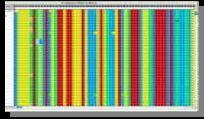


# A molecular phylogeny of the Acacias of the KNP



**Michelle van der Bank & Olivier Maurin**





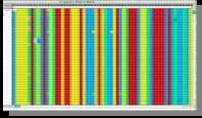
# New type for *Acacia*

***Acacia nilotica***



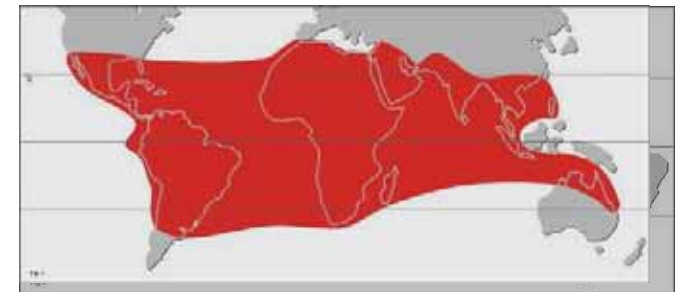
***Acacia penninervis***

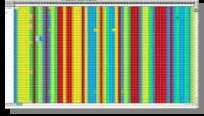




# Classification of *Acacia* (Maslin, 2005)

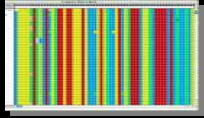
<i>Acacia</i> treated as a single genus	<i>Acacia</i> treated as multiple genera
<i>Acacia</i>	<i>Acacia</i>
Subgenus <i>Phyllodineae</i>	
Subgenus <i>Acacia</i>	<i>Vachellia</i>
Subgenus <i>Aculeiferum</i>	
Section <i>Spiciflorare</i>	<i>Senegalia</i>
Section <i>Filicinae</i>	<i>Acaciella</i>
“ <i>Acacia coulteri</i> ” group:	<i>Mariosousa</i>





# Aims of the project

To produced a molecular phylogenetic tree of *Acacia* species and close relatives occurring in the Kruger National Park



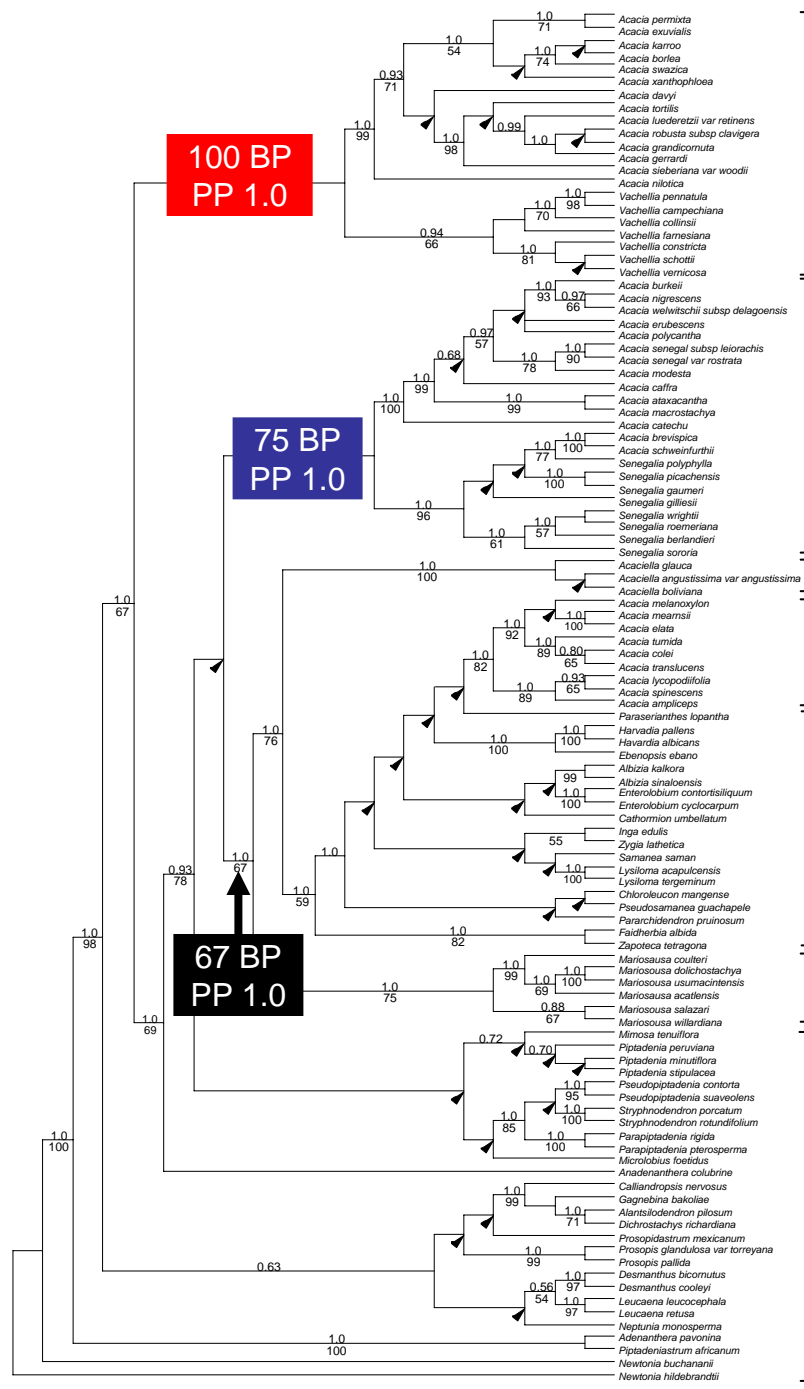
# Material and Methods

Number of samples = 109

*matK/trnK; trnL-F; psbA-trnH*

Maximum Parsimony & Bayesian Analysis

TL=2225 steps  
 CI=0.7  
 RI=0.8



**Vachellia**

**Senegalia**

**Acaciella**

**Acacia**

**Ingeae**

**Mariosousa**

**Mimosea**

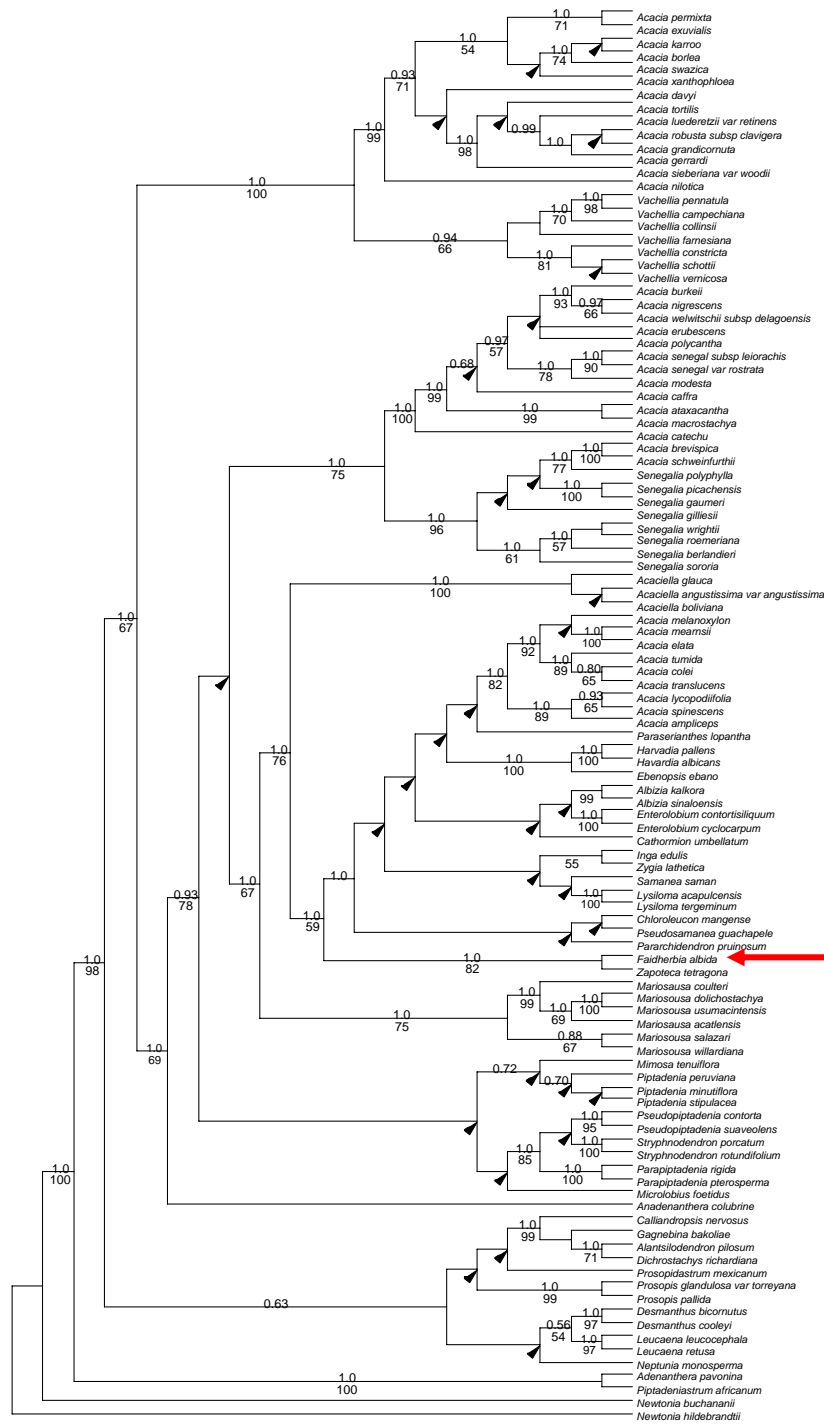
**Clade A**

**Clade B**

**Clade C**

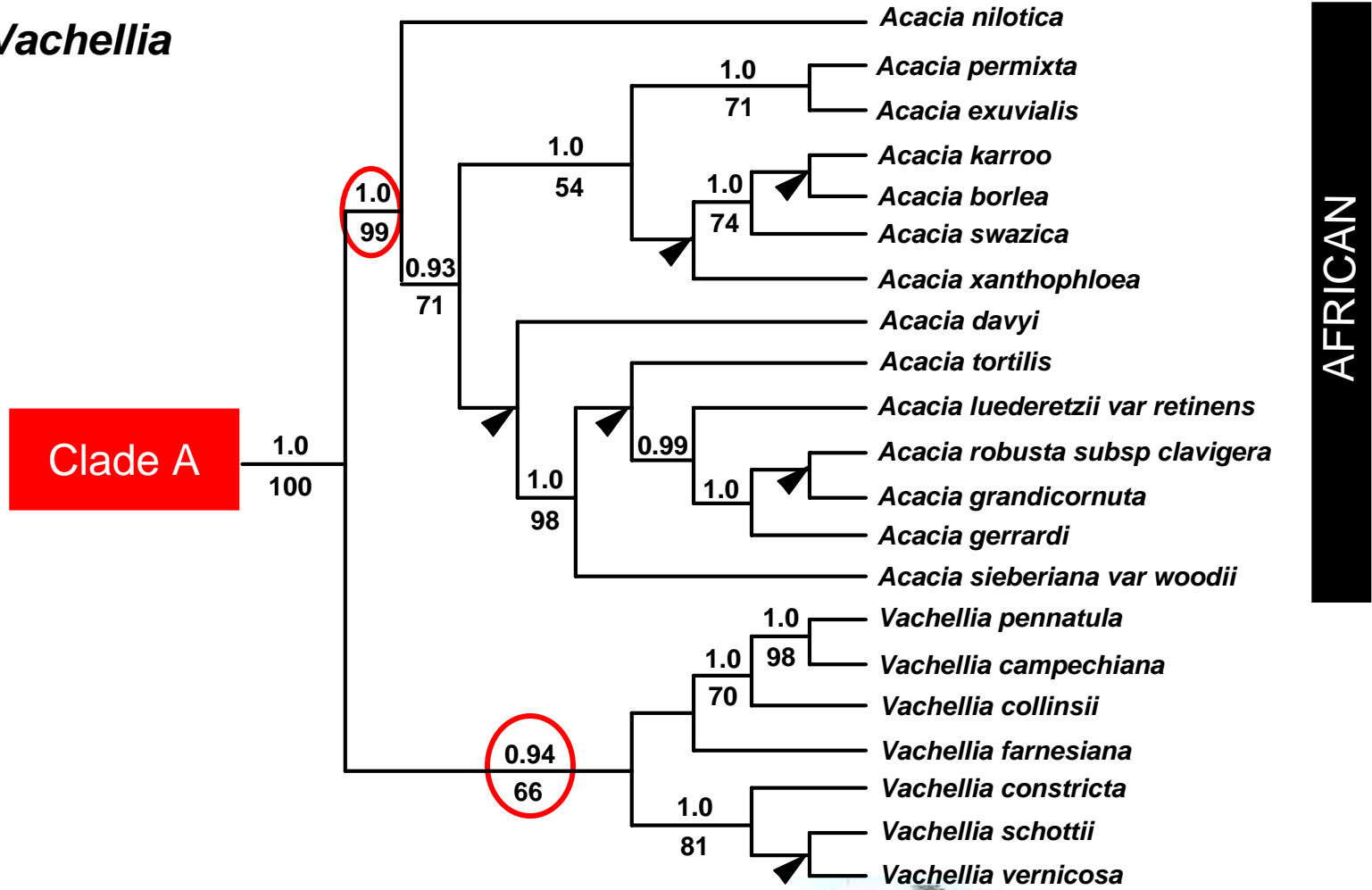
- Acacia permixta
- Acacia exuvialis
- Acacia karoo
- Acacia borlea
- Acacia swazca
- Acacia xanthophloea
- Acacia davyi
- Acacia tortilis
- Acacia luederatzi var retinens
- Acacia robusta subsp clavigera
- Acacia grandicomuta
- Acacia gerrardi
- Acacia sieberiana var woodii
- Acacia ribicola
- Vachellia pennatula
- Vachellia campechiana
- Vachellia collinsii
- Vachellia farnesiana
- Vachellia consricta
- Vachellia schottii
- Vachellia verrucosa
- Acacia burkeii
- Acacia nigrescens
- Acacia welwitschii subsp delagoensis
- Acacia erubescens
- Acacia polycantha
- Acacia senegal subsp leiorachis
- Acacia senegal var rostrata
- Acacia modesta
- Acacia caffra
- Acacia ataxacantha
- Acacia macrostachya
- Acacia catechu
- Acacia brevispica
- Acacia schweinfurthii
- Senegalia polyphylla
- Senegalia picachensis
- Senegalia gauveri
- Senegalia gilliesii
- Senegalia wrightii
- Senegalia roemeriana
- Senegalia berlandieri
- Senegalia sororia
- Acaciella glauca
- Acaciella angustissima var angustissima
- Acaciella boliviana
- Acacia melanoxylon
- Acacia meirnsii
- Acacia elata
- Acacia tumida
- Acacia cotei
- Acacia translucens
- Acacia lycopodifolia
- Acacia spinescens
- Acacia amplexiceps
- Paraserianthes lophantha
- Hanvadia pallens
- Hanvadia albicans
- Ebenopsis ebano
- Albizia kalkora
- Albizia sinaloensis
- Enterobolium contortifolium
- Enterobolium cyclocarpum
- Cathormion umbellatum
- Inga edulis
- Zygia lathetica
- Samanea saman
- Lysiloma acapulcensis
- Lysiloma tergeminum
- Chloroleucon mangense
- Pseudosamanea guachapele
- Parachidendron pruinosum
- Faidherbia albida
- Zapoteca tetragona
- Mariosousa couleri
- Mariosousa dolichostachya
- Mariosousa usumacintensis
- Mariosousa acatensis
- Mariosousa salazari
- Mariosousa willardiana
- Mimosa tenuiflora
- Piptadenia peruviana
- Piptadenia minutiflora
- Piptadenia stipulacea
- Pseudopiptadenia contorta
- Pseudopiptadenia suaveolens
- Stryphnodendron porcatum
- Stryphnodendron rotundifolium
- Parapiptadenia rigida
- Parapiptadenia pterosperma
- Microlobius foetidus
- Acadenanthera colubrina
- Calliandropsis nervosus
- Gagnebina bakoliae
- Alantsiodendron pilosum
- Dichrostachys richardiana
- Prosopidastum mexicanum
- Prosopis glandulosa var torreyana
- Prosopis pallida
- Desmanthus bicornutus
- Desmanthus cooleyi
- Leucaena leucoccephala
- Leucaena retusa
- Neptunia monosperma
- Adenanthera pavonina
- Piptadeniastum africanum
- Newtonia buchananii
- Newtonia hildebrandtii

TL=2225 steps  
 CI=0.7  
 RI=0.8



Position of *Faidherbia*

# Vachellia



*Acacia nilotica*



*Acacia karroo*

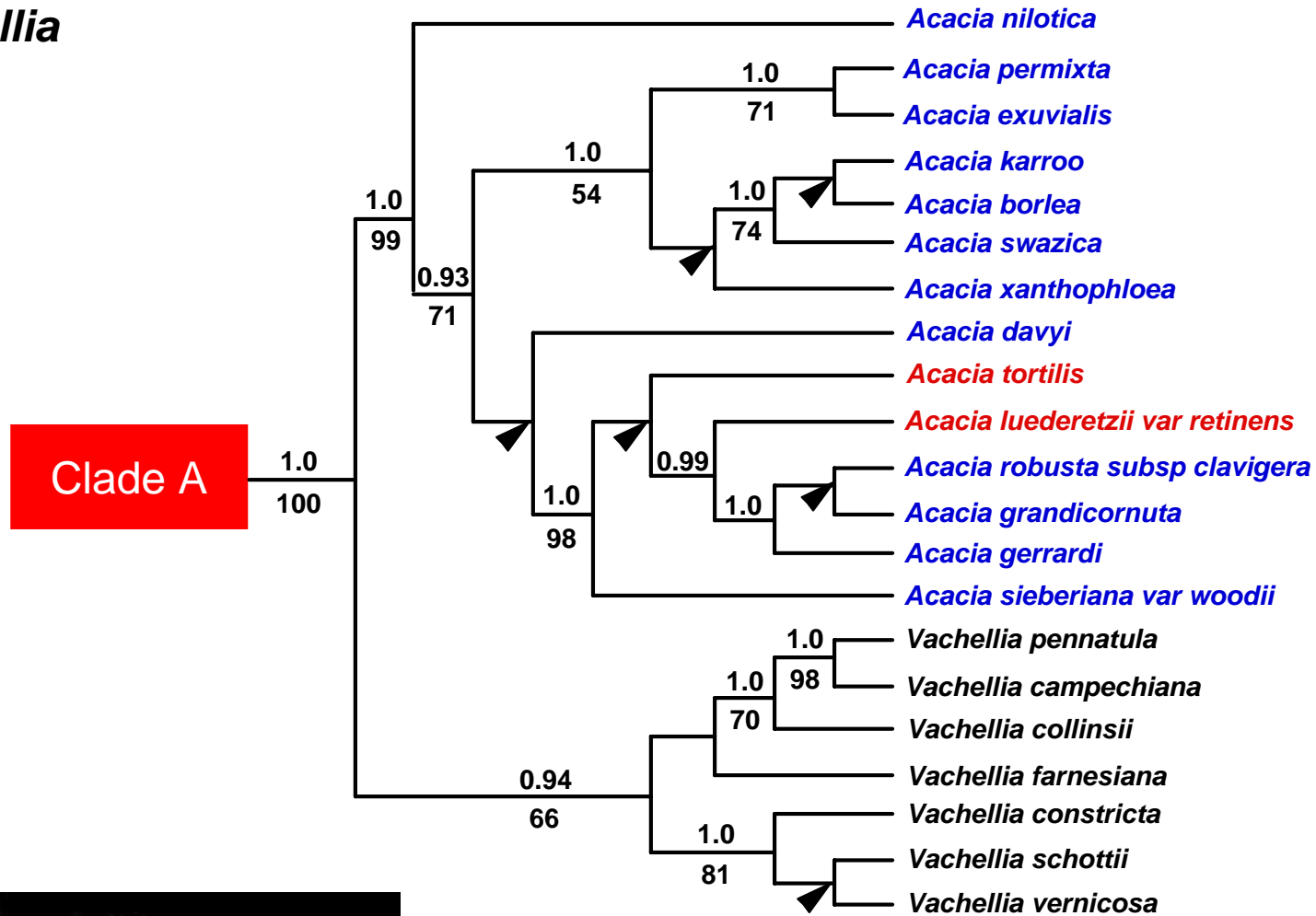


*Acacia xanthophloea*



*Acacia tortilis*

# Vachellia

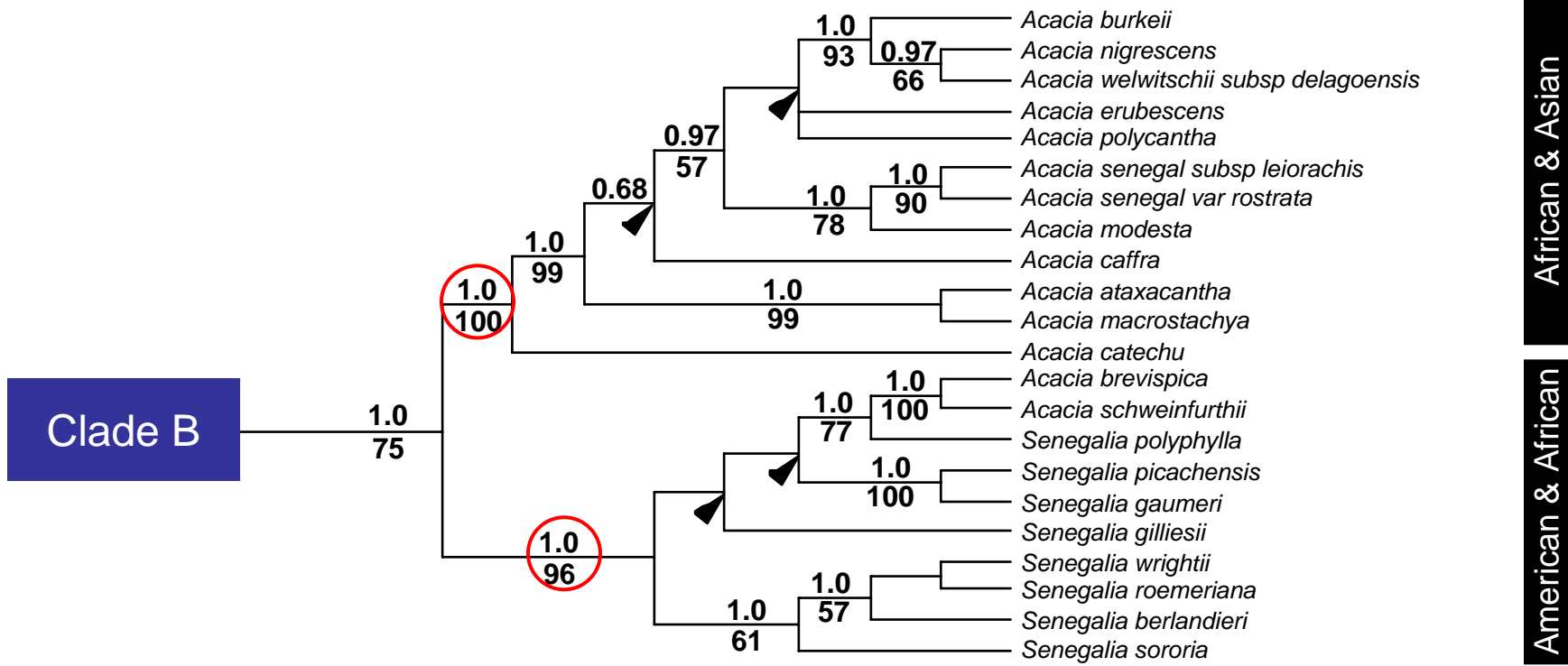


Straight thorns, paired at the nodes



Straight and recurved thorns, paired at the nodes

# Senegalia



African & Asian

American & African



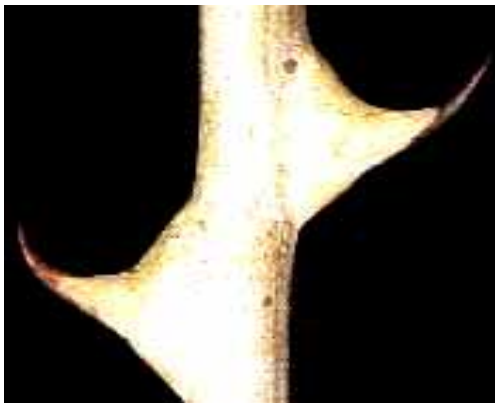
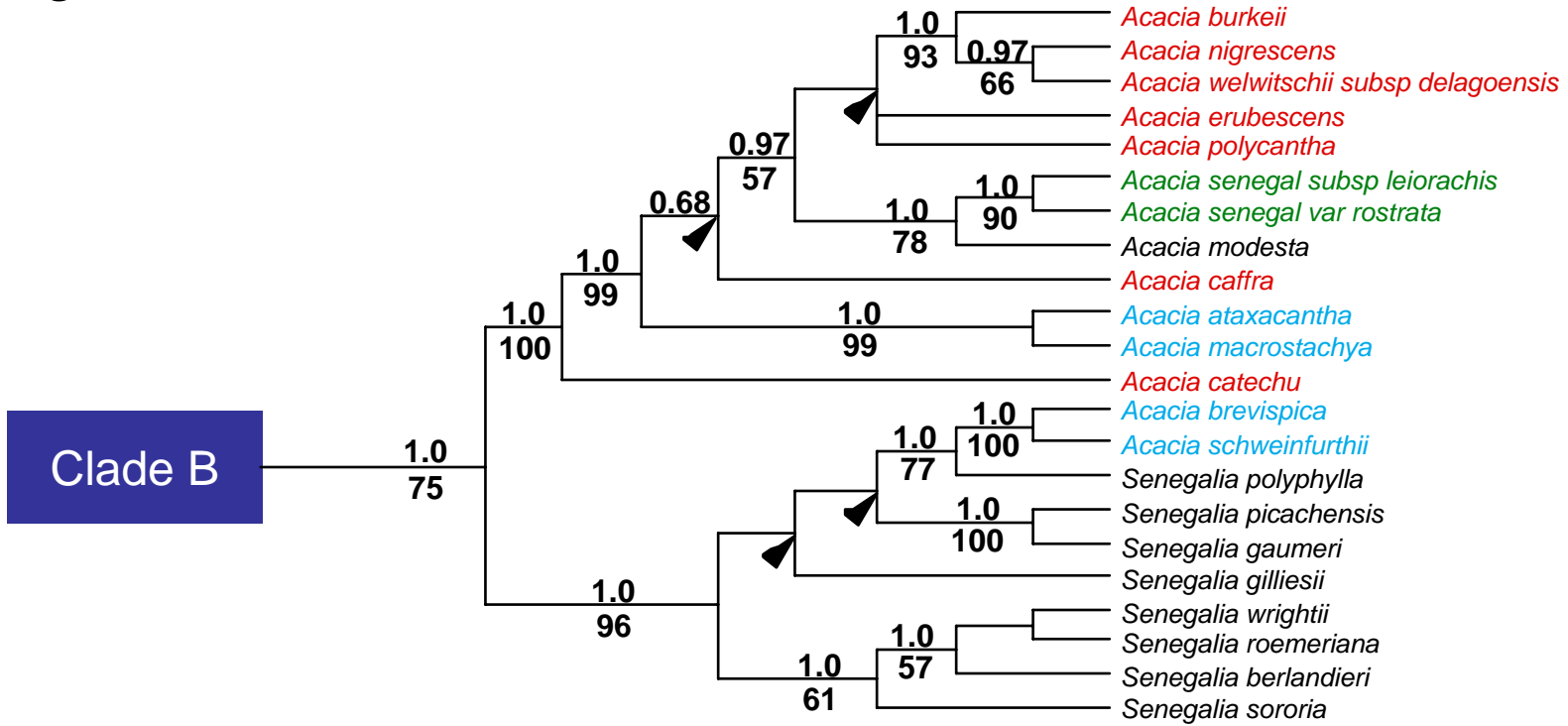
*Acacia brevispica*



*Acacia caffra*



# Senegalia



Scattered irregularly along the internodes

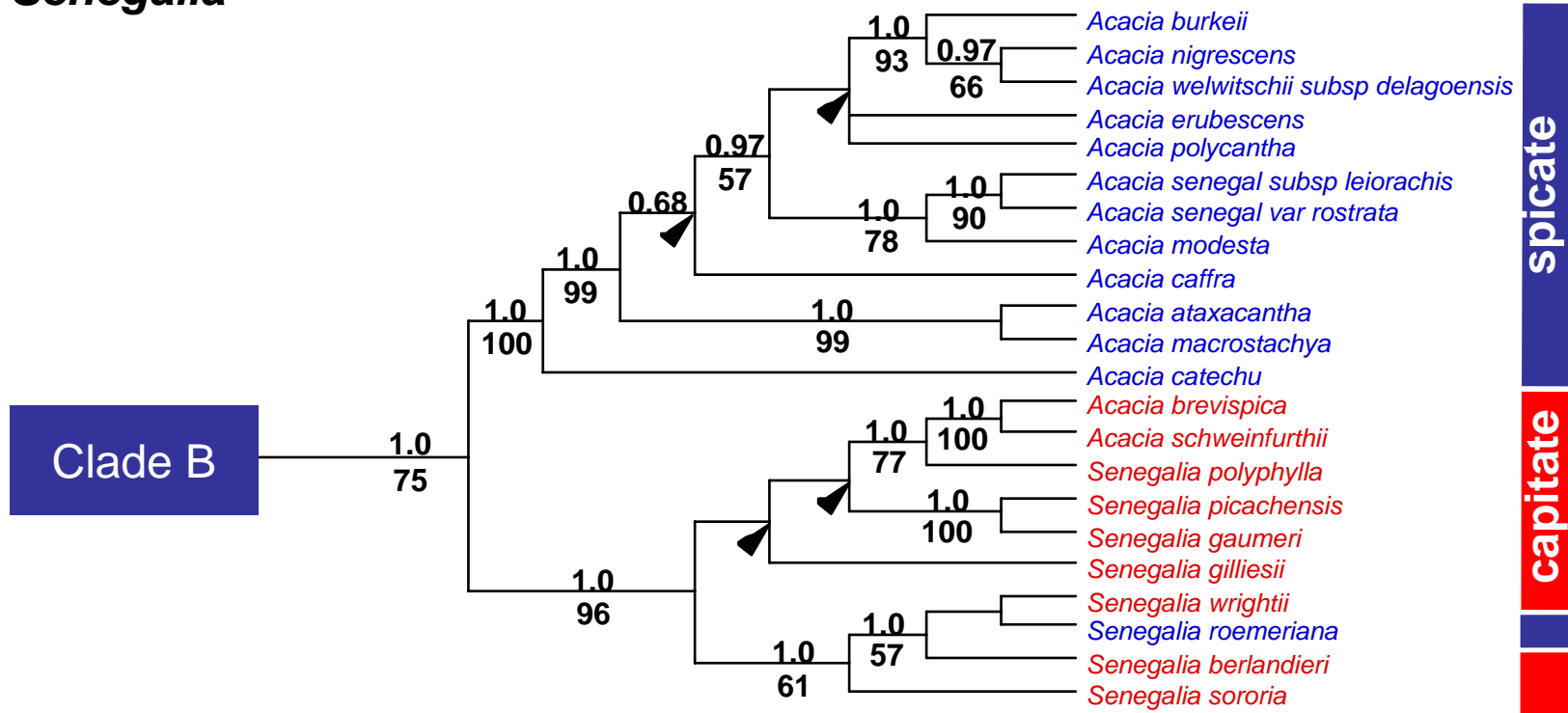


In threes at the nodes



Paired, located at the nodes

# Senegalia

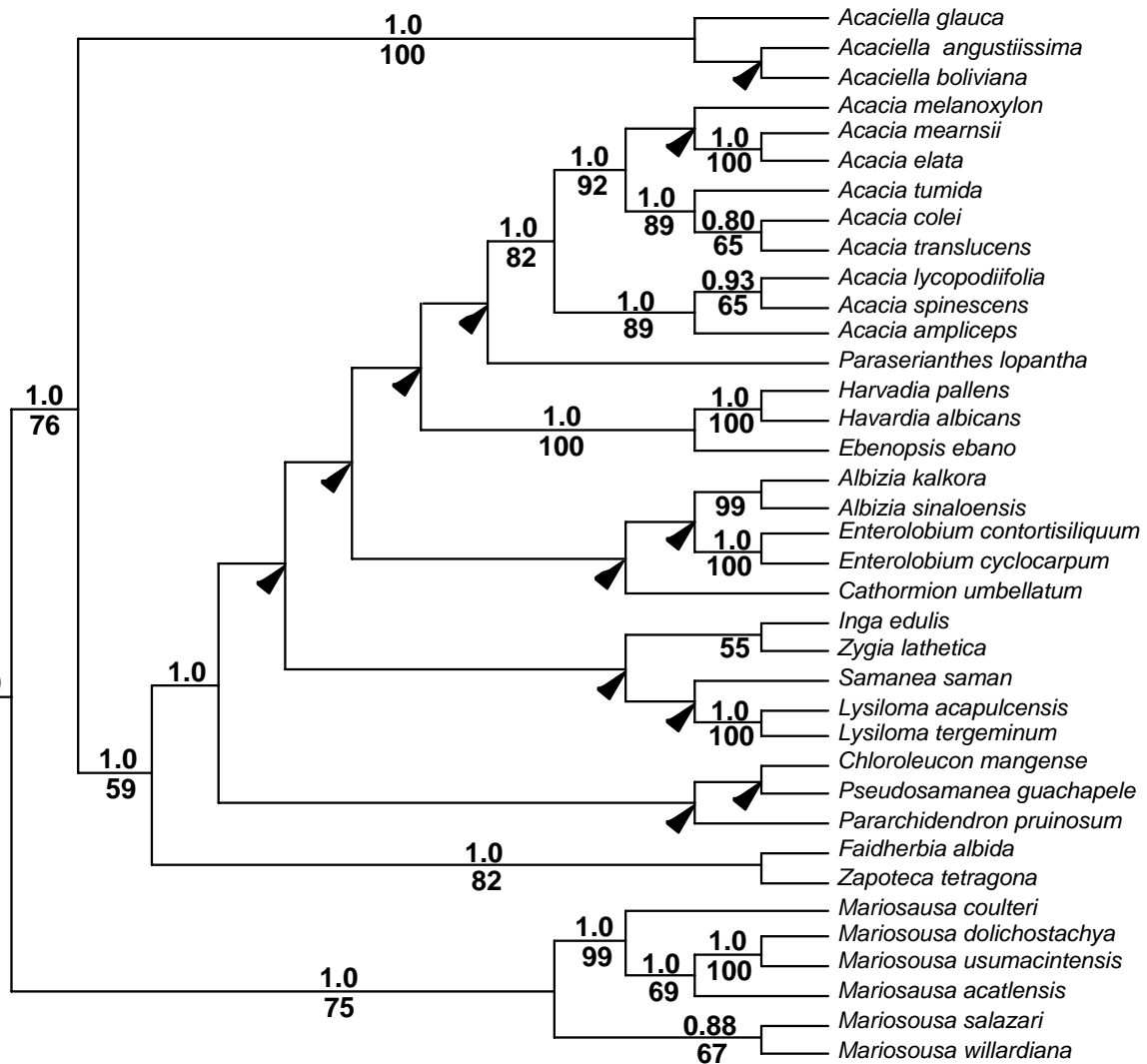


**spicate**

**capitate**



**Clade C**



**Acaciella**

**Acacia**

**Ingeae**

**Mariosousa**



*Acacia glauca*

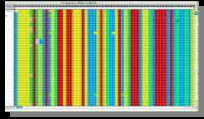


*Mariosousa coulteri*



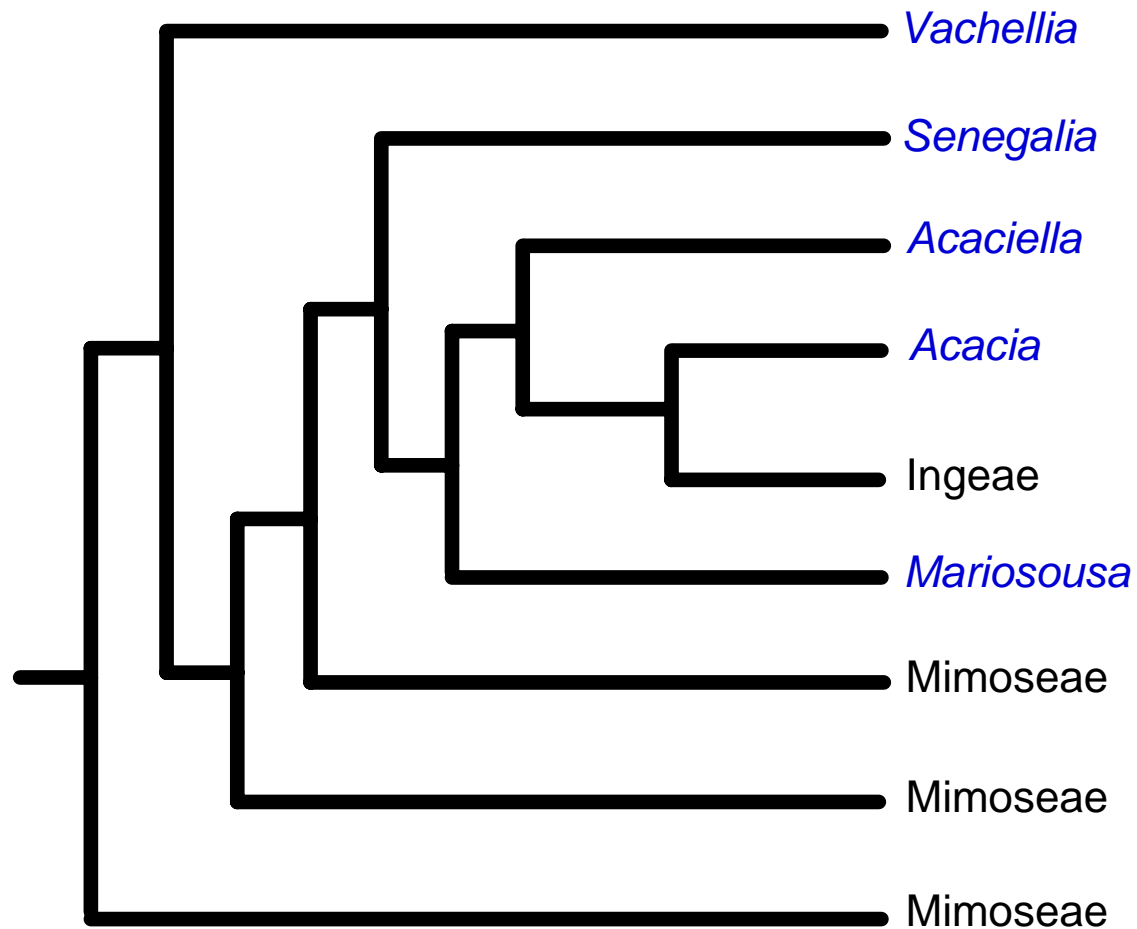
*Inga edulis*

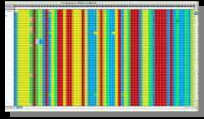




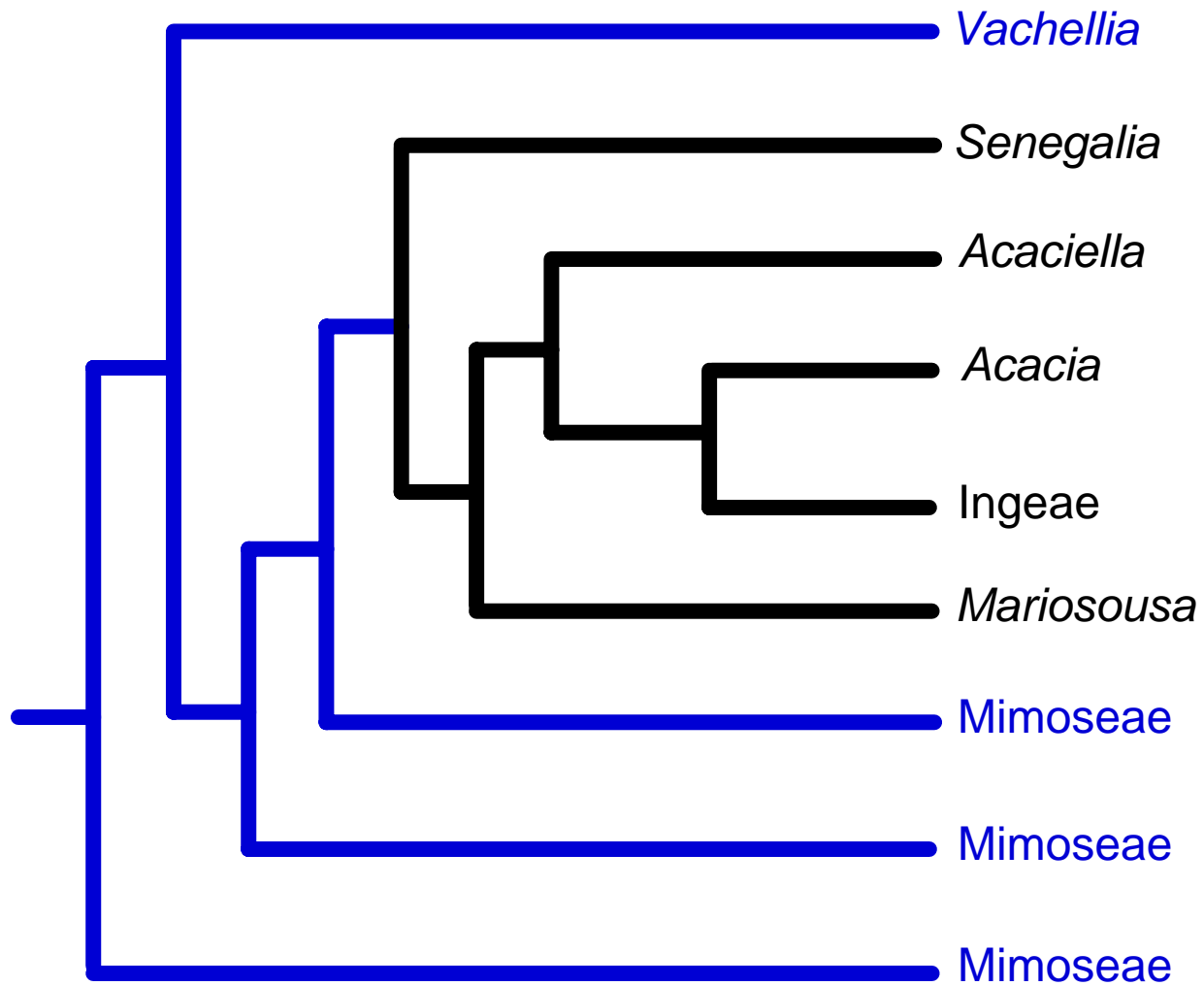
# Conclusions

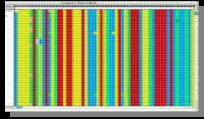
(1) Polyphyly of *Acacia* s.l. and that it be split into at least five genera



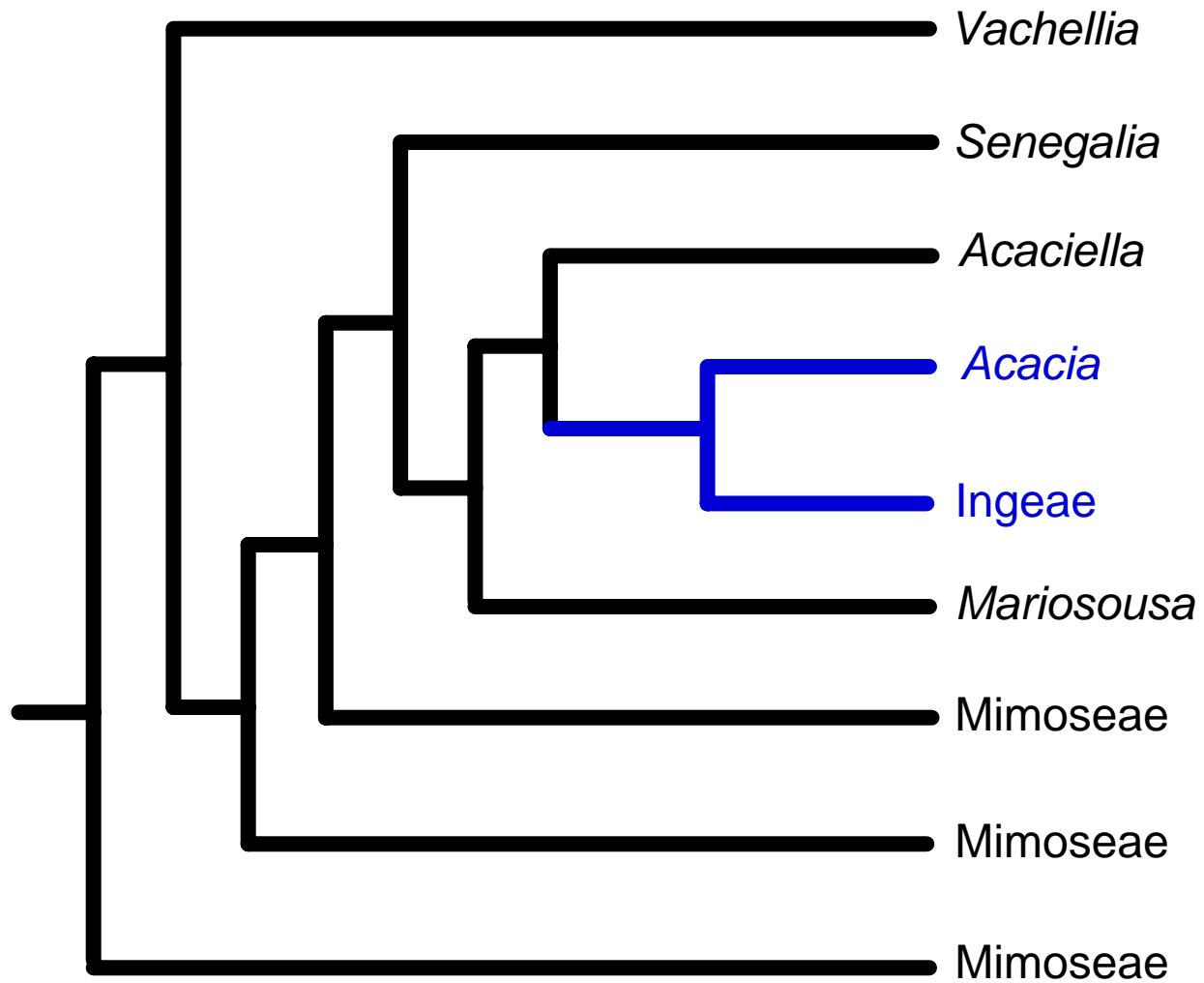


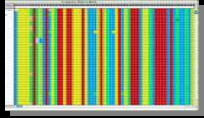
# Conclusions





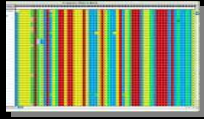
# Conclusions





# Conclusions

- (1) Polyphyly of *Acacia* s.l. and that it be split into at least five genera
- (2) *Faidherbia albida* is placed in Ingeae
- (3) For the study of the *Acacia*'s of the Kruger National Park the following transfers are proposed:



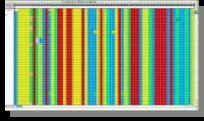
# Proposed combinations for the Acacias of the Kruger National Park.

## **SENEGALIA**

*Senegalia burkei*  
*Senegalia brevispica*  
*Senegalia caffra*  
*Senegalia erubescens*  
*Senegalia polyacantha*  
*Senegalia nigrescens*  
*Senegalia senegal* var. *leiorachis*  
*Senegalia senegal* var. *rostrata*  
*Senegalia schweinfurthii*  
*Senegalia welwitschii* subsp. *delagoensis*

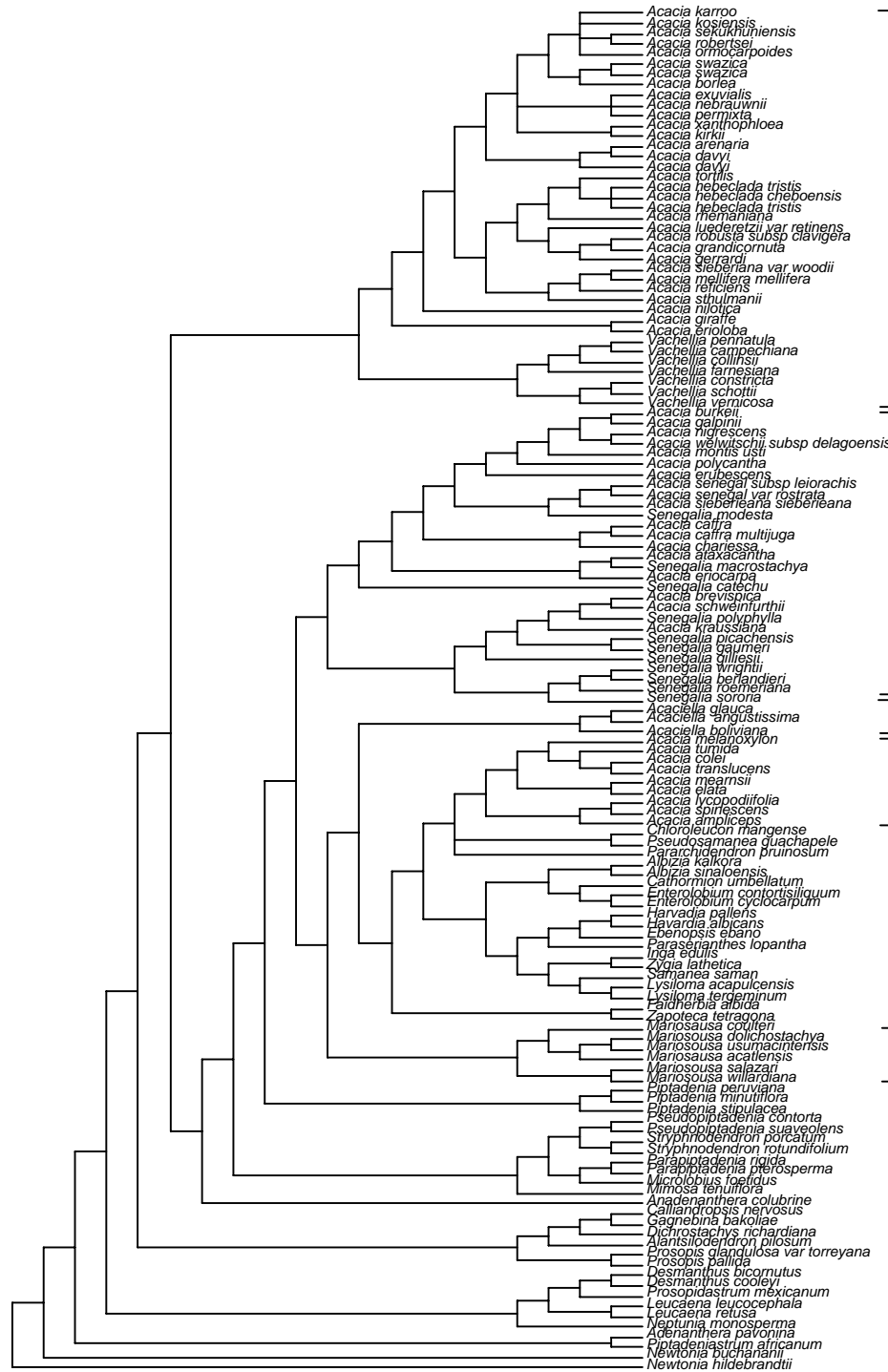
## **VACHELLIA**

*Vachellia borleae*  
*Vachellia exuvialis*  
*Vachellia davyi*  
*Vachellia gerrardii*  
*Vachellia grandicornuta*  
*Vachellia karroo*  
*Vachellia luederetzii* var. *retinens*  
*Vachellia nilotica*  
*Vachellia permixta*  
*Vachellia robusta* subsp. *clavigera*  
*Vachellia sieberiana* var. *woodii*  
*Vachellia swazica*  
*Vachellia tortilis*  
*Vachellia xanthophloea*



# Future Work

- (1) Broader sampling of African species:
  - southern African species ( $\pm 90\%$ )
  - east Africa



**Vachellia**

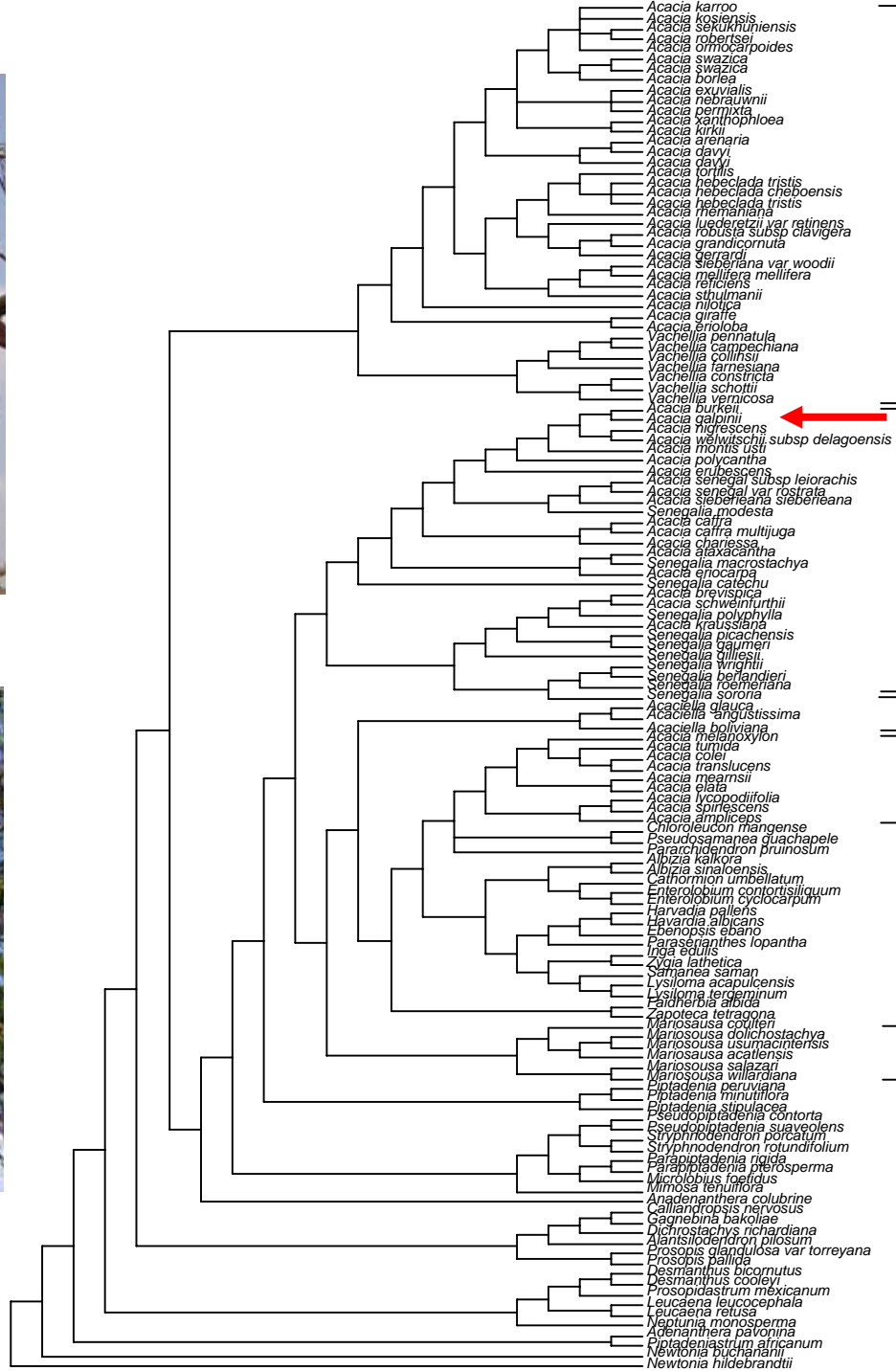
**Senegalia**

**Acaciella**

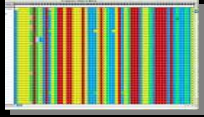
**Acacia**

**Mariosousa**

- Acacia karroo
- Acacia kosiersis
- Acacia sekukuniensis
- Acacia robertsei
- Acacia ormocarpoides
- Acacia swazica
- Acacia swazica
- Acacia borlea
- Acacia exuvialis
- Acacia heuroulynnii
- Acacia permixta
- Acacia xanthophloea
- Acacia kirkii
- Acacia arenaria
- Acacia davii
- Acacia hebeclada
- Acacia hebeclada tristis
- Acacia hebeclada chepoensis
- Acacia hebeclada tristis
- Acacia menziesiana
- Acacia lucida var retinens
- Acacia robusta subsp clavigera
- Acacia grandicornuta
- Acacia stiebiana
- Acacia stiebiana var woodii
- Acacia mellifera mellifera
- Acacia meliensis
- Acacia stuhlmanii
- Acacia niolpa
- Acacia giraffe
- Acacia erioloba
- Vachellia pernatula
- Vachellia meschiana
- Vachellia collinsii
- Vachellia larnesiana
- Vachellia constricta
- Vachellia schottii
- Vachellia vernicosa
- Acacia purbit
- Acacia galpinii
- Acacia nigrescens
- Acacia trivittata subsp delagoensis
- Acacia montis usii
- Acacia polycantha
- Acacia erubesens
- Acacia senegal subsp leiorachis
- Acacia senegal var rostrata
- Acacia senegal subsp sieberiana
- Senegalia modesta
- Acacia catira
- Acacia catira multijuga
- Acacia chariessa
- Acacia alaxacantha
- Senegalia macrostachya
- Acacia eriocarpa
- Senegalia catechu
- Acacia brevispica
- Acacia schweinfurthii
- Senegalia polyphylla
- Acacia kraussiana
- Senegalia picachensis
- Senegalia gajmeri
- Senegalia lillesii
- Senegalia wrightii
- Senegalia berlandieri
- Senegalia roemeriana
- Senegalia sororia
- Acaciella oluca
- Acaciella oluca subsp oluensis
- Acaciella boliviana
- Acacia melanoxylon
- Acacia turbia
- Acacia coleii
- Acacia translucens
- Acacia mearsii
- Acacia elata
- Acacia lycopodiifolia
- Acacia spirifers
- Acacia ampliceps
- Chlorolobon mangense
- Pseudosamanea guachapele
- Paratchidendron pruinosum
- Albizia kalkora
- Albizia sinclairiana
- Cathormion umbellatum
- Enterolobium confertissimum
- Enterolobium cyclocarpum
- Harvardia pallens
- Harvardia albicans
- Paraserianthes elbano
- Paraserianthes lophantha
- Inga edulis
- Cynea lathetica
- Samania saman
- Lysiloma acapulcensis
- Lysiloma tetragonum
- Leptolobus tiliifolius
- Zapoteca tetragona
- Mariosousa cotinifera
- Mariosousa dolichostachya
- Mariosousa usumacintensis
- Mariosousa acapulcensis
- Mariosousa salicifolia
- Mariosousa willardiana
- Piptadenia peruviana
- Piptadenia tiliifolia
- Piptadenia stipulacea
- Pseudopiptadenia contorta
- Pseudopiptadenia suaveolens
- Stryphnodendron portacatum
- Stryphnodendron rotundifolium
- Parapiptadenia noida
- Parapiptadenia perispermia
- Mimolobus laevis
- Mimolobus laevis
- Anadenanthera colubrina
- Calliandropsis nervosus
- Cacabeina bakolae
- Dichrostachys richardiana
- Antistilodendron pilosum
- Prosopis glandulosa var torreyana
- Prosopis pallida
- Desmanthus bicornutus
- Desmanthus cooleyii
- Prosopidastrum mexicanum
- Leucaena leucocephala
- Leucaena retusa
- Neptunia monosperma
- Adenanthera pavonina
- Piptadeniastrum africanum
- Newtonia buchananii
- Newtonia hildebrandtii



Correctly identified  
*Acacia galpinii*  
 Johan Hurter



# Future Work

(2) Additional nuclear gene (ITS) to resolve the relationships within *Senegalia* and *Vachellia*



# ACKNOWLEDGEMENTS

SANPARKS

SANBI — Johan Hurter

FINANCIAL SUPPORT— NRF, University of Johannesburg, SASOL