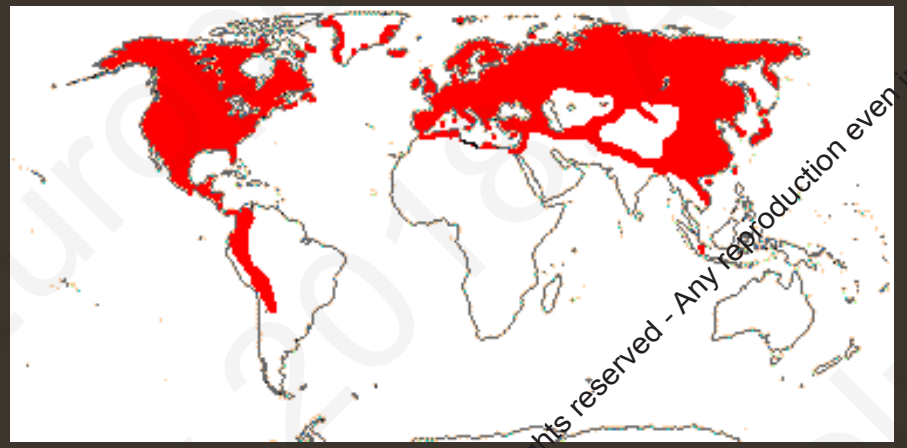
University of Colorado Boulder

Historical biogeography and the evolution of environmental niche in Datureae (Solanaceae)

Julia Dupin @juliadupin – Montpellier, Aug 19, 2018

Diversity of clade distributions



Factors shaping geographical distribution

Phylogenetic relationships

Geographical starting point

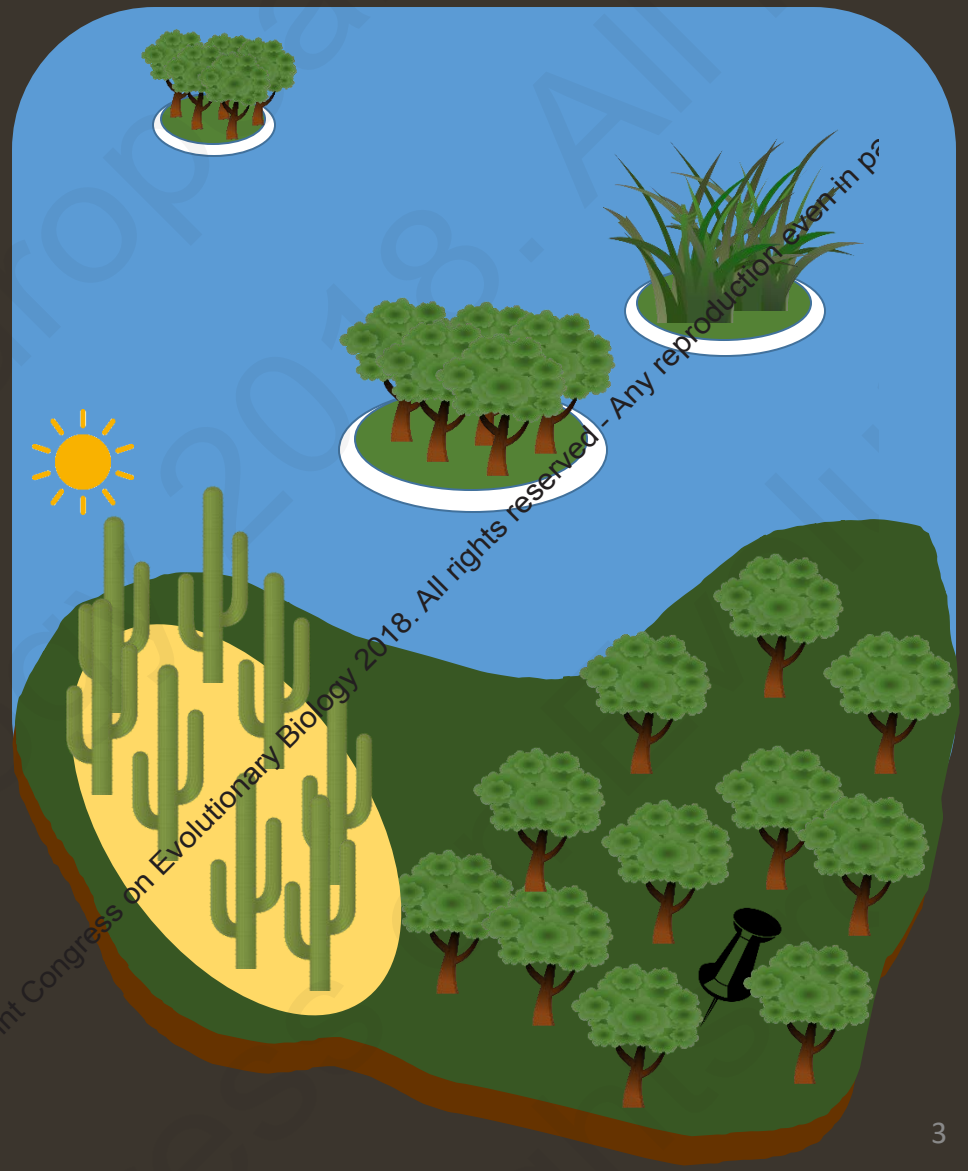
Ancestral ecological niche

Exposure to new niches

Limitations to dispersal

Amount of time

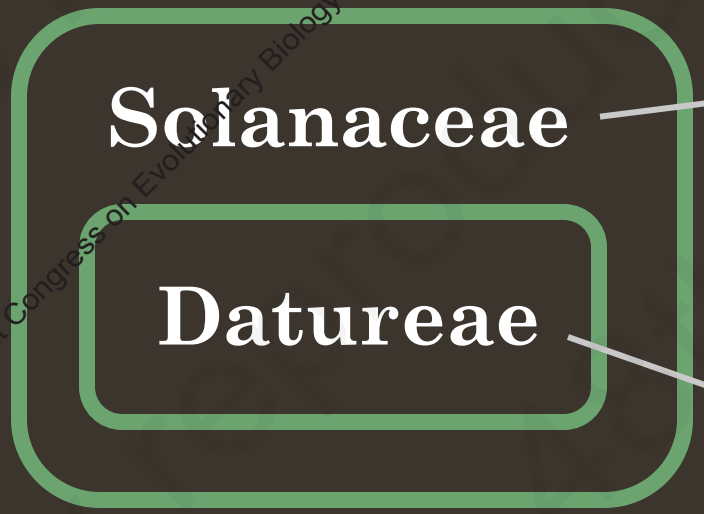
Trait lability



Main goal

Understand the relative importance of these factors in determining the large-scale distribution of clades

Study systems



~ 2,800 species
Worldwide
Sampling: 40%

18 species
Americas
Sampling: 100%

Study system

Solanaceae

Datureae

~ 2,800 spp, including

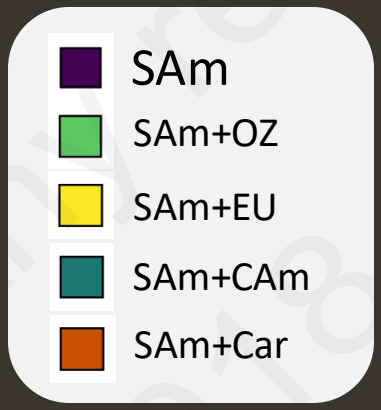
- Geographical starting point?
- Directionality of dispersals?
- Frequency of shifts to new niches?

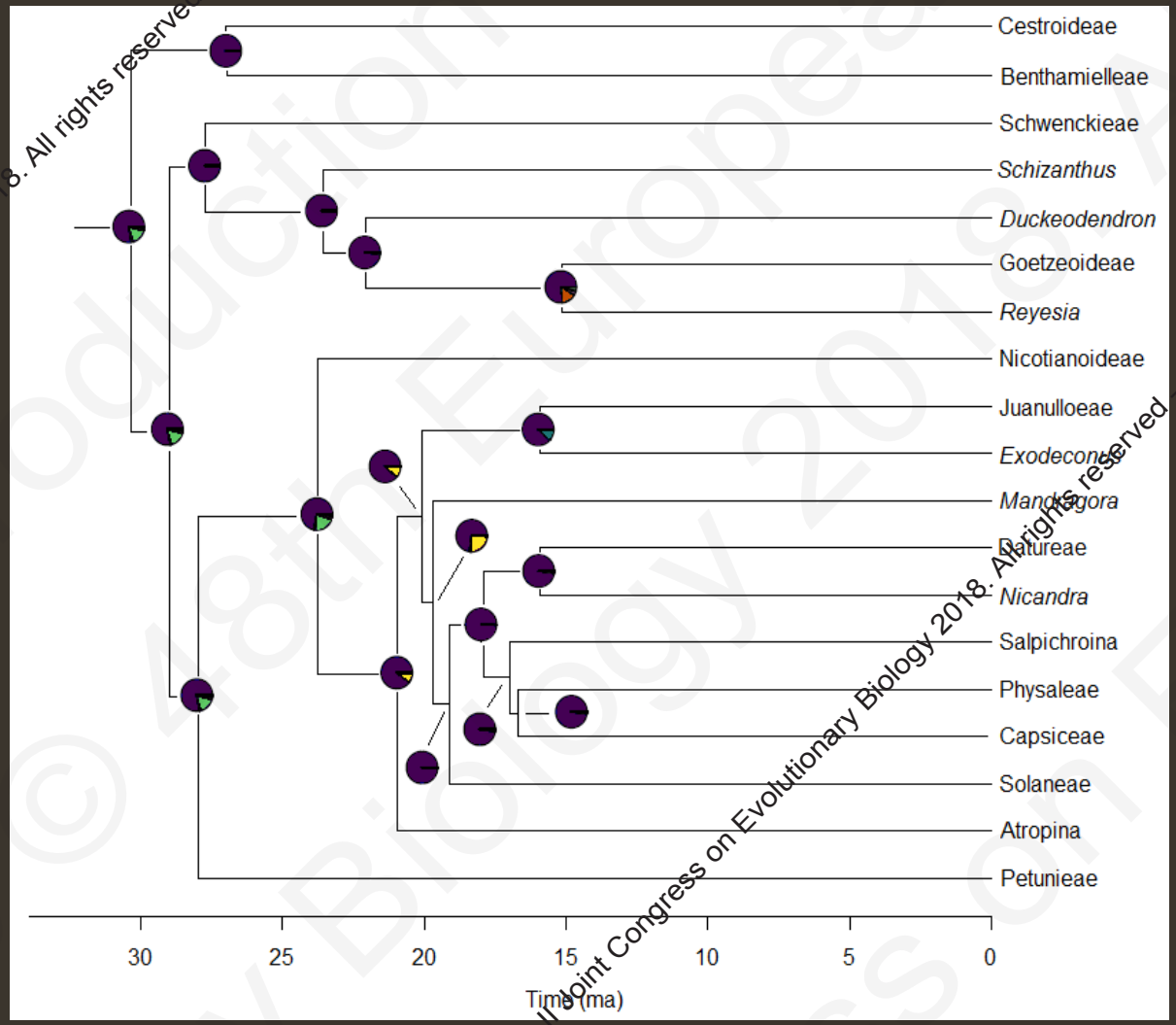
Solanaceae - Approach

- Biogeographic likelihood model (*BioGeoBEARS*, Matzke, 2013)

- Biogeographic stochastic mapping (BSM; Matzke, 2016)

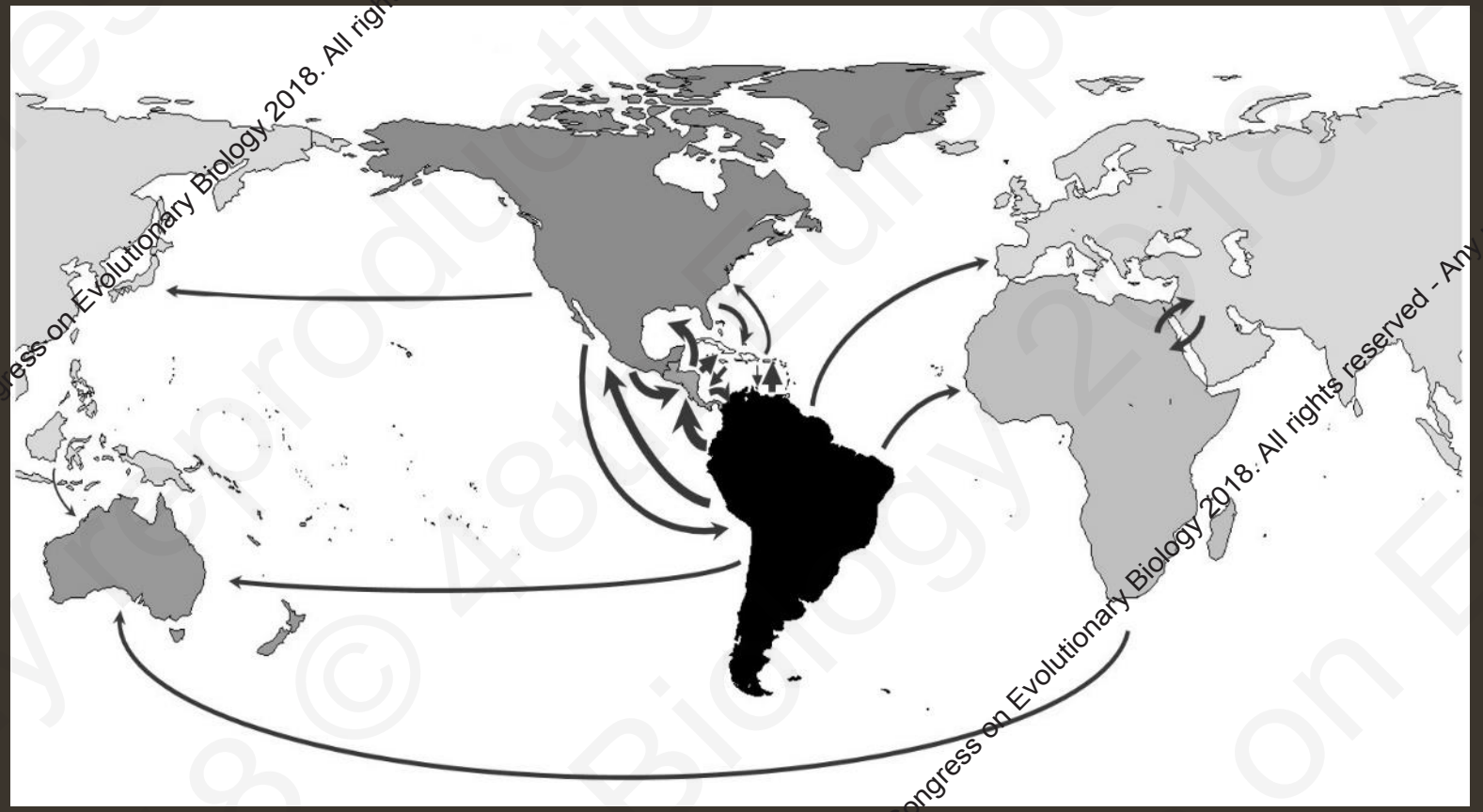
South America as ancestral range





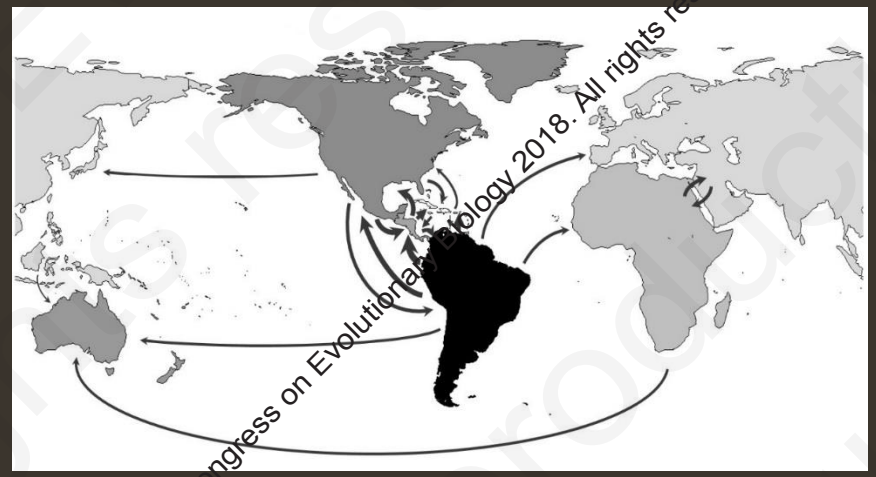
Dupin et al., 2017 J. of Biogeography

Directionality due to species richness and distance between areas



Dupin et al., 2017 J. of Biogeography

Pattern of niche conservatism



Recent **<u>range expansions</u>**

- Within single type of terrestrial ecoregion (e.g. dry, tropical or temperate)
- 80% wet tropical areas

Dupin et al., 2017 J. of Biogeography

Study system

Solanaceae

Datureae

18 species
3 genera

Dupin & Smith, 2018 Taxon

- Geographical starting point?
- Amount of time?
- Ancestral niche?
- Niche shifts?

Hypothesis

Study system

Datura L.

Brugmansia Pers.

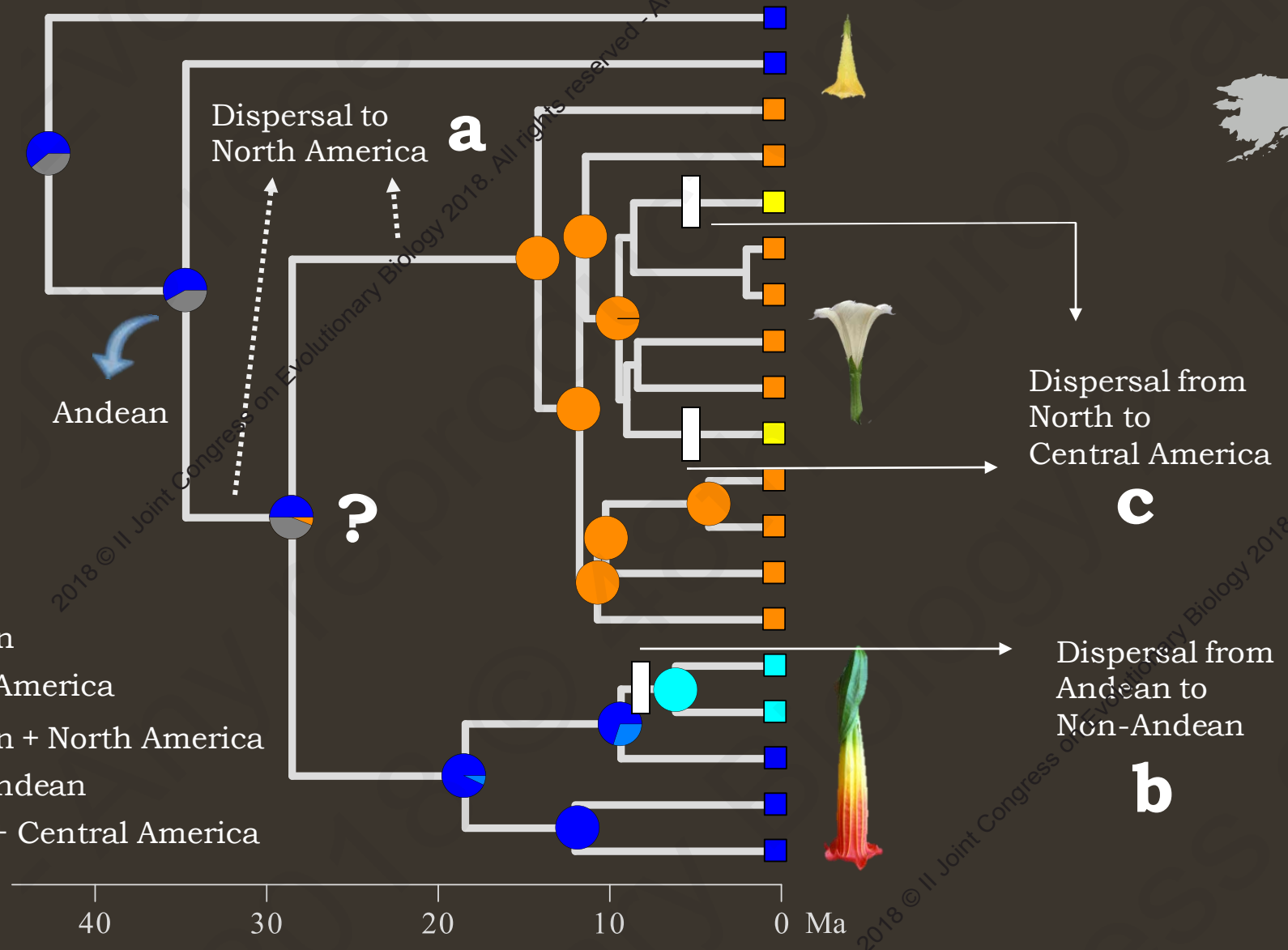
Trompettia J. Dupin

Datureae - Approach

- Biogeographic likelihood model (*BioGeoBEARS*, Matzke, 2013)

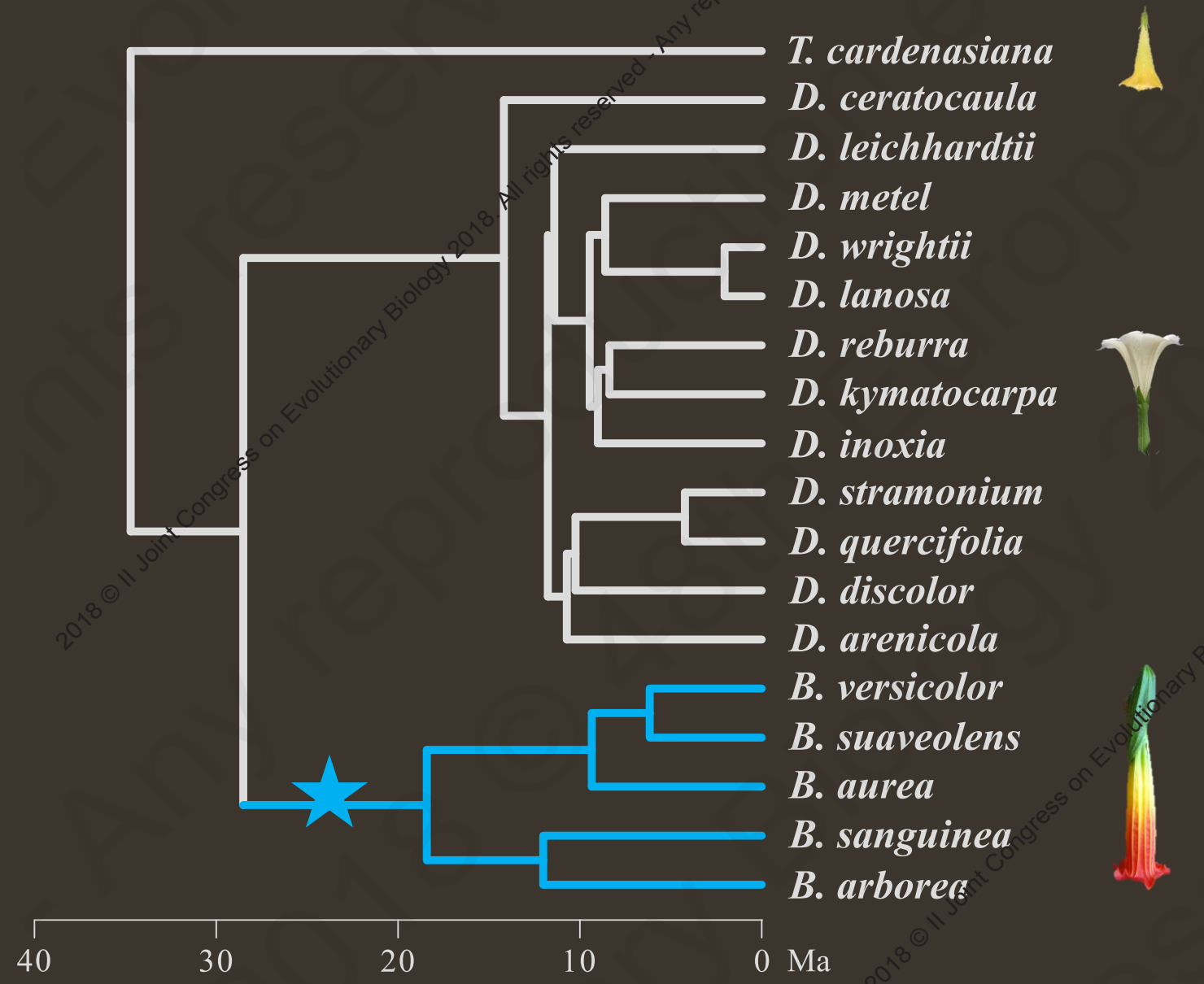
- Detection of shifts in trait optima under the OU model (*l1ou*, Khabbazian et al 2016)

Andean ancestral state



Dupin & Smith, in prep

Brugmansia spp under a different selective regime

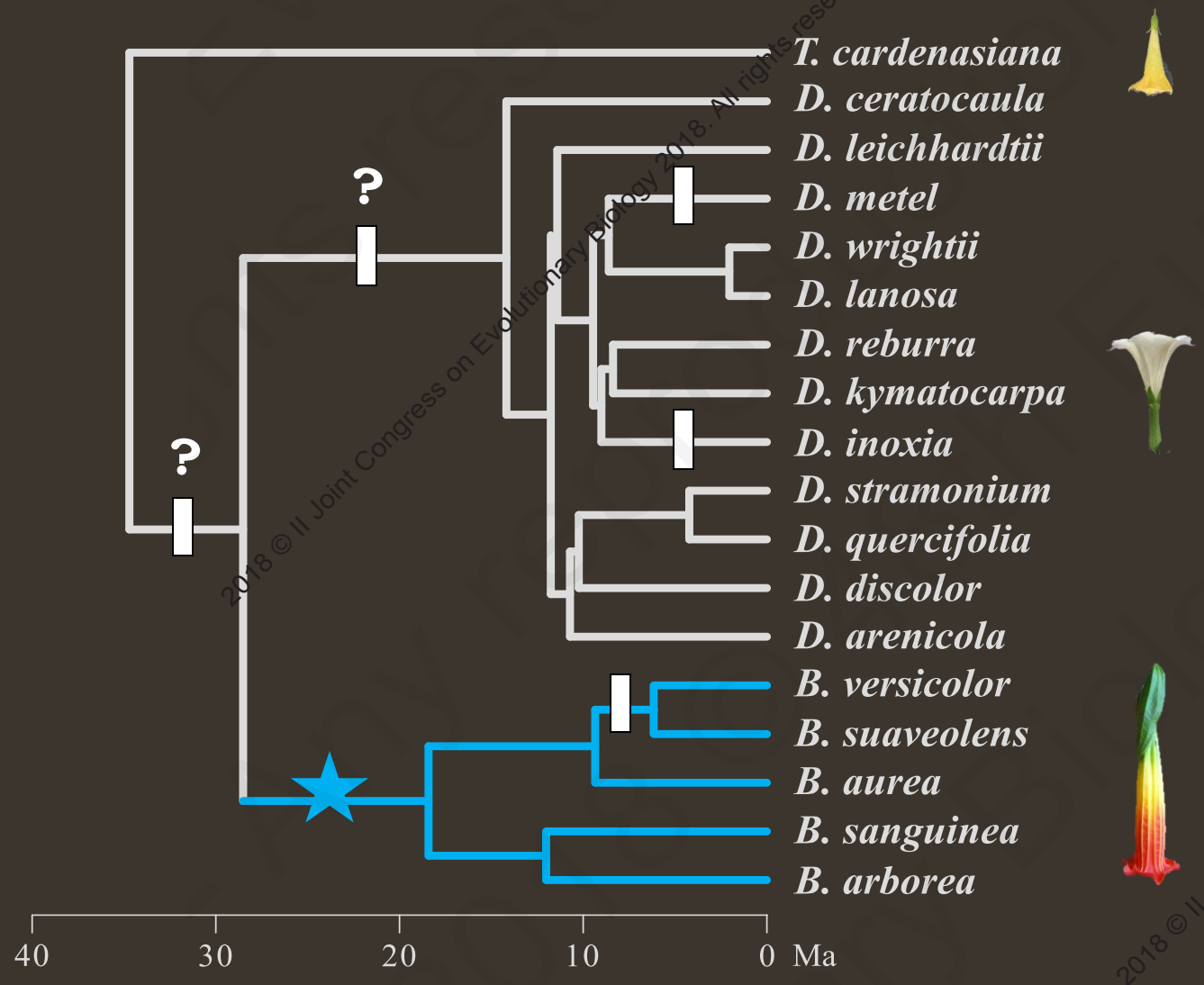


Dry environment

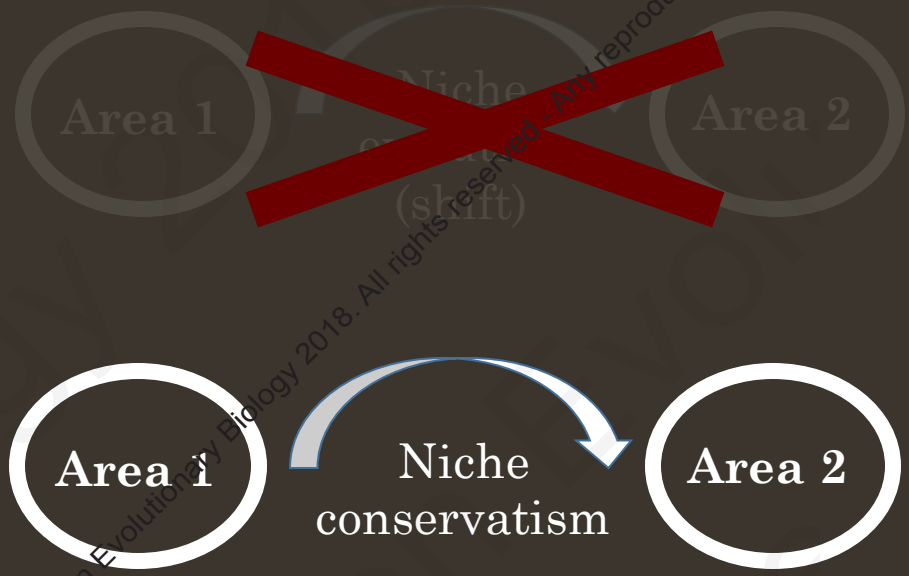
Wet environment

Dupin & Smith, in prep

Shift in environmental niche does *not* correspond to dispersal events

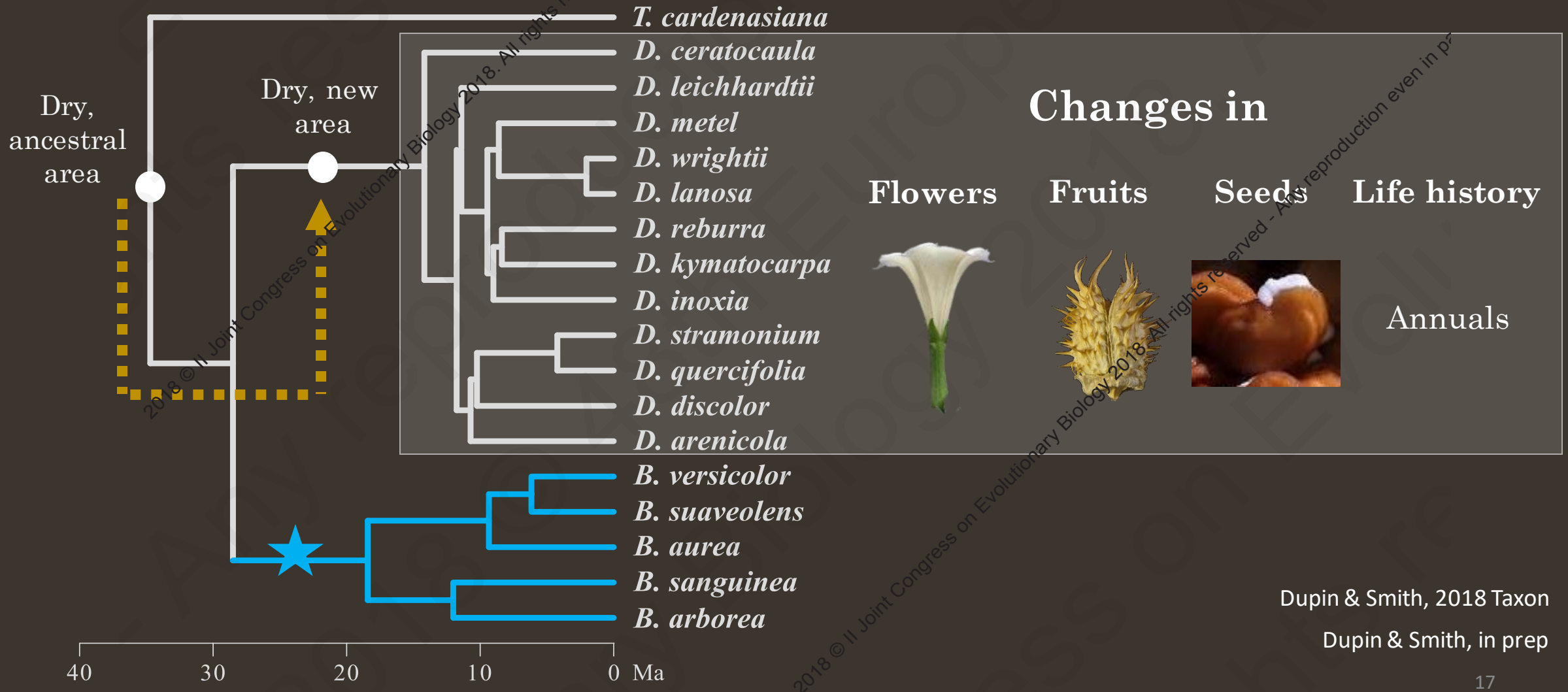


Hypothesis



Dupin & Smith, in prep

North America diversification is linked to drastic changes in morphology and physiology



Dupin & Smith, 2018 Taxon

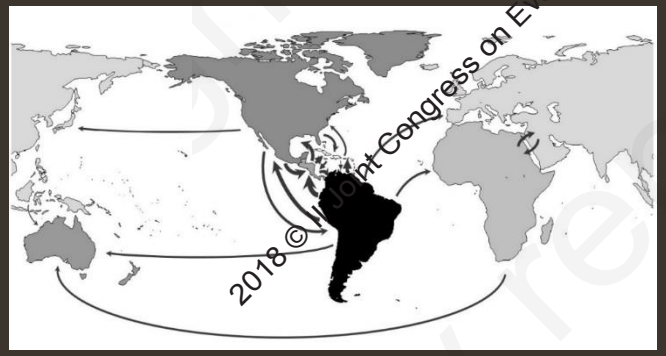
Dupin & Smith, in prep

Concluding remarks

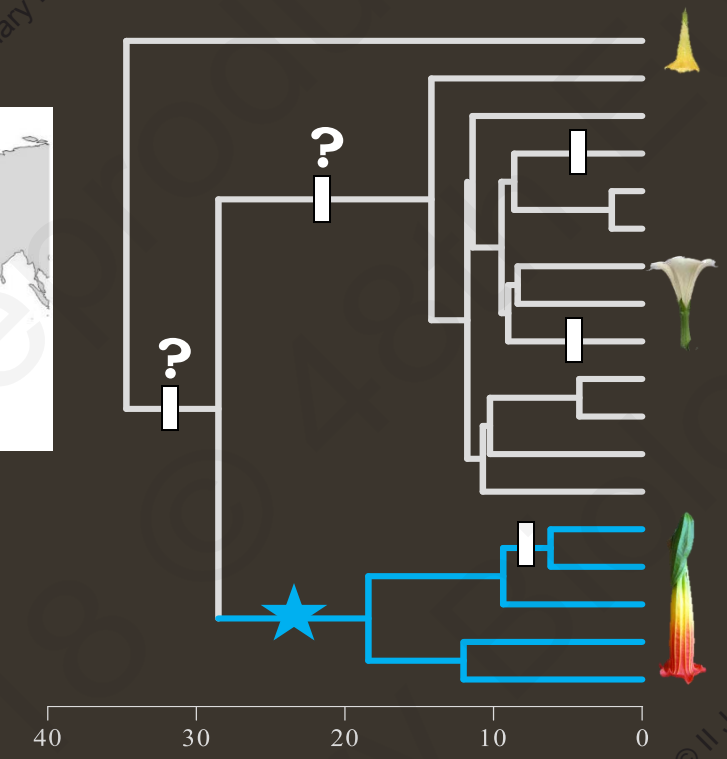
Biogeographical patterns in plants at continental scales

Environmental niche conservatism

Solanaceae



Recent **range expansions**
- Within single type of terrestrial ecoregion



Conserved environmental niche while radical *evolution* of morphology and physiology

Dry, new env.

Annuals

Dry, ancestral env.

Historical biogeography and the evolution of environmental niche in Datureae (Solanaceae)

Julia Dupin @juliadupin

Muito obrigada! (Thank you!)

Dr. Stacey Smith and Smith lab at CU Boulder

Collaborators

Dick Olmstead
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Lynn Bohs
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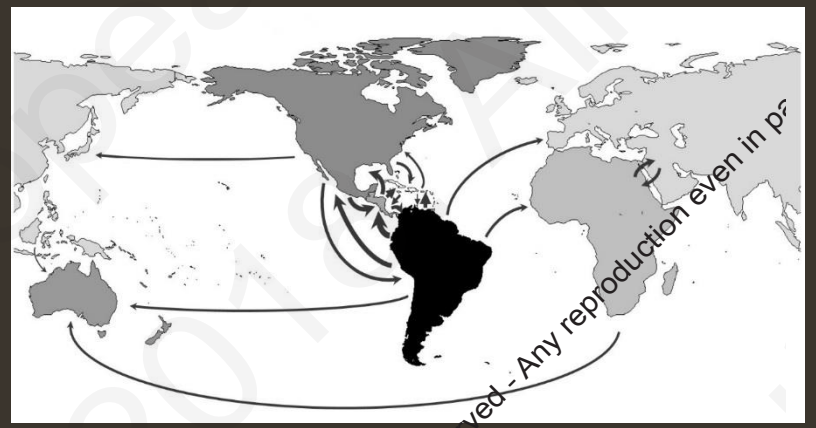
Sandy Knapp

Organizers

Ernst Mayr Symposium

Funding



Dry new env.

Annuals

Dry ancestral env.