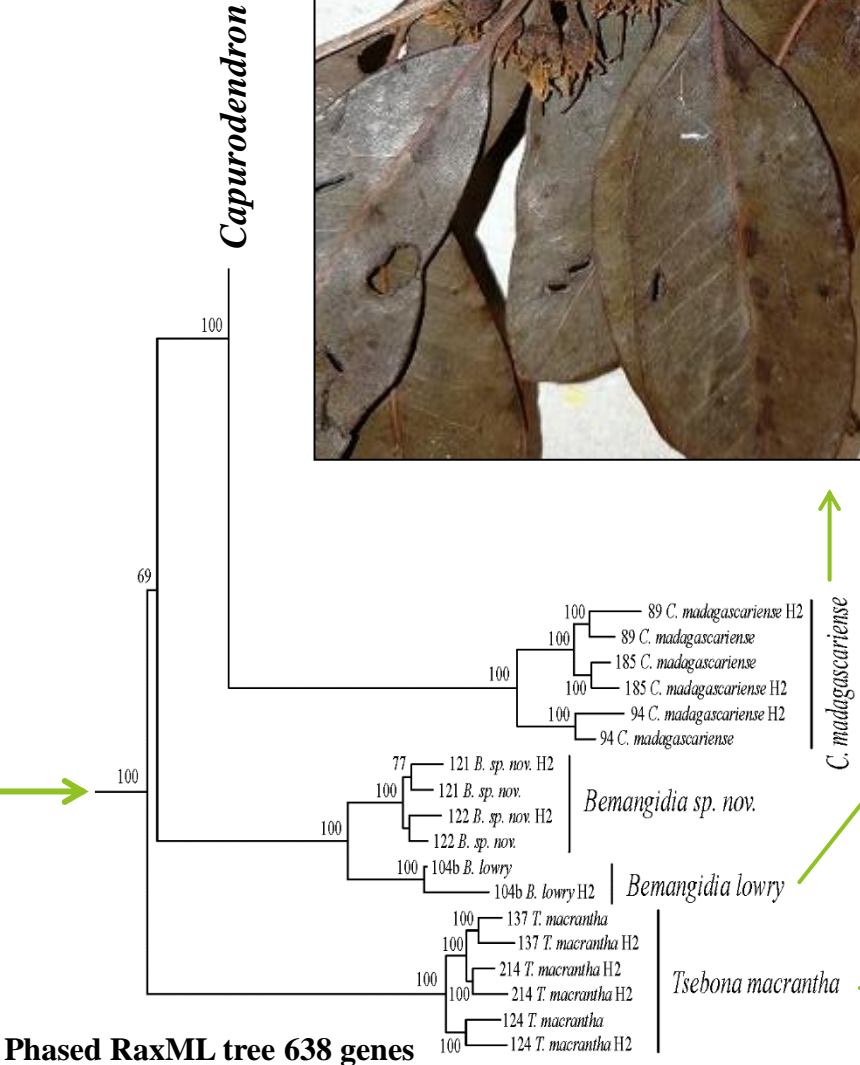

Tseboneae *

Sapoteae *
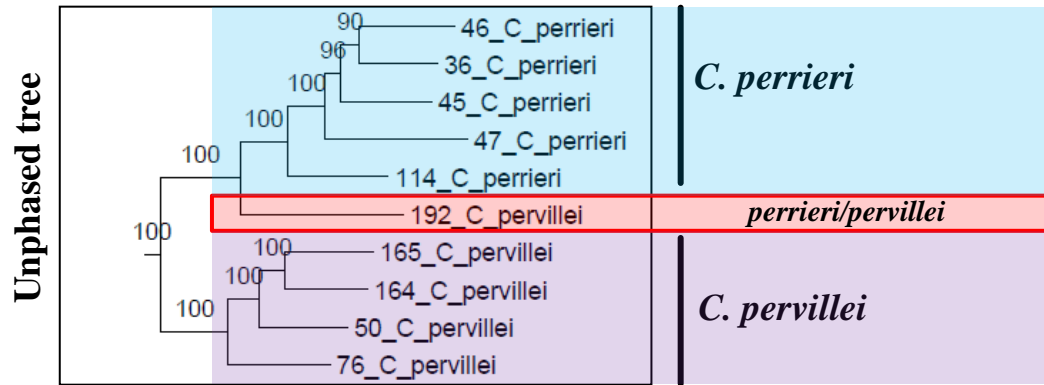
Isonandreae

Inhambanella

Gluemeae *

Sideroxyleae *

Chrysophylleae *

Sapotaceae tribes

Results

Capurodendron

Phased RaxML tree 638 genes

100	89 *C. madagascariense* H2	
100	89 *C. madagascariense*	
	185 *C. madagascariense*	
100	185 *C. madagascariense* H2	
100	94 *C. madagascariense* H2	*C. madagascariense*
	94 *C. madagascariense*	

77 — 121 *B. sp. nov.* H2
100 — 121 *B. sp. nov.*
100 — 122 *B. sp. nov.* H2   *Bemangidia sp. nov.*
100 — 122 *B. sp. nov.*

100 — 104b *B. lowry*
100 — 104b *B. lowry* H2   *Bemangidia lowry*

100 — 137 *T. macrantha*
100 — 137 *T. macrantha* H2
100 — 214 *T. macrantha* H2   *Tsebona macrantha*
100 — 214 *T. macrantha* H2
100 — 124 *T. macrantha*
100 — 124 *T. macrantha* H2

69

100

100

Results

C. perrieri

C. pervillei

C. perrieri/pervillei

Results
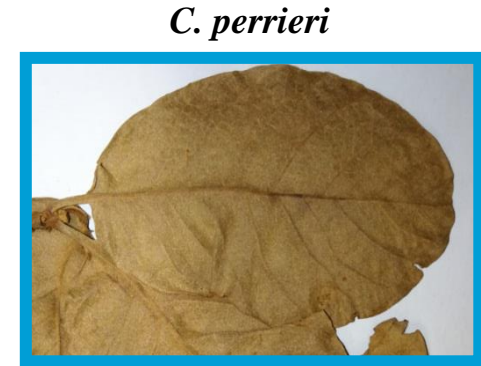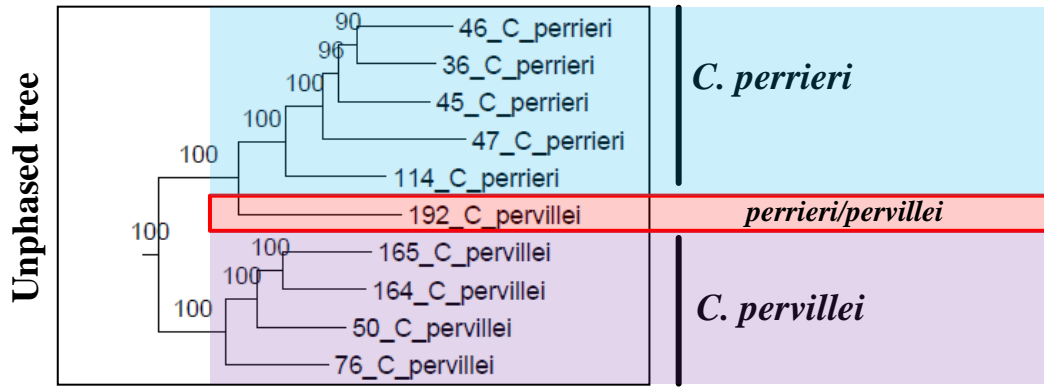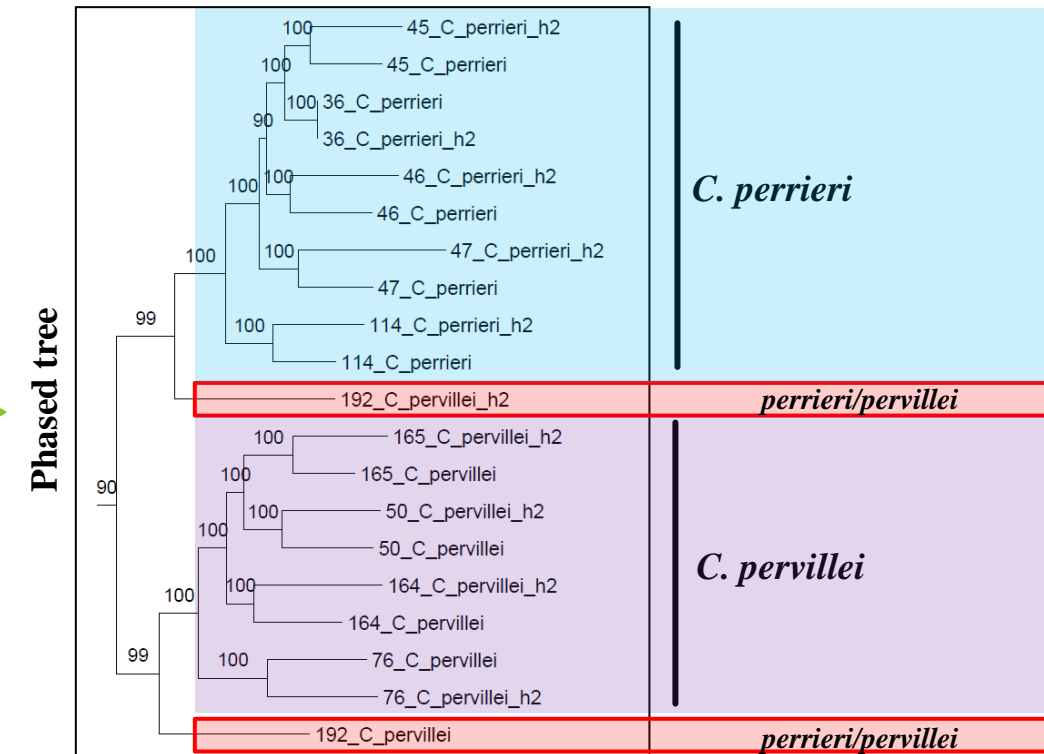

C. perrieri

C. pervillei

C. perrieri/pervillei

Phasing can help detecting hybrids

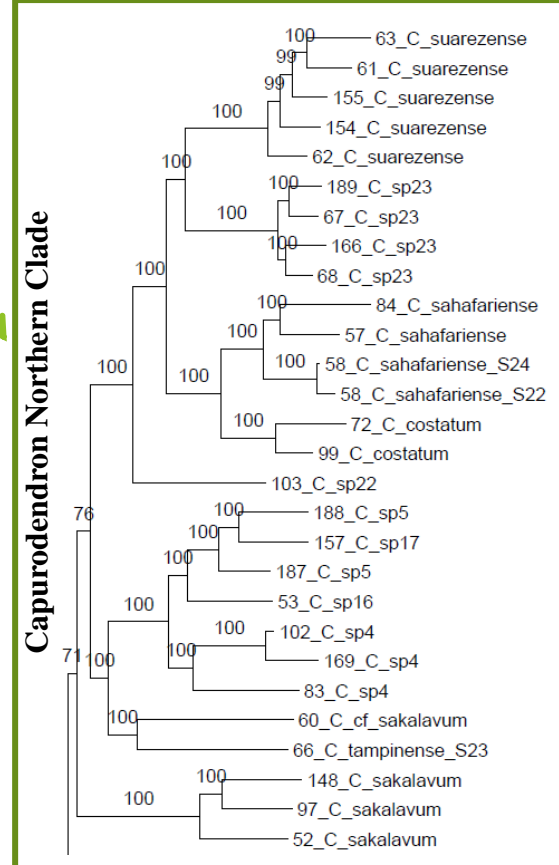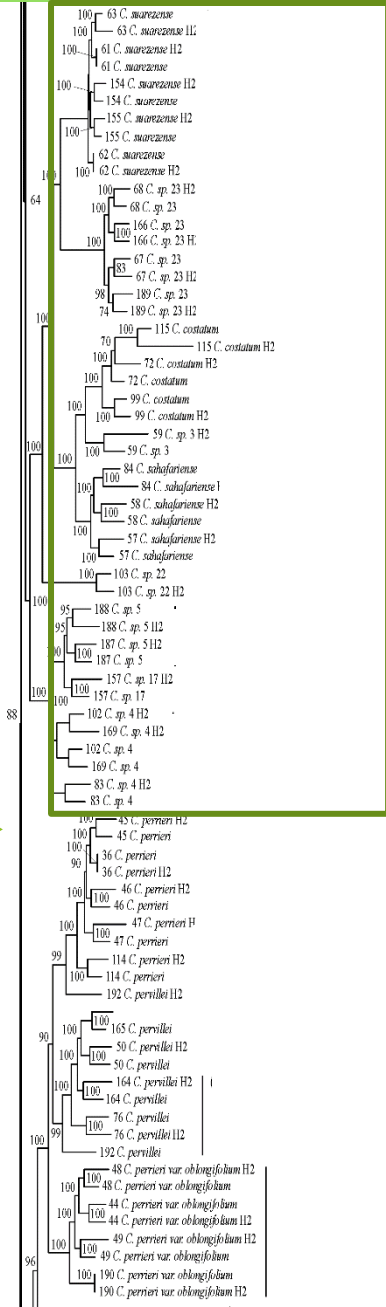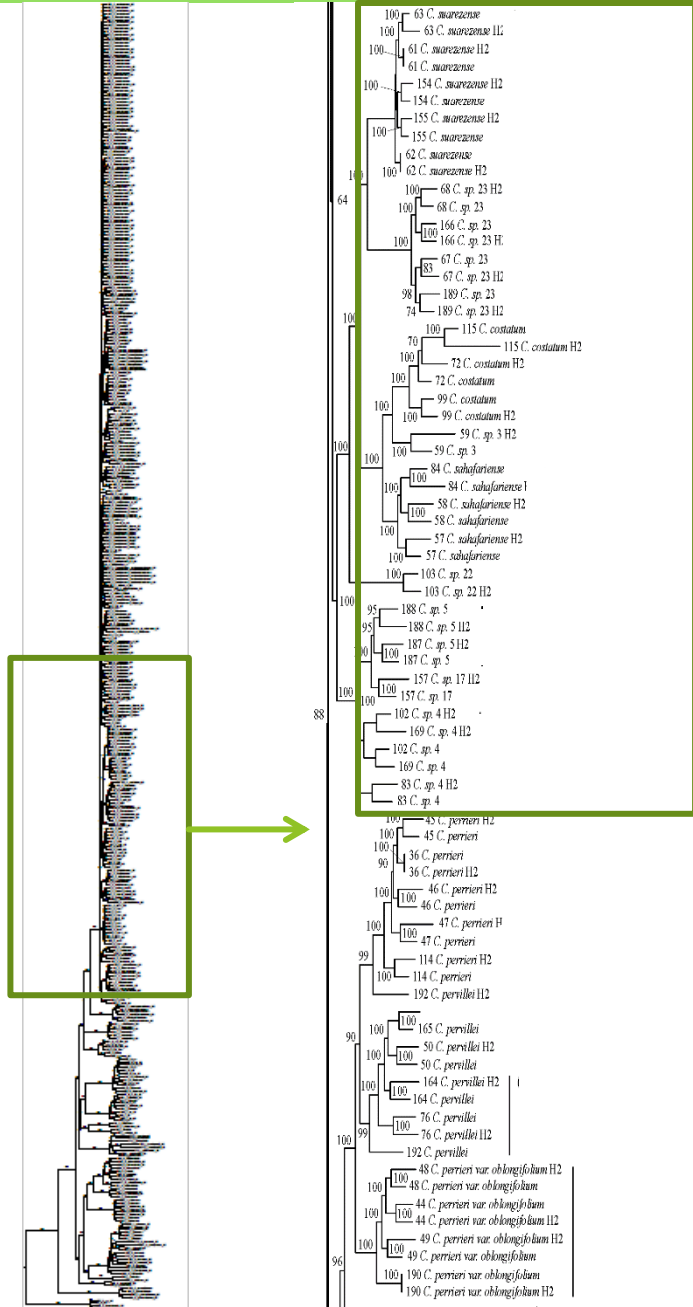# Results

~ 52 clades/morphologies candidates for species

Capurodendron Northern Clade

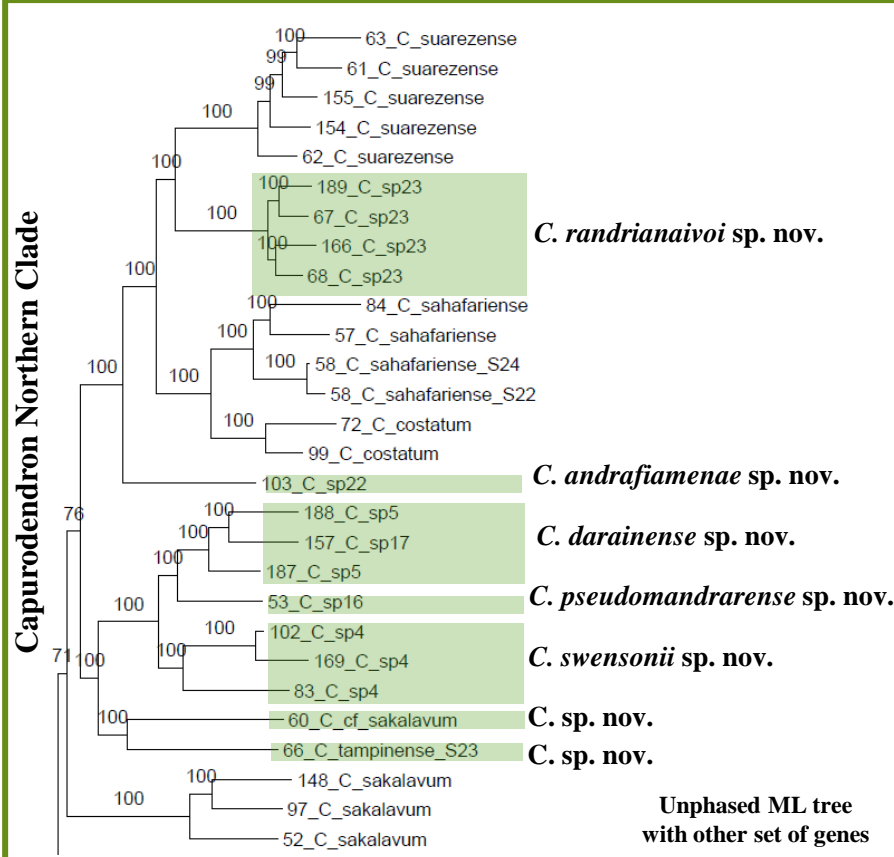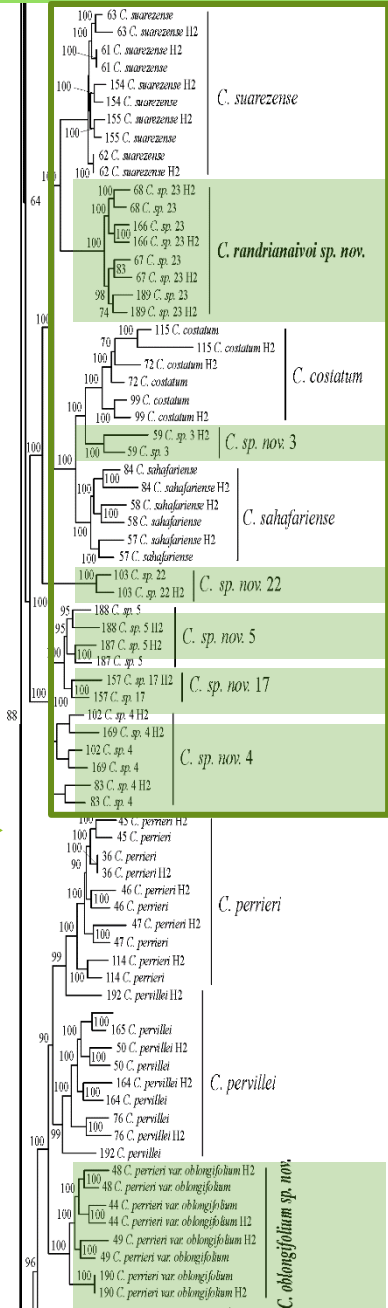Unphased ML tree
with other set of genes

Results

~ 52 clades/morphologies candidates for species

Only 28 species described so far

24 new species?

Capurodendron Northern Clade

C. suarezense

C. randrianaivoi sp. nov.

C. costatum

C. sp. nov. 3

C. sahafariense

C. sp. nov. 22

C. sp. nov. 5

C. sp. nov. 17

C. sp. nov. 4

C. perrieri

C. pervillei

C. oblongifolium sp. nov.

= new species

Capurodendron Northern Clade

- 63_C_suarezense
- 61_C_suarezense
- 155_C_suarezense
- 154_C_suarezense
- 62_C_suarezense
- 189_C_sp23
- 67_C_sp23
- 166_C_sp23
- 68_C_sp23

C. randrianaivoi sp. nov.

- 84_C_sahafariense
- 57_C_sahafariense
- 58_C_sahafariense_S24
- 58_C_sahafariense_S22
- 72_C_costatum
- 99_C_costatum
- 103_C_sp22 — *C. andrafiamenae* sp. nov.
- 188_C_sp5
- 157_C_sp17
- 187_C_sp5 — *C. darainense* sp. nov.
- 53_C_sp16 — *C. pseudomandrarense* sp. nov.
- 102_C_sp4
- 169_C_sp4
- 83_C_sp4 — *C. swensonii* sp. nov.
- 60_C_cf_sakalavum — C. sp. nov.
- 66_C_tampinense_S23 — C. sp. nov.
- 148_C_sakalavum
- 97_C_sakalavum
- 52_C_sakalavum

**Unphased ML tree
with other set of genes**

Results

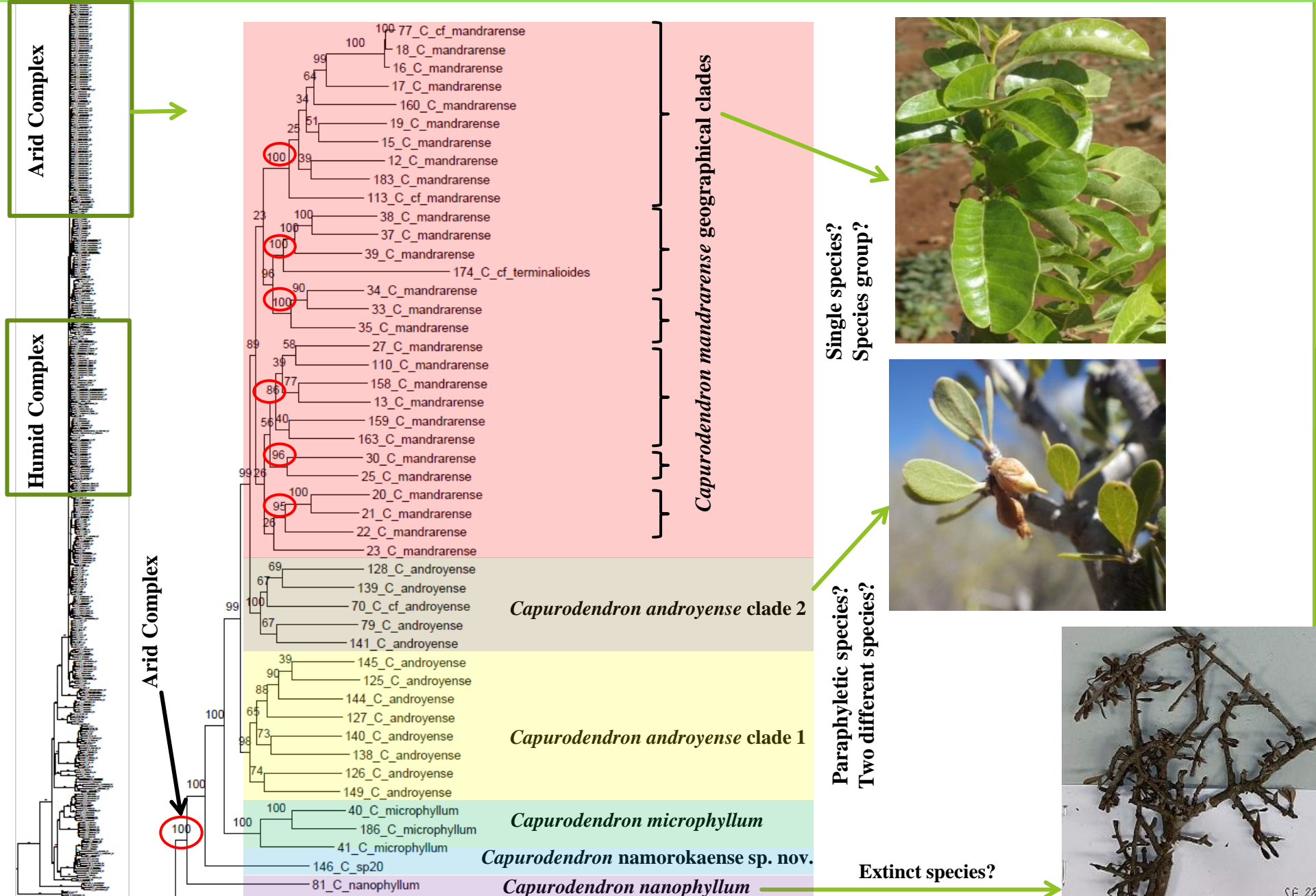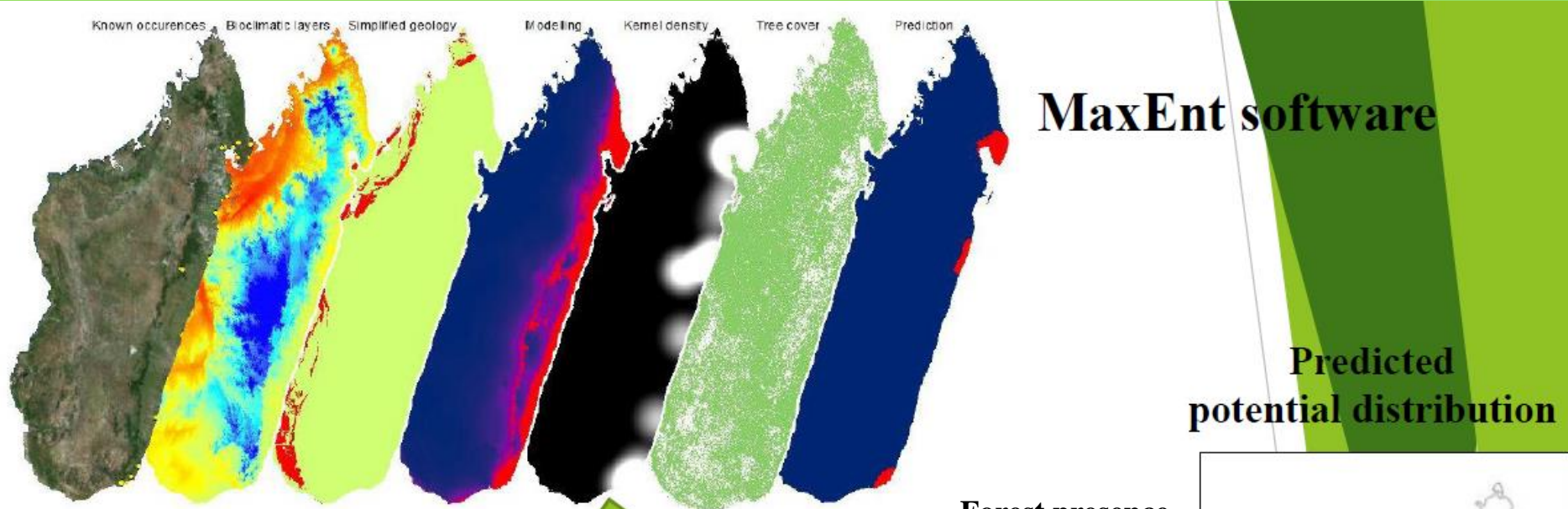The SSS species of the year for 2018

Described species

Undescribed species

= new species

Results

Arid Complex

Humid Complex

Arid Complex

Capurodendron mandrarense geographical clades

100 77_C_cf_mandrarense
100 18_C_mandrarense
99 16_C_mandrarense
64 17_C_mandrarense
34 160_C_mandrarense
51 19_C_mandrarense
25 15_C_mandrarense
100 39 12_C_mandrarense
183_C_mandrarense
113_C_cf_mandrarense
23 100 38_C_mandrarense
100 37_C_mandrarense
100 39_C_mandrarense
96 174_C_cf_terminalioides
90 34_C_mandrarense
100 33_C_mandrarense
35_C_mandrarense
89 58 27_C_mandrarense
39 110_C_mandrarense
77 158_C_mandrarense
86 13_C_mandrarense
56 40 159_C_mandrarense
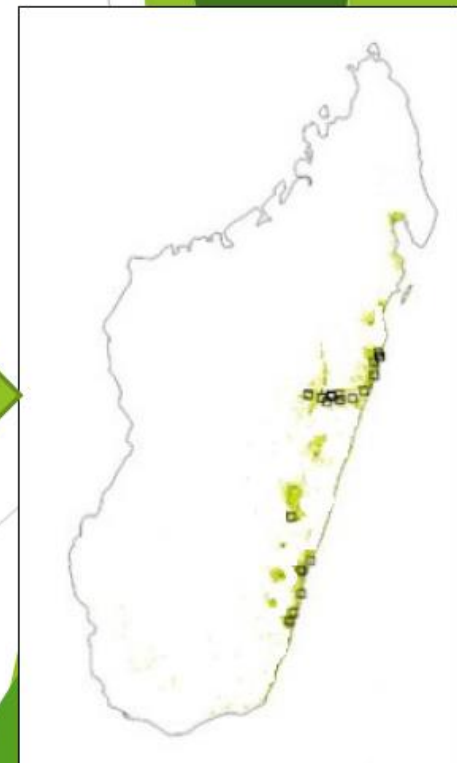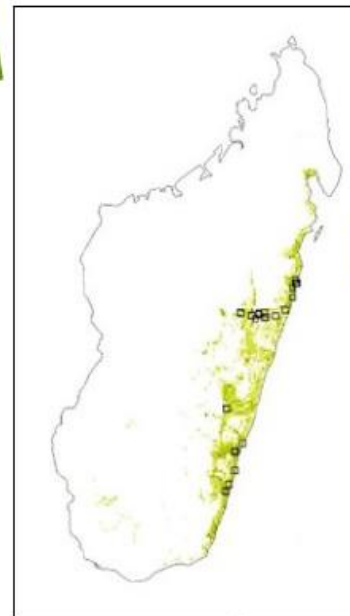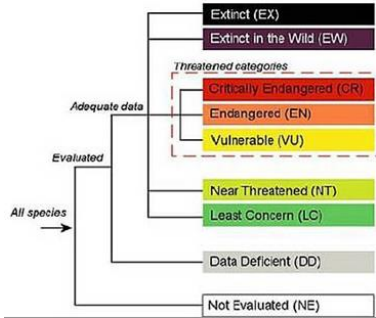163_C_mandrarense
96 30_C_mandrarense
25_C_mandrarense
99 26 100 20_C_mandrarense
95 21_C_mandrarense
26 22_C_mandrarense
23_C_mandrarense

69 128_C_androyense
67 139_C_androyense
99 100 70_C_cf_androyense
67 79_C_androyense
141_C_androyense

Capurodendron androyense clade 2

39 145_C_androyense
90 125_C_androyense
88 144_C_androyense
65 127_C_androyense
98 73 140_C_androyense
138_C_androyense
74 126_C_androyense
149_C_androyense

Capurodendron androyense clade 1

100 100 40_C_microphyllum
186_C_microphyllum
41_C_microphyllum

Capurodendron microphyllum

146_C_sp20

Capurodendron namorokaense sp. nov.

81_C_nanophyllum

Capurodendron nanophyllum

100

100

100

Single species?
Species group?

Paraphyletic species?
Two different species?

Extinct species?

Known occurences Bioclimatic layers Simplified geology Modelling Kernel density Tree cover Prediction

MaxEnt software

Predicted potential distribution

Forest presence filtering

Extinct (EX)

Extinct in the Wild (EW)

Threatened categories

Critically Endangered (CR)

Endangered (EN)

Vulnerable (VU)

Adequate data

Extinction risk

Near Threatened (NT)

Least Concern (LC)

Evaluated

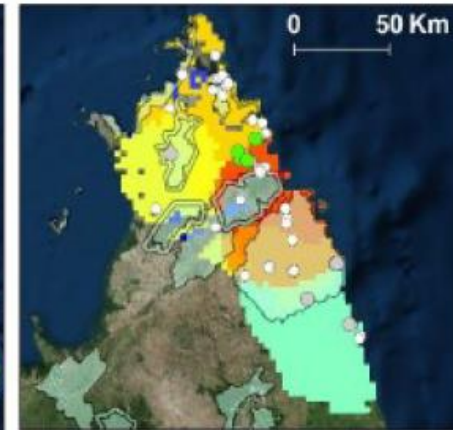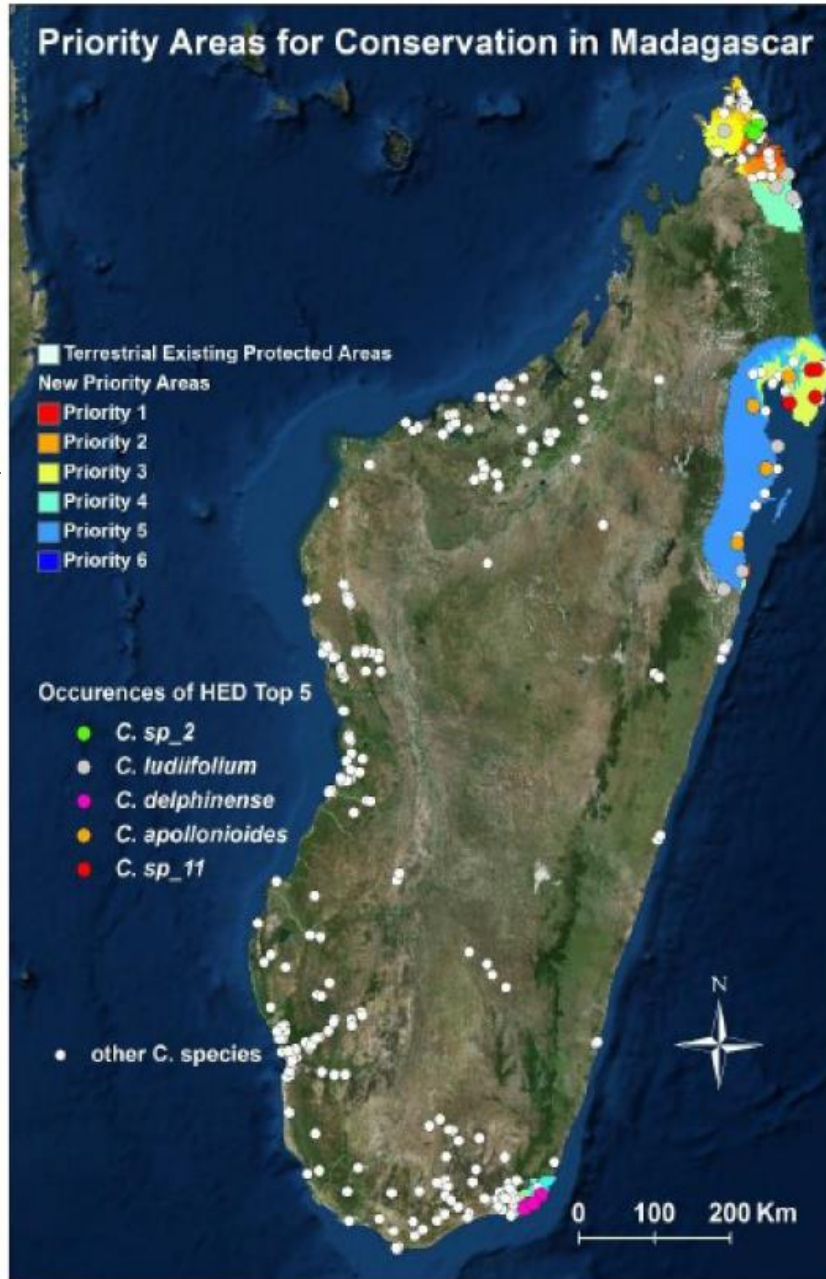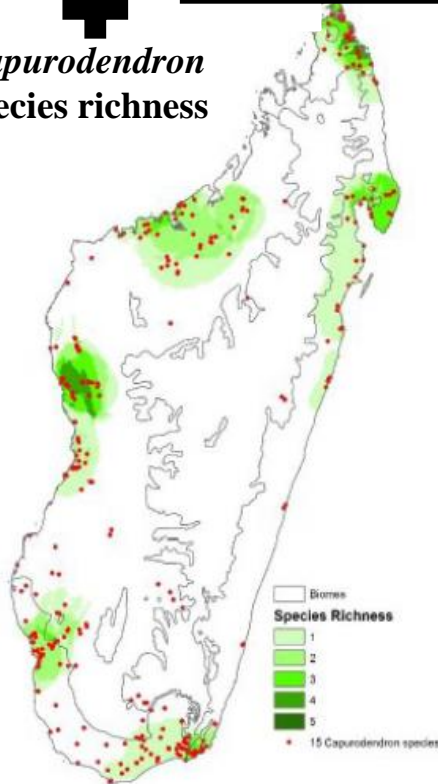*All species*

Data Deficient (DD)

Not Evaluated (NE)

Priority Areas for Conservation

IUCN protection categories

+

Capurodendron species richness

Aknowledgements

Yamama Naciri

Laurent Gautier

Camille Christe

Richard Randrianaivo

Aina Randriarisoa

Carlos Galan Boluda

Thank you!

Contact: Carlos.g.boluda@gmail.com