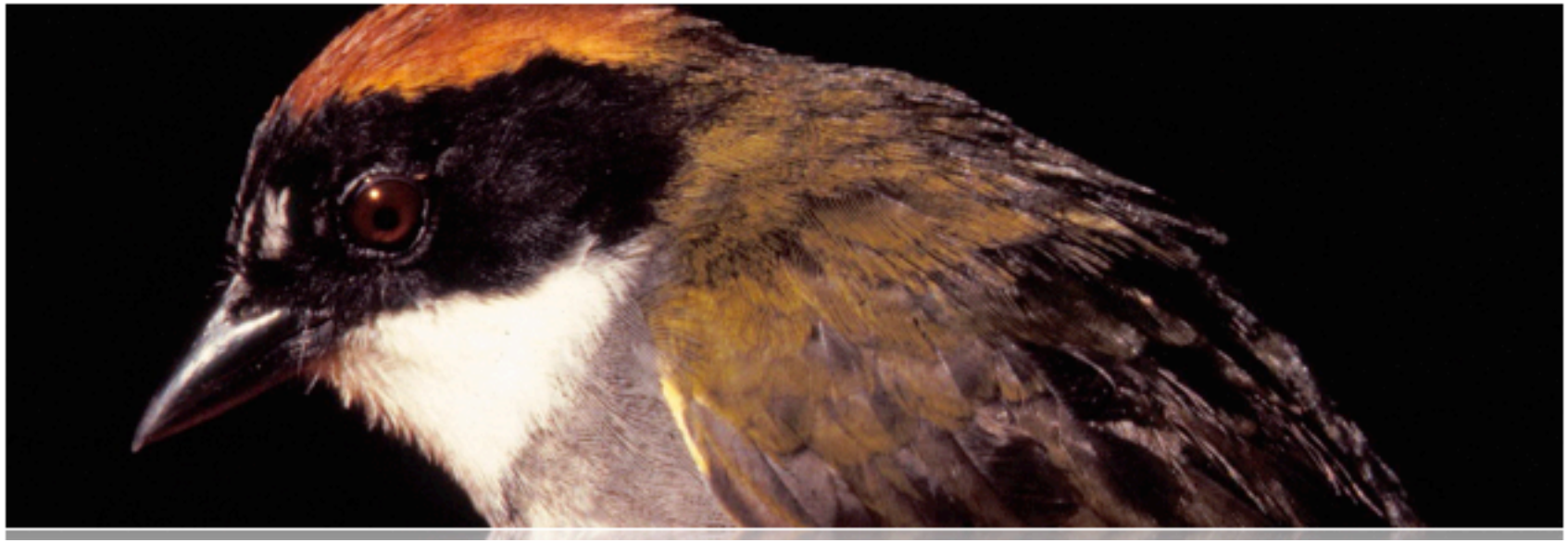
Inicio C. D. Cadena Estudiantes Proyectos Publicaciones SIG CIEM

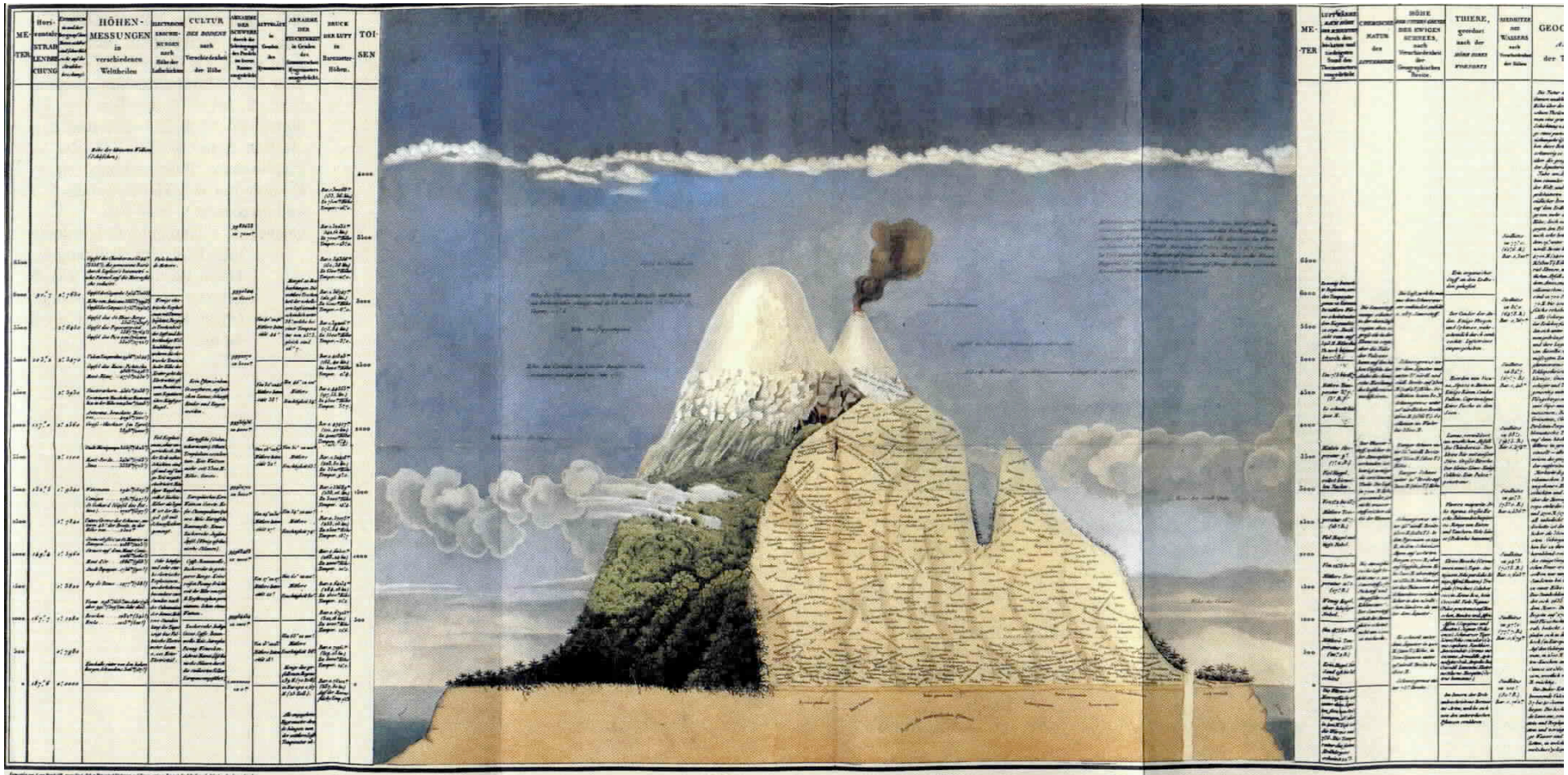
Universidad de los Andes

Departamento de Ciencias Biológicas

Laboratorio de Biología Evolutiva de Vertebrados



http://evolvert.uniandes.edu.co/



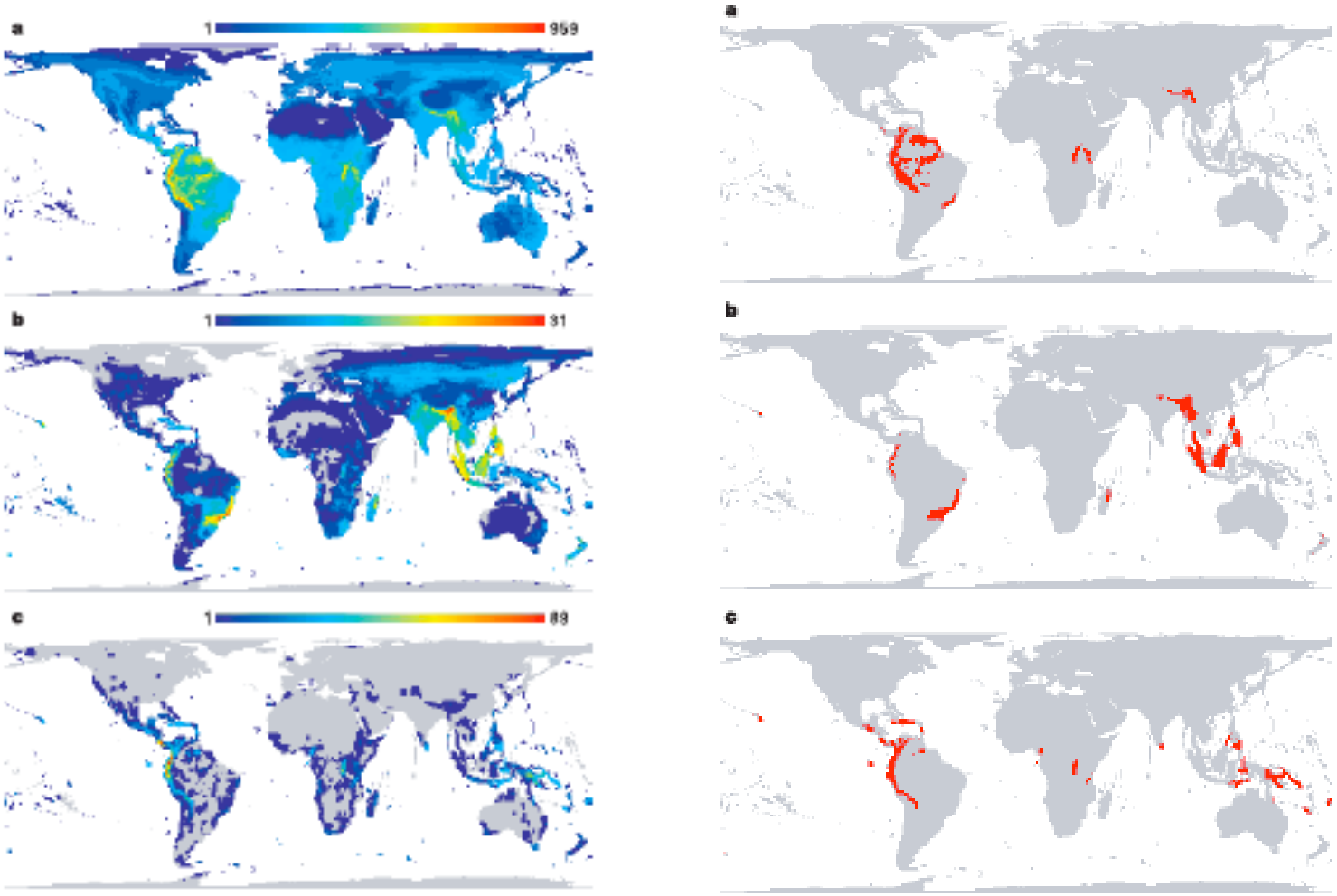
Geographie der Pflanzen in den Tropen-Ländern;

ein Naturgemälde der Anden,

gegründet auf Beobachtungen und Messungen, welche vom 10ten Grade nördlicher bis zum 10ten Grade südlicher Breite angestellt worden sind, in den Jahren 17

von ALEXANDER VON HUMBOLDT und A. G. BONPLAND.

Neotropical Mountains as Avian Diversity Hotspots



Total Species

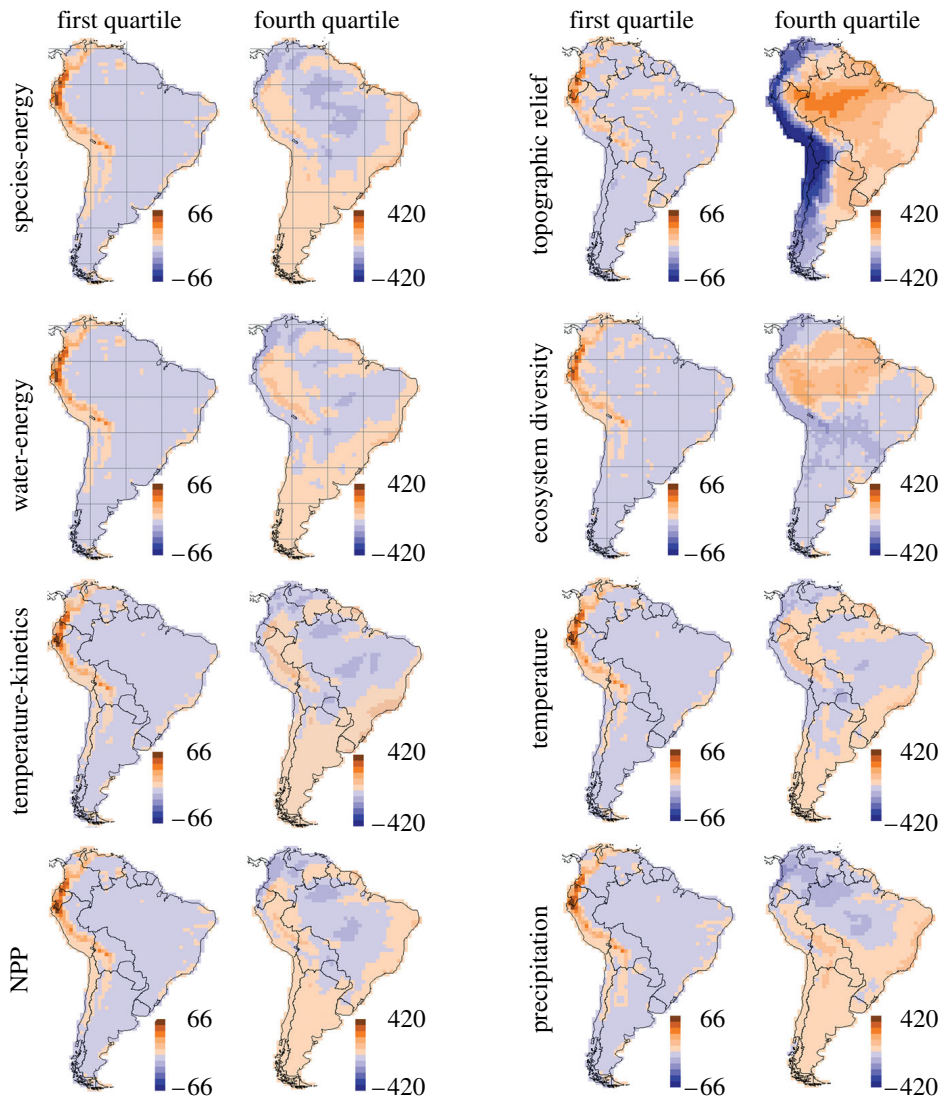
Threatened Species

Endemic Species

Orme et al. (2005)

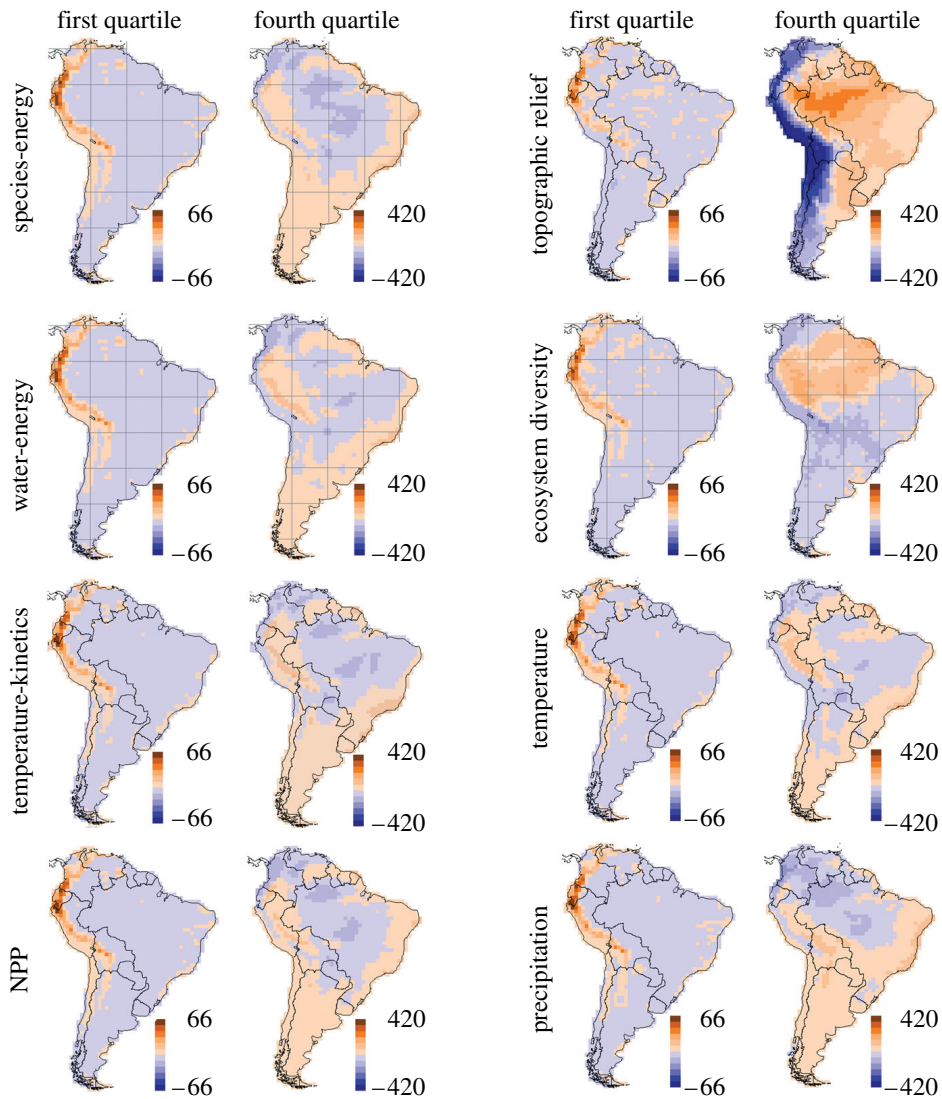
Photos by Andrés M. Cuervo

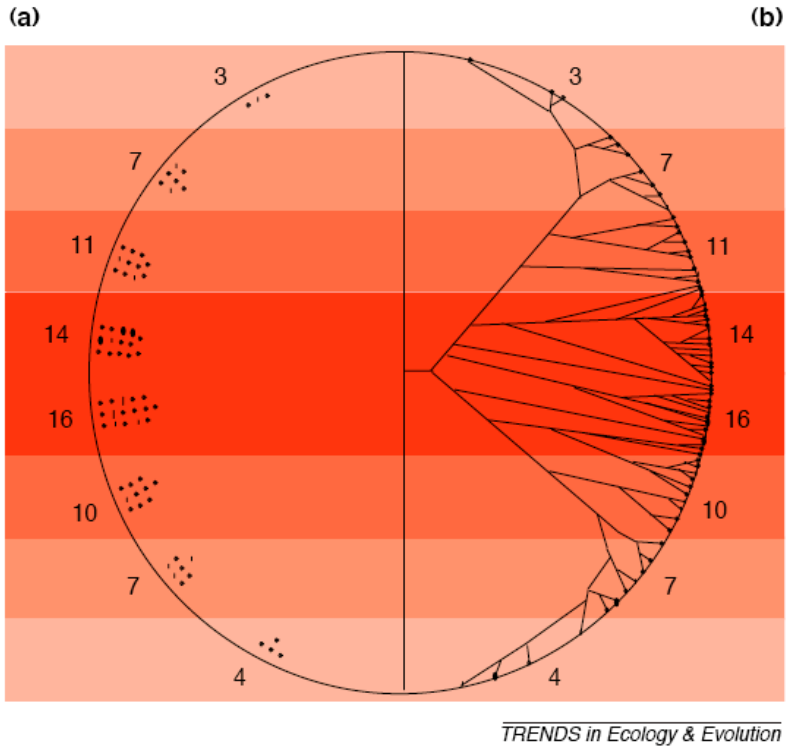
Difficulty in Explaining Diversity and Endemism in the Andes



Rahbek et al. (2007)

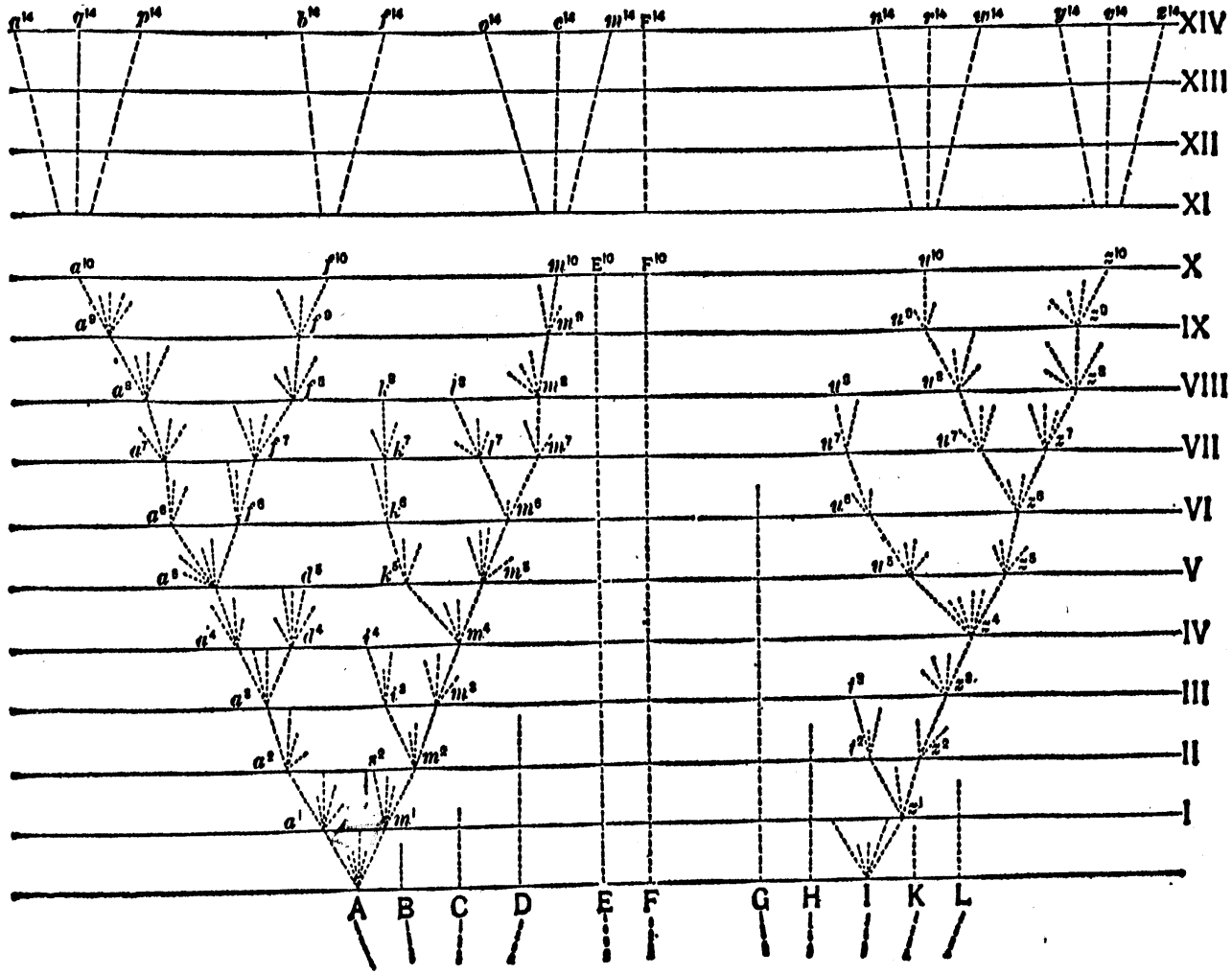
A Role for History ?



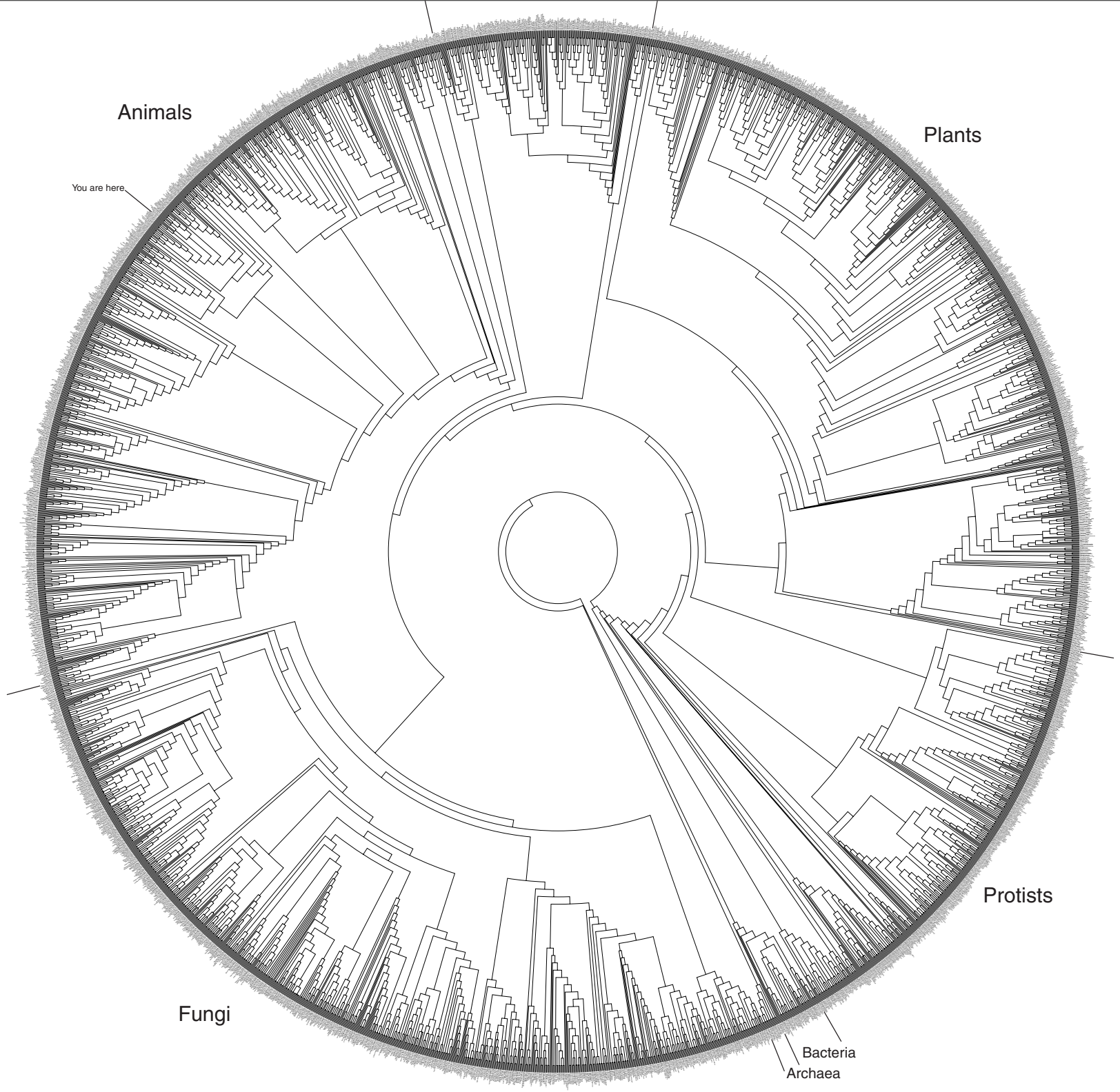


Rahbek et al. (2007)

Wiens & Donoghue (2004)

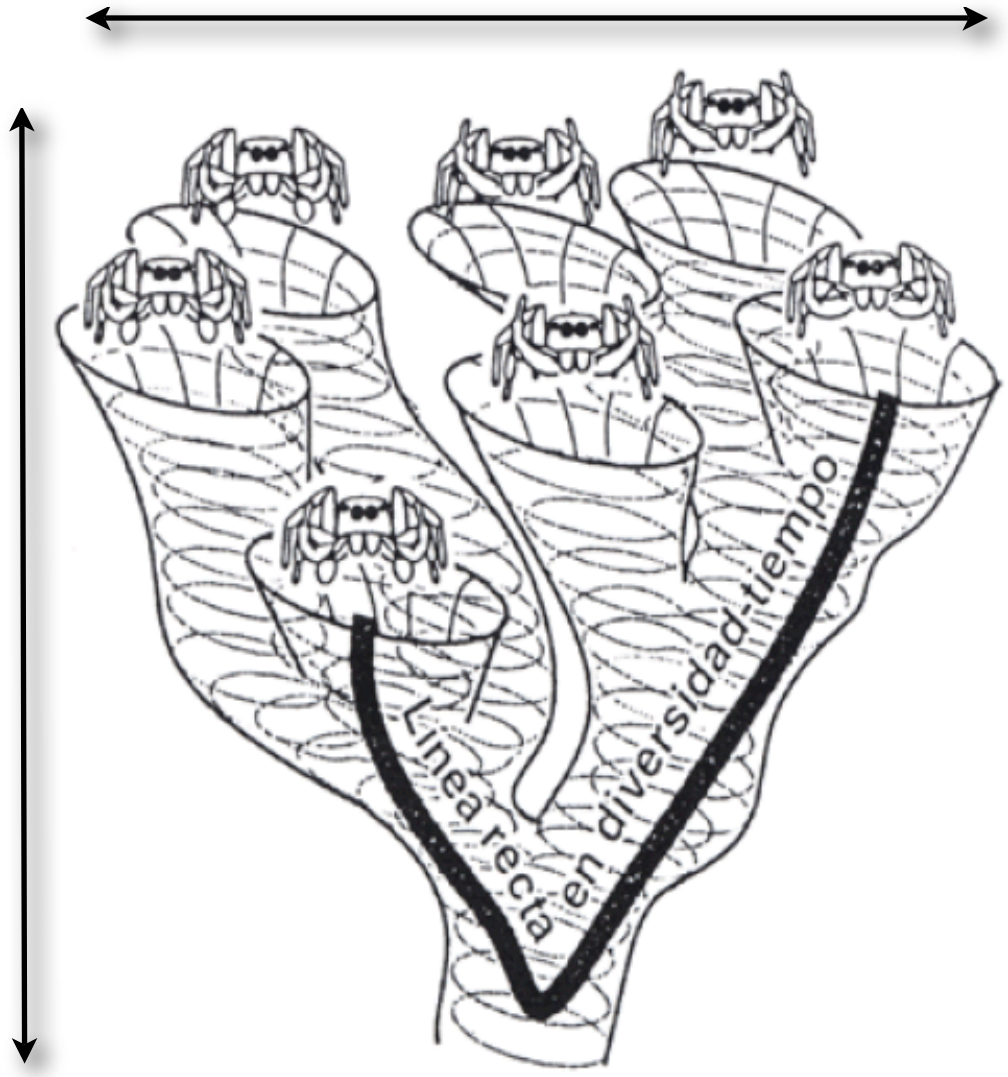


Darwin (1859)


Animals
Plants
You are here
Protists
Fungi
Bacteria
Archaea

Horizontal View of Biodiversity

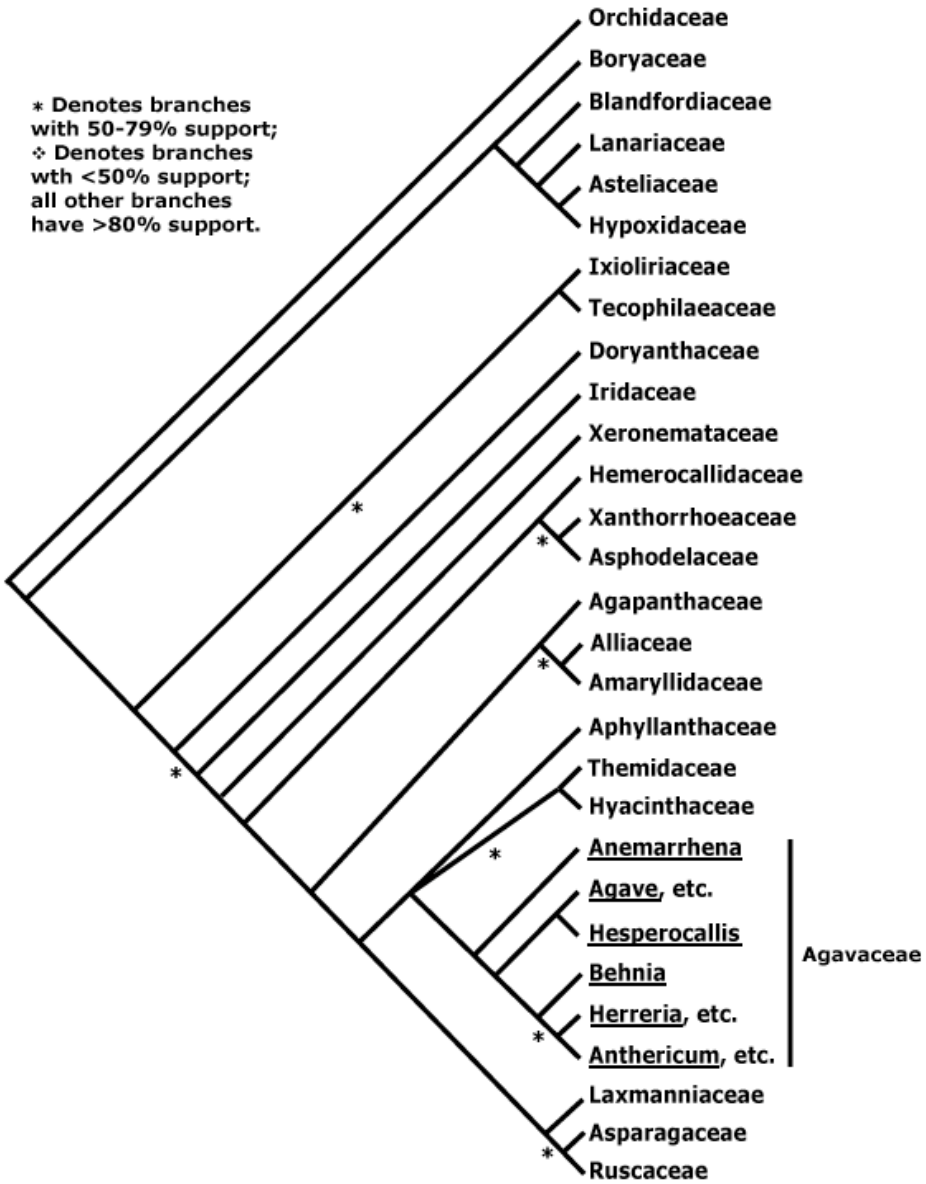
Vertical View of Diversification



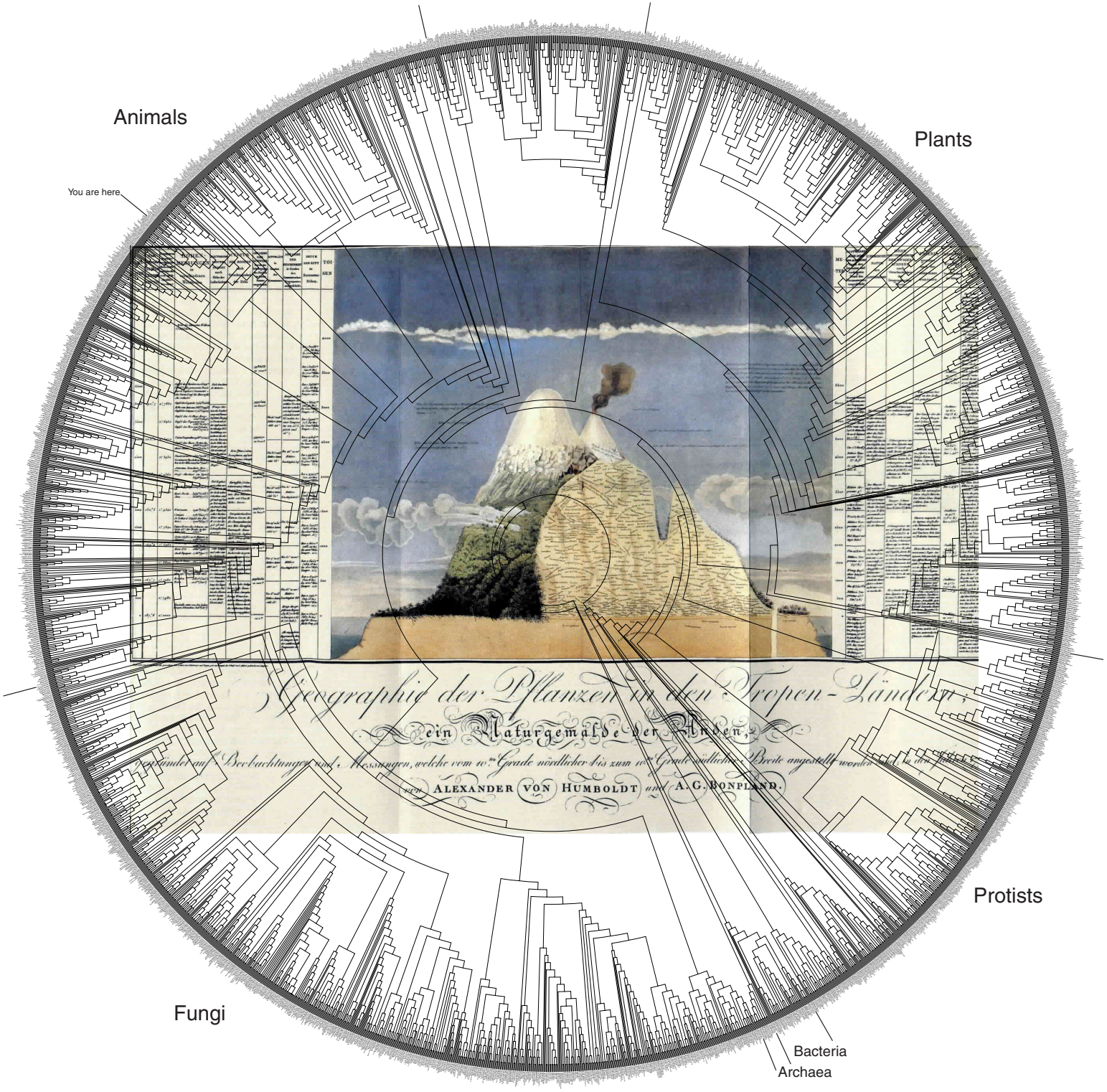
Maddison & Pérez (2001)

Why are Orchids so Diverse?

Are they?



http://www.mobot.org/MOBOT/research/APweb/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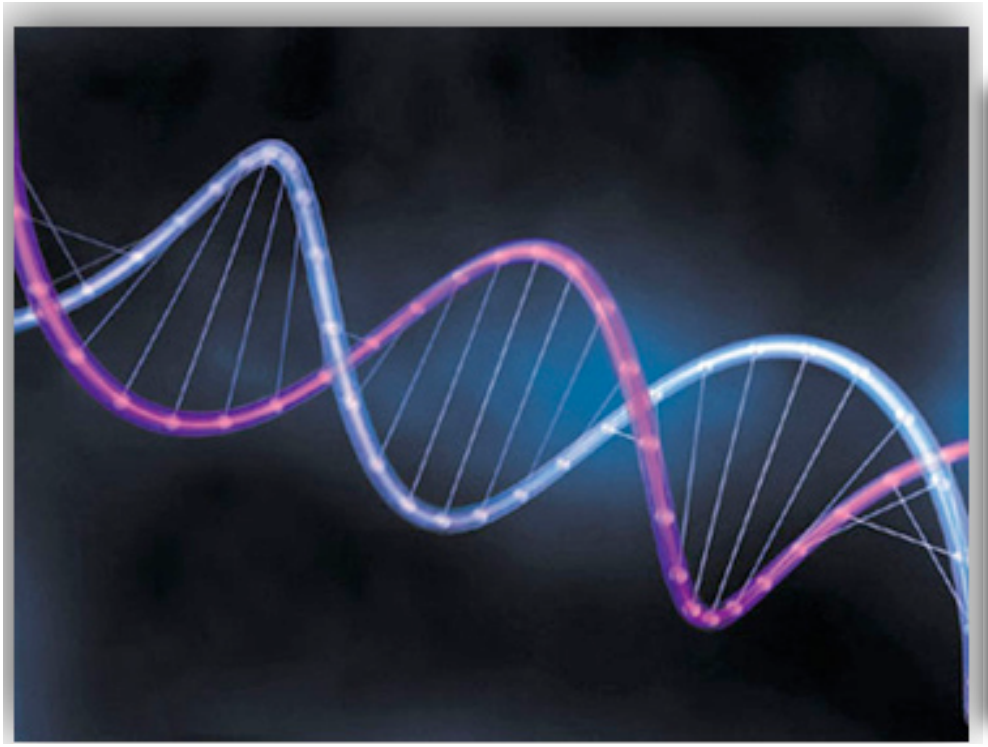
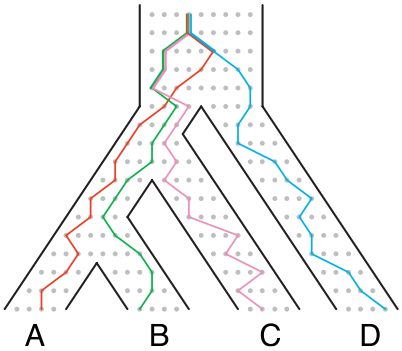
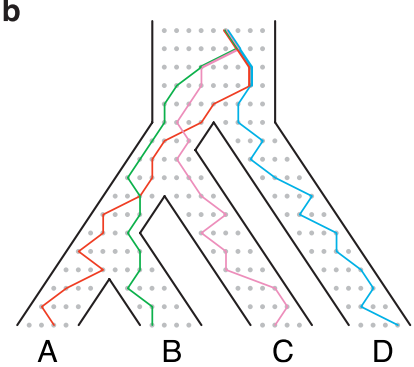
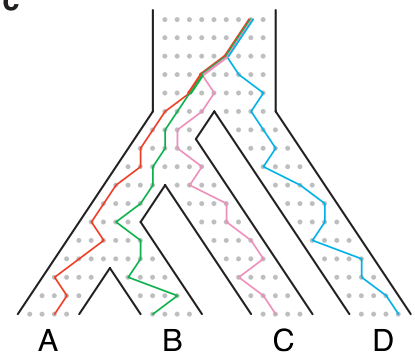


mitochondria
Mitochondria Inner Structure
Inner membrane
Outer membrane
Cristae
Matrix
Figure 1
http://www.microscopy.fsu.edu/cells/animals/mitochondria.html
http://www.hybridmedicalanimation.com/pages/chloroplast.html


A
B
C
D


b
A
B
C
D


c
A
B
C
D

C. D. Cadena, J. Fjeldsa, A. M. Cuervo, S. L. Bonatto, N. Krabbe, H. Mata, T. S. Schulenberg, E. Valderrama

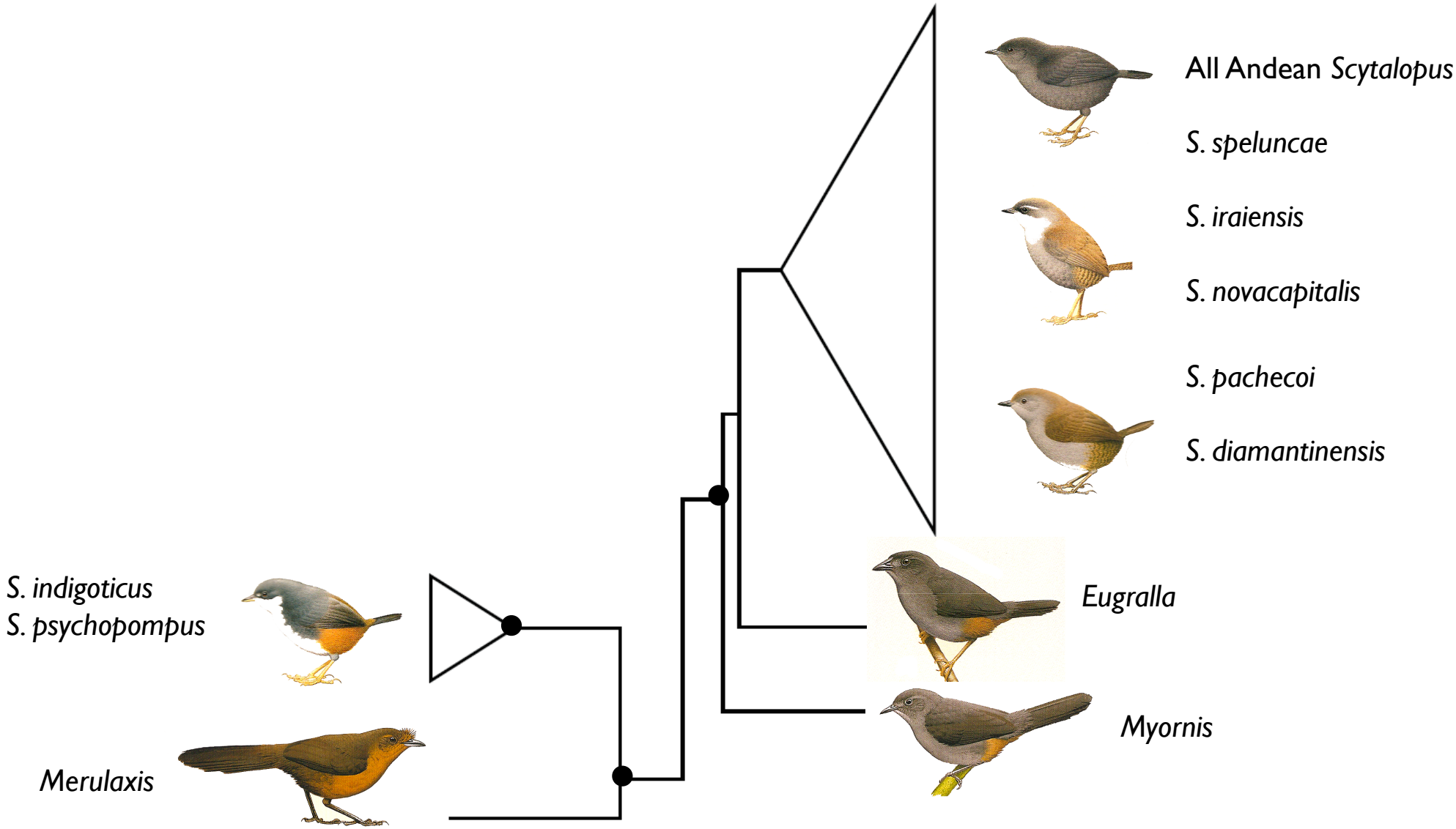
Why Mouse-like, Morphologically Indistinguishable Birds are Ideal Models to Study Montane Diversification

Why Mouse-like, Morphologically Indistinguishable Birds are Ideal Models to Study Montane Diversification

- Probably the most speciose genus of Neotropical birds (c. 40 - and counting)
- All species occur on montane areas
- Widespread in all major montane systems in the Neotropics N to Costa Rica (except tepuis)
- Nearly flightless:
    - Expected to closely track history of their preferred habitats
    - Allows timing diversification events based on biogeographic events

Rethinking Morphological Conservativeness: Molecules and Internal Anatomy Reveal *Scytalopus* is not Monophyletic

G. N. Maurício, H. Mata, M. R. Bornschein, C. D. Cadena, H. Alvarenga, S. L. Bonatto



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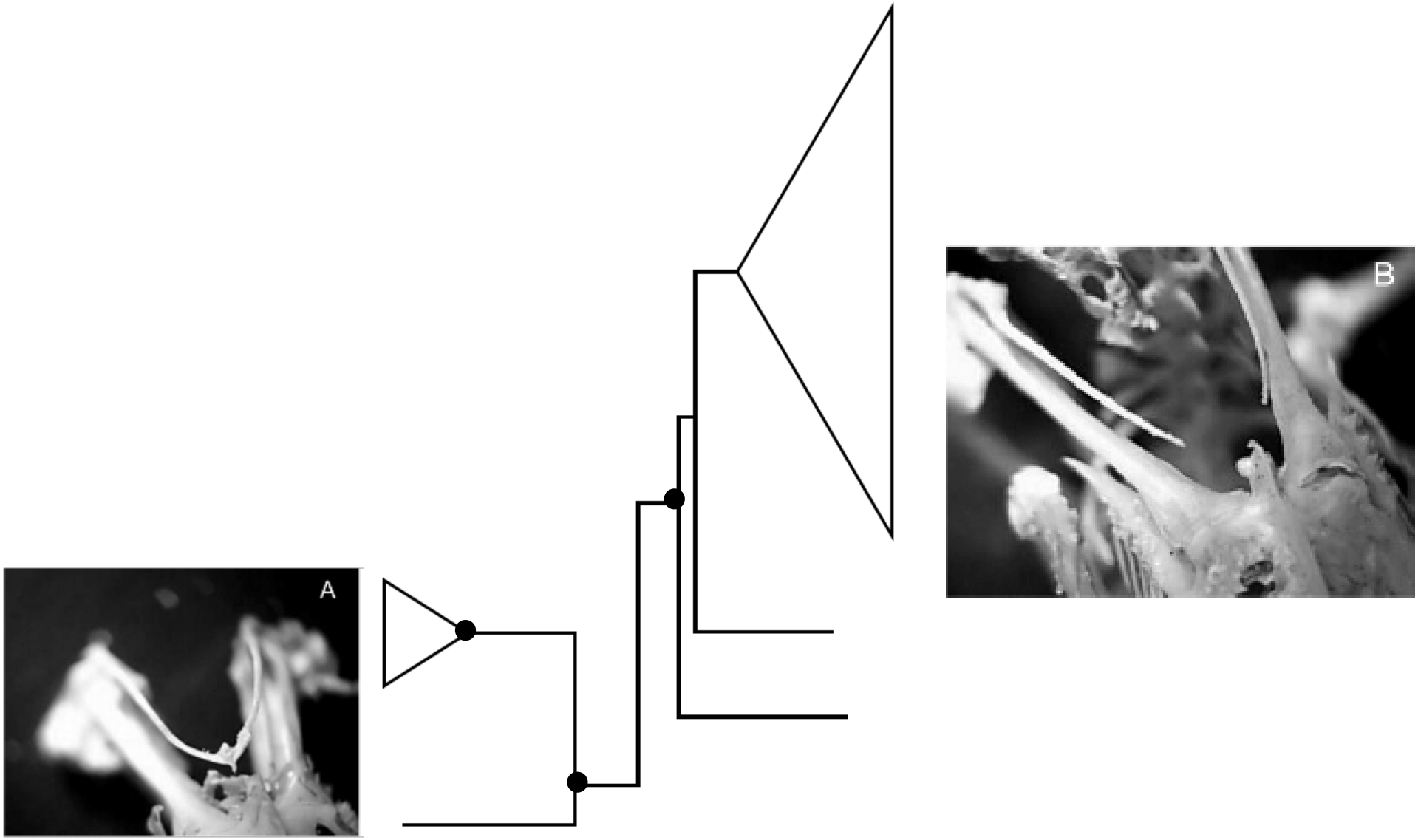
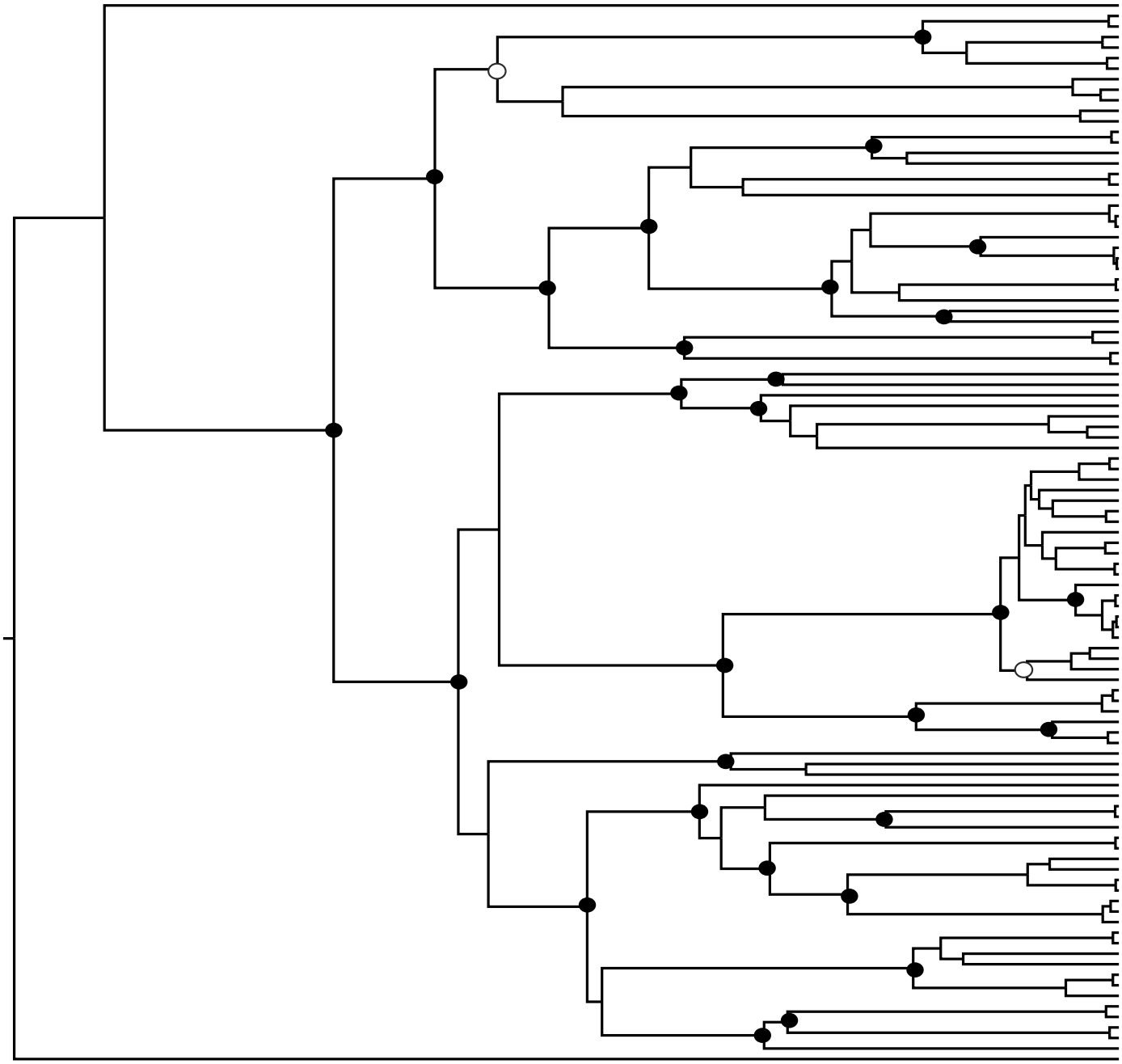
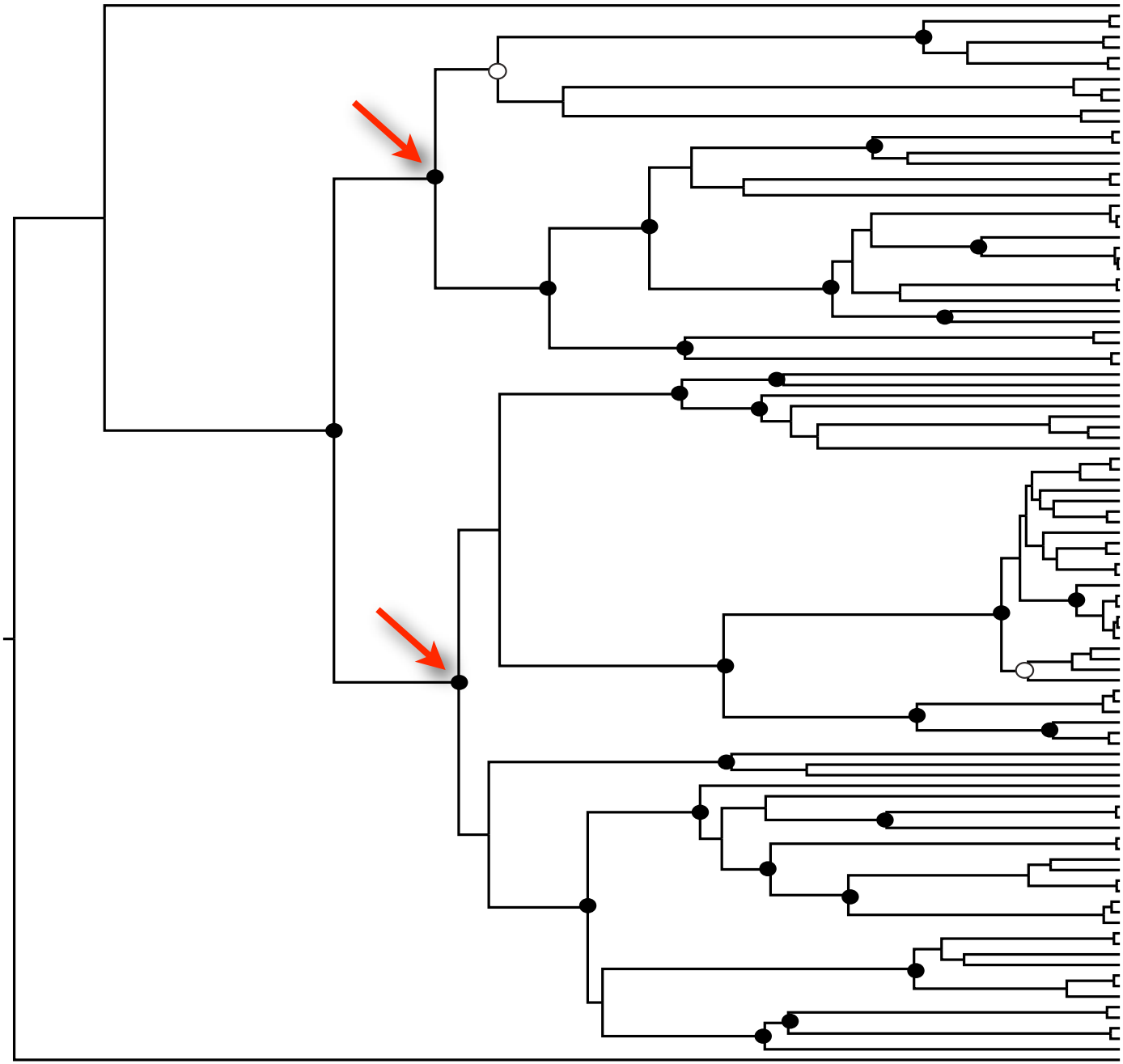
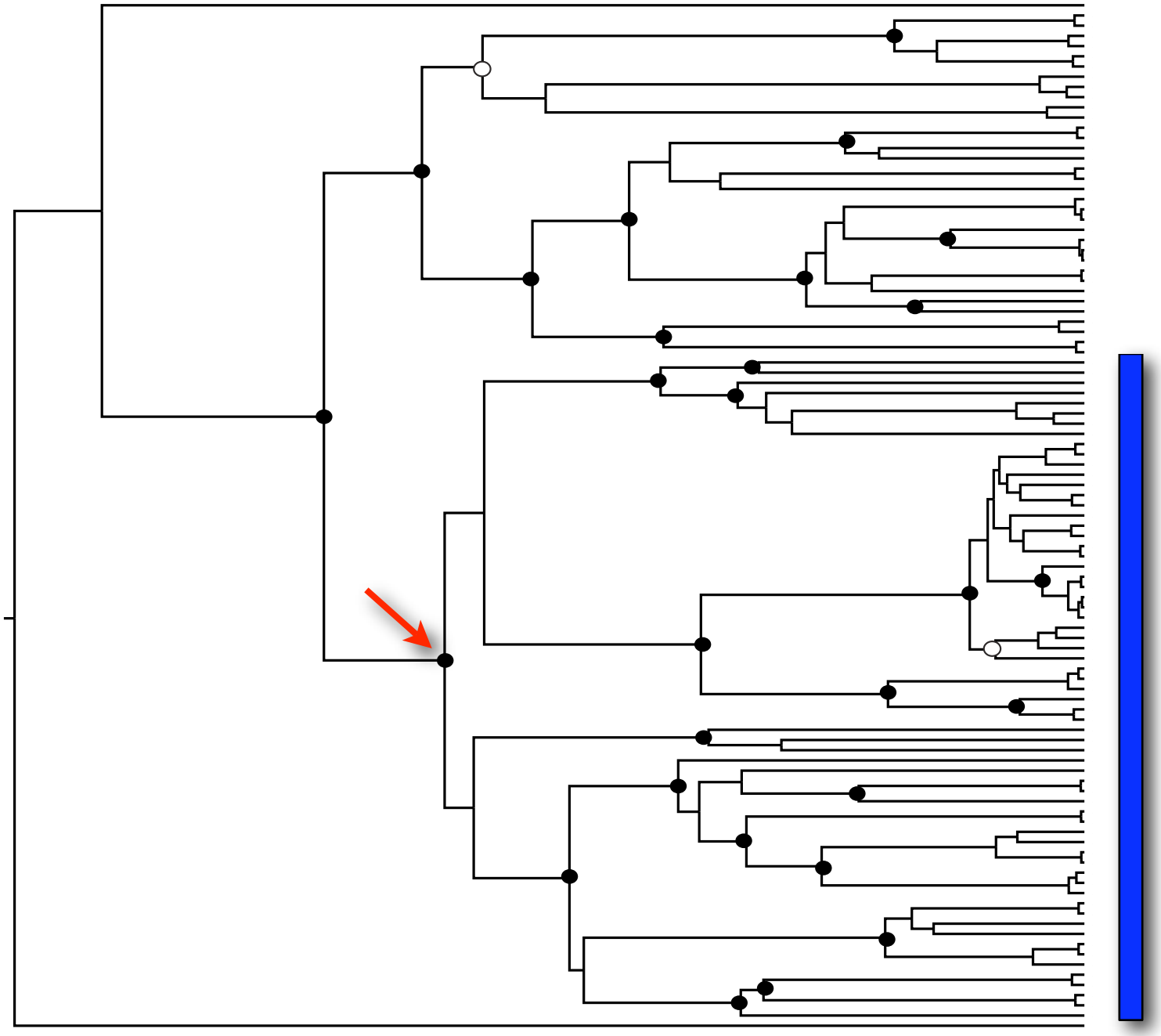
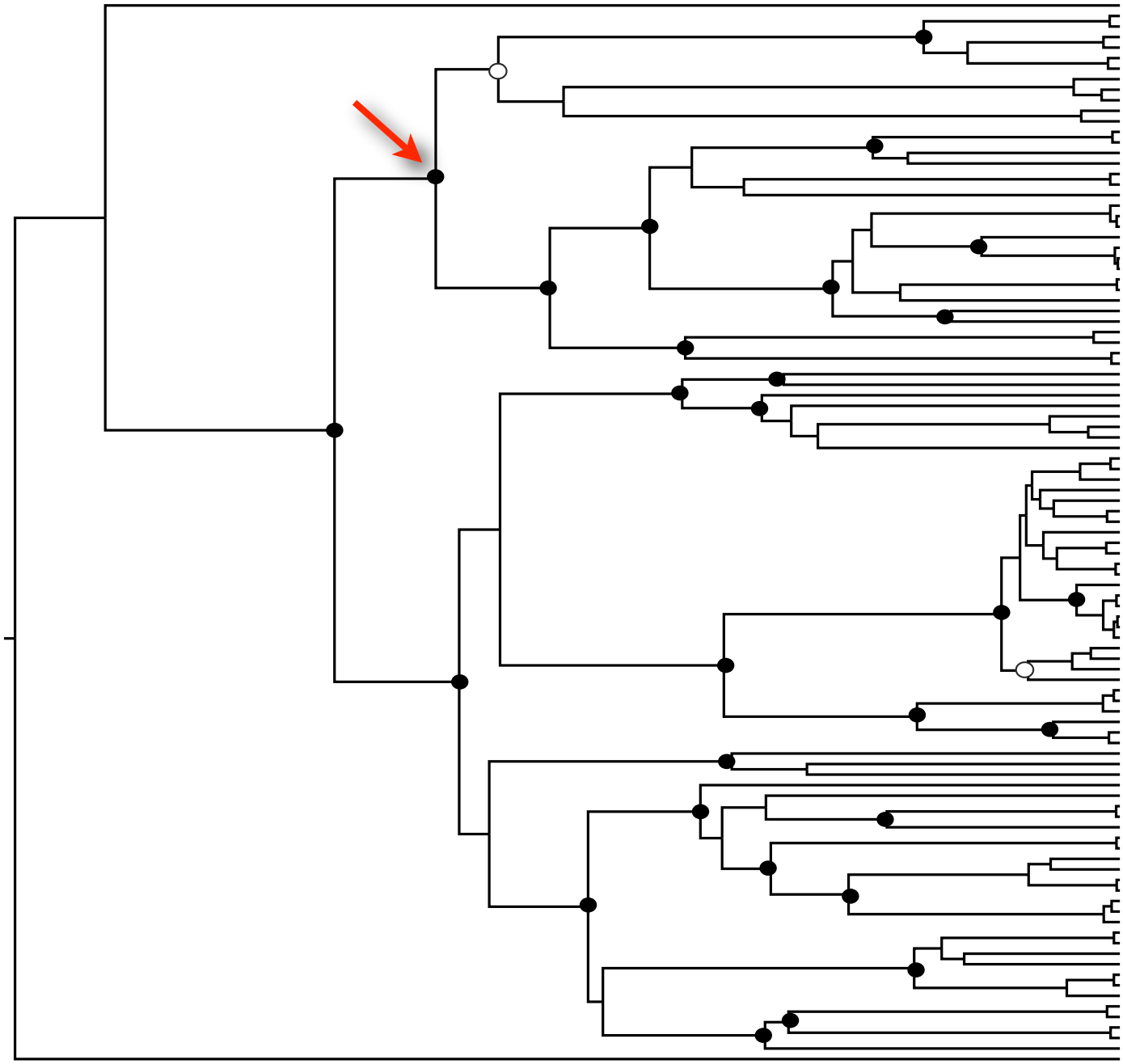


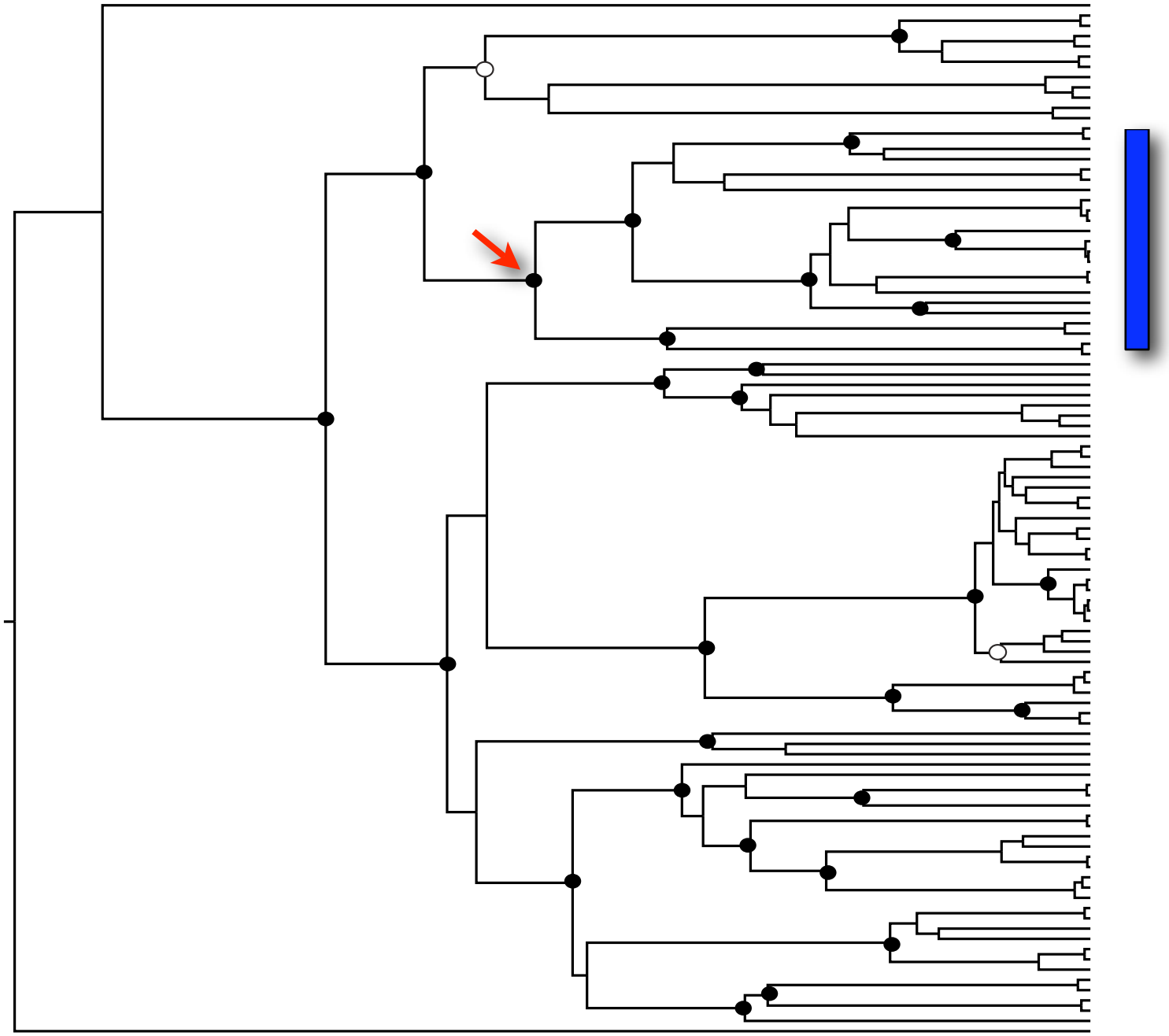




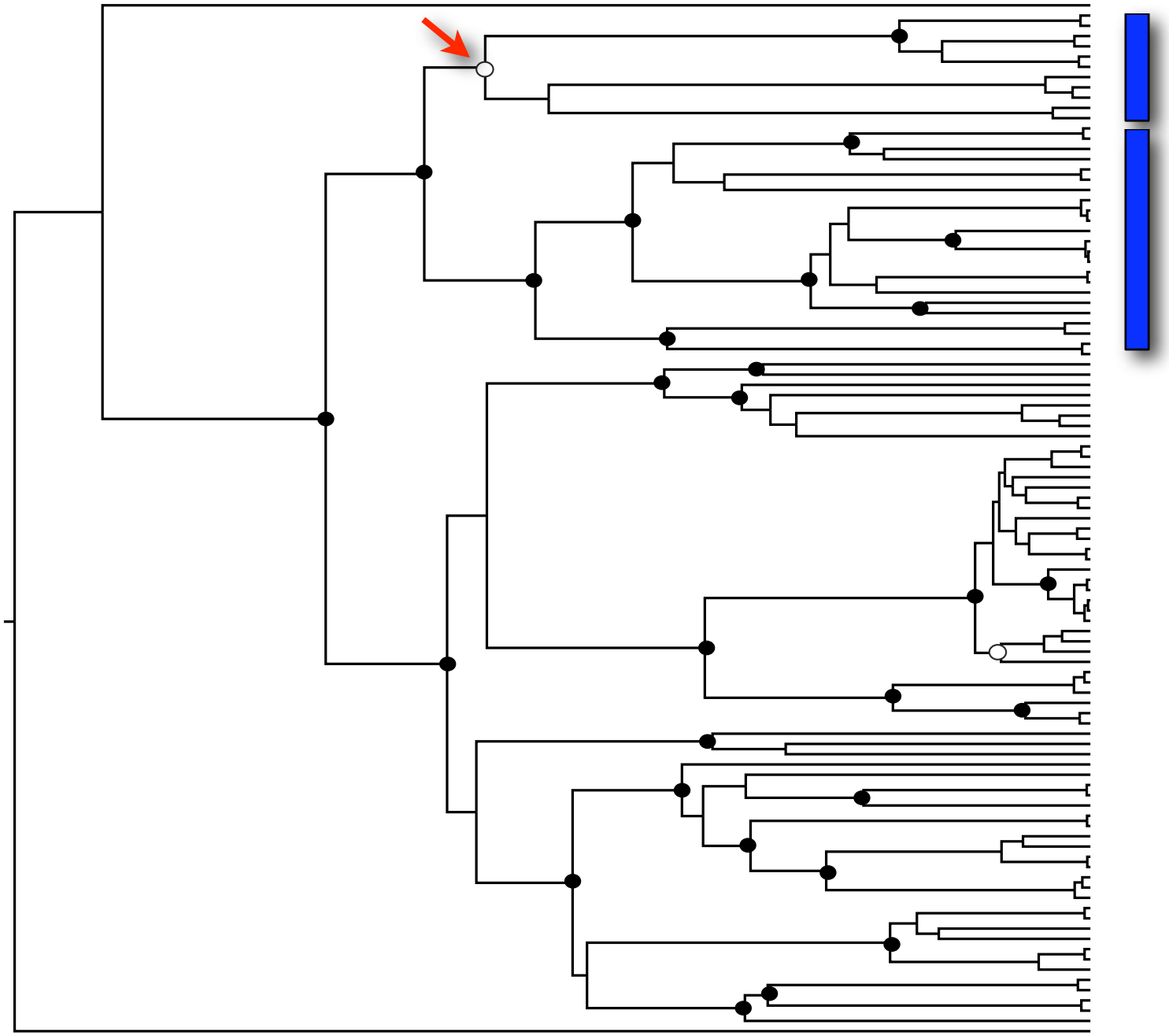


Mostly
Northern
Andes



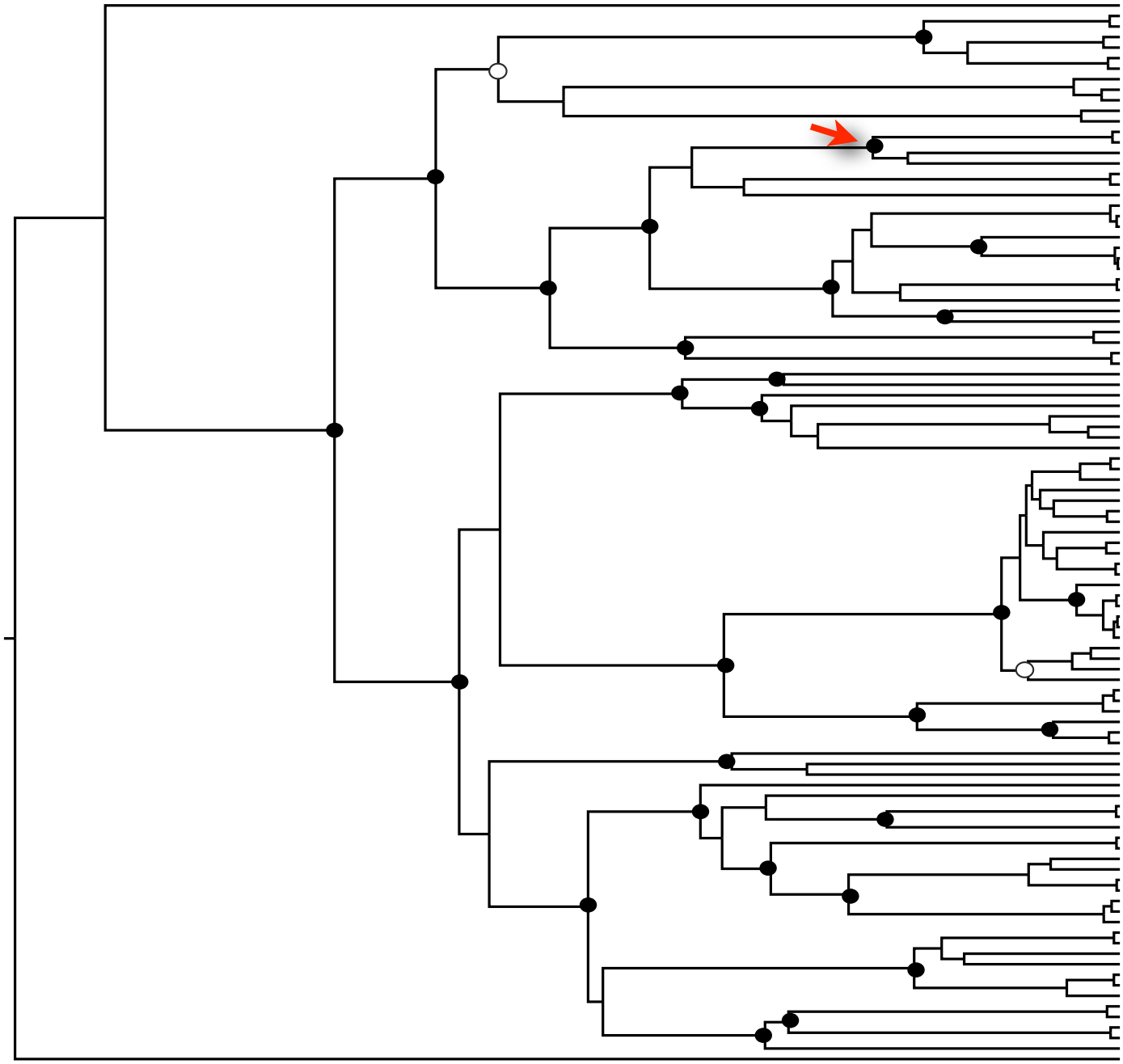


Mostly Southern Andes



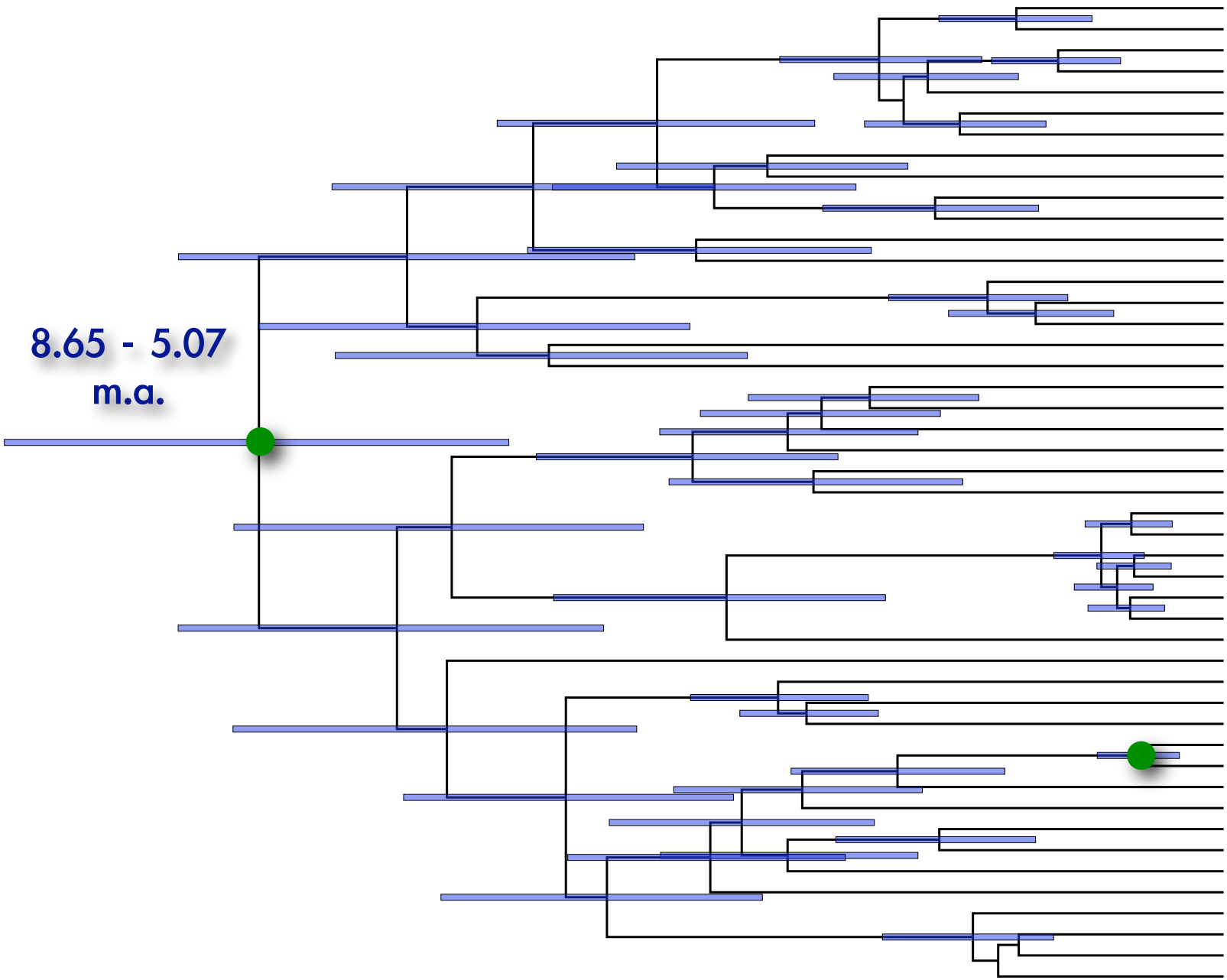
Brazil

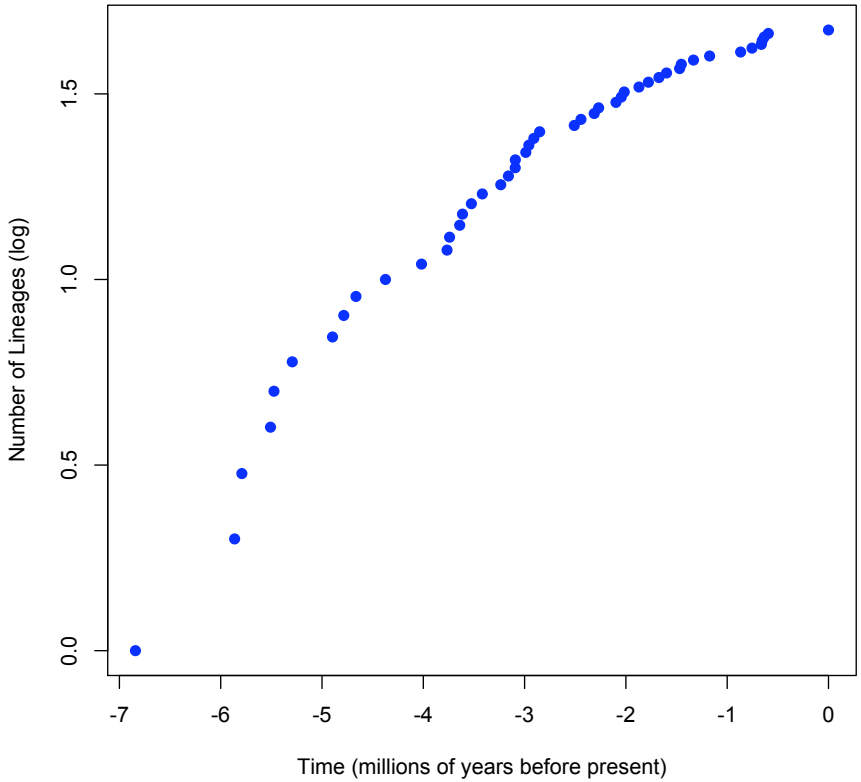
Mostly Southern Andes

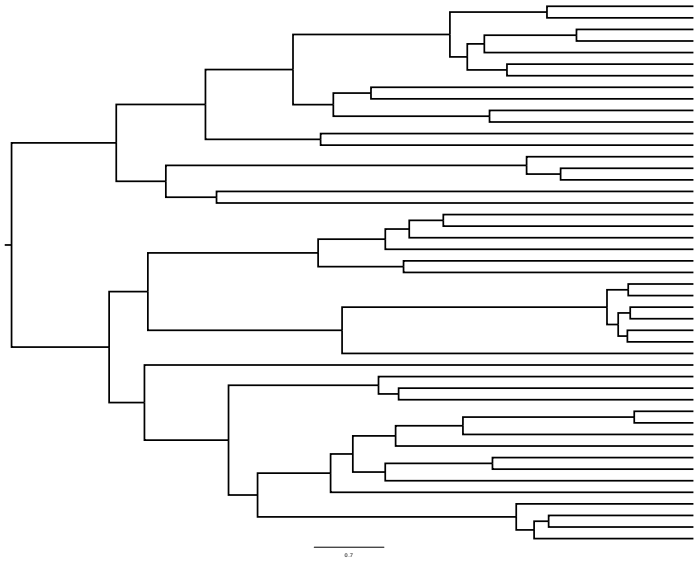


Scytalopus canus Complex

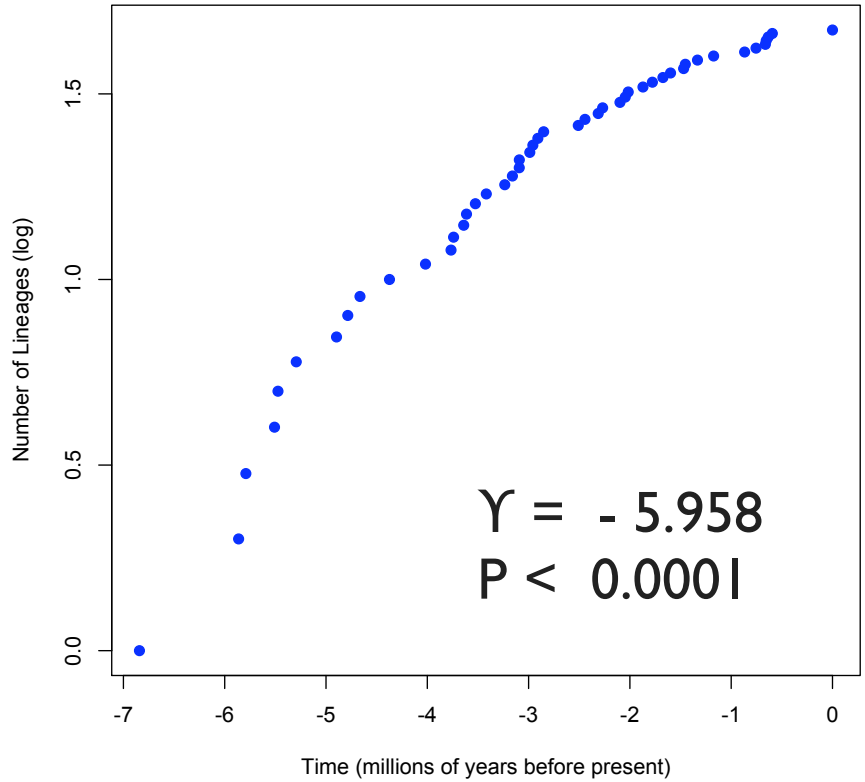
Temporal Calibration and Uncertainty in Node Age Estimates

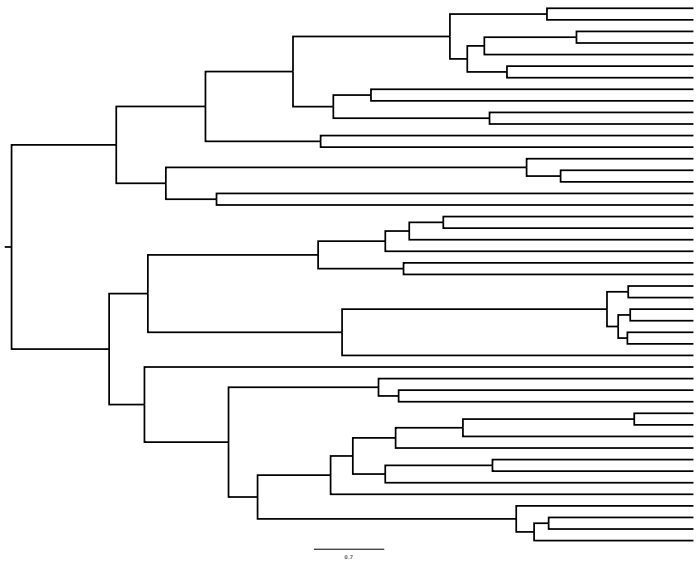



Number of Lineages (log)
0.0
0.5
1.0
1.5
-7
-6
-5
-4
-3
-2
-1
0
Time (millions of years before present)



Declining Diversification Rate Through Time

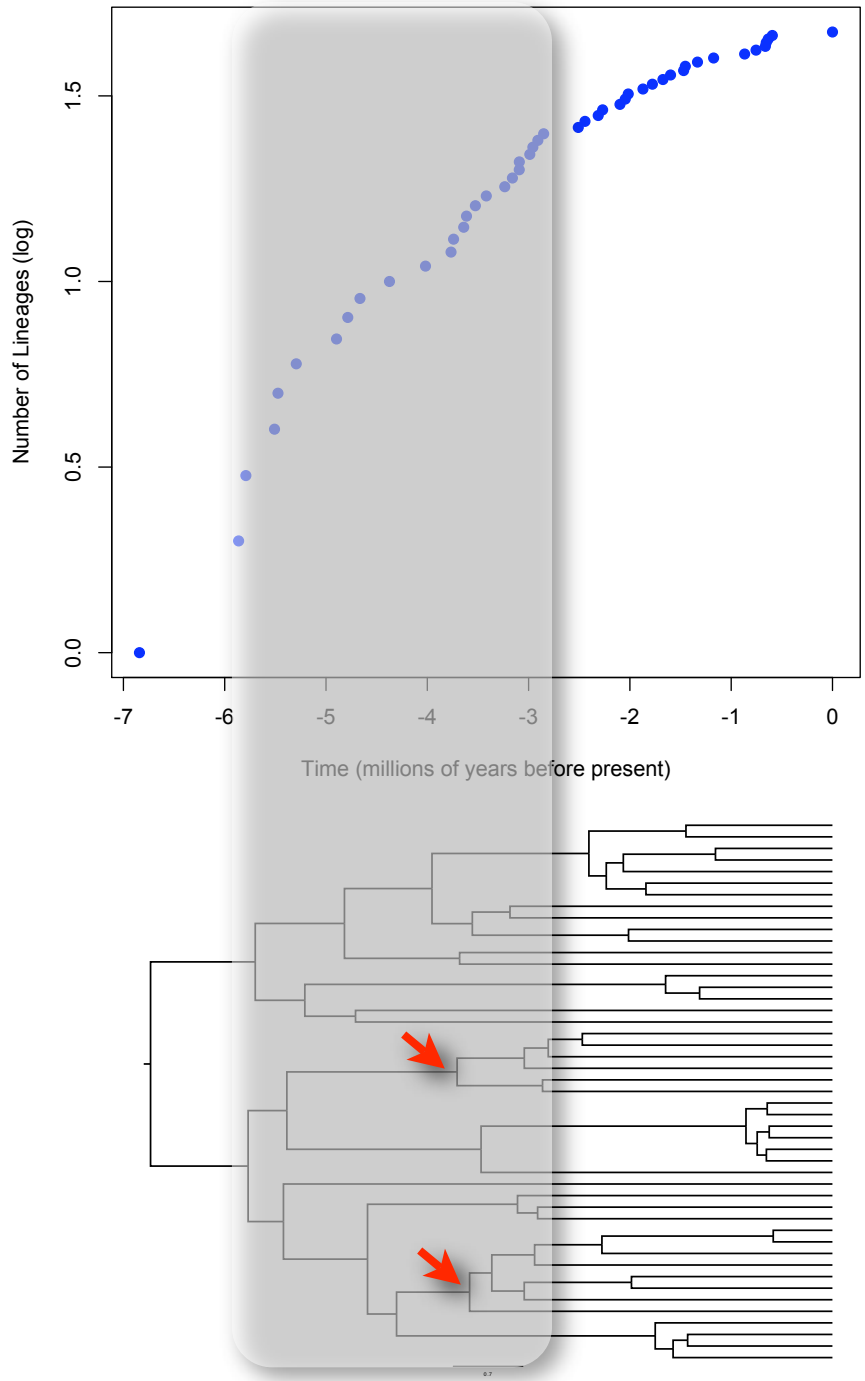




	log likelihood	Δ AIC
DDL	46.24	0
DDE	41.78	8.92
Pure Birth	24.91	40.67

Analyses follow Rabosky & Lovette (2008)

c. 6 - c. 3 m.a.



Net diversification rate:
c. 0.50 events My^{-1}

Waiting time for speciation:
c. 2 My

A Continental (non)Adaptive Radiation ?

Scytalopus Tapaculos
0.5 s * My^{-1}

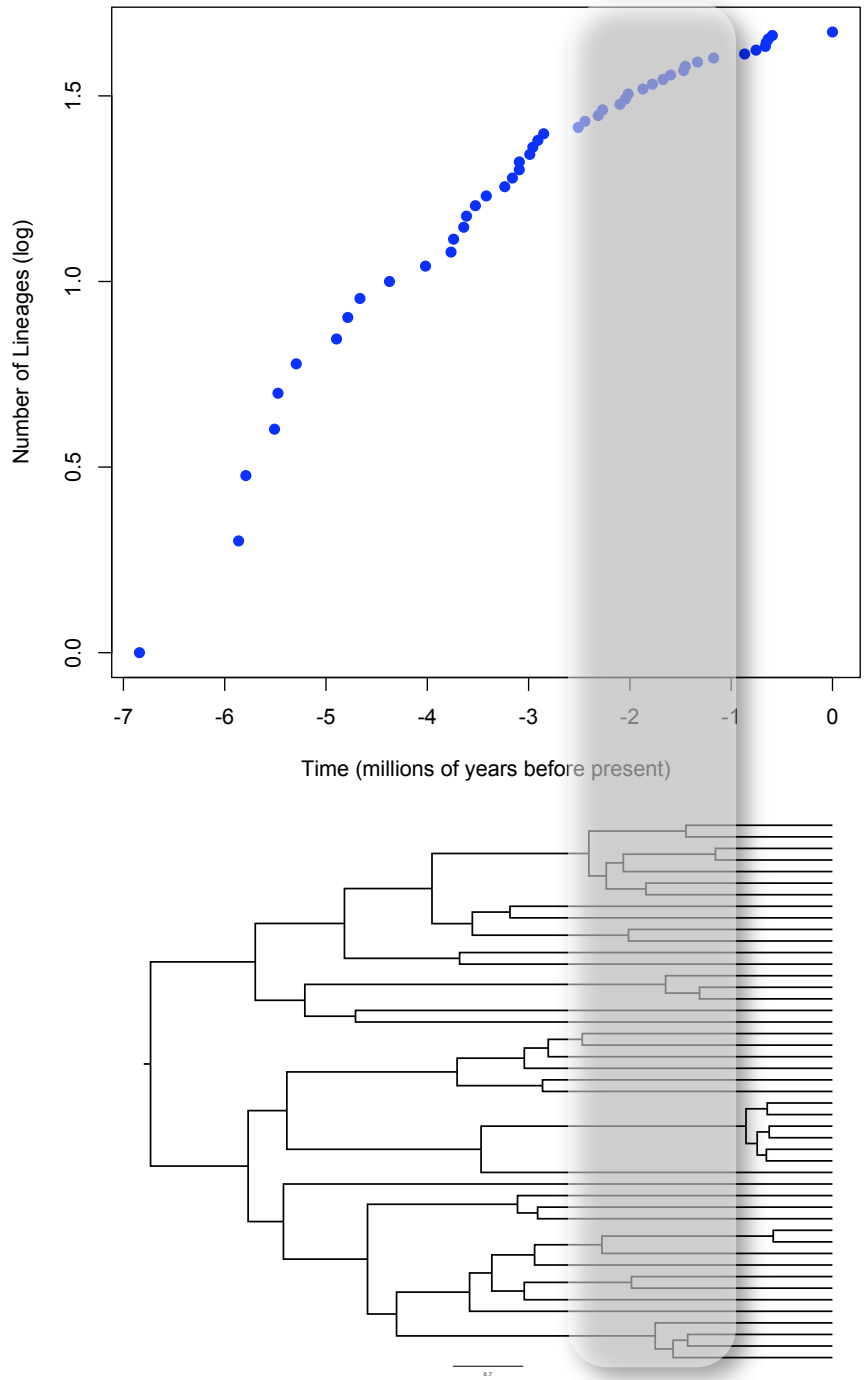
Hawaiian Silverswords
0.56 s * My^{-1}

Baldwin & Sanderson (1998)

Lake Tanganyika Cichlids
0.75-1.49 s * My^{-1}

McCune (1997)

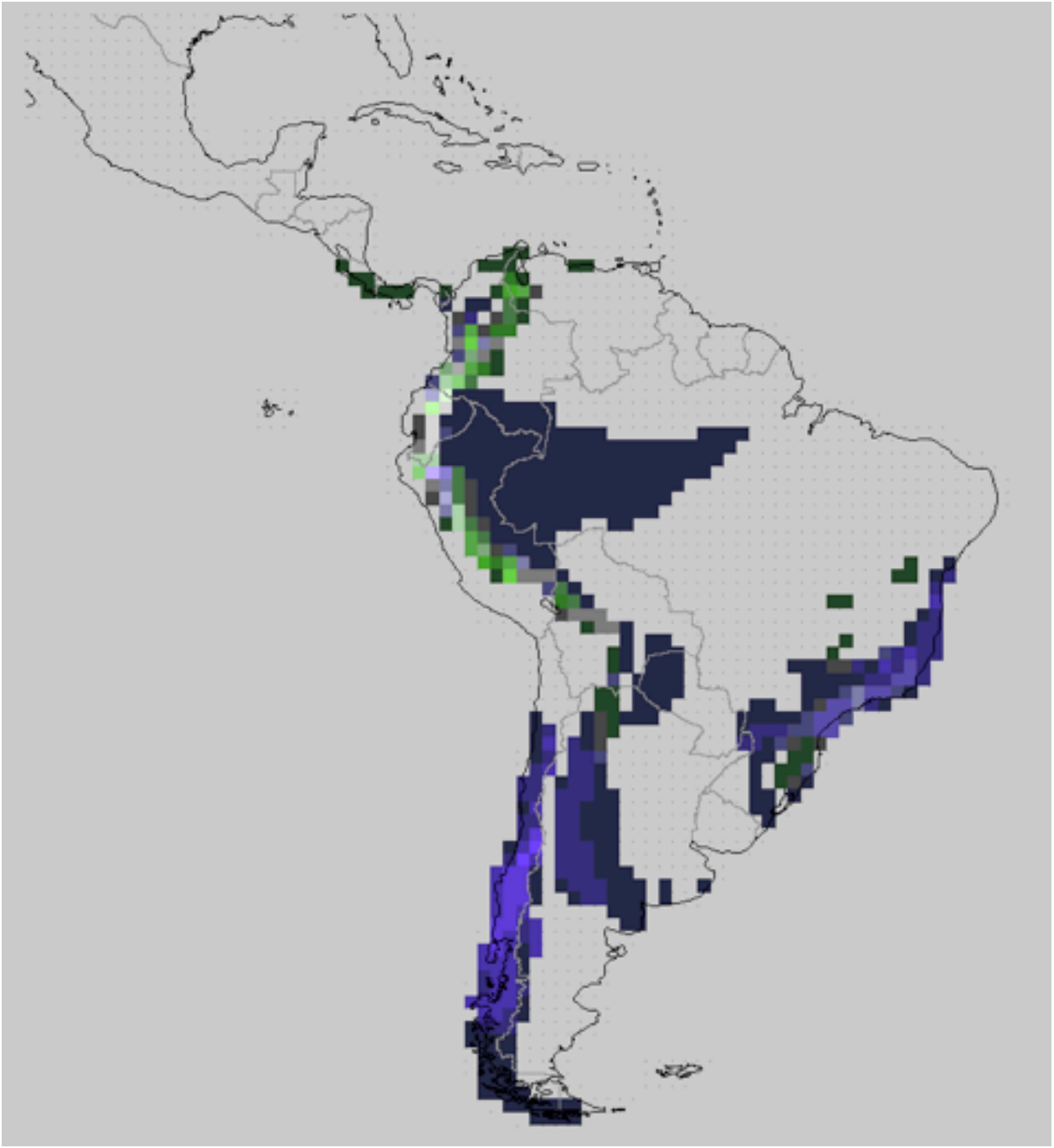
c. 2.5 - c. 1 m.a.



Net diversification rate:
c. 0.25 events My^{-1}

Waiting time for speciation:
c. 4 My

Distribution of Rhinocryptid Diversity and Clade Age



Conclusions

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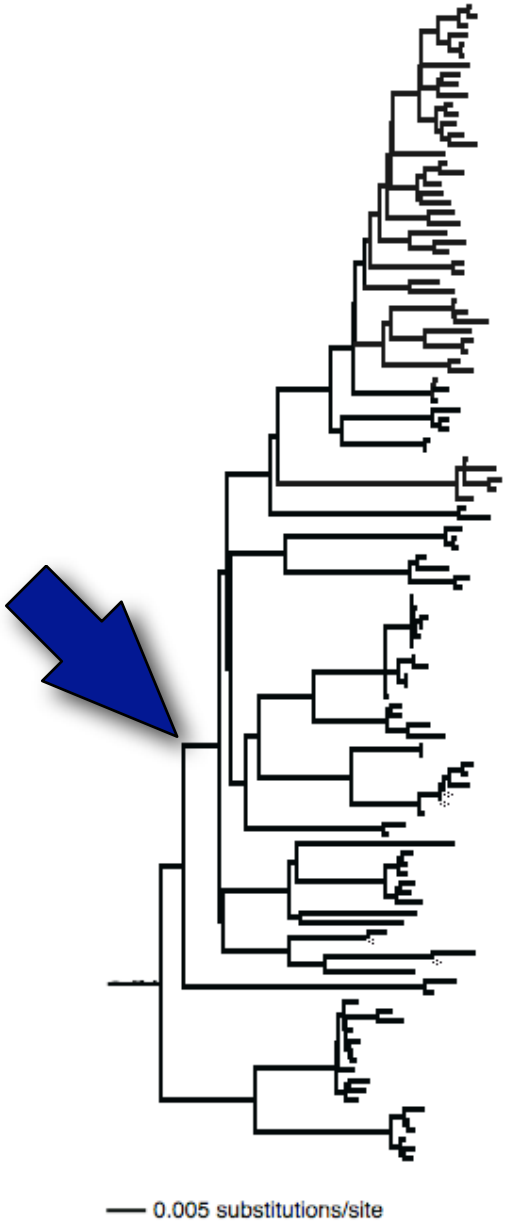
- No evidence for speciation along elevational gradients. Vicariance coupled with low dispersal abilities promotes allopatric differentiation.
- Declining diversification rate through time suggests density-dependent processes (ecological opportunity) controls lineage production
- High Northern Andean diversity augmented by colonization events from southern lineages

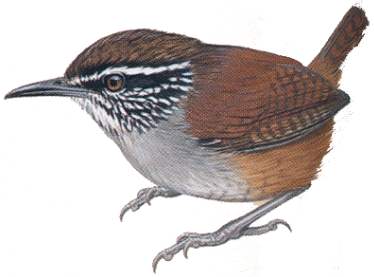
Explosive Diversification After Colonizing the Andes in *Atlapetes*

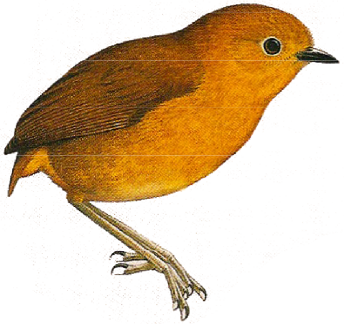
C. D. Cadena, J. Klicka, J. Pérez-Emán



Comparative Phylogeography of Andean Birds

C. D. Cadena, A. Navas, E. Valderrama, F. Velásquez, A. M. Cuervo, J. Pérez, J. Klikca, K. Vargas, M. Isler, T. Chesser





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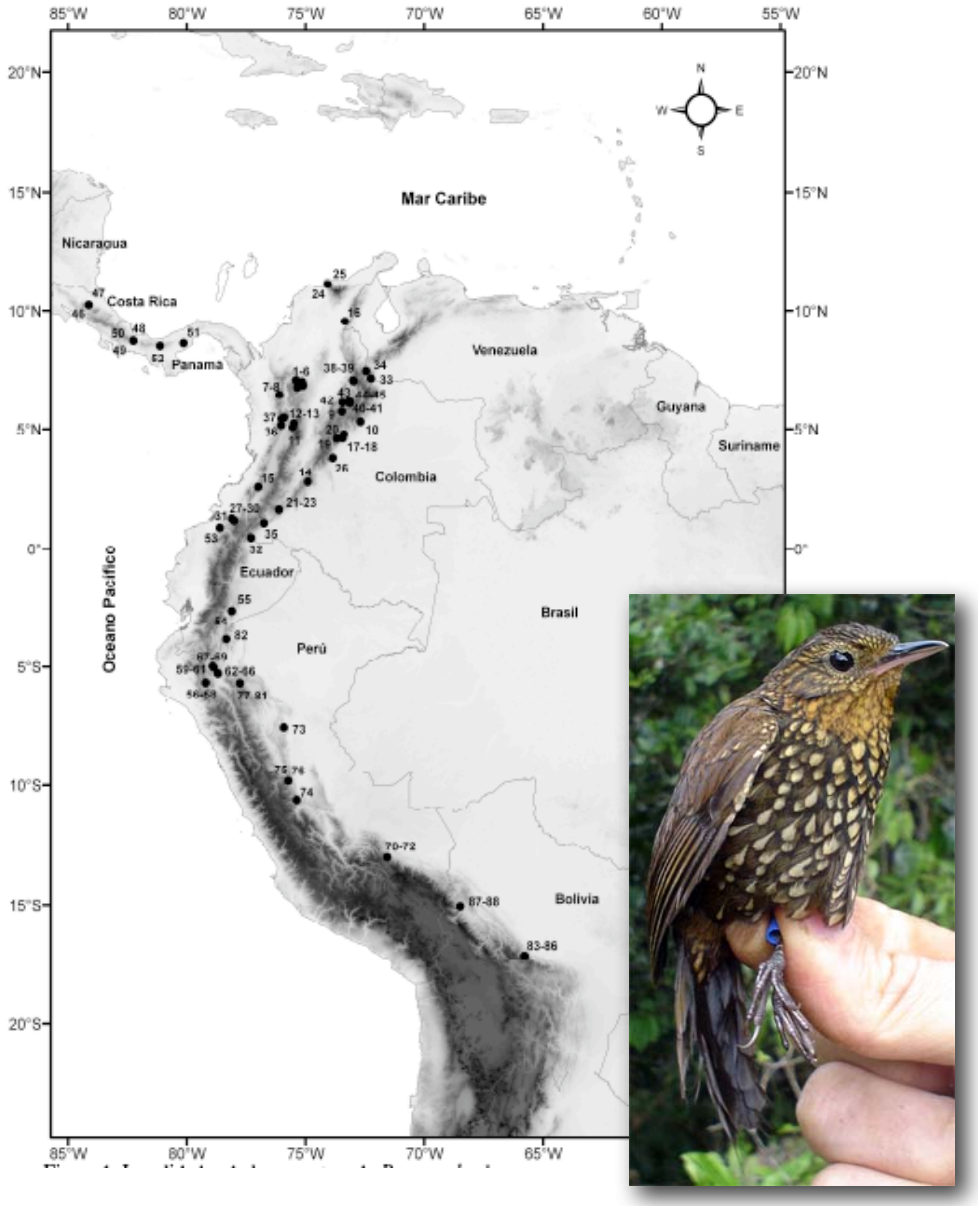

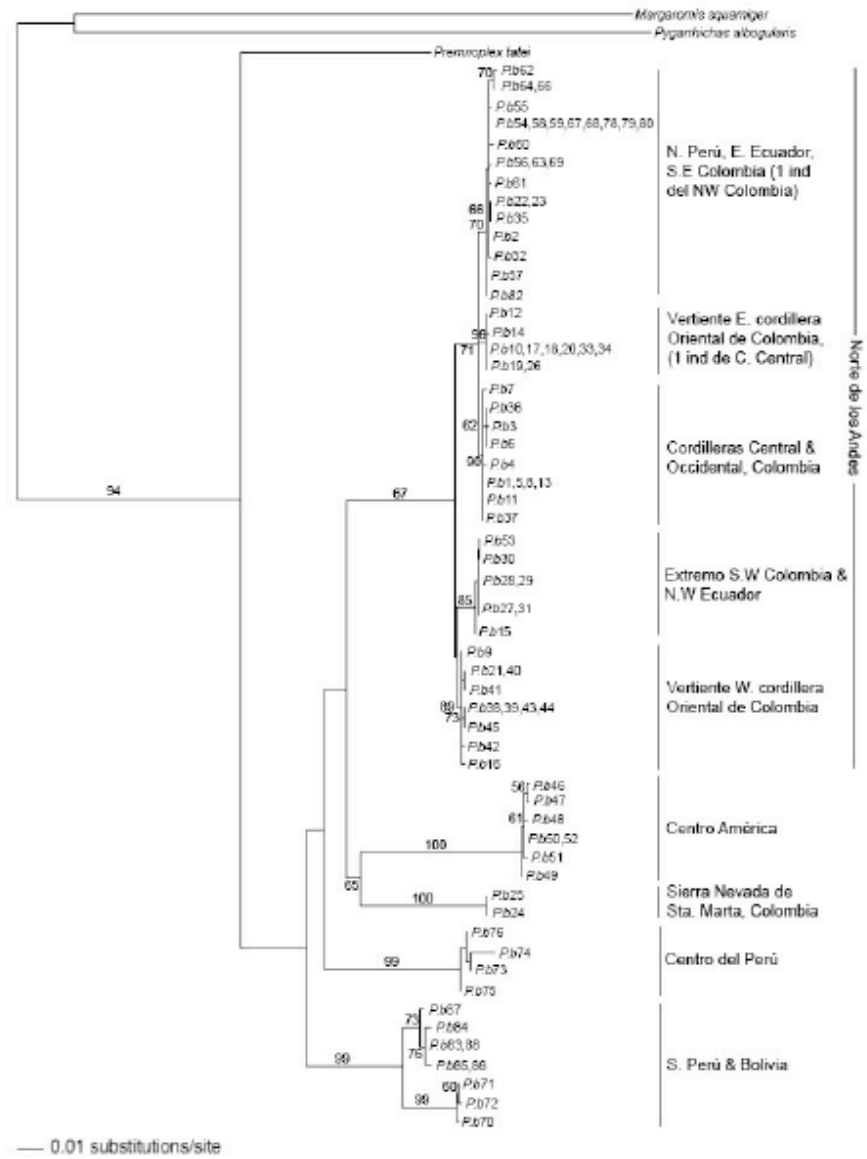

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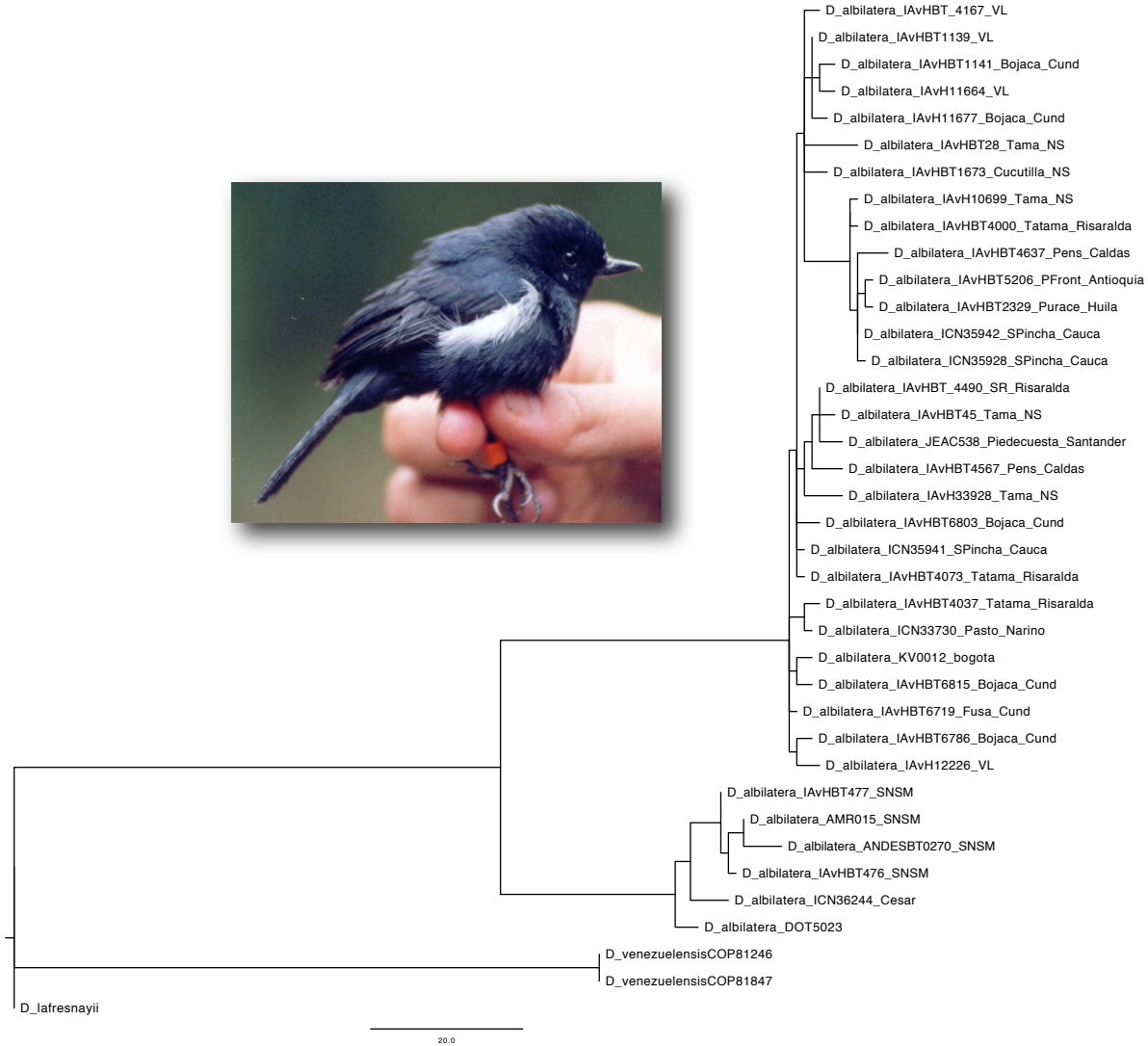
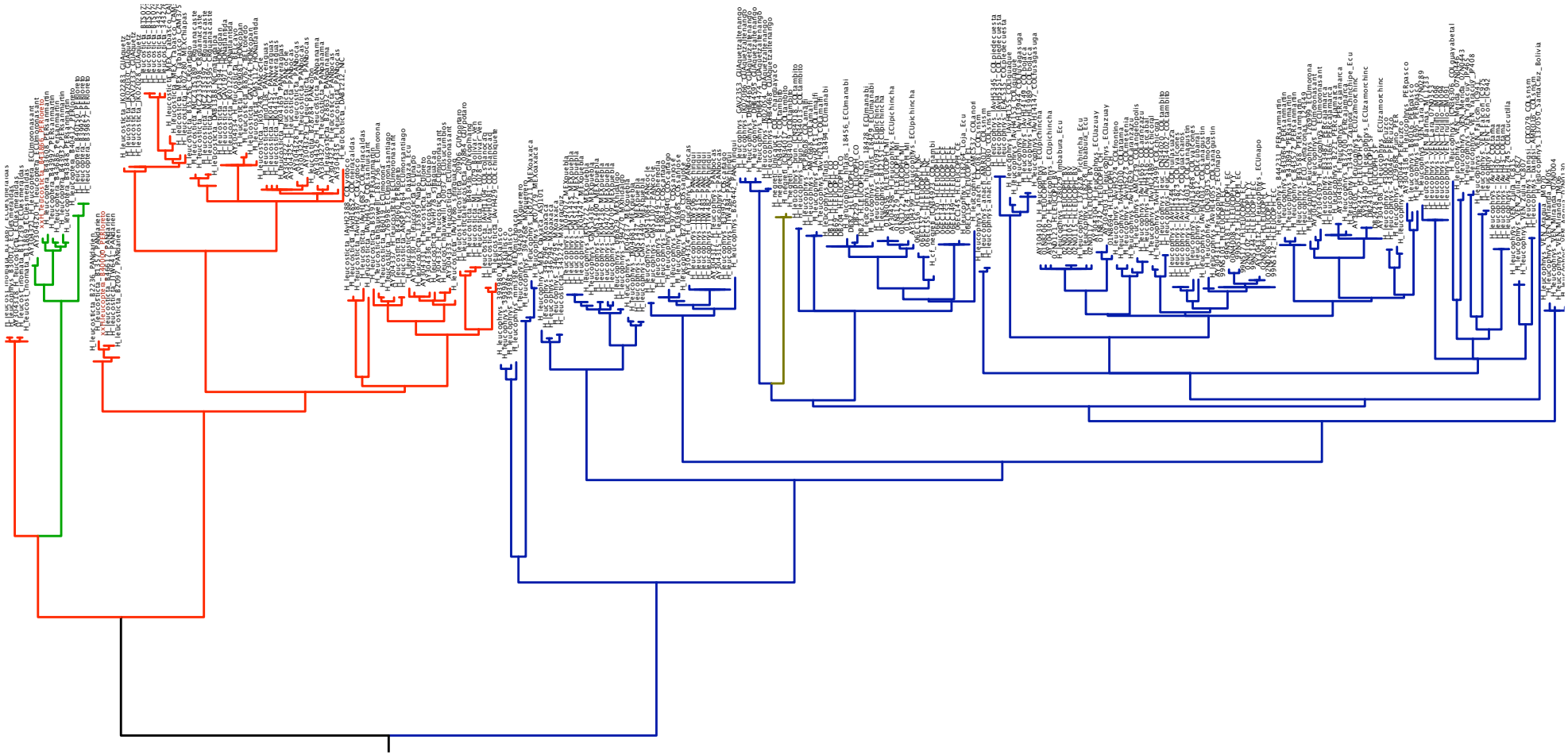


The History of Speciation in *Henicorhina* Wood-Wrens

C. D. Cadena, J. Klicka, J. Pérez-Emán, A. M. Cuervo



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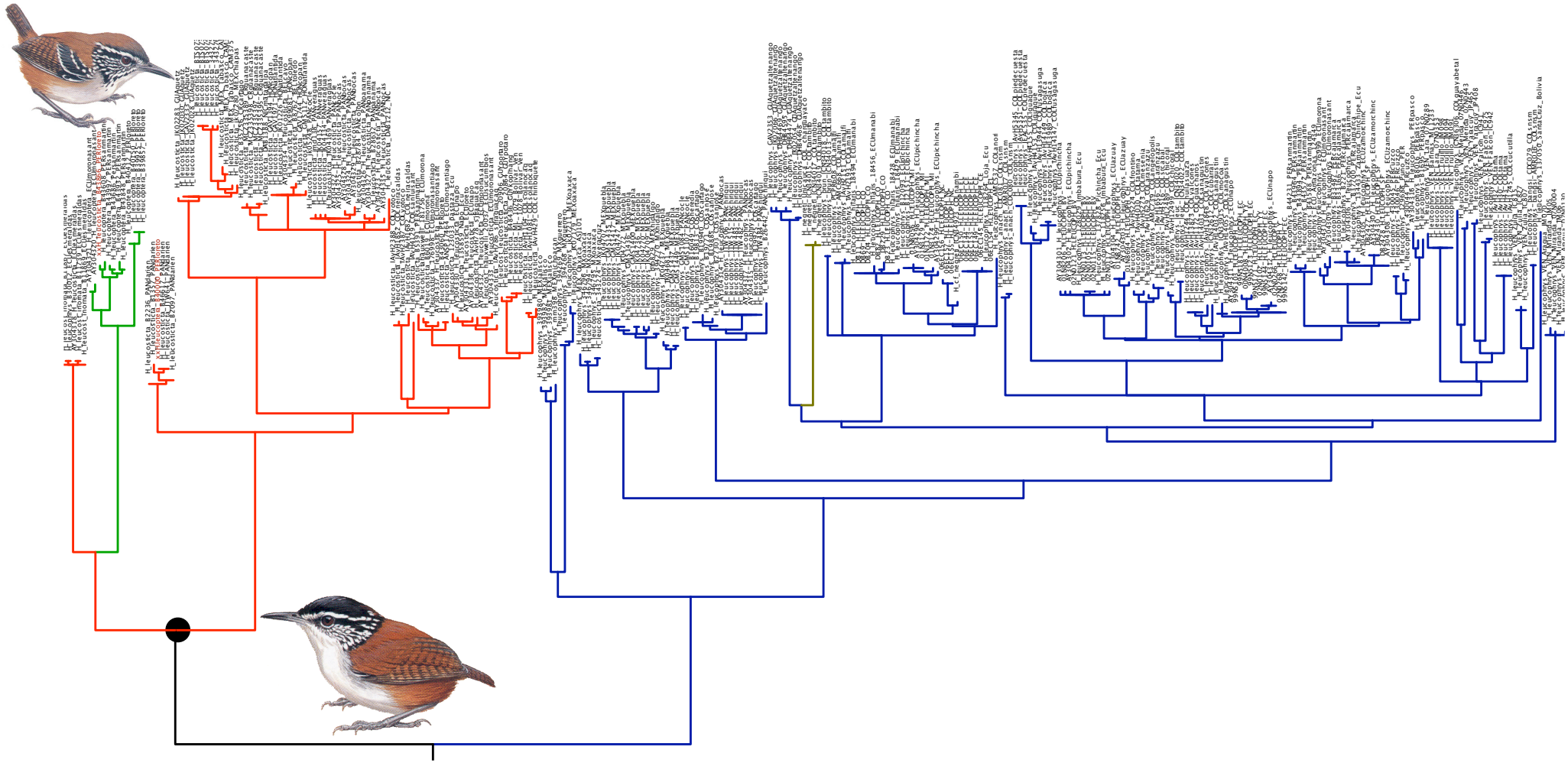

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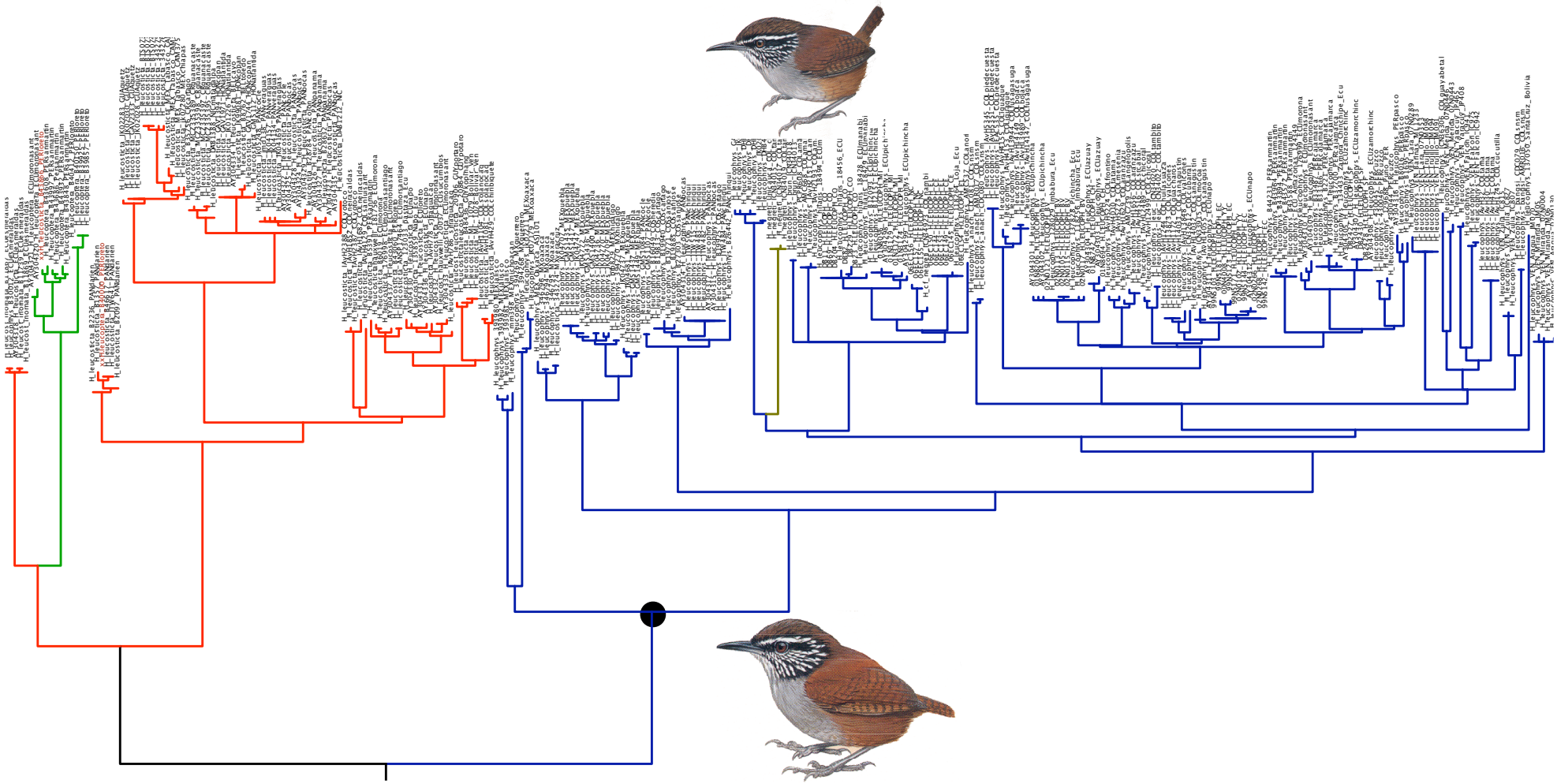

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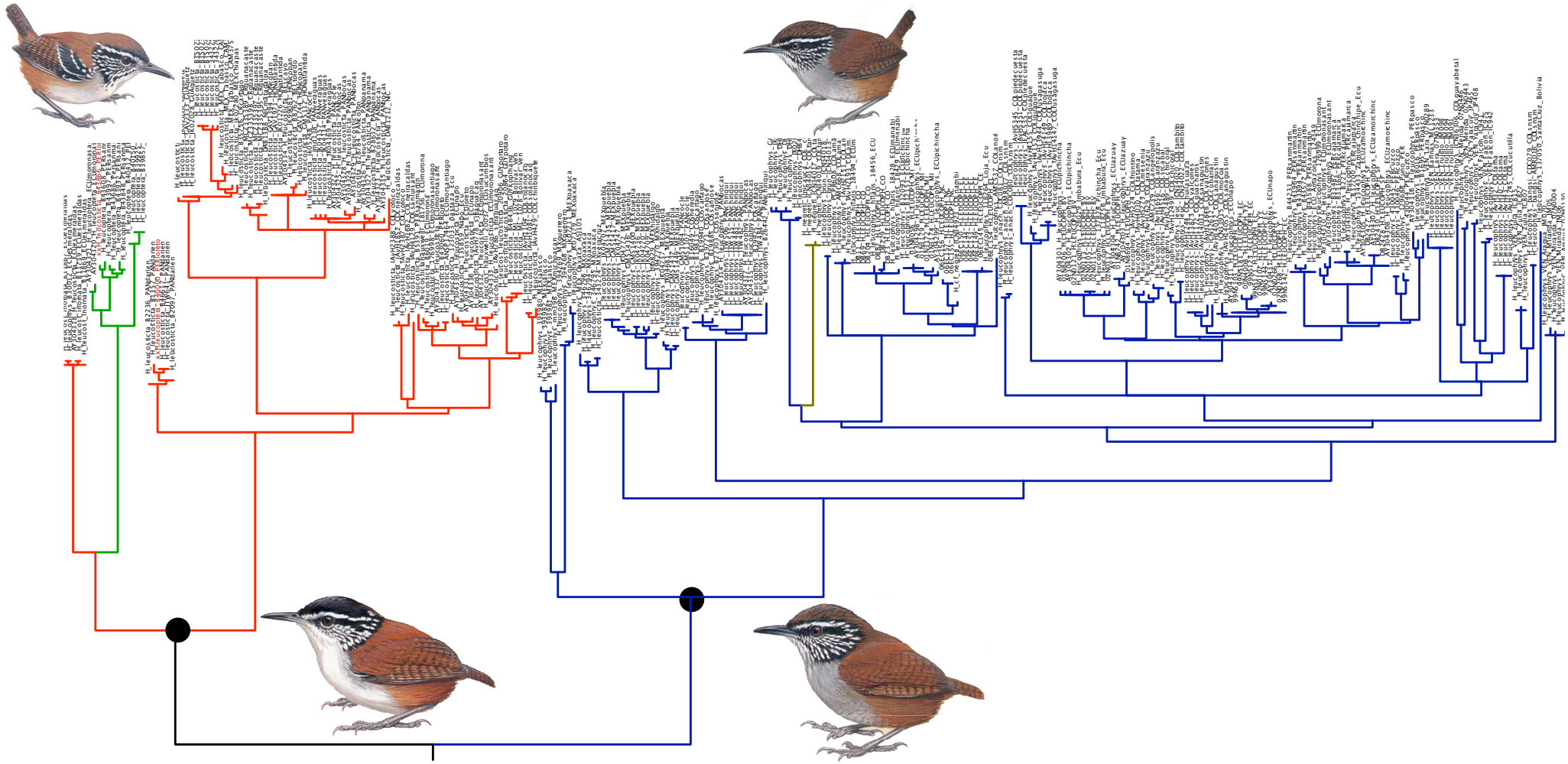

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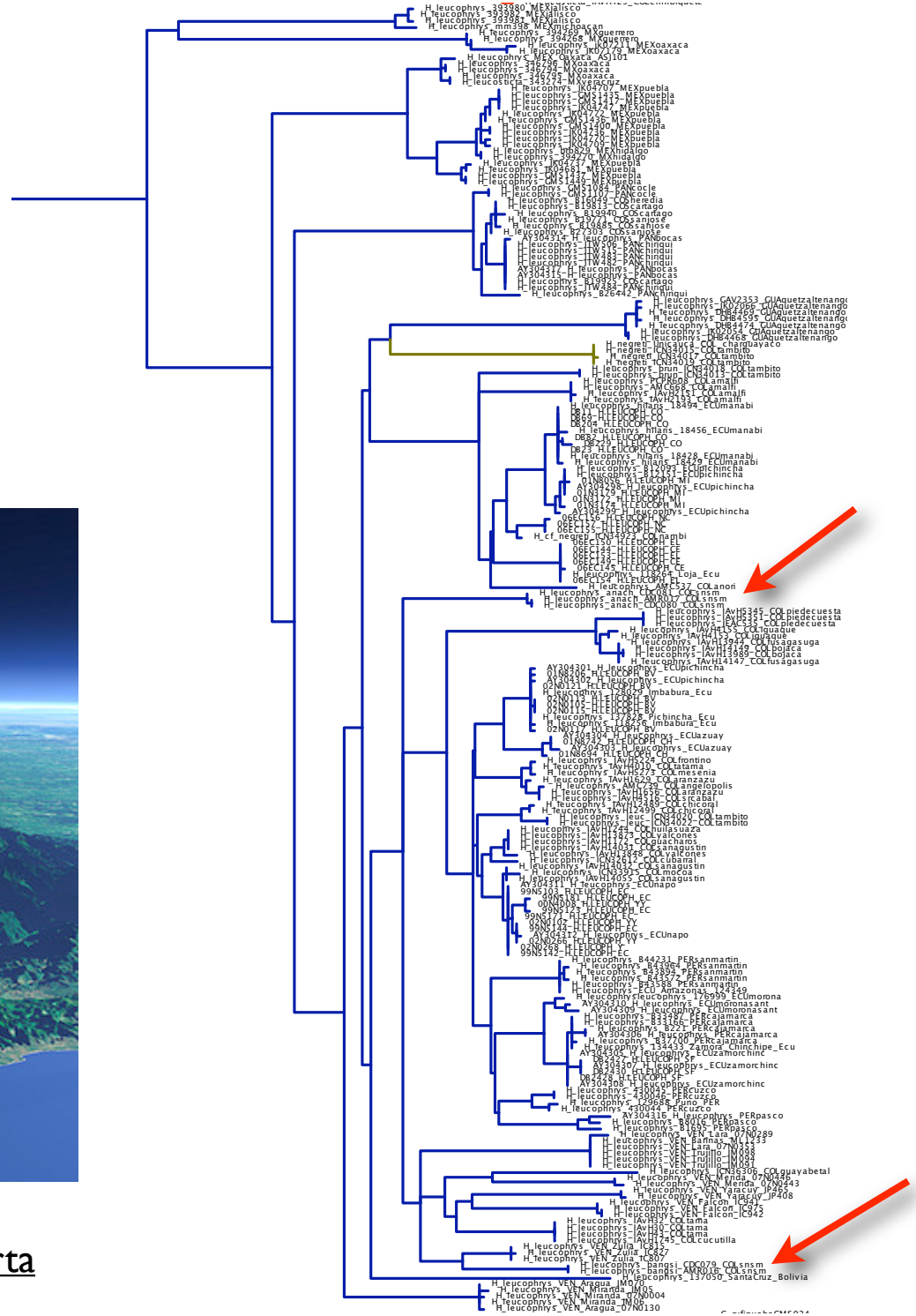

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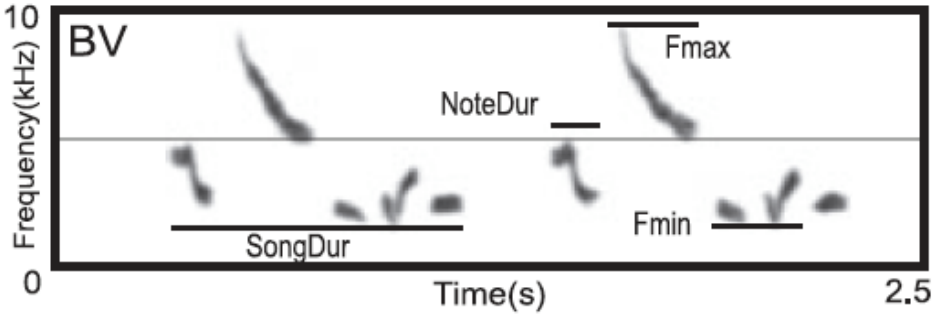
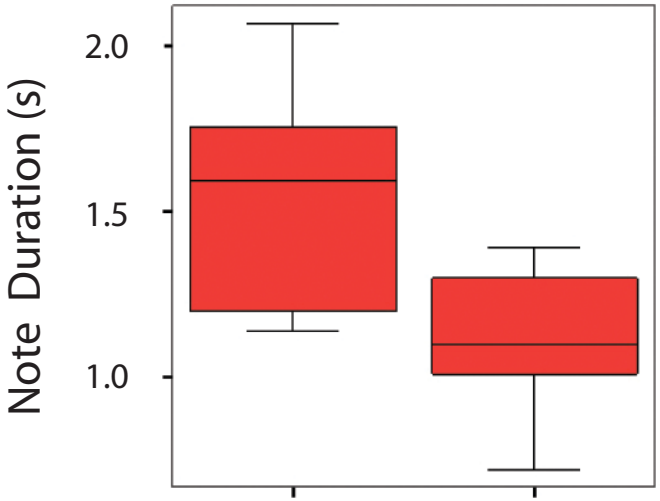

10
BV
Frequency(kHz)
Fmax
NoteDur
Fmin
SongDur
0
Time(s)
2.5


Note Duration (s)
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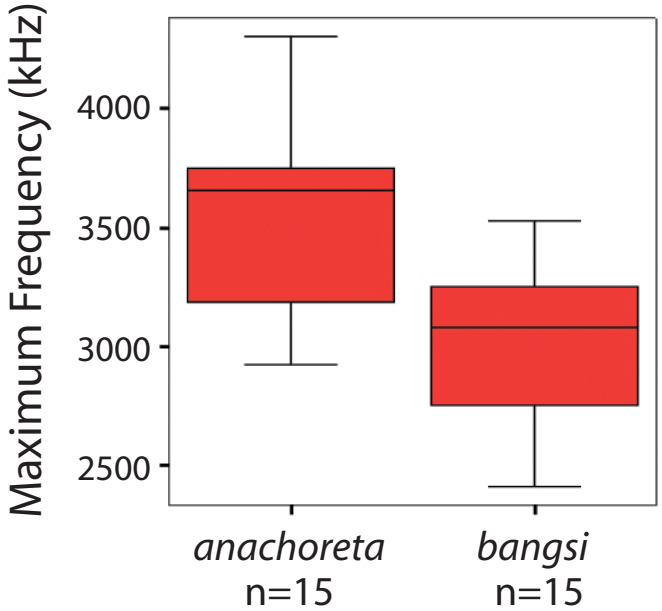
1.0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3500
3000
2500
anachoreta
n=15
bangsi
n=15

Processes Involved in Community Assembly and the Phylogenetic Structure of Assemblages

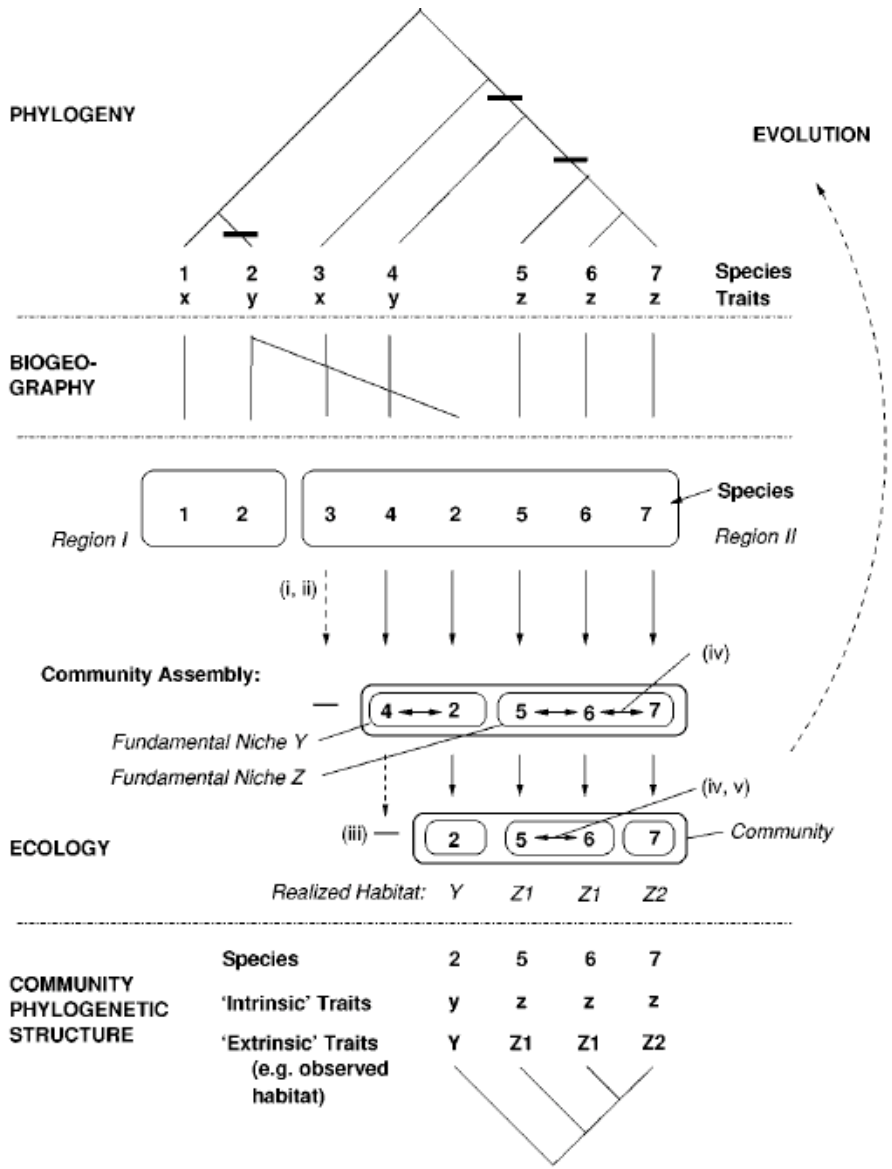


Figure from Webb (2002)

Trait Evolution, Phenotypic Structure and Phylogenetic Structure in Assemblages

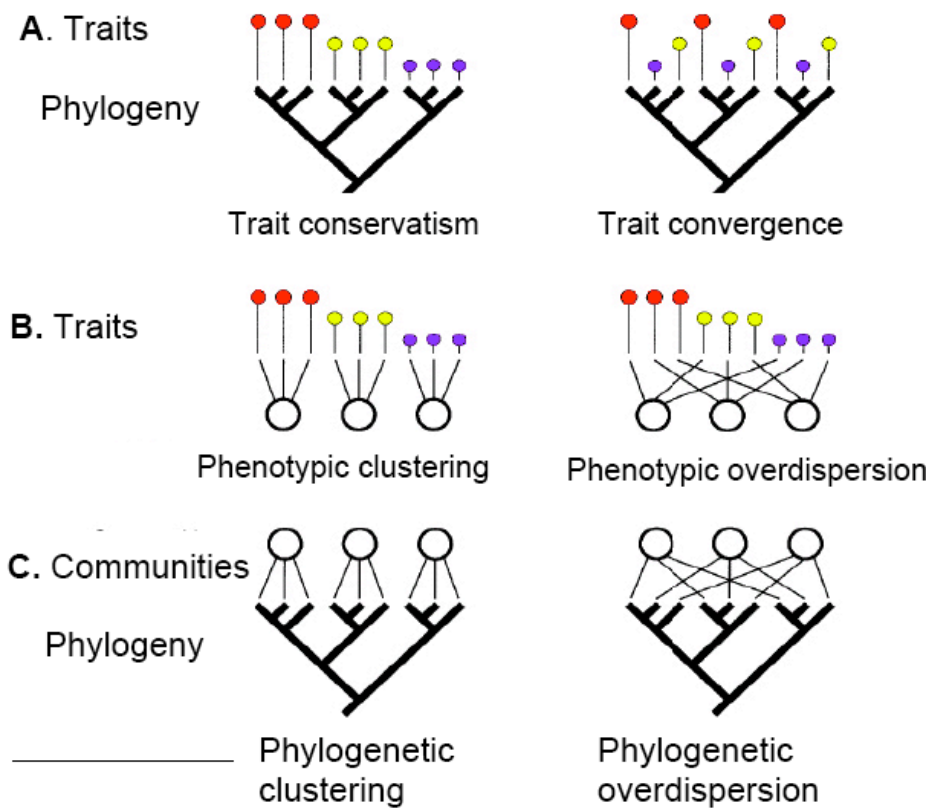


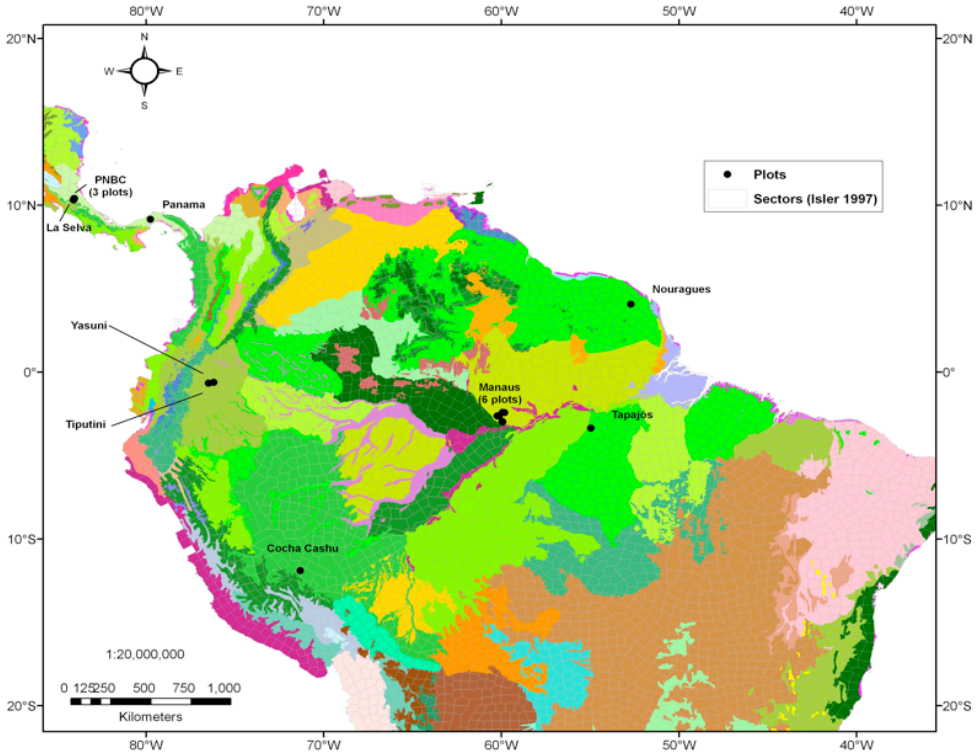
Figure from Graham & Parra

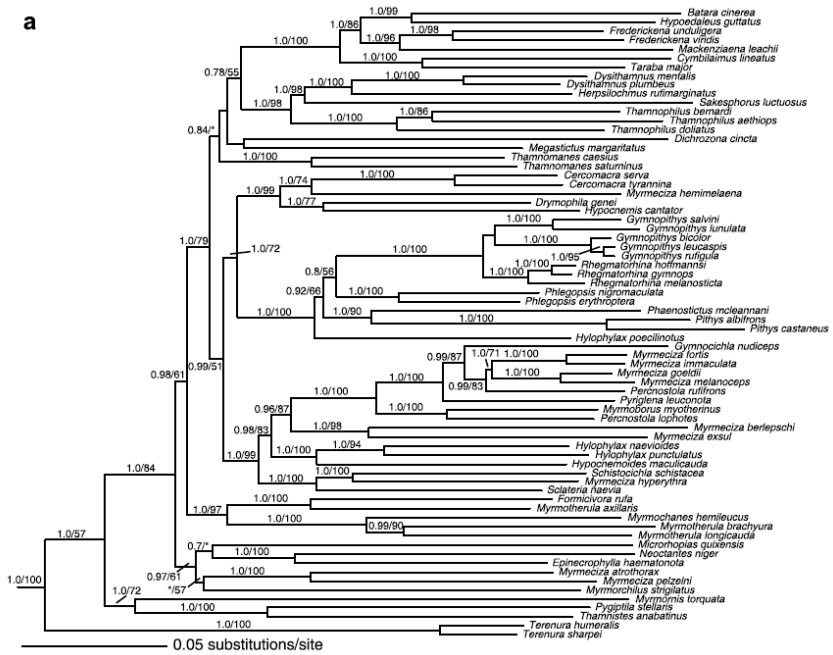
Phylogenetic Structure of Typical Antbird (Thamnophilidae) Assemblages

Juan Pablo Gómez[1], Carlos Daniel Cadena[1], Gustavo A. Bravo[2]

[1]Laboratorio de Biología Evolutiva de Vertebrados, Departamento de Ciencias Biológicas, Universidad de los Andes, Bogotá - Colombia; *E-mail*: ju-gome2@uniandes.edu.co

[2] Museum of Natural Science, Louisiana State University





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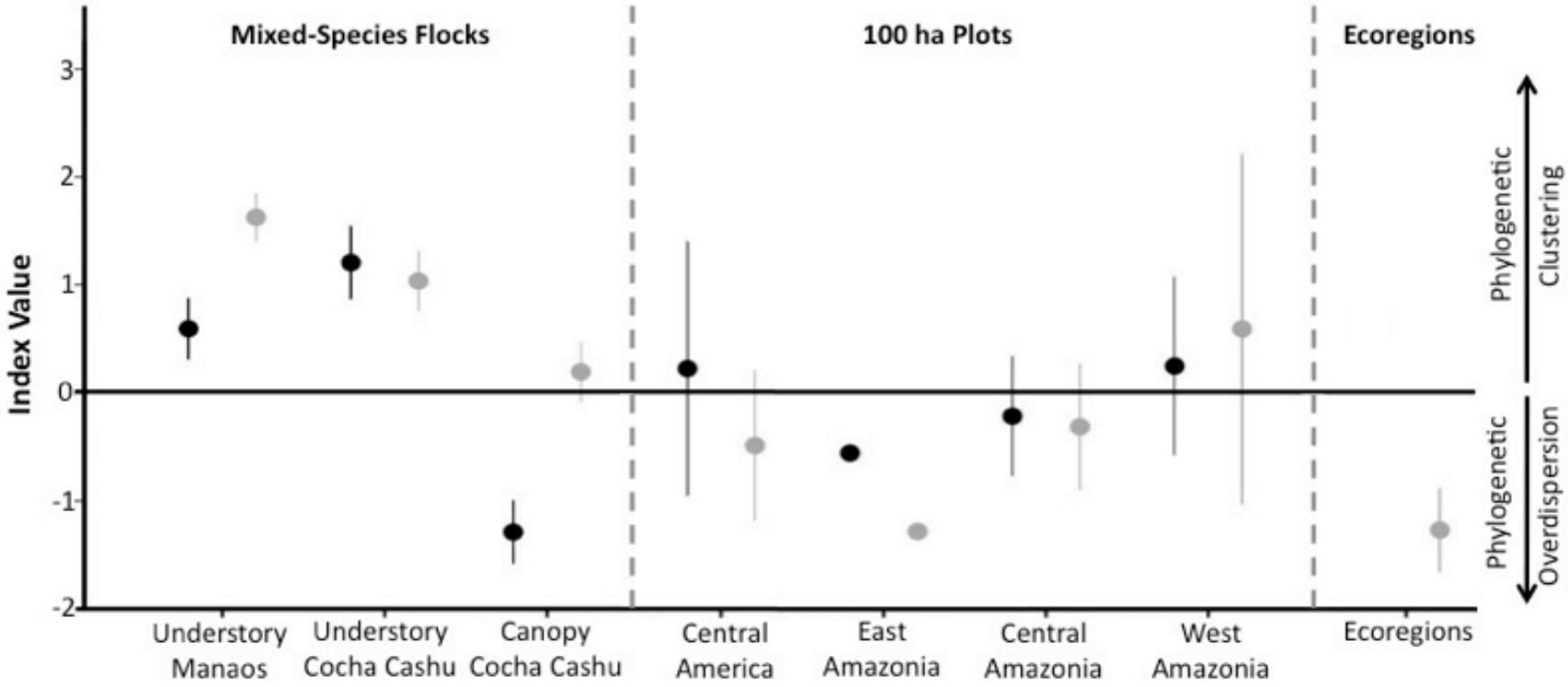
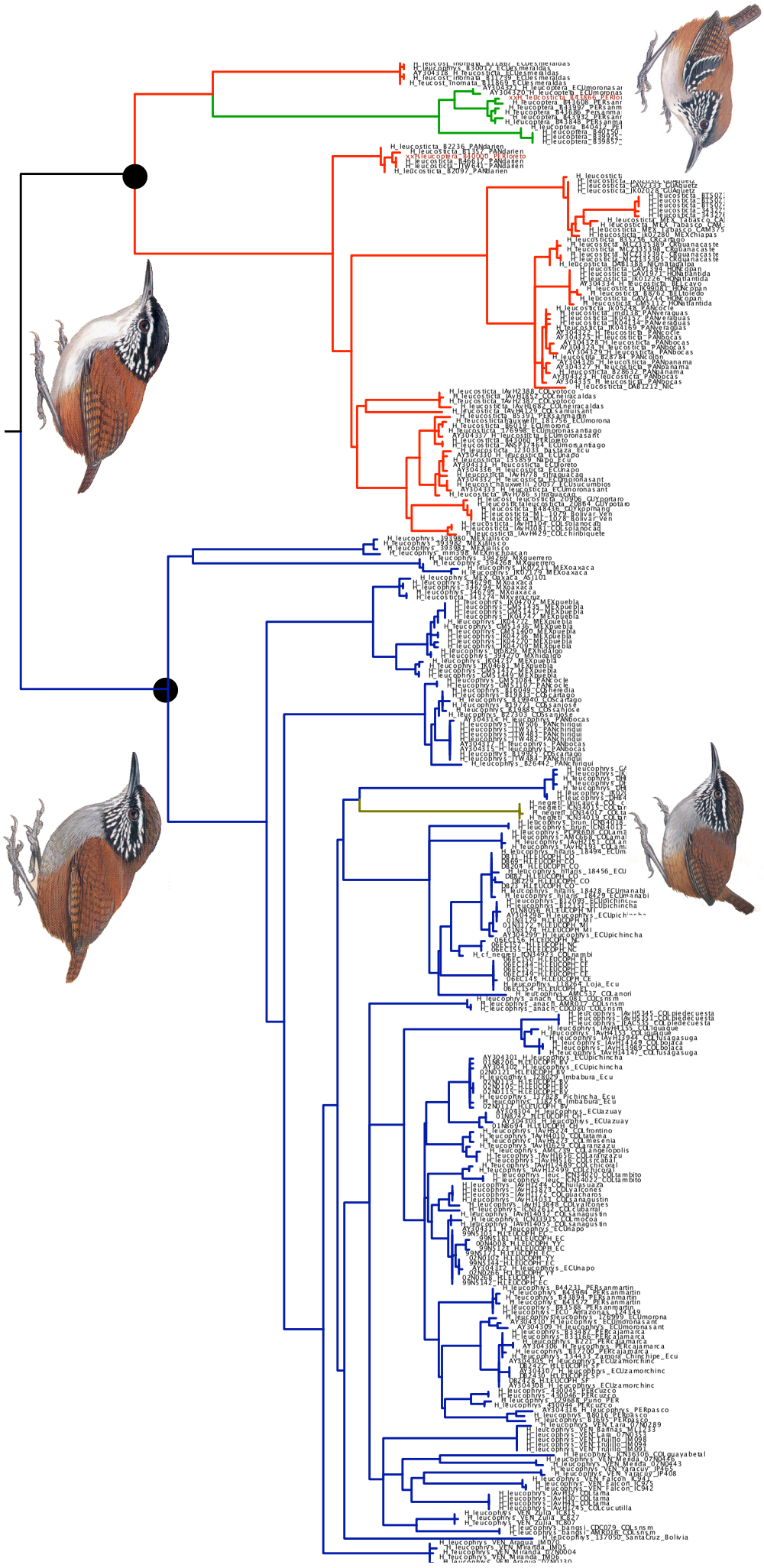
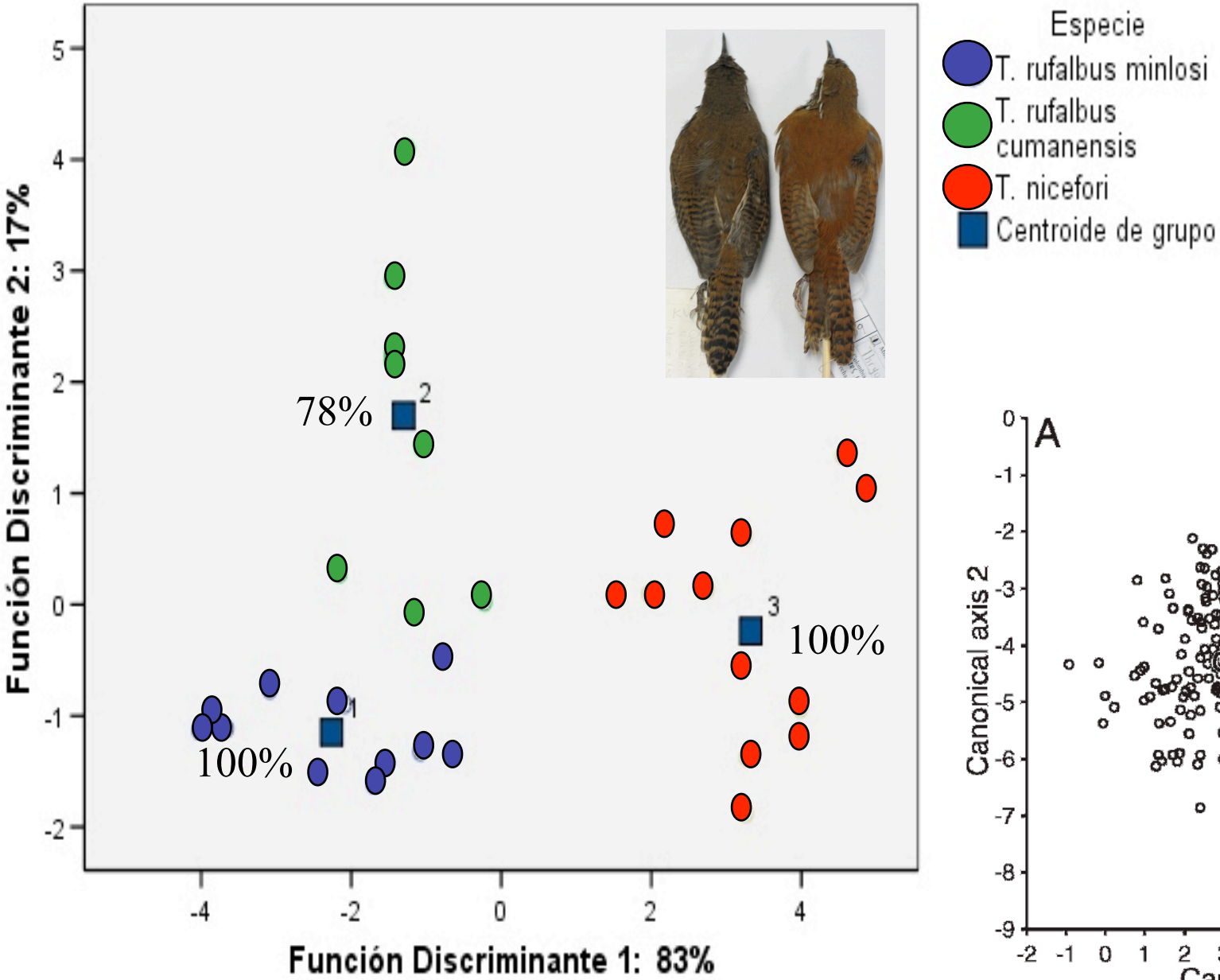
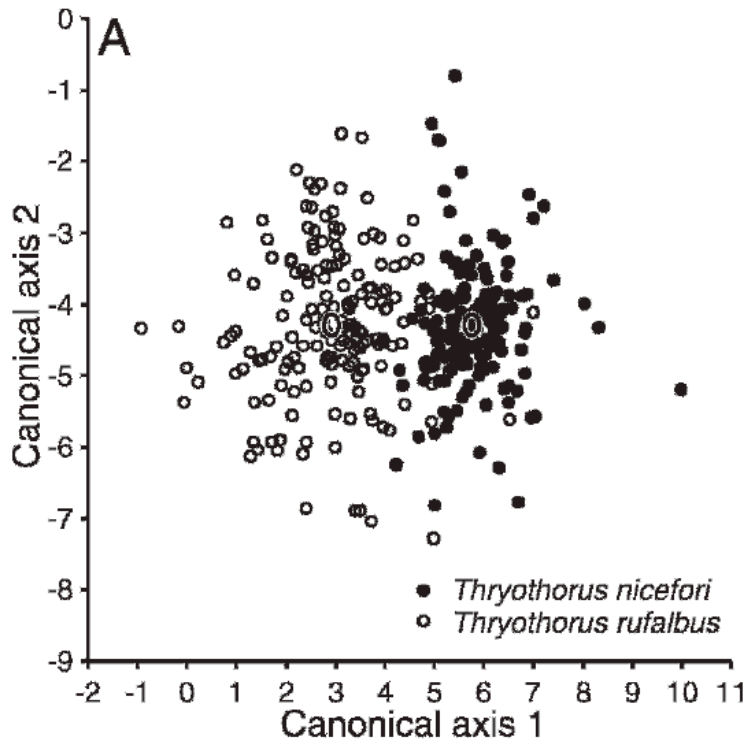


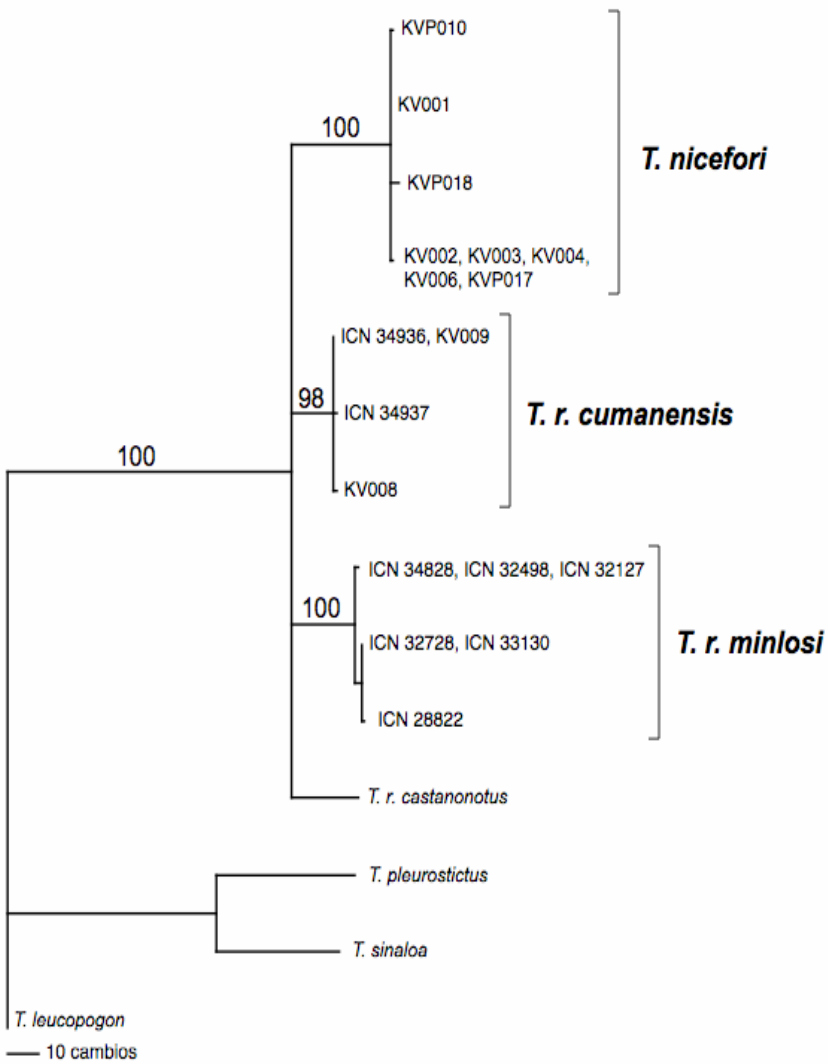


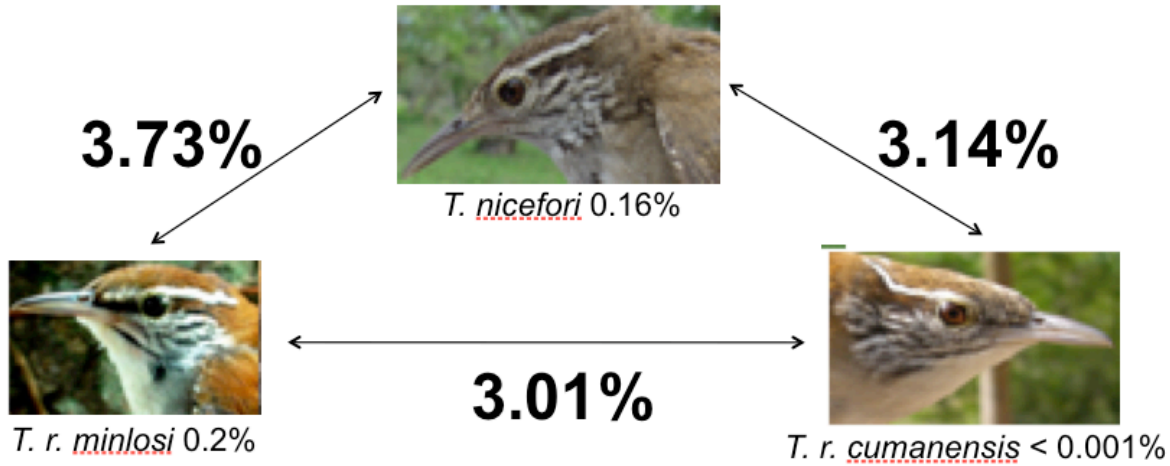
Thryothorus nicefori is Phenotypically and Vocally Distinct



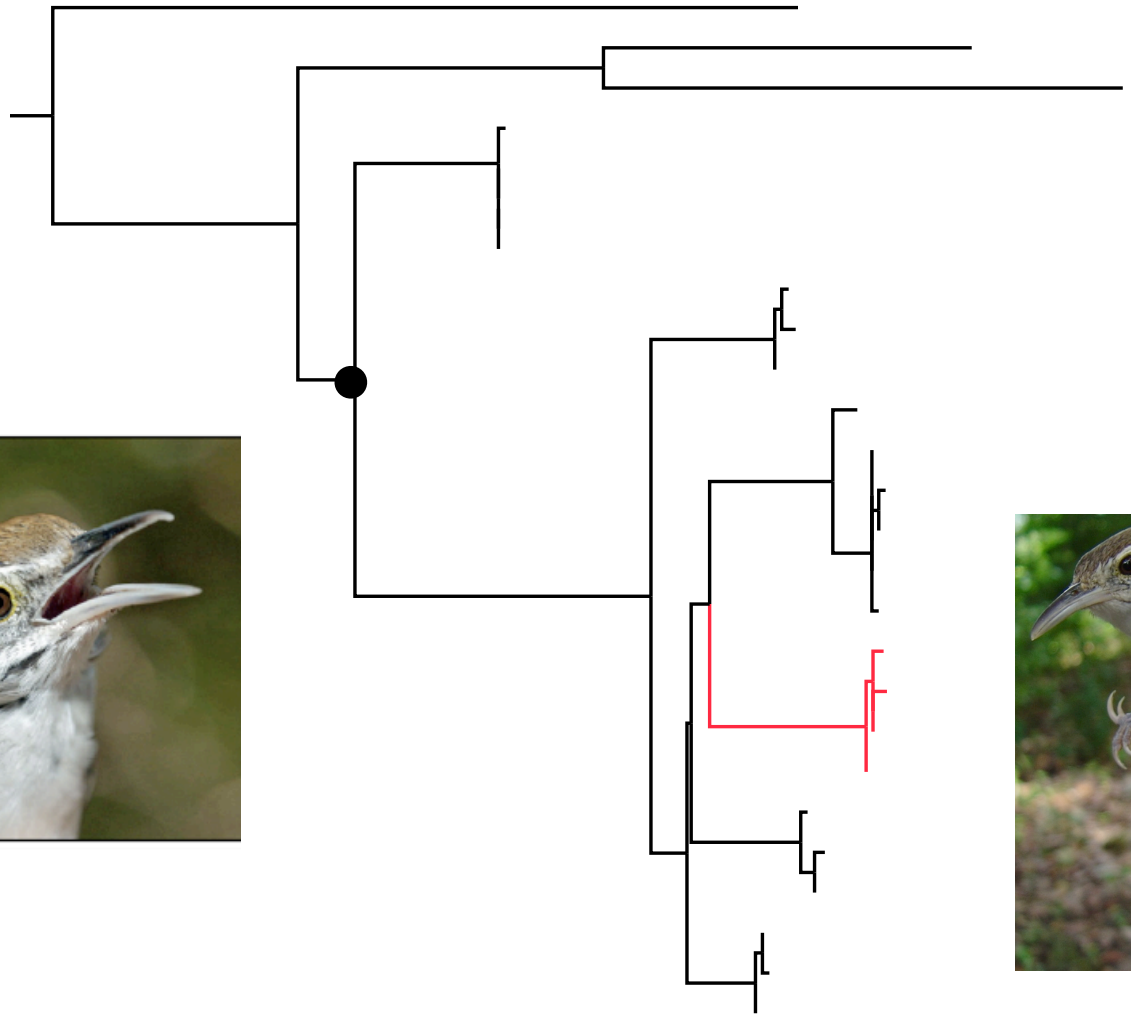


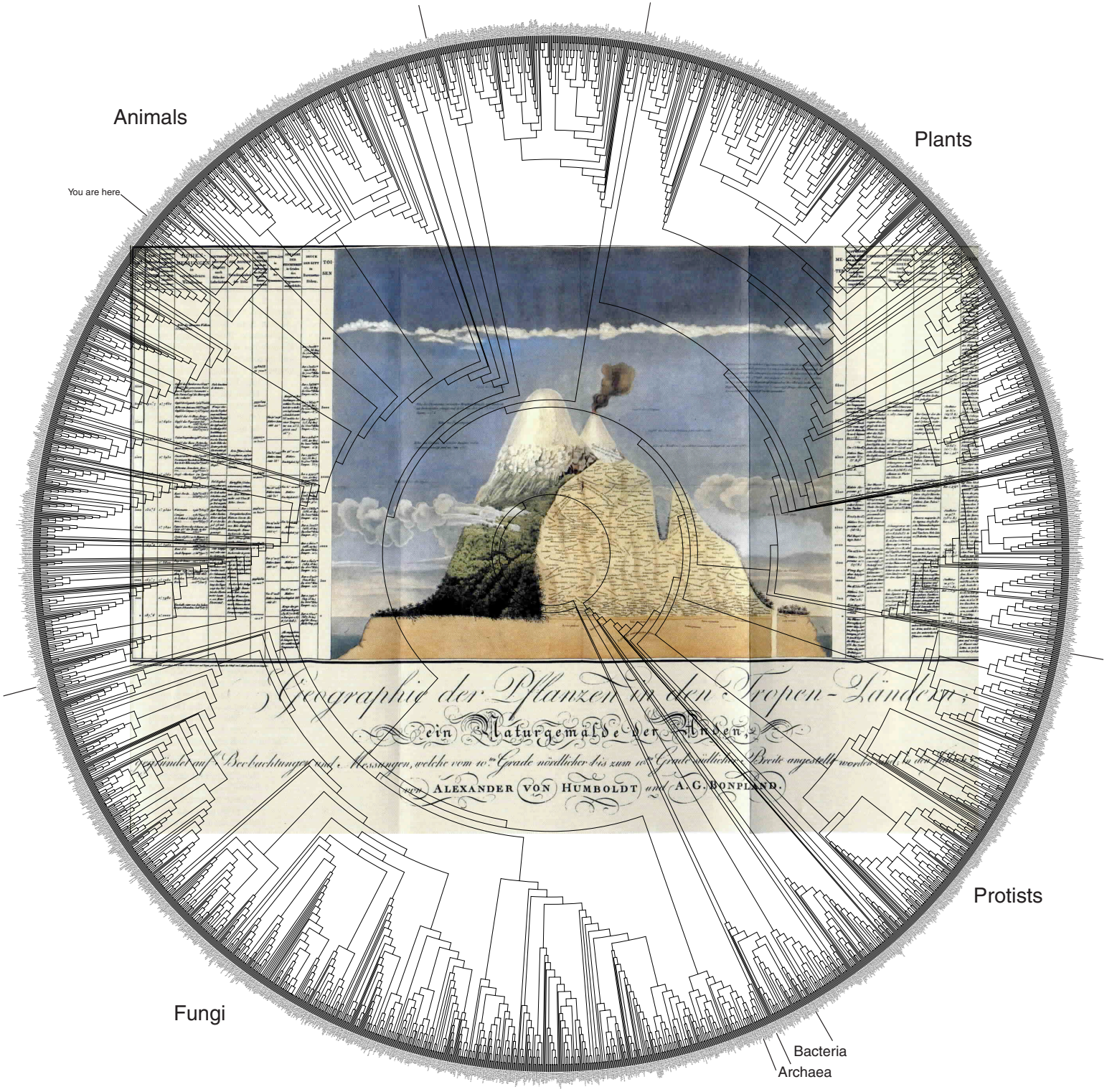
Thryothorus nicefori is Genetically Distinct





Thryothorus nicefori is nested within *T. rufalbus*




Animals
Plants
You are here
Geographie der Pflanzen in den Tropen-Ländern,
ein Naturgemälde der Anden,
gegründet auf Beobachtungen und Messungen, welche vom 10ten Grade nördlicher bis zum 10ten Grade südlicher Breite angestellt worden
von ALEXANDER VON HUMBOLDT und A. G. BONPLAND.
Protists
Fungi
Bacteria
Archaea

AMNH
ANSP
COP
FLMNH
FMNH
IAvH
IB-UNAM
ICN
LNS
KU
LSUMZ
MBM
MCZ

MLS
MUSM
MVZ
QU
UCR
USNM
UMBM
UV-MHN
UWBM
WFVZ
YPM
ZMUC