

*Biota International Symposium on Phylogeography*



**Comparative phylogeography of Atlantic Forest birds  
Filogeografia comparada de aves da Mata Atlântica**

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# Biomias neotropicais

- Florestas
  - Mata Atlântica
  - Floresta Amazônica
  - Floresta de terras baixas a oeste dos Andes
- Separação por vegetação seca
  - Diagonal seca (Chaco, cerrado e caatinga)
  - Norte (Llanos)



## Alta diversidade

Quais os processos que a geraram?

Qual a relação entre os biomas?

Existem padrões biogeográficos?

# Mata Atlântica

Brasil, Argentina e Paraguai

Isolada das demais florestas da AS

Hoje: 11% a 16% da cobertura

Elevação: 0 a 1700 m

Latitude: 1° a 30°

Vegetação seca a úmida



Um dos 5 *hotspots* de biodiversidade

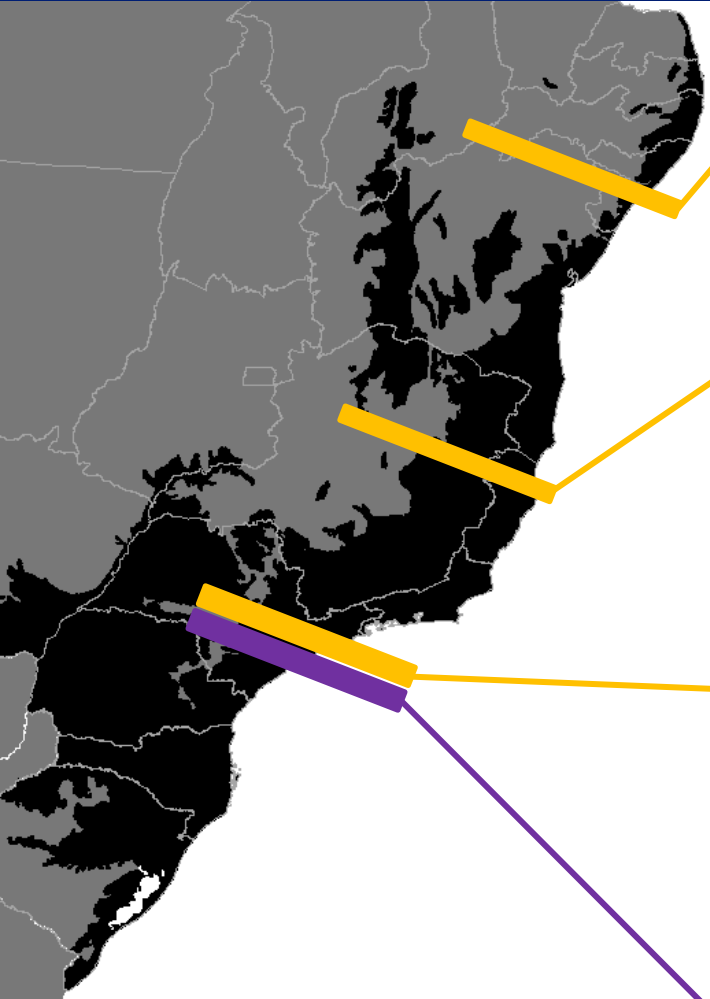
Muitas espécies endêmicas

# Mata Atlântica

Existem padrões biogeográficos gerais?  
Quais os processos que geraram sua alta diversidade?



# Filogeografia de organismos da Mata Atlântica







Lucas Grandinetti  
 Miguel Ridrigues  
 Germano Woehl

*Hypsiboas semilineatus*  
 Carnaval et al., 2009

*H. albomarginatus*  
 Carnaval et al., 2009

*Hyla faber*  
 Carnaval et al., 2009





Lucas Grandinetti  
 Miguel Ridrigues  
 Germano Woehl

*Hypsiboas semilineatus*  
 Carnaval et al., 2009

*H. albomarginatus*  
 Carnaval et al., 2009

*Hyla faber*  
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 Carnaval et al., 2009

*Hyla faber*  
 Carnaval et al., 2009



Luciano Costa

*Melipona quadrifasciata*  
 Batalha-Filho et al. in press



www.ufrgs.br

*Bothrops jararaca*  
 Graziotin et al., 2006



Carlos Rivero

*Cerdocyon thous*  
 Tchaicka et al., 2007



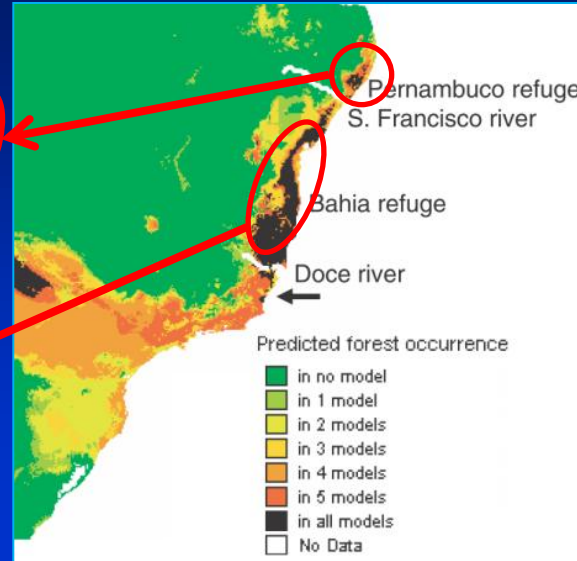
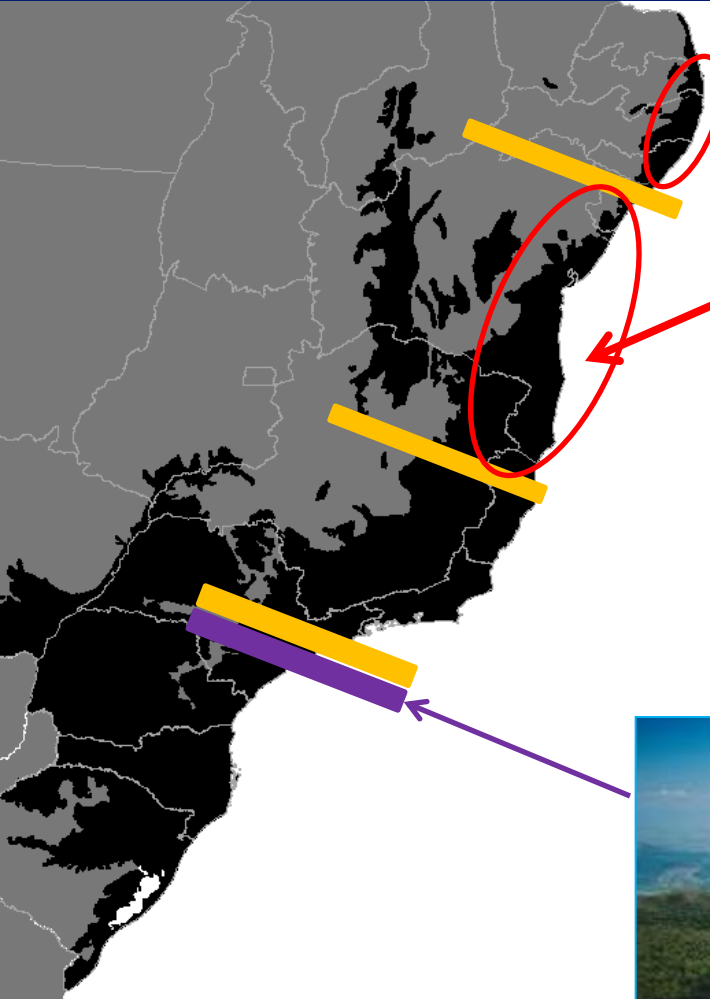
Ryan photographic

*Desmodus rotundus*  
 Martins et al., 2010

Pleistocene

Pre-Pleistocene

# Possíveis processos causadores das quebras



Florestas estáveis no Pleistoceno  
Carnaval & Moritz, 2008



Dinâmica geológica no Quaternário  
(ex. vale do rio Paraíba do Sul;  
Silva & Straube, 1996)

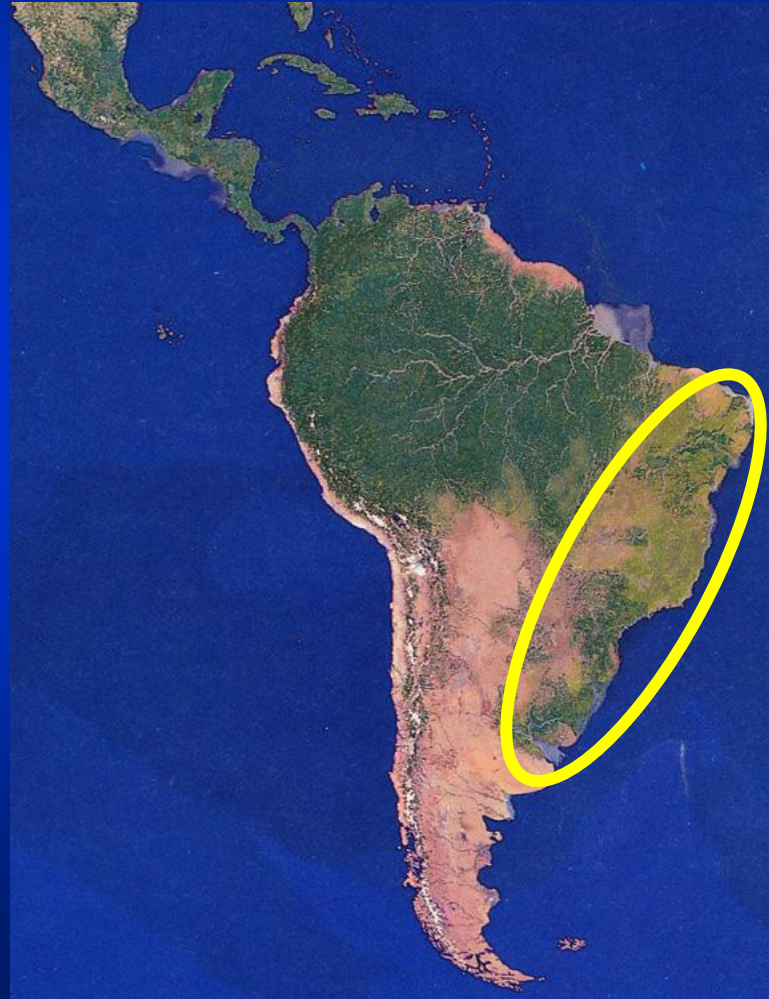


Rios  
(Pellegrino *et al.*, 2005)

# Aves como modelos

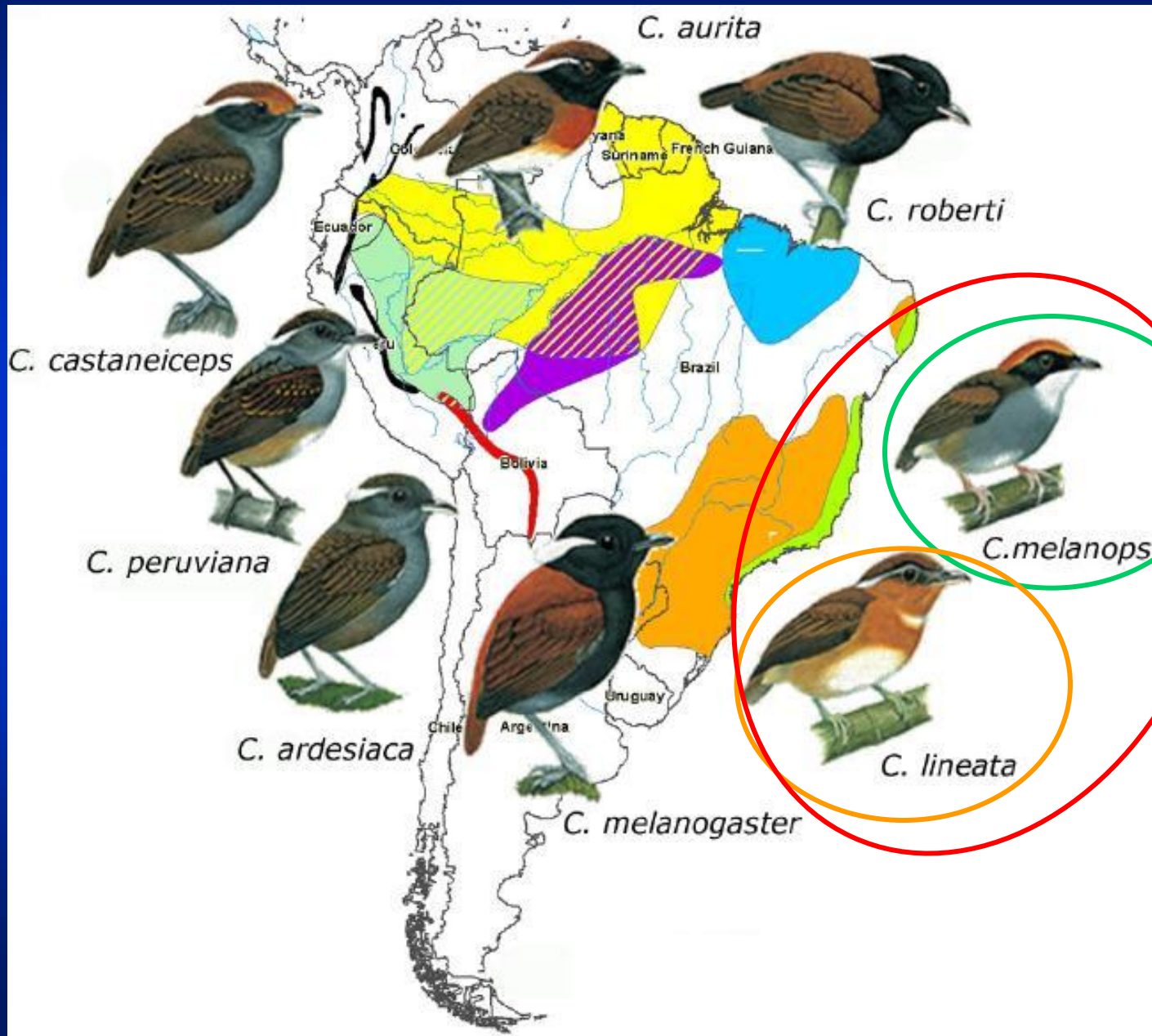


Espécies de aves da Mata Atlântica são monofiléticas?



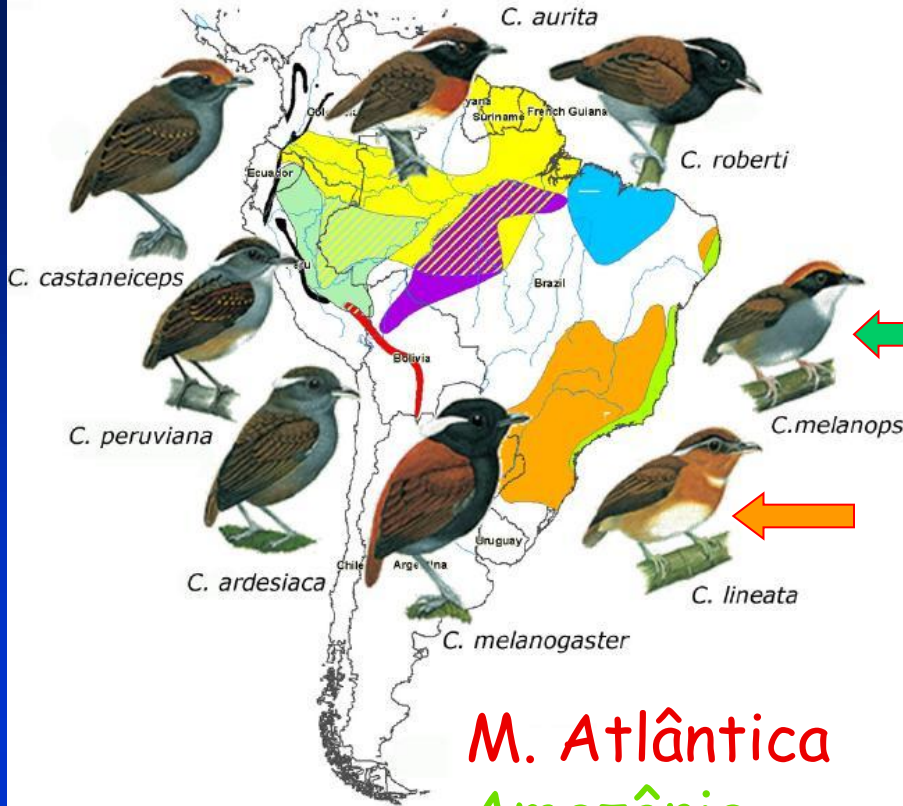


# Gênero *Conopophaga*

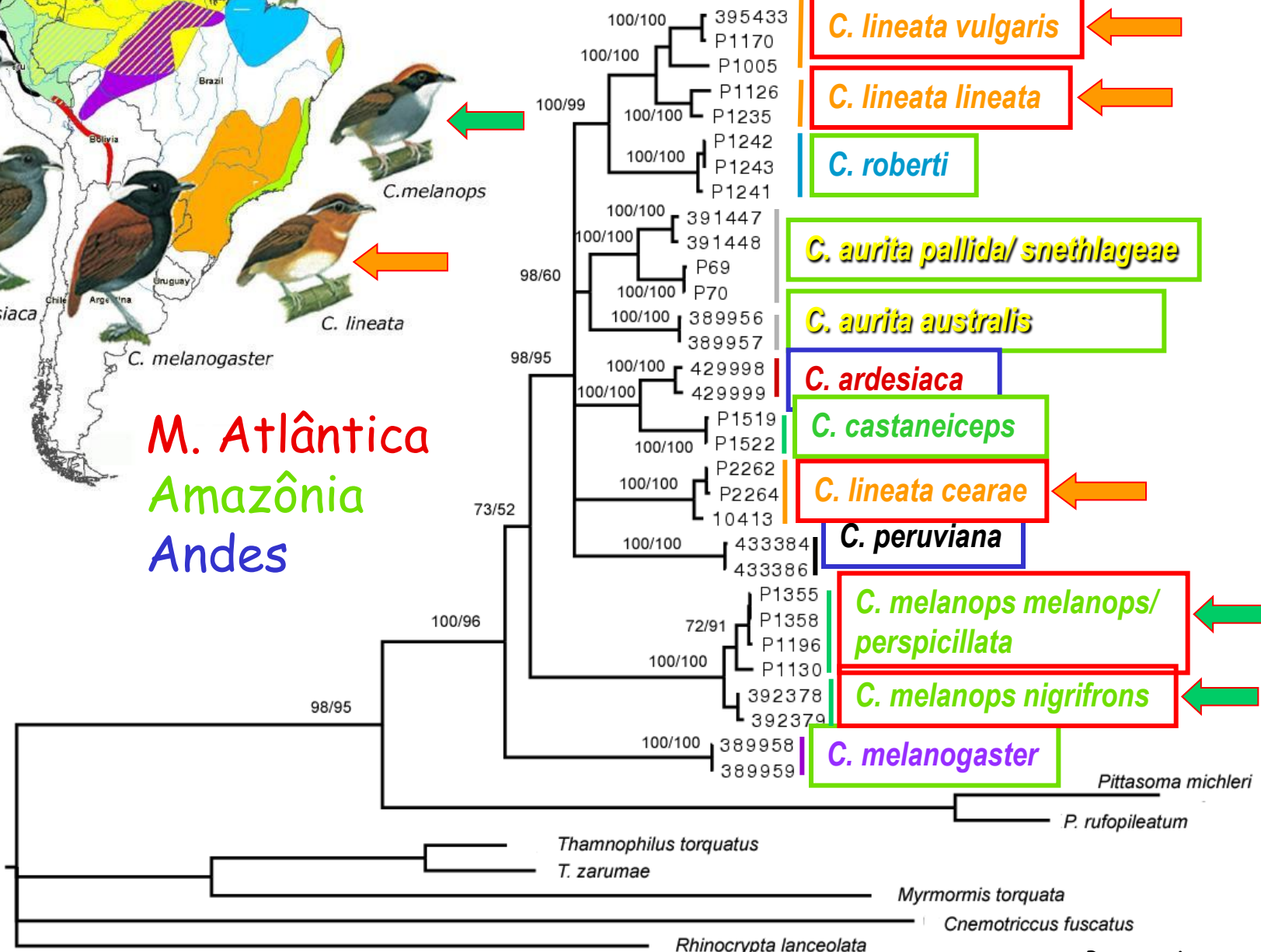


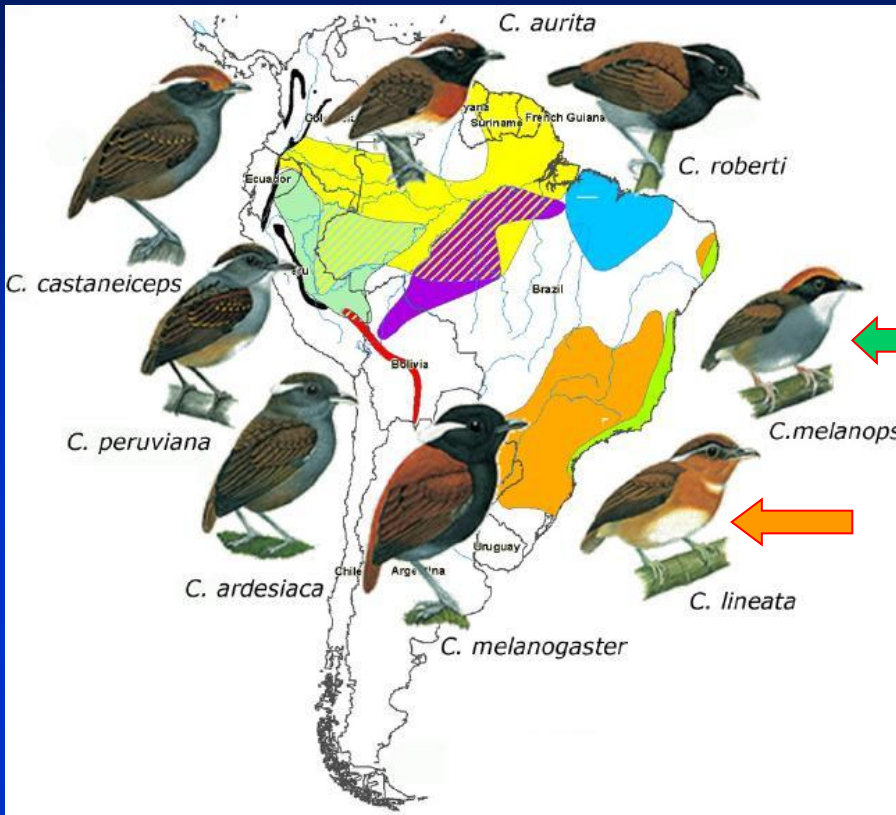
# Gênero *Conopophaga*

2270 pb de ND2, ND3 e cit b



M. Atlântica  
 Amazônia  
 Andes





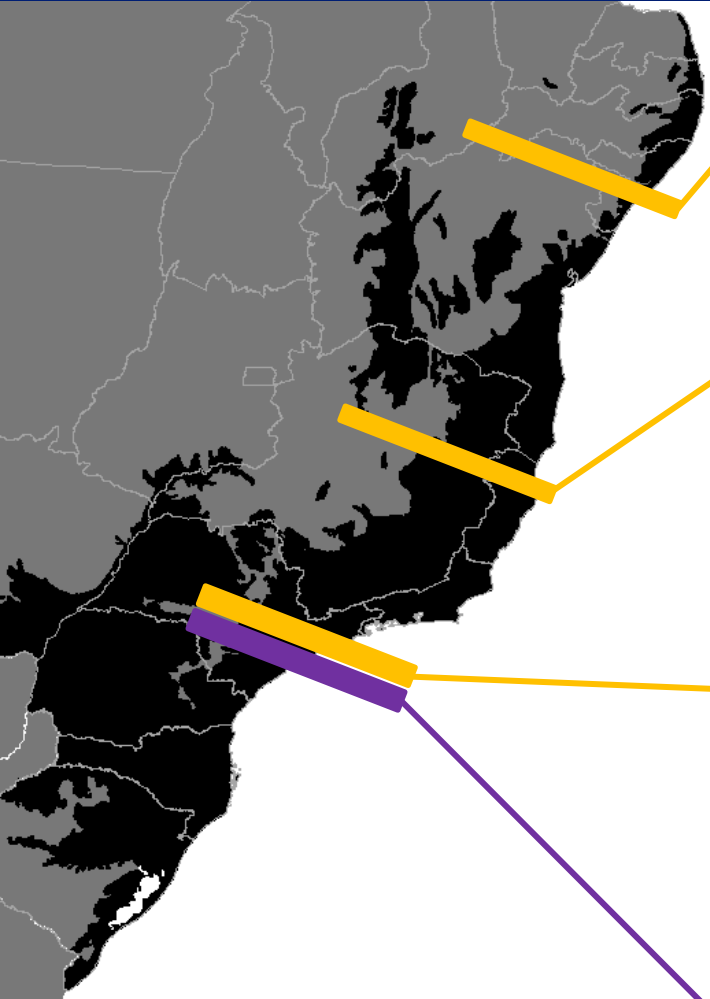
## Conclusão 1 - aves da Mata Atlântica

- *Conopophaga melanops* é monofilética.
- *Conopophaga lineata* não é monofilética.
- História evolutiva na FA é complexa.

# Filogeografia de Aves da Mata Atlântica



# Filogeografia de organismos da Mata Atlântica







*Hypsiboas semilineatus* *H. albomarginatus* *Hyla faber*  
 Carnaval et al., 2009 Carnaval et al., 2009 Carnaval et al., 2009





*Hypsiboas semilineatus* *H. albomarginatus* *Hyla faber*  
 Carnaval et al., 2009 Carnaval et al., 2009 Carnaval et al., 2009





*Hypsiboas semilineatus* *H. albomarginatus* *Hyla faber*  
 Carnaval et al., 2009 Carnaval et al., 2009 Carnaval et al., 2009



*Melipona quadrifasciata*  
 Batalha-Filho et al. in press



*Bothrops jararaca*  
 Graziotin et al., 2006



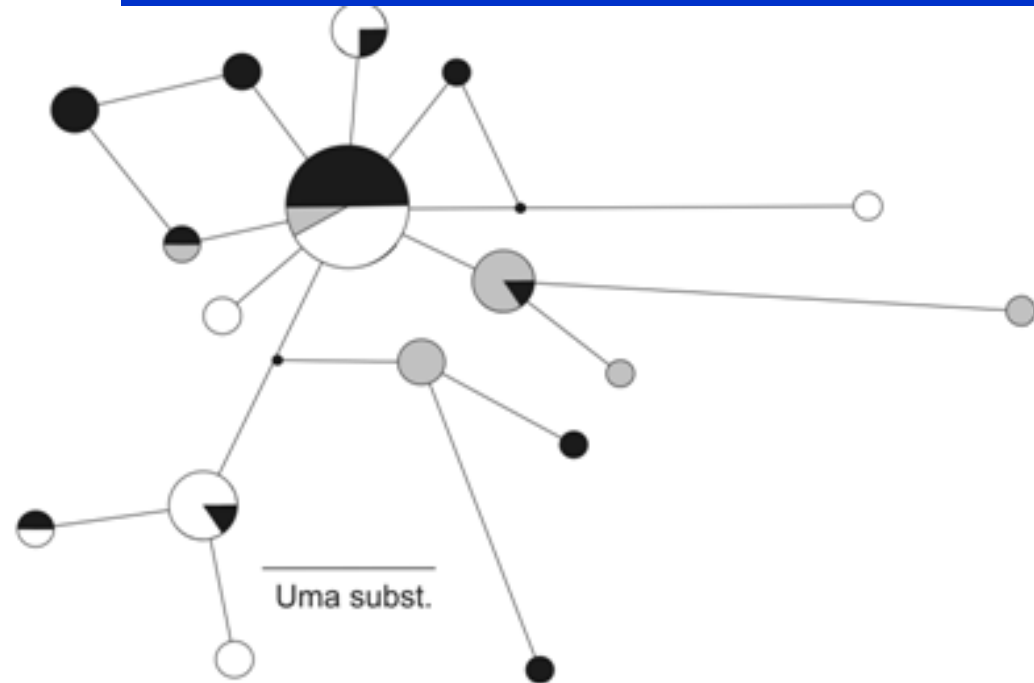
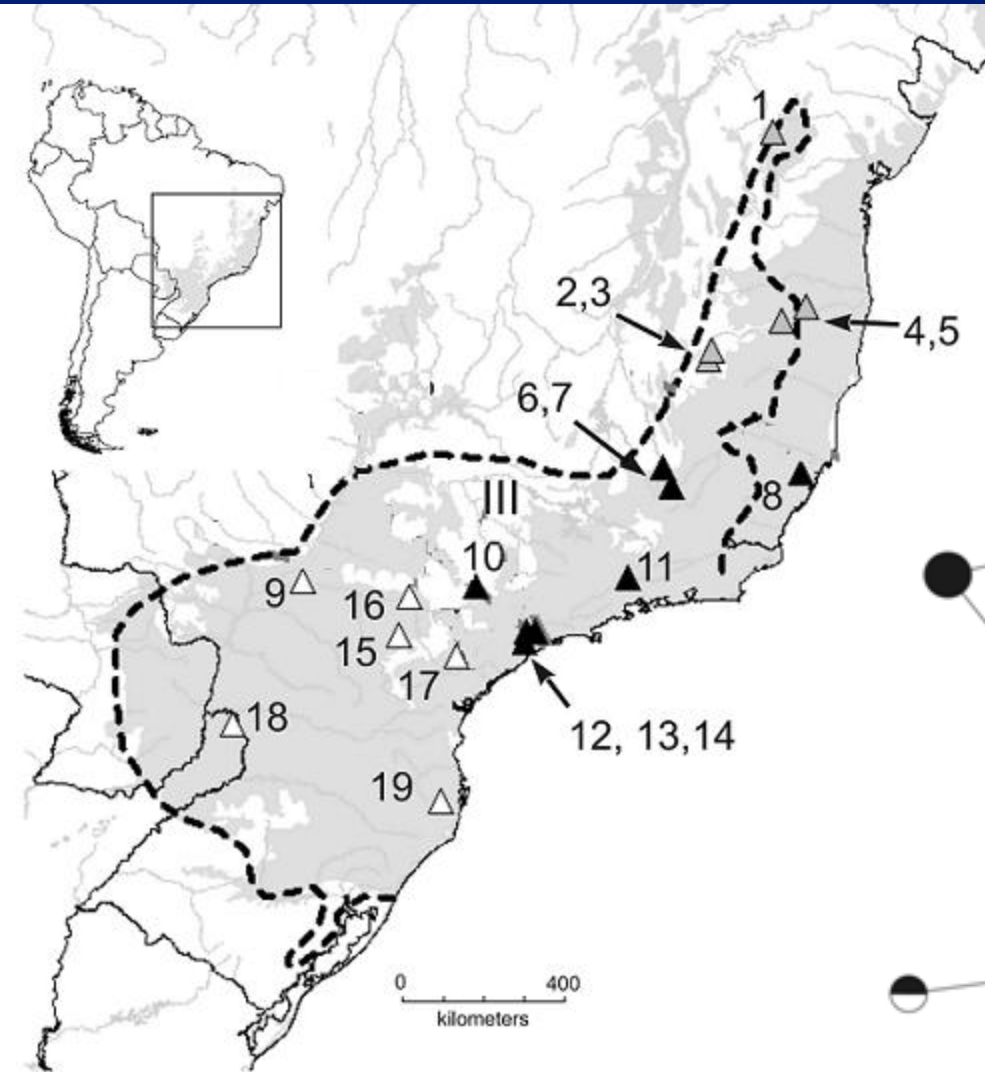
*Cerdocyon thous*  
 Tchaicka et al., 2007



*Desmodus rotundus*  
 Martins et al., 2010

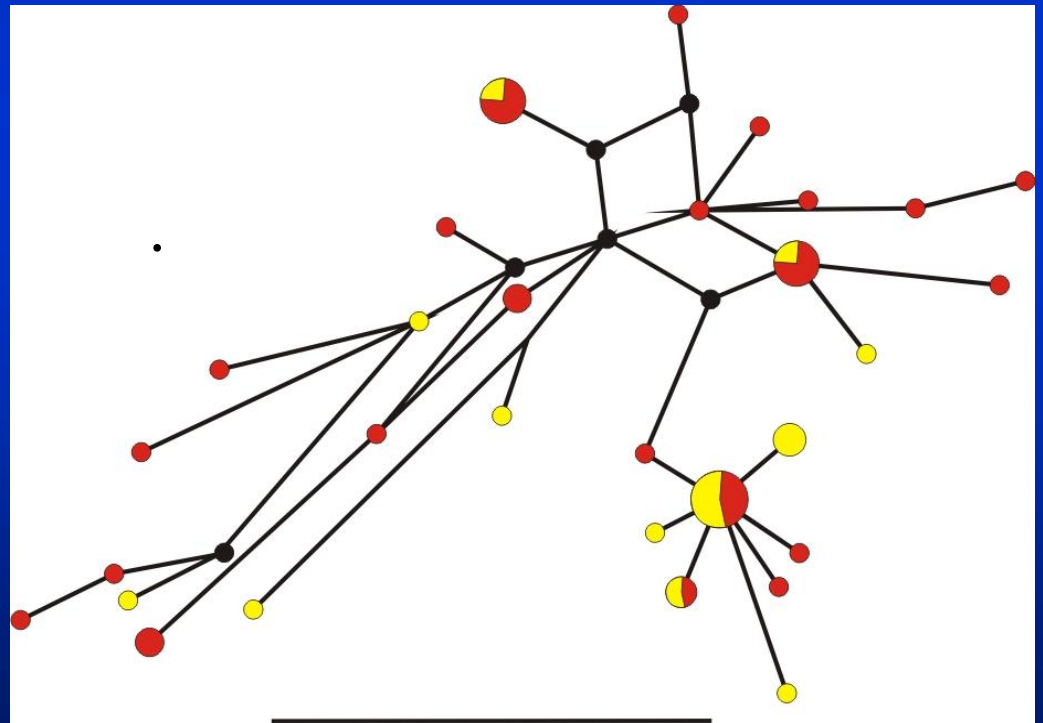
 Pleistocene  
 Pre-Pleistocene

# *Schiffornis virescens* 476 pb região controladora

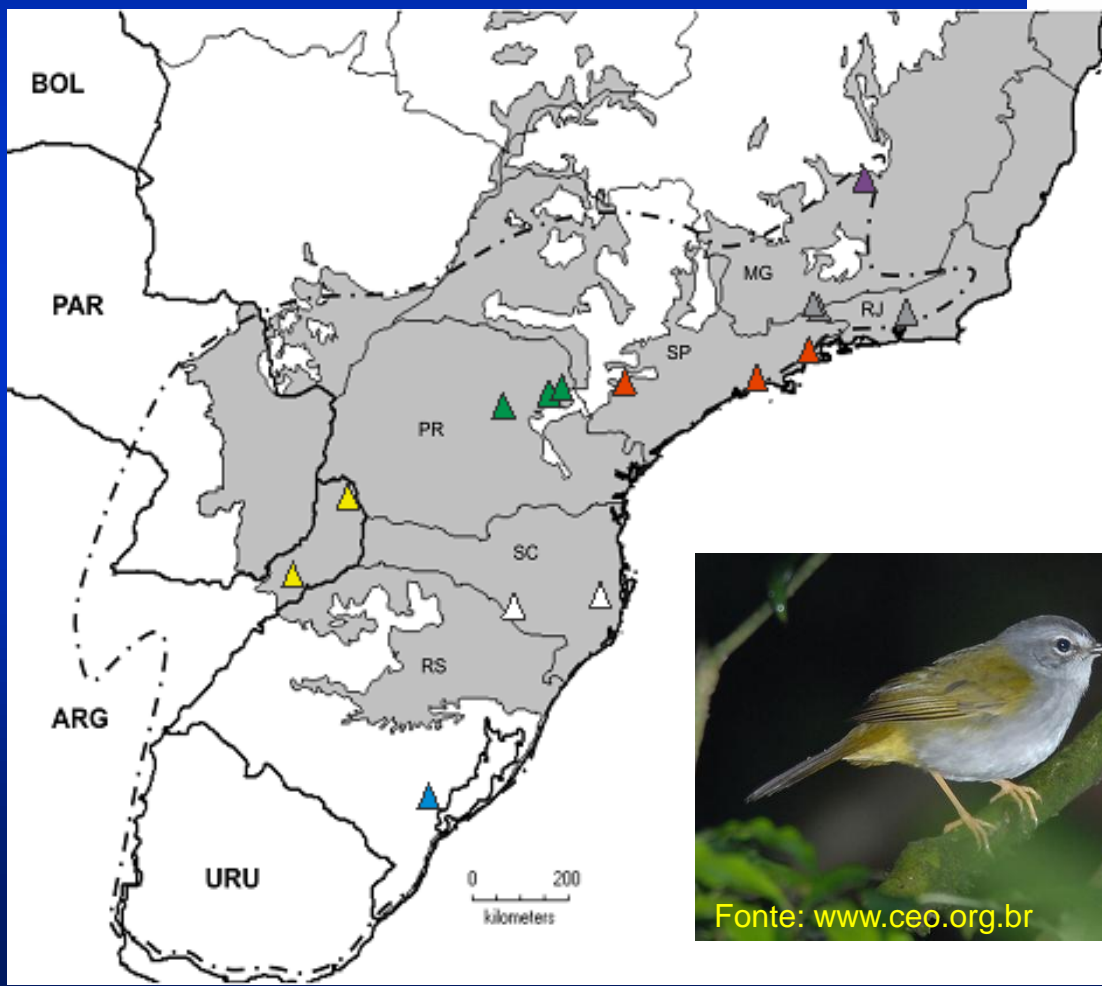
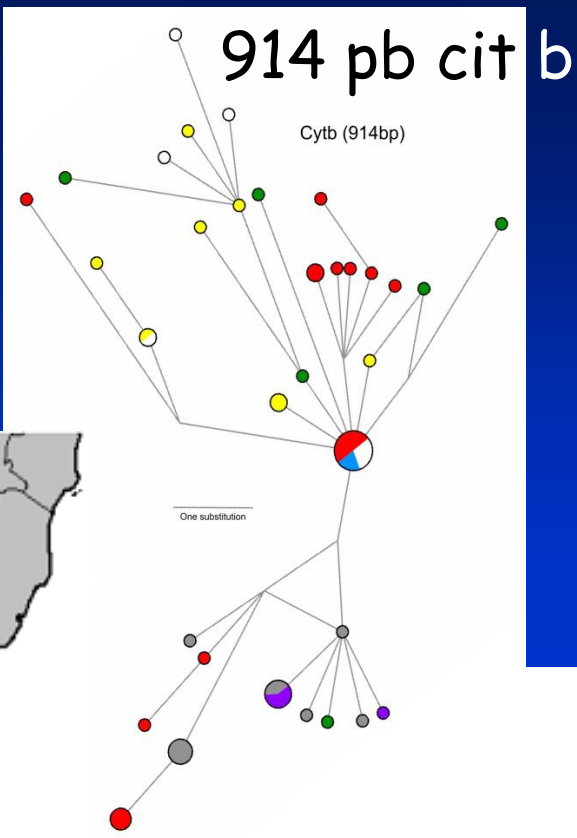


# *Tachyphonus coronatus*

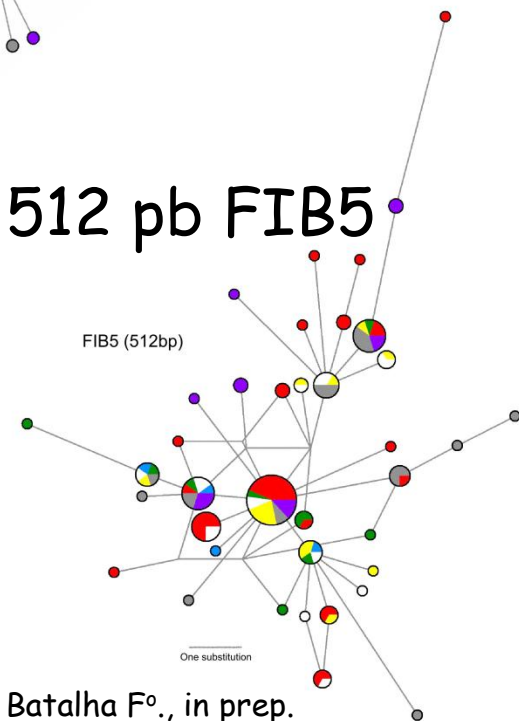
1000 pb cit b



# *Basileuterus leucoblepharus*



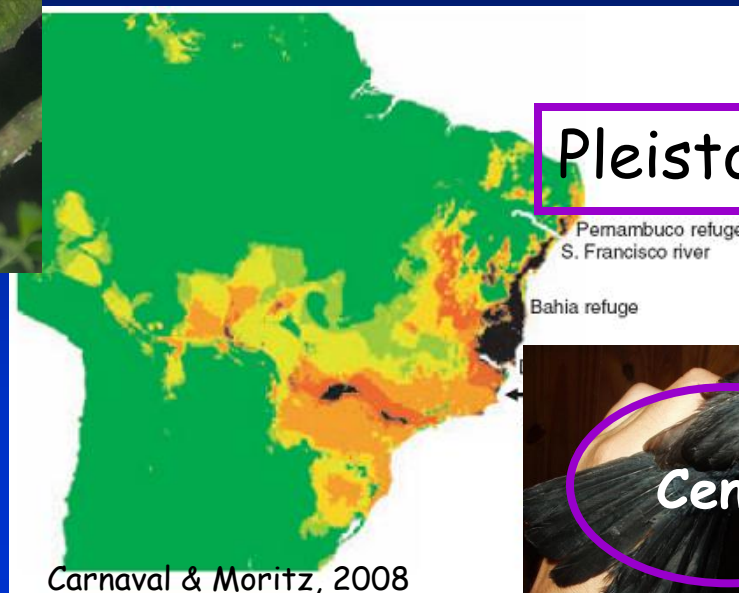
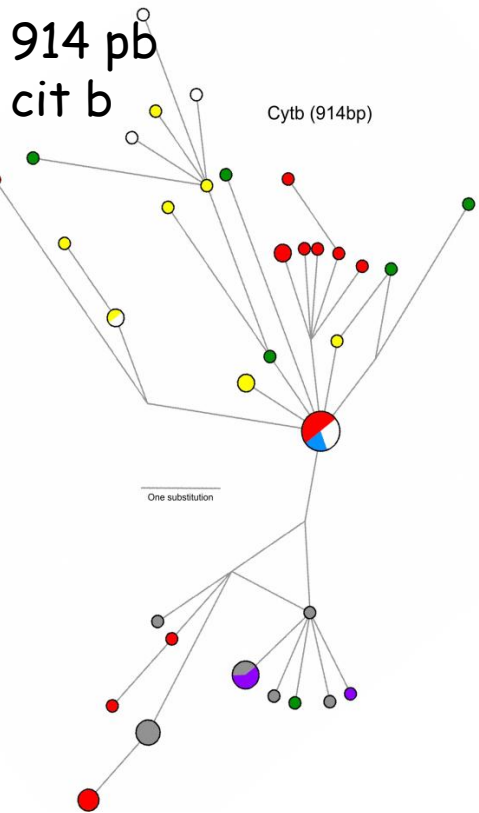
## 512 pb FIB5



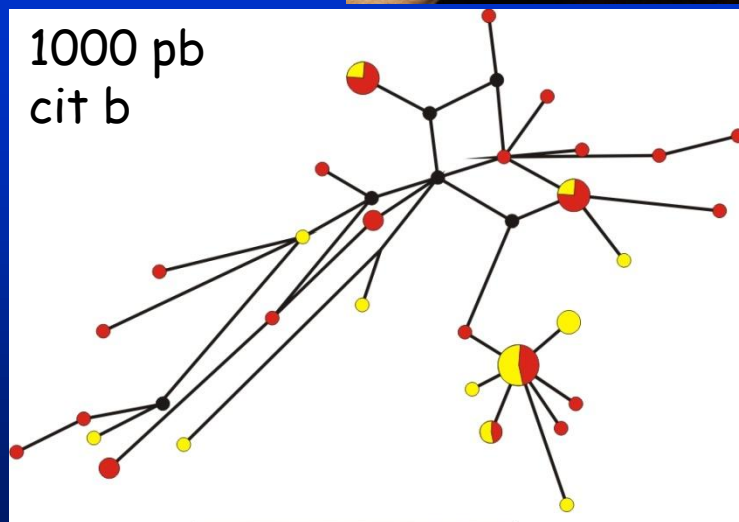
Batalha F<sup>o</sup>., in prep.



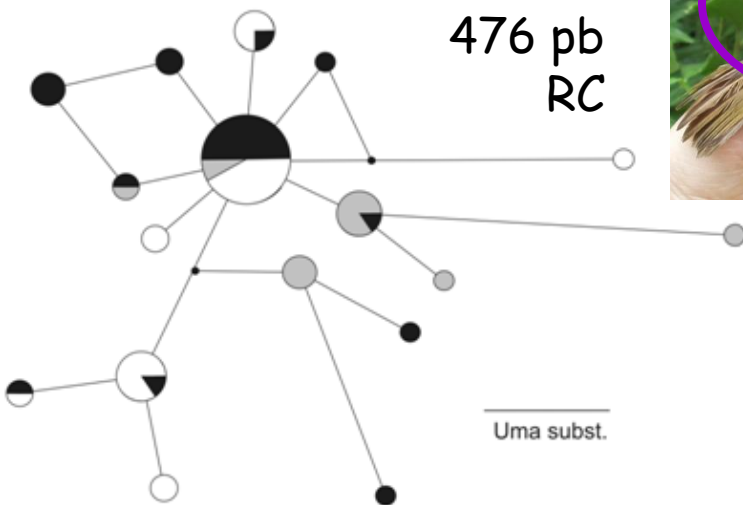
# Expansão populacional



476 pb  
RC



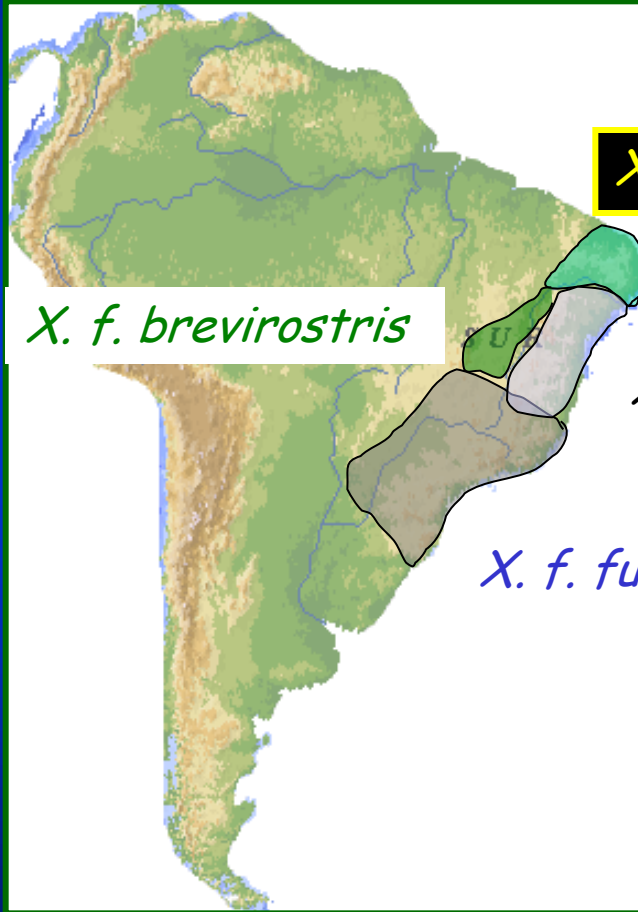
Cabanne, in prep.; Batalha F<sup>o</sup>., in prep.



## Conclusão 2 - aves da Mata Atlântica

- Há espécies sem estrutura genética populacional com sinal de expansão populacional durante o Pleistoceno.
- E outras espécies???

# *Xiphorhynchus fuscus*



*X. f. atlanticus*

*X. f. brevirostris*

*X. f. tenuirostris*

*X. f. fuscus*



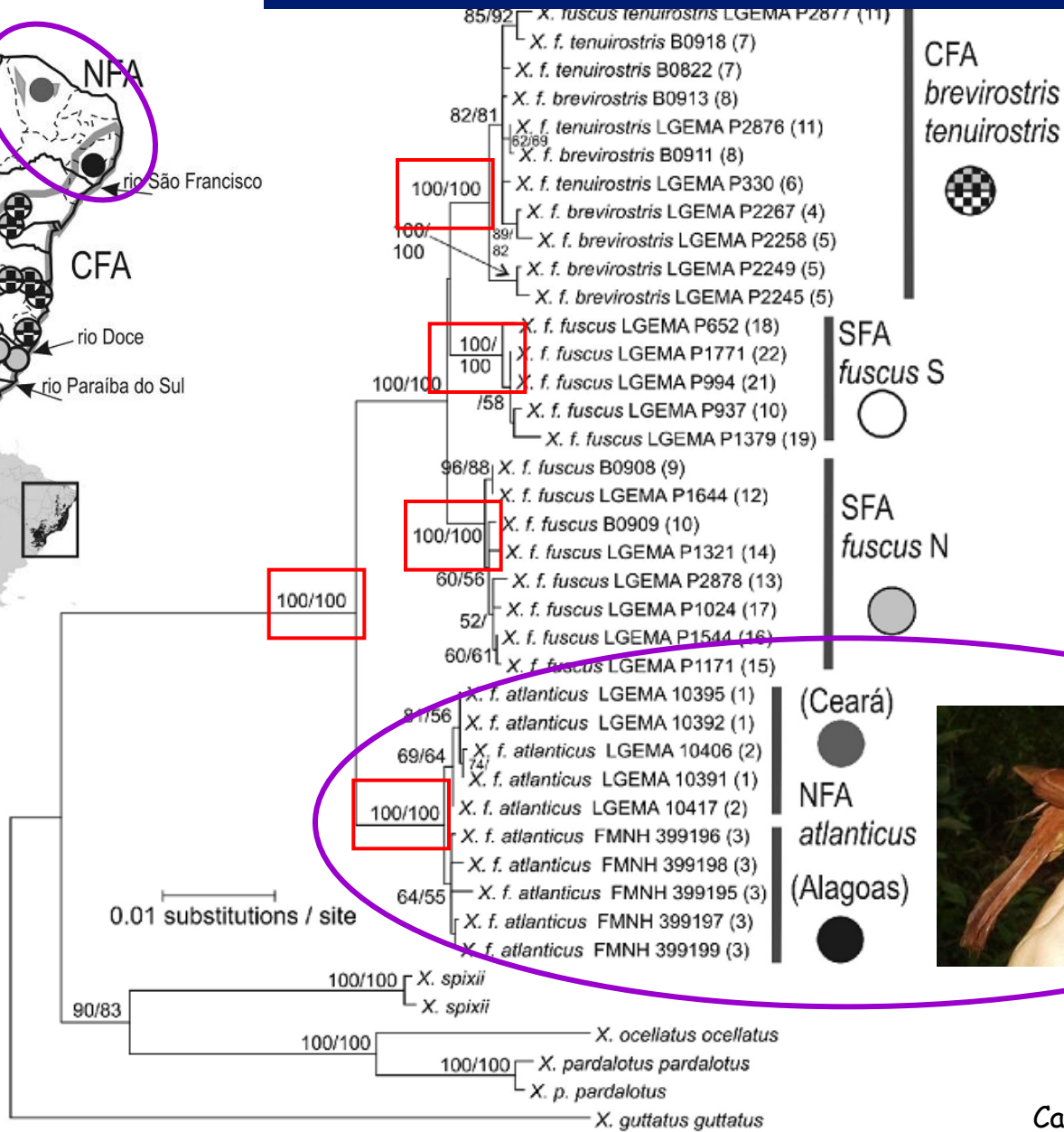
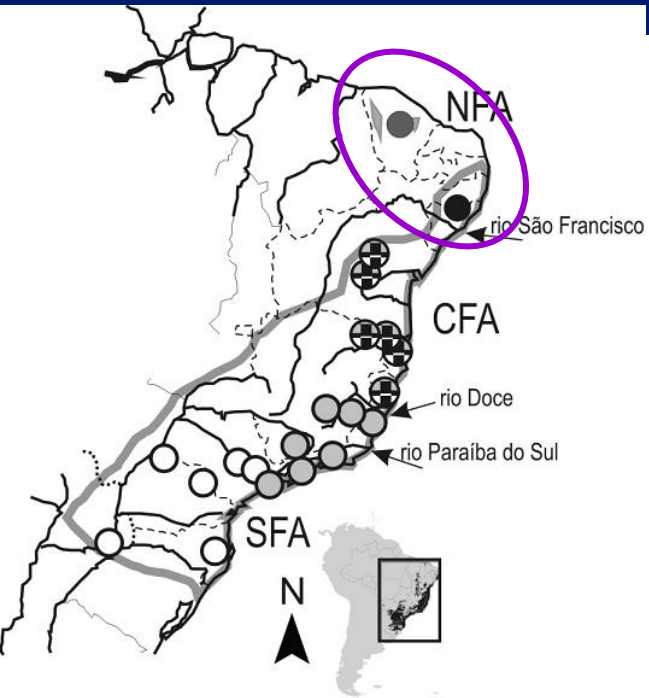
Foto: GS Cabanne



Foto: GS Cabanne

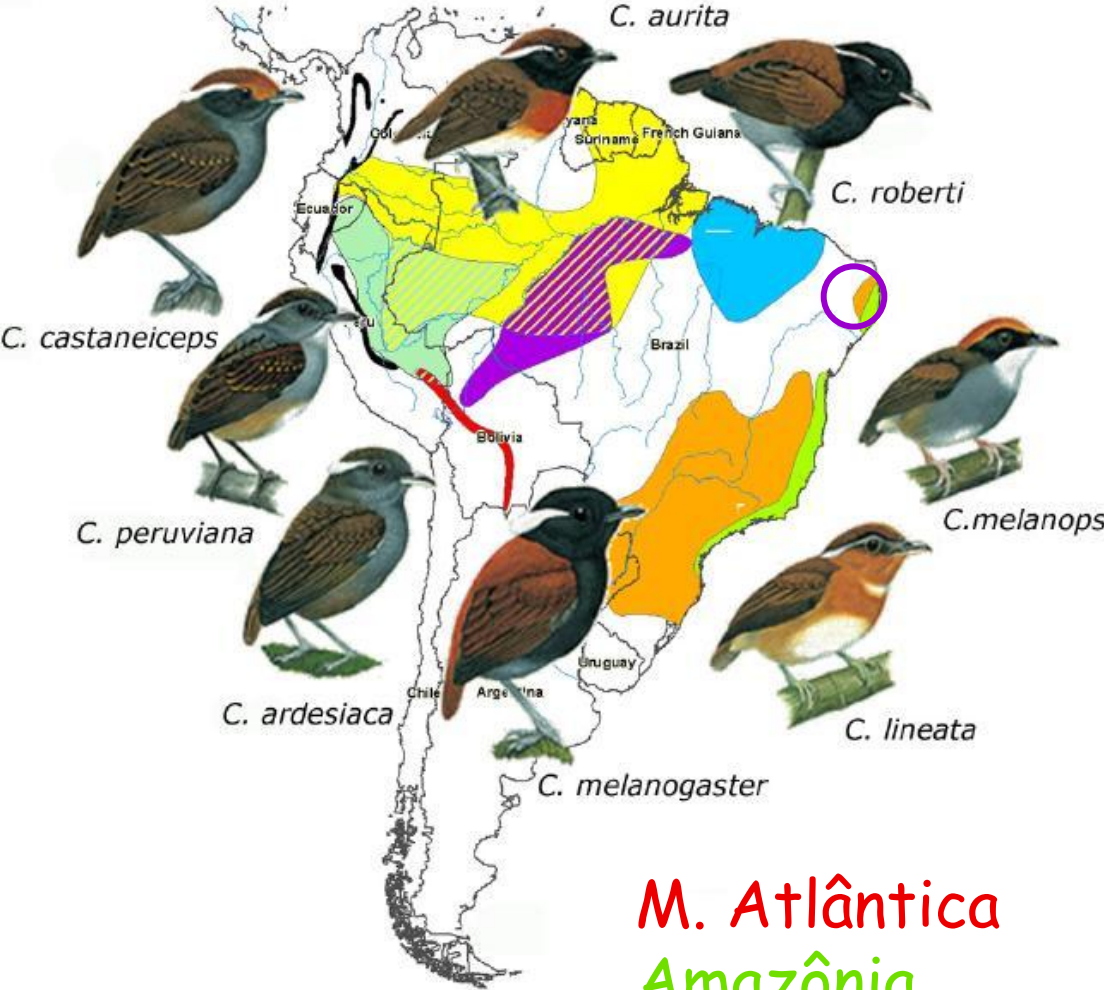
# *Xiphorhynchus fuscus*

3046 pb ND2, ND3, cit b, Fib5

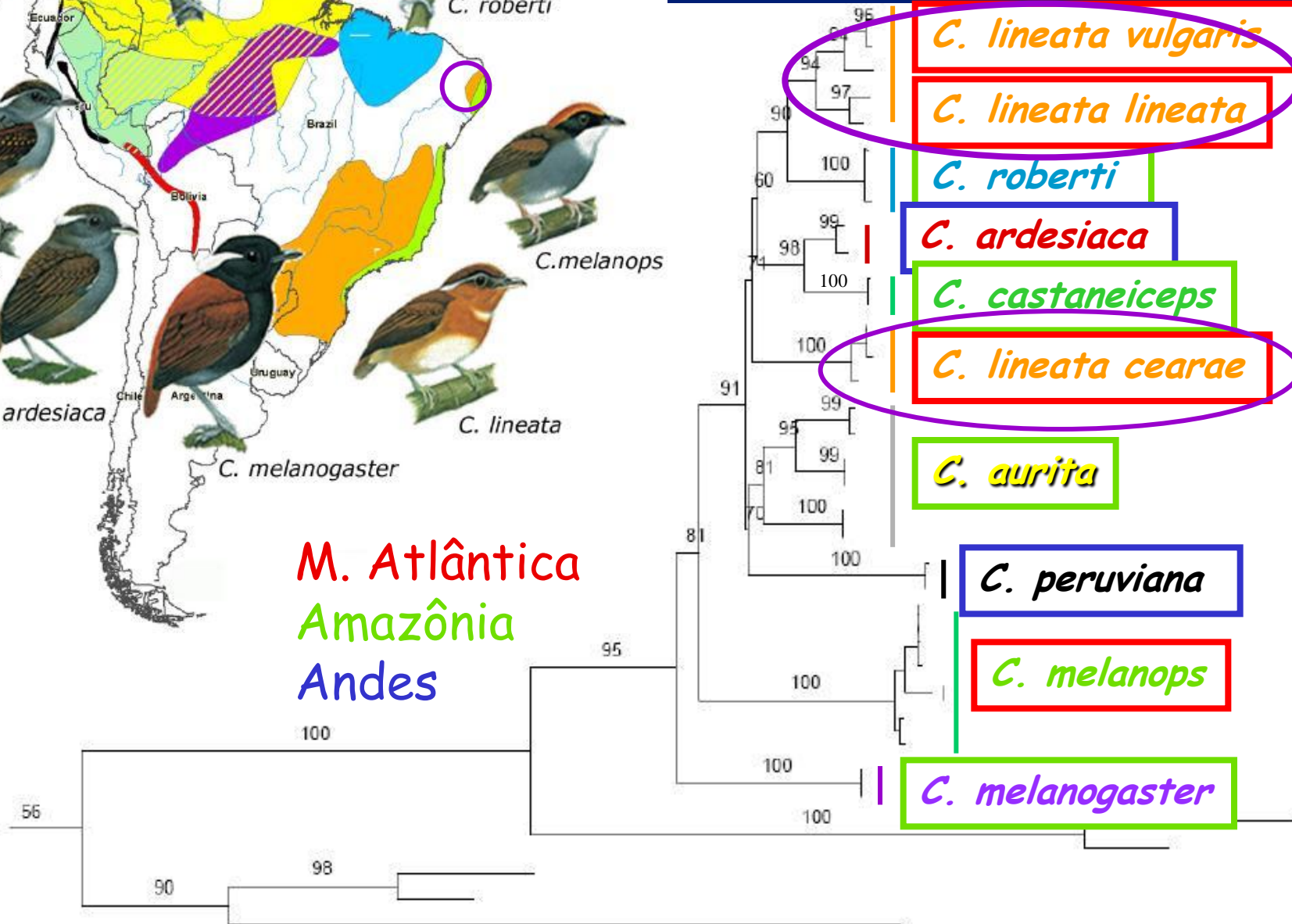


# Gênero *Conopophaga*

878 pb de ND2 e cit b

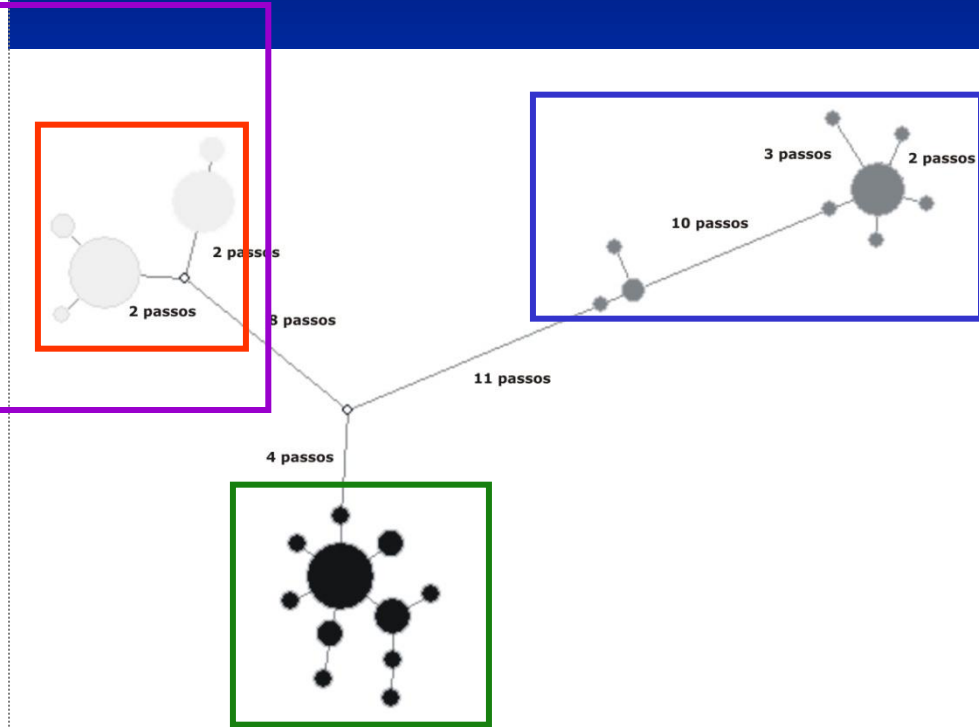
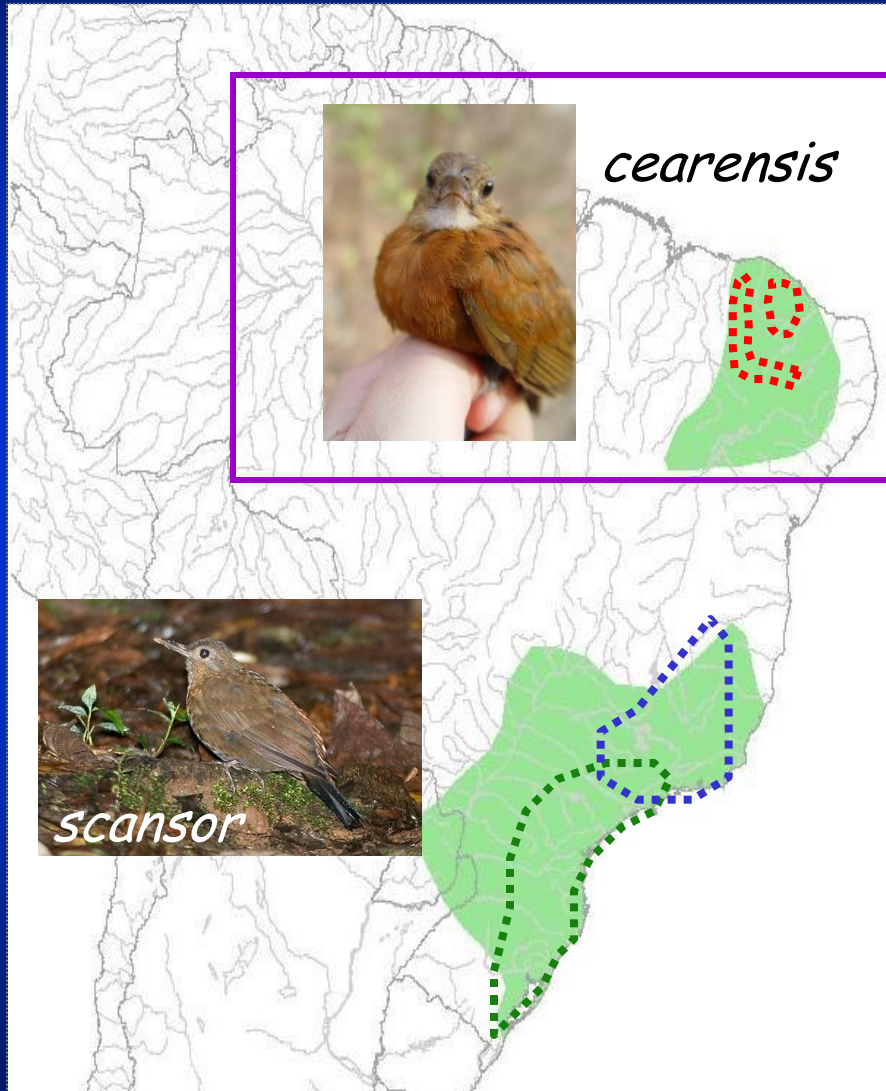


M. Atlântica  
Amazônia  
Andes

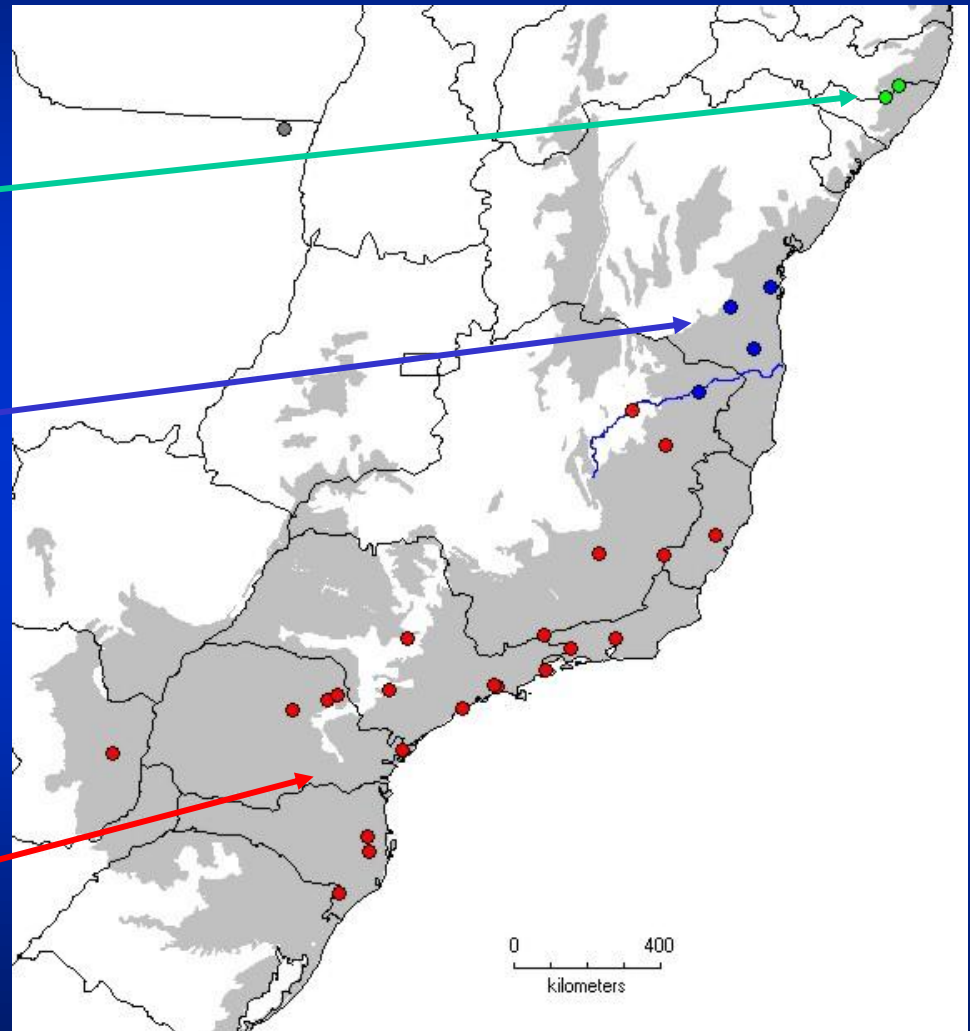
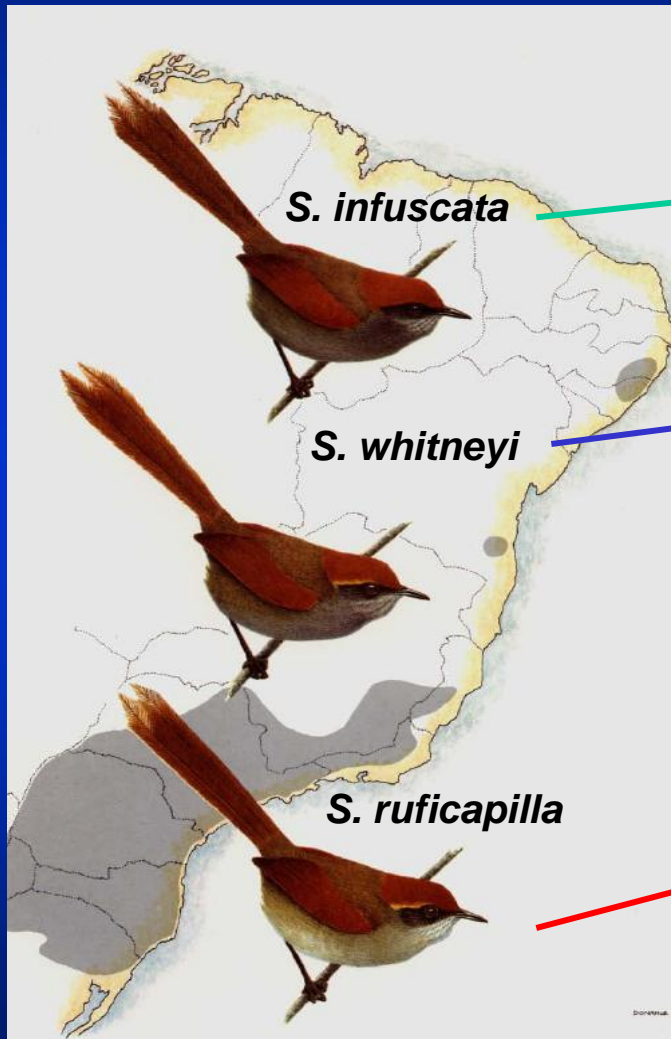


# Linhagens de *Sclerurus scansor*

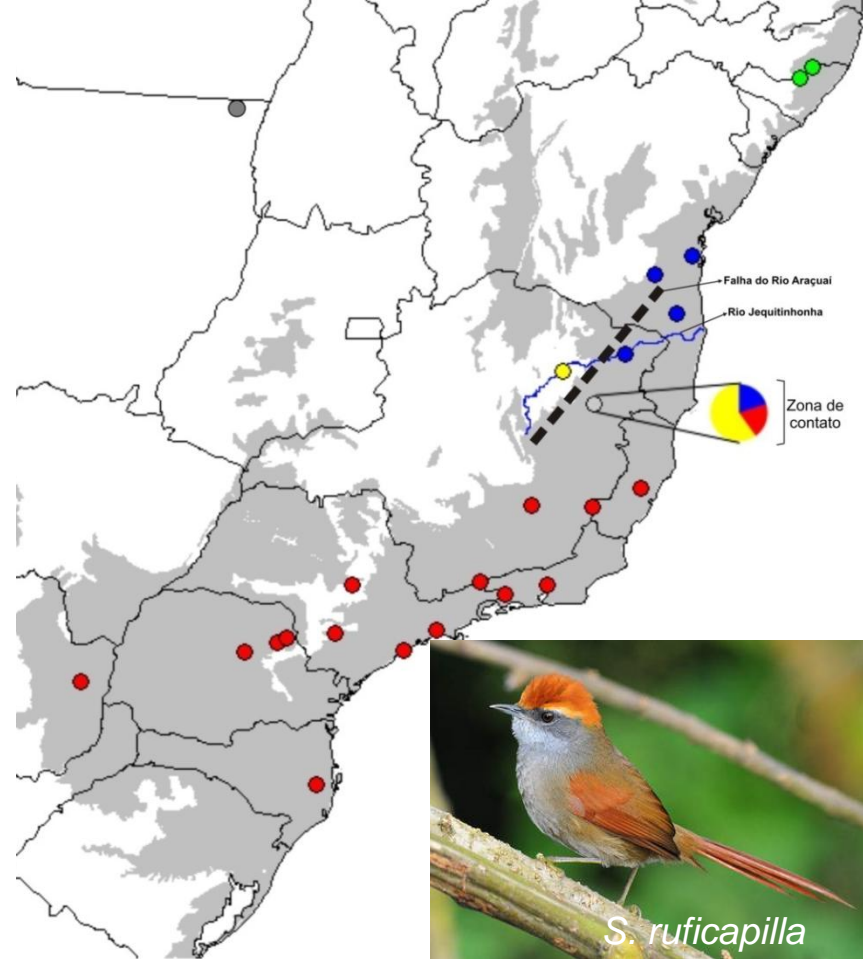
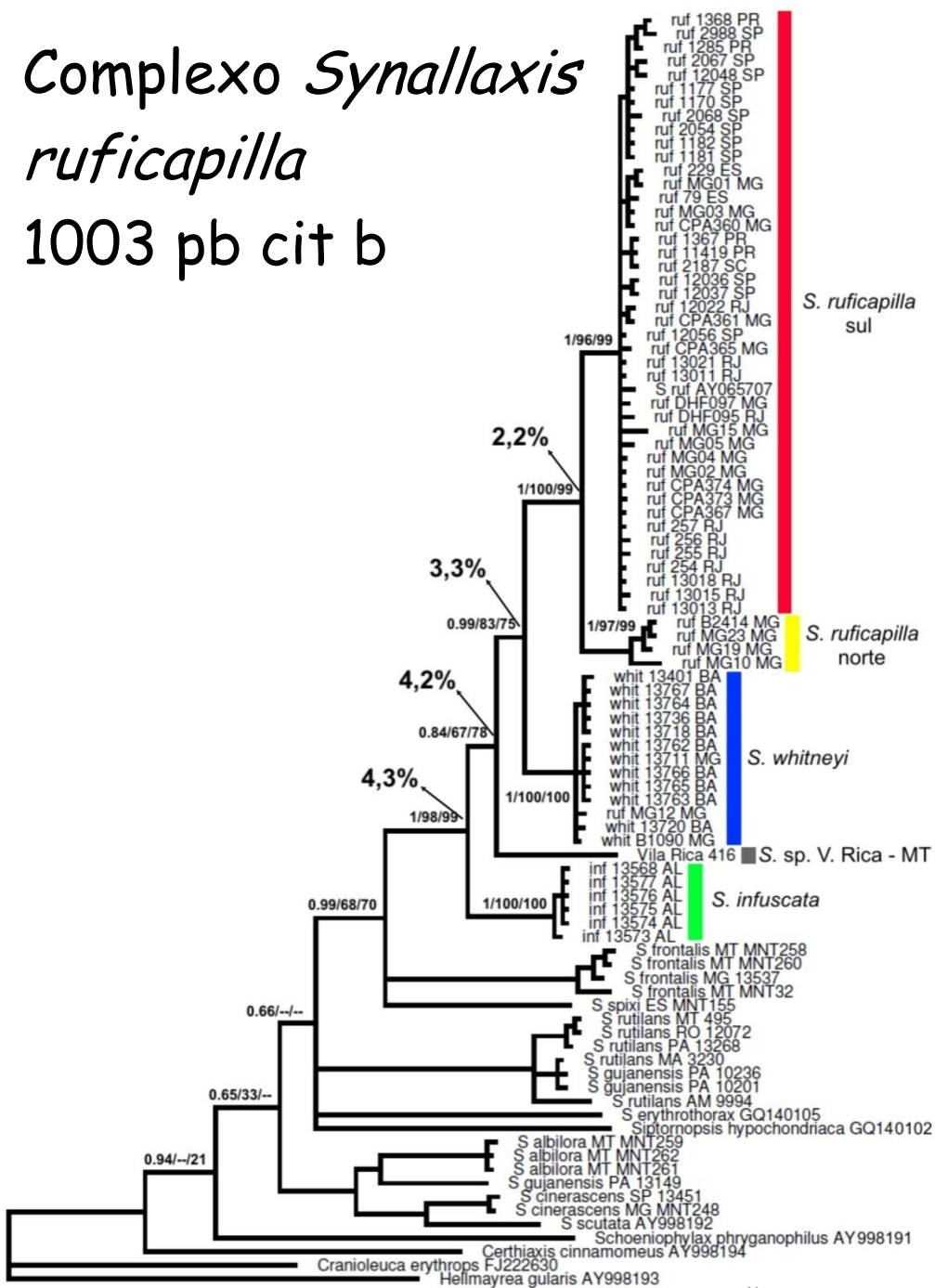
1041 pb ND2



# Complexo *Synallaxis ruficapilla*



# Complexo *Synallaxis* *ruficapilla* 1003 pb cit b



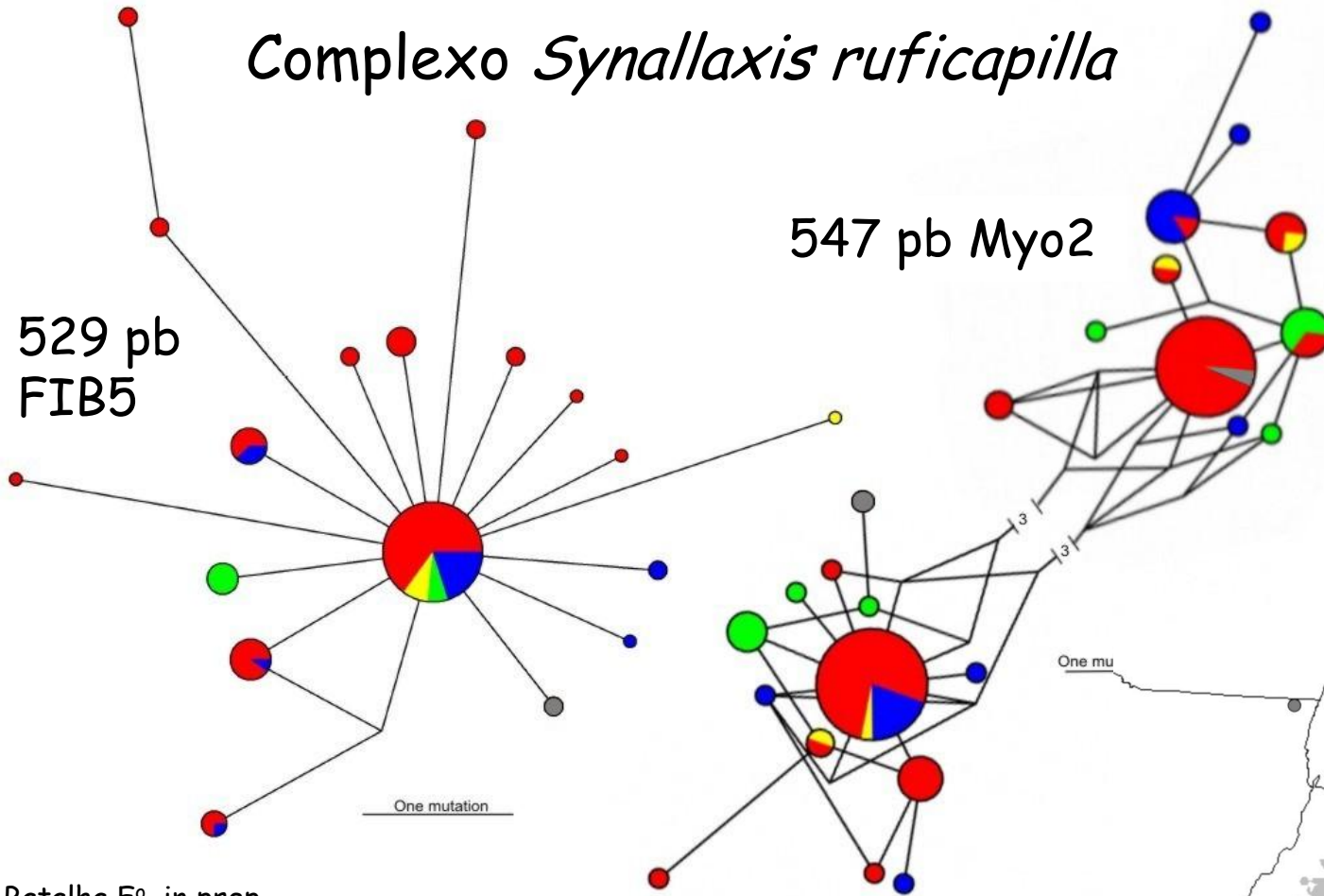
Batalha F<sup>o</sup>, in prep.



# Complexo *Synallaxis ruficapilla*

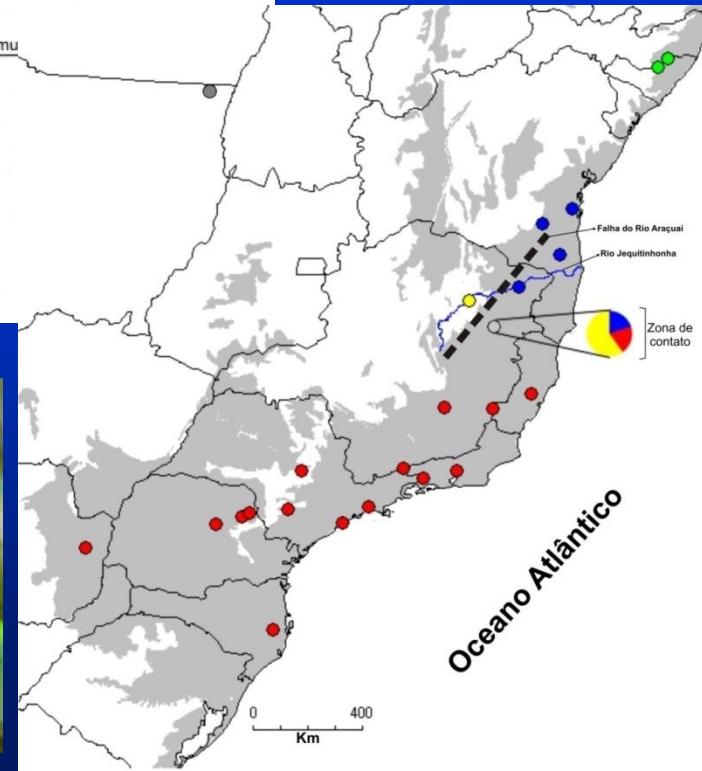
529 pb  
FIB5

547 pb Myo2

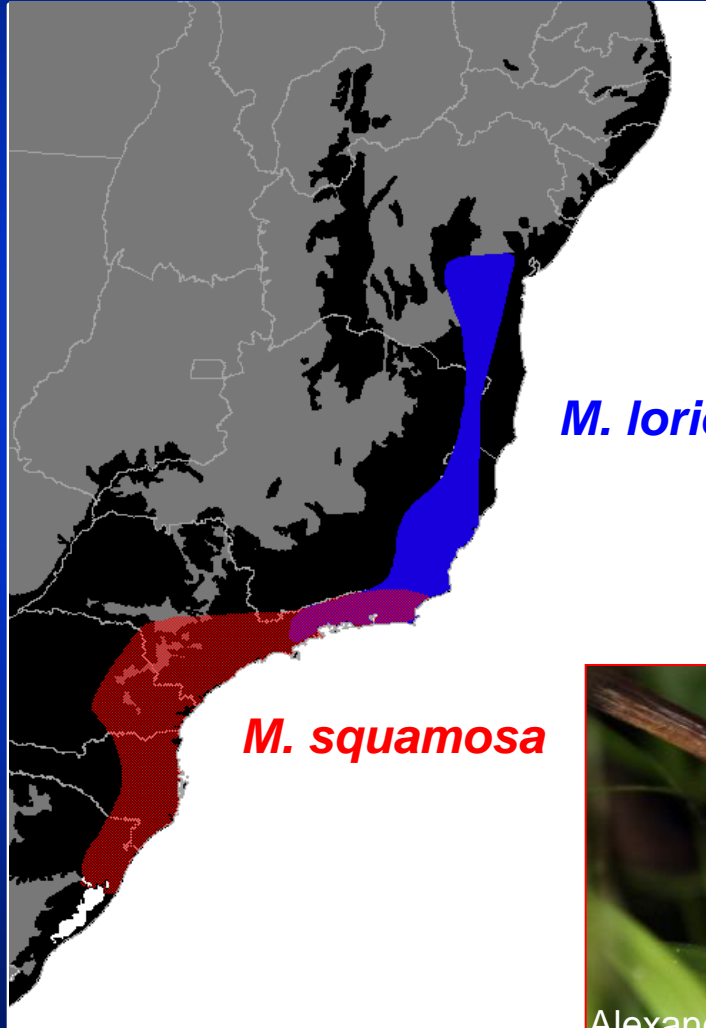


Batalha F<sup>o</sup>, in prep.

One mu



# *Myrmeciza loricata* e *M. squamosa*



*M. loricata*

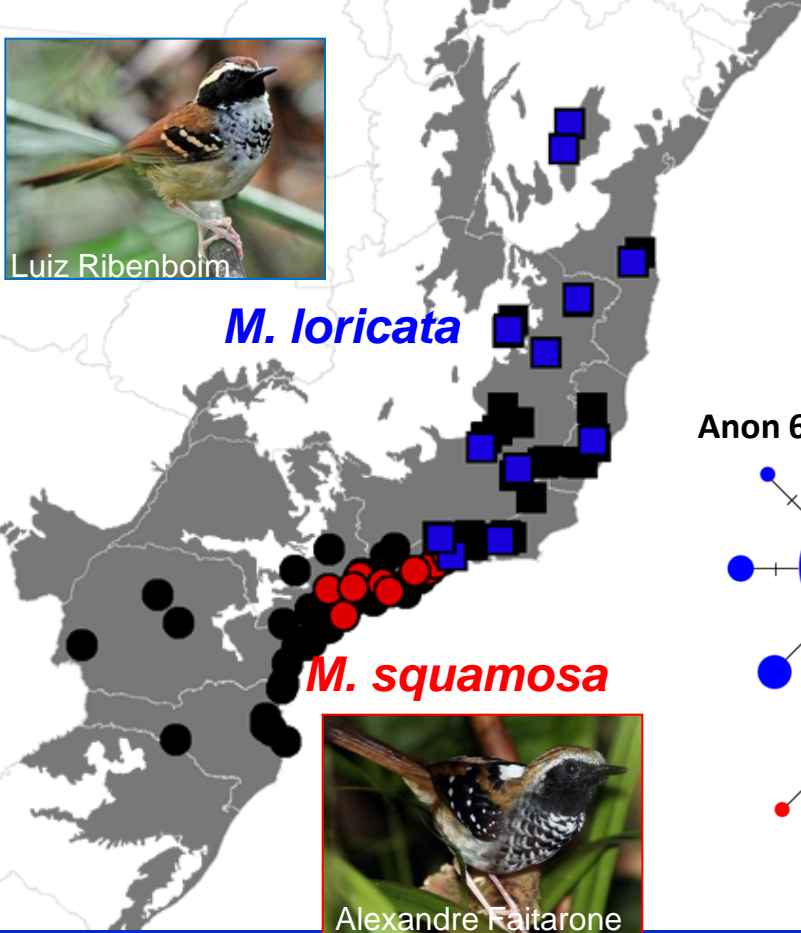
*M. squamosa*



Luiz Ribenboim



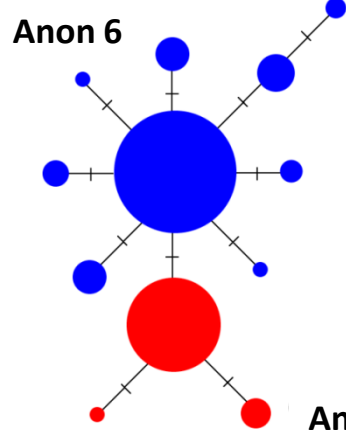
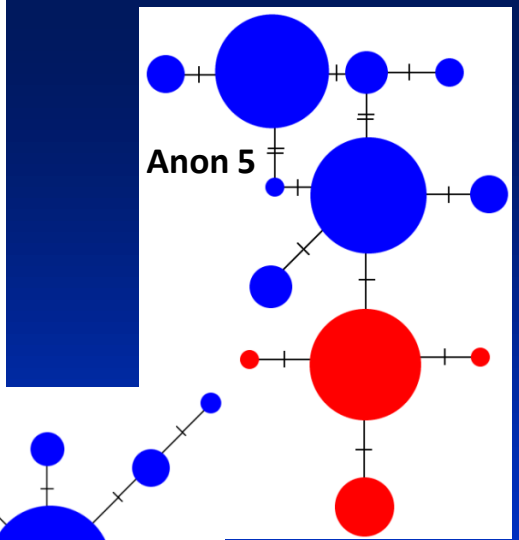
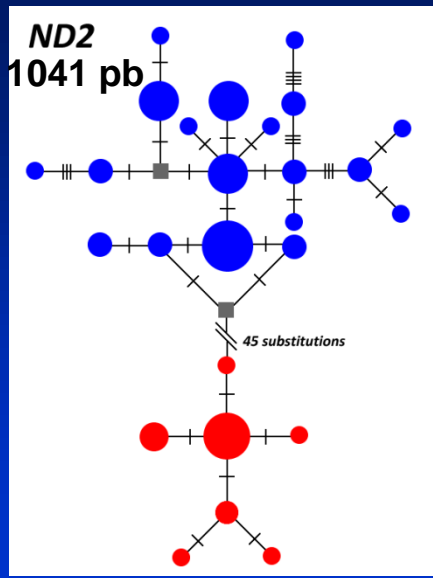
Alexandre Faitarone



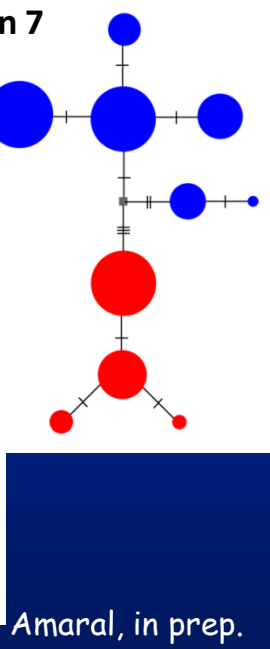
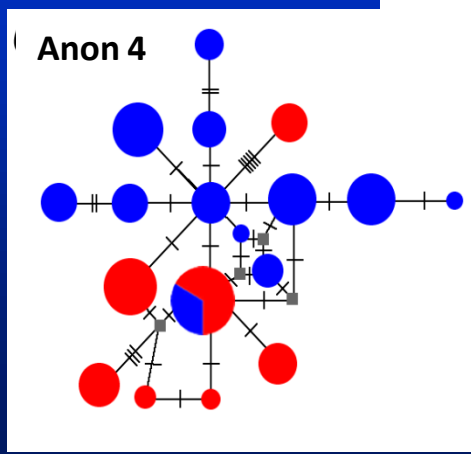
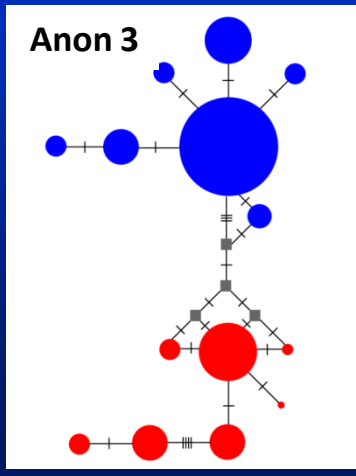
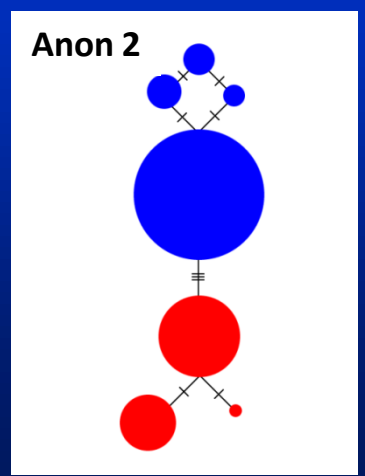
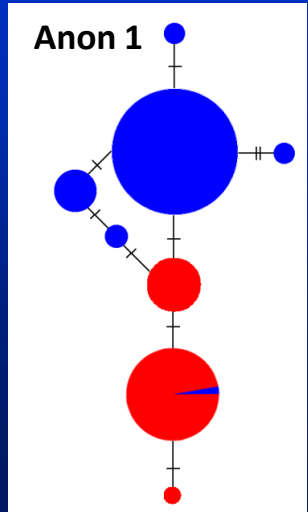
*M. loricata*



*M. squamosa*



Marcadores anônimos (SNPs): 50 a 456 pb



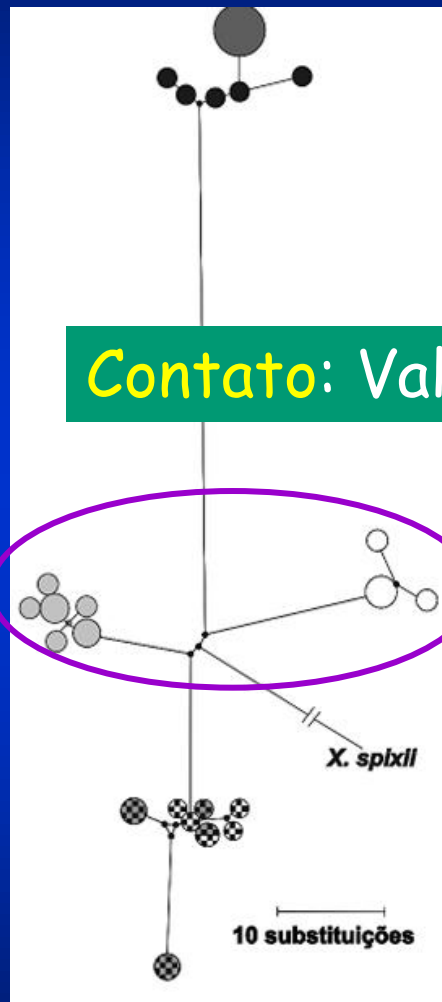
## Conclusão 3 - aves da Mata Atlântica

- Há espécies e complexos de espécies de aves florestais da MA com estrutura populacional.
- Brejos de altitude (florestas relictuais) no Ceará abrigam uma avifauna geneticamente distinta do restante da MA.

# Linhagens de *X. fuscus fuscus* no sul da Mata Atlântica



Foto: GS Cabanne



**Contato:** Vale do rio Paraíba do Sul (tempo incongruente)

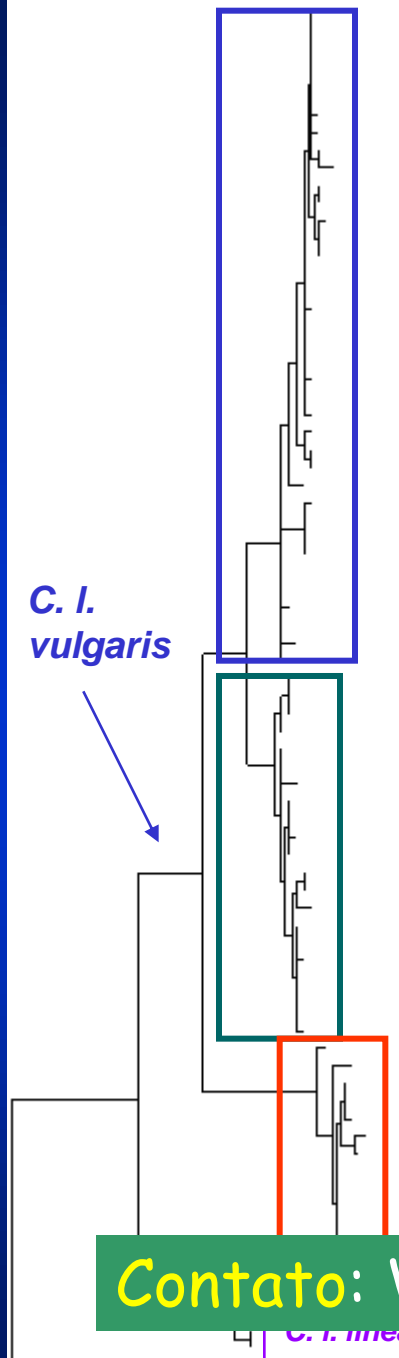


# Linhagens de *Conopophaga lineata vulgaris*

467 pb região controladora



*C. l.  
vulgaris*



*C. l. lineata*

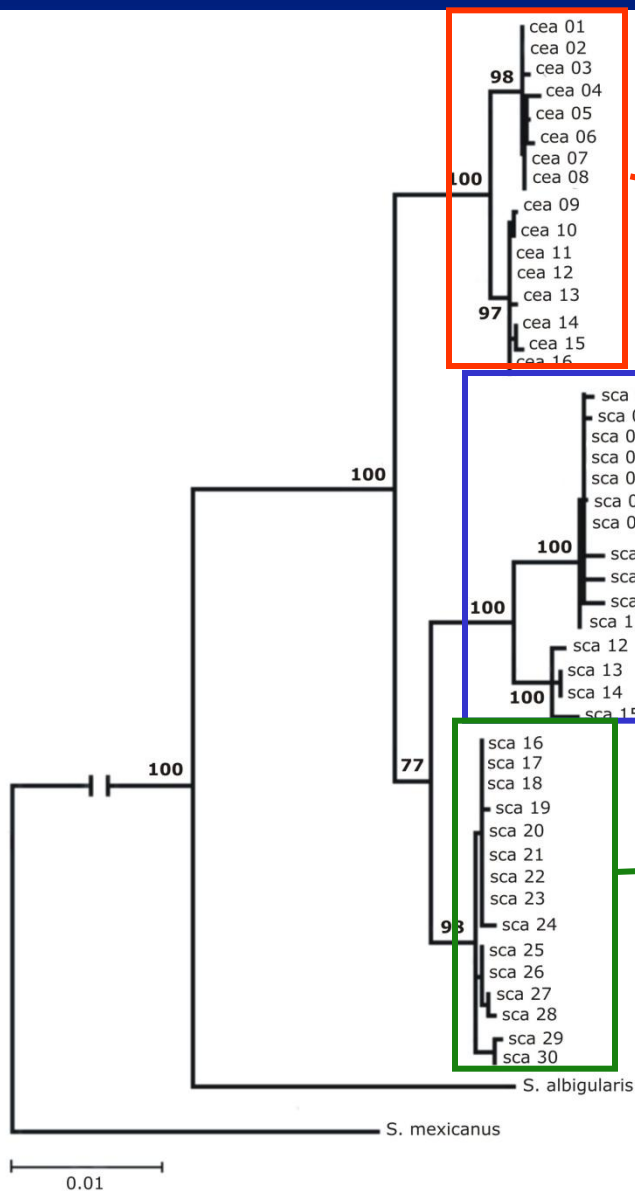
*C. melanops*



Frequências das  
linhagens por localidade

**Contato:** Vale do rio Paraíba do Sul (tempo incongruente)

# Linhagens de *Sclerurus scansor* 2432 pb ND2, ND3, cit b

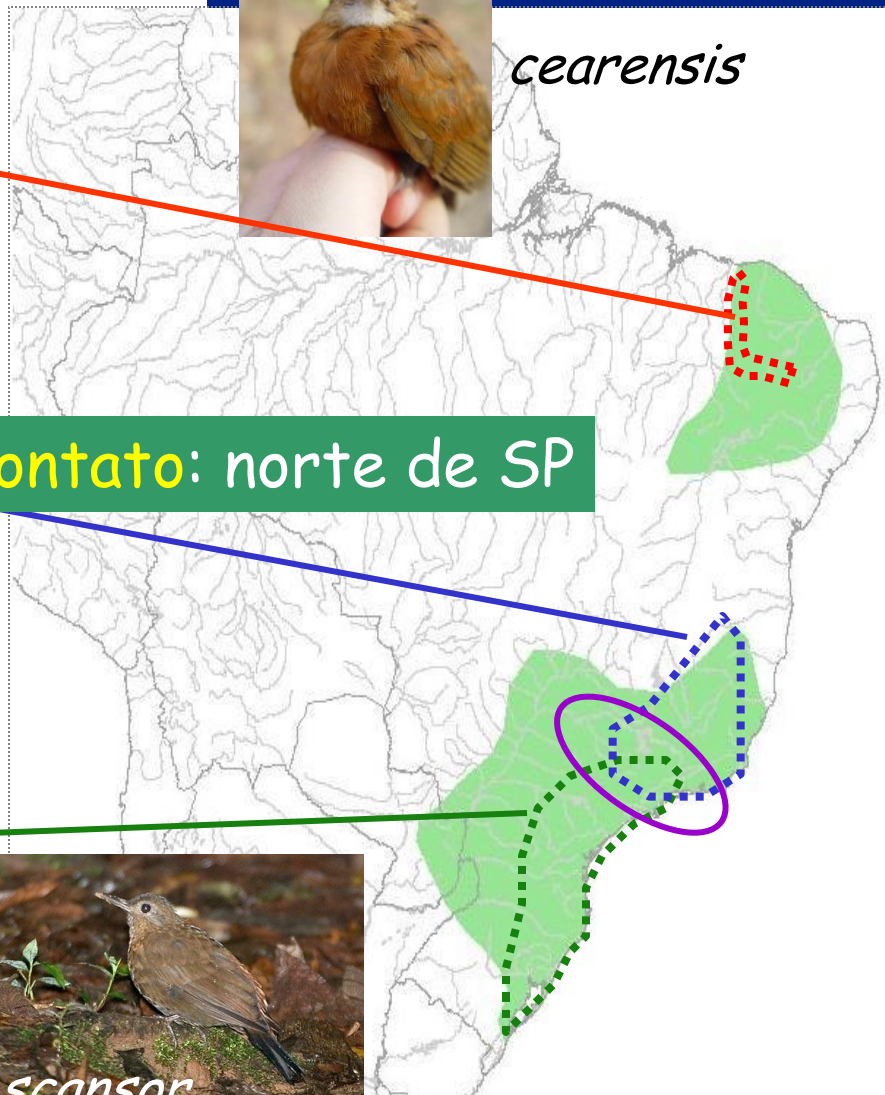


*cearensis*

Contato: norte de SP

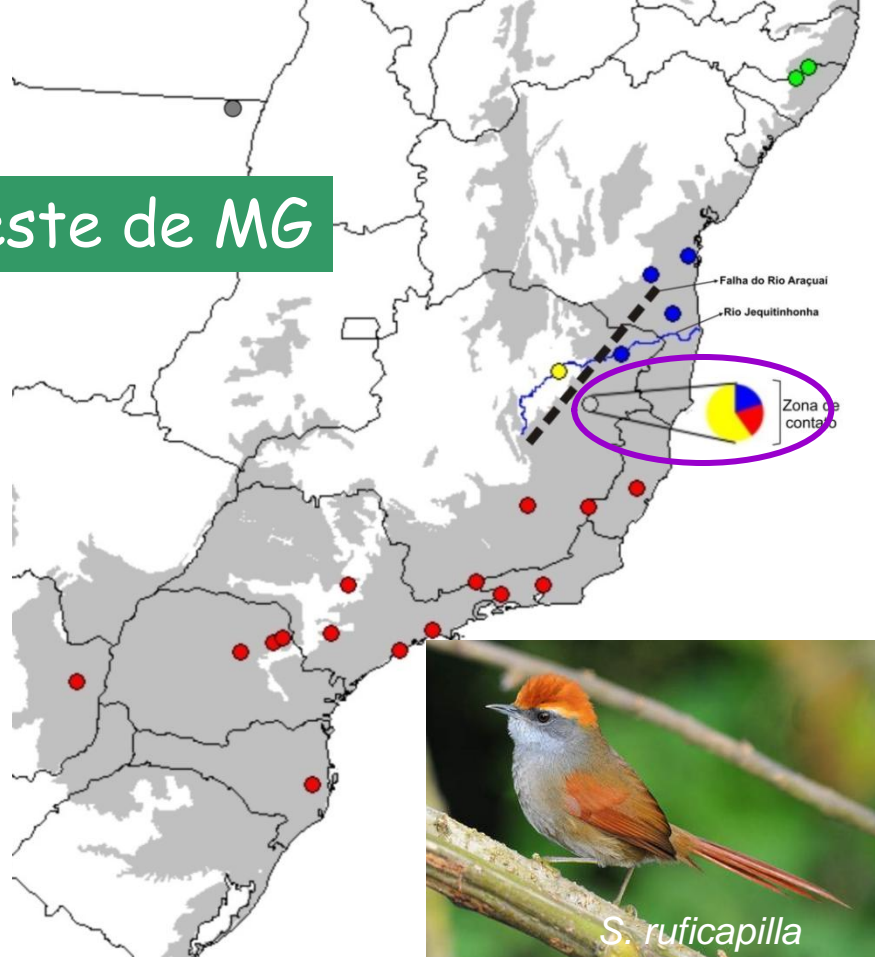
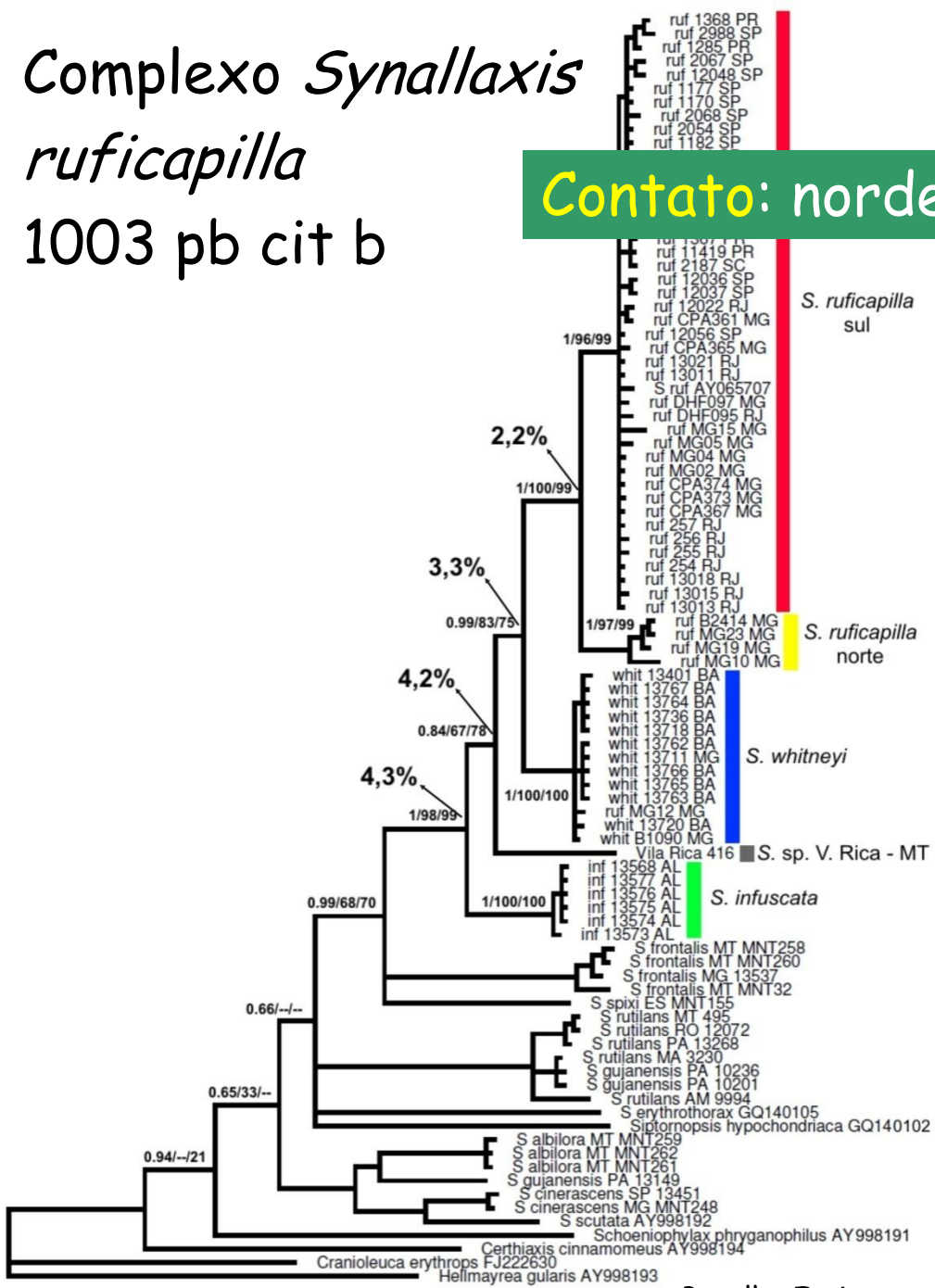


*scansor*



Complexo *Synallaxis*  
*ruficapilla*  
 1003 pb cit b

Contato: nordeste de MG



Batalha F<sup>o</sup>, in prep.

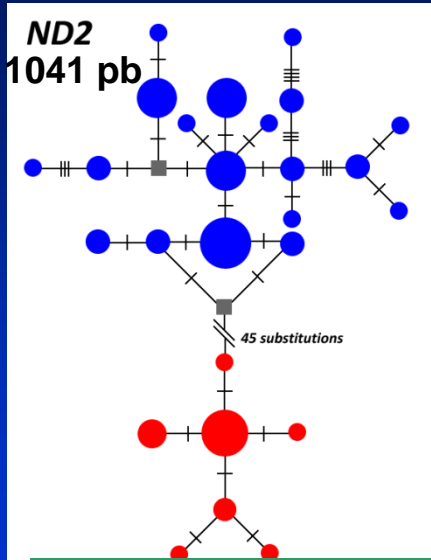
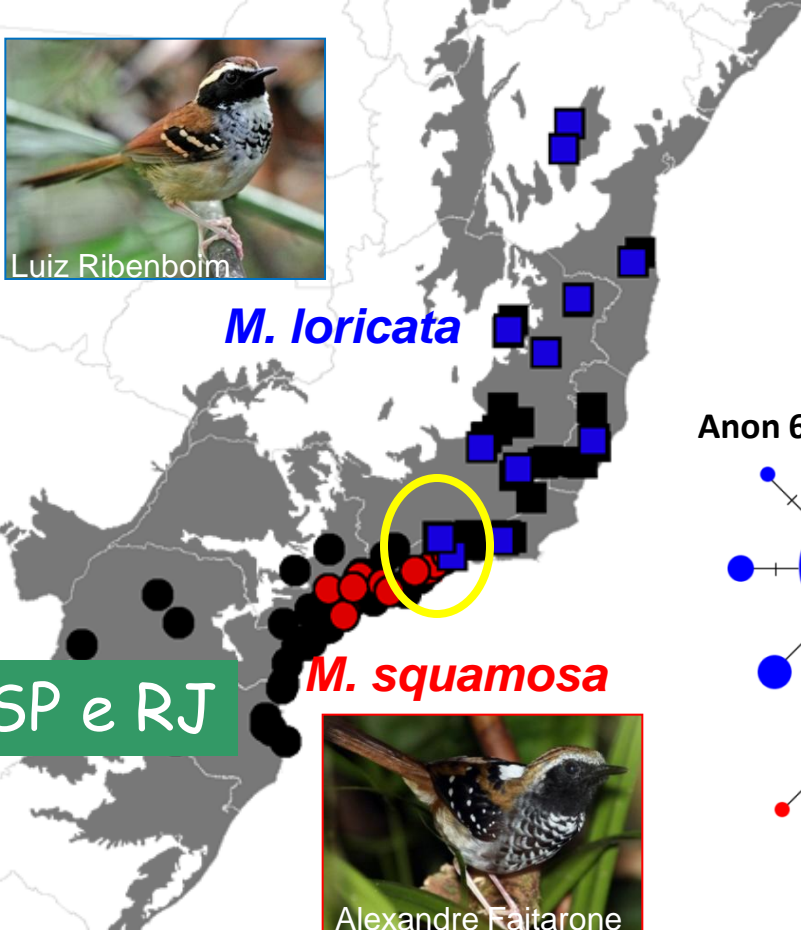




*M. loricata*

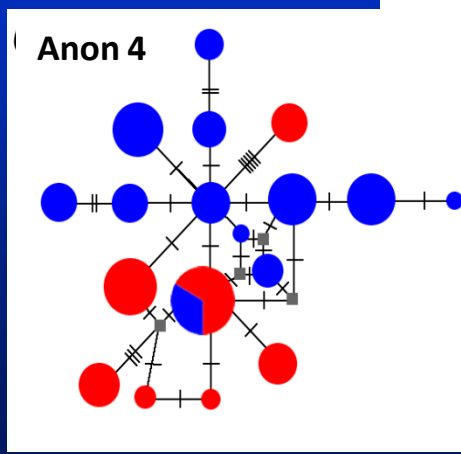
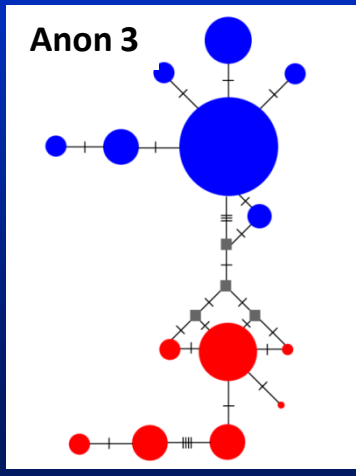
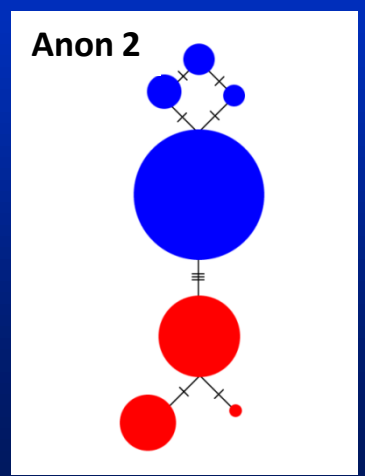
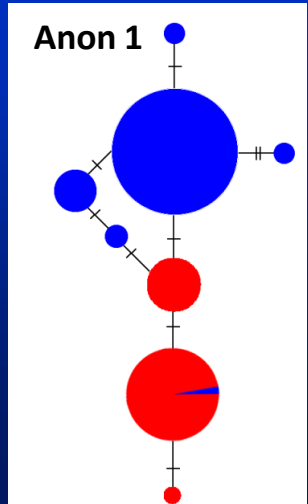
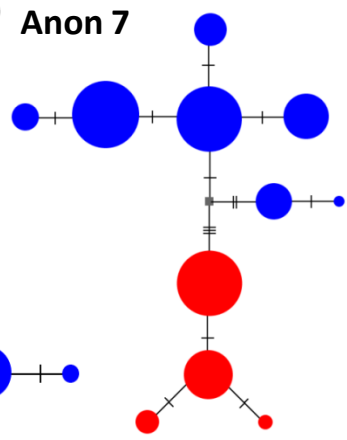
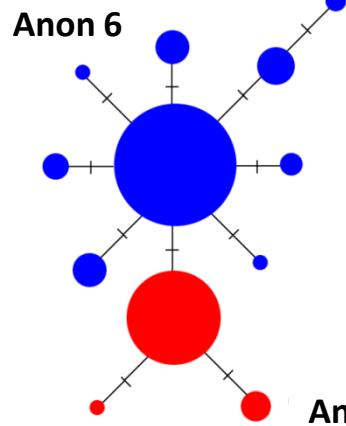
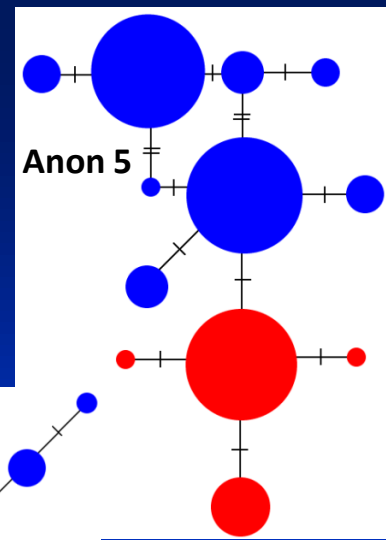


*M. squamosa*



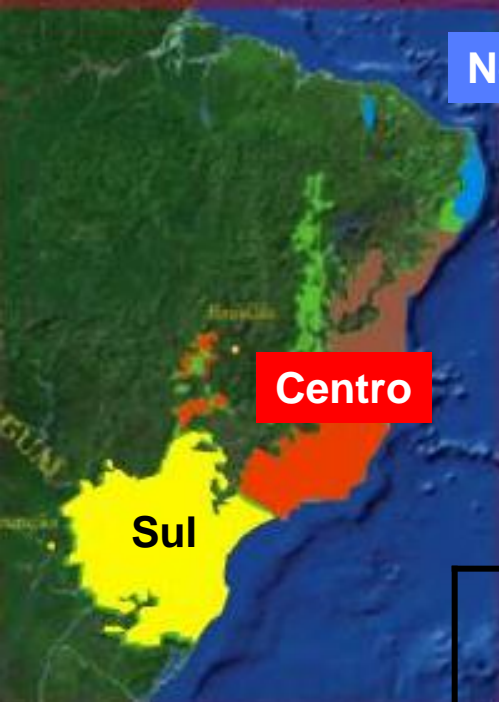
Contato: divisa SP e RJ

Marcadores anônimos (SNPs): 50 a 456 pb



## Conclusão - aves da Mata Atlântica

- Há padrões congruentes de estrutura populacional que indicam pelo menos dois componentes na MA .
- Há congruência de contato de linhagens no ou próximo ao estado de SP.



Norte

Centro

Sul

## Datas de divergência (mil anos)

	Norte vs. demais	Centro vs. sul
<i>X. fuscus</i>	500-800	400-440 (3)
<i>C. lineata</i>	n.a.	320-420 (3)
<i>S. scansor</i>	550-600	86 (2)
<i>S. ruficapilla</i>		715-1.300 (2)
<i>Myrmeciza</i> (2 sp)		2.500-6.500

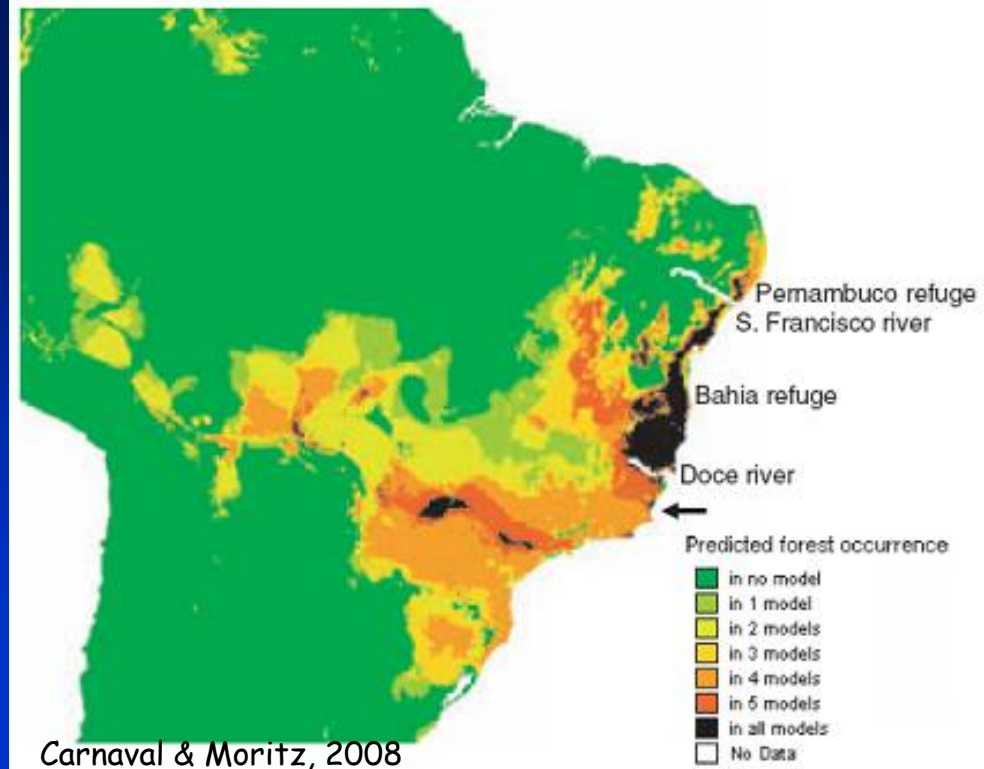


Norte

Centro

Sul

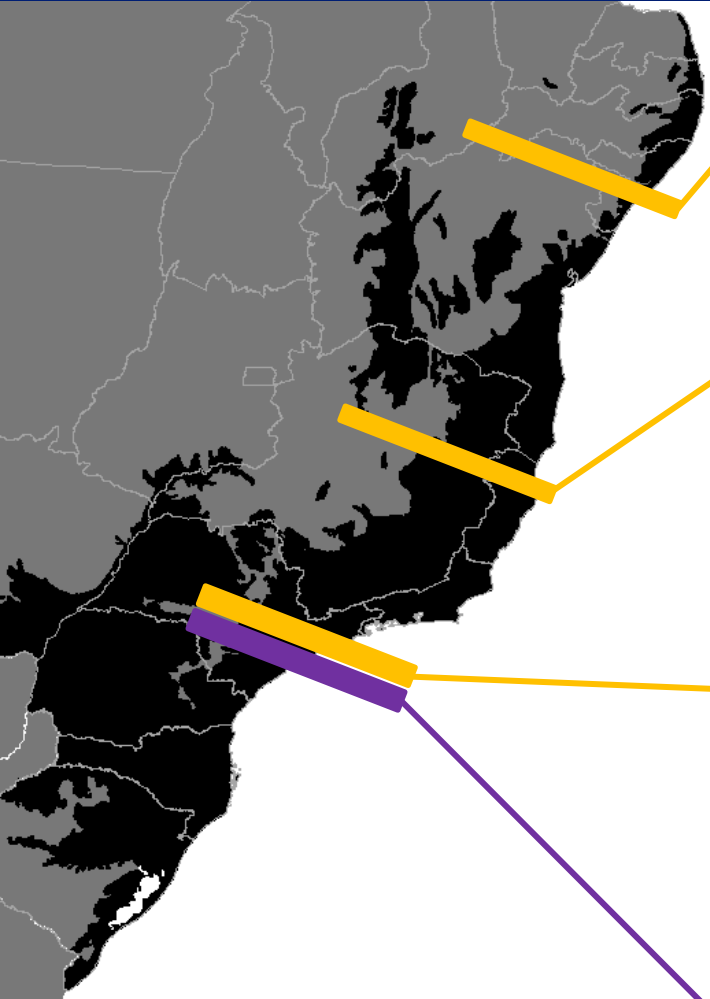
## Expansão populacional



	Sim	Não
<i>X. fuscus</i>	S, C?	<i>atlanticus</i>
<i>C. lineata</i>	S, C	
<i>S. scansor</i>	S, C	<i>cearensis</i>
<i>S. ruficapilla</i>	S/C	
<i>Myrmeciza</i> (2 sp)	<i>M. loricata?</i>	

Cabanne et al., 2007, 2008  
Pessoa, in prep.  
D'Horta, in prep.  
Batalha Fo. in prep.;  
Amaral in prep.

# Filogeografia de organismos da Mata Atlântica



Lucas Grandinetti  
  
*Hypsiboas semilineatus*  
 Carnaval et al., 2009

Miguel Ridrigues  
  
*H. albomarginatus*  
 Carnaval et al., 2009

Germano Woehl  
  
*Hyla faber*  
 Carnaval et al., 2009

Lucas Grandinetti  
  
*Hypsiboas semilineatus*  
 Carnaval et al., 2009

Miguel Ridrigues  
  
*H. albomarginatus*  
 Carnaval et al., 2009

Germano Woehl  
  
*Hyla faber*  
 Carnaval et al., 2009

Lucas Grandinetti  
  
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 Carnaval et al., 2009

Miguel Ridrigues  
  
*H. albomarginatus*  
 Carnaval et al., 2009

Germano Woehl  
  
*Hyla faber*  
 Carnaval et al., 2009

Luciano Costa  
  
*Melipona quadrifasciata*  
 Batalha-Filho et al. in press

www.ufrgs.br  
  
*Bothrops jararaca*  
 Graziotin et al., 2006

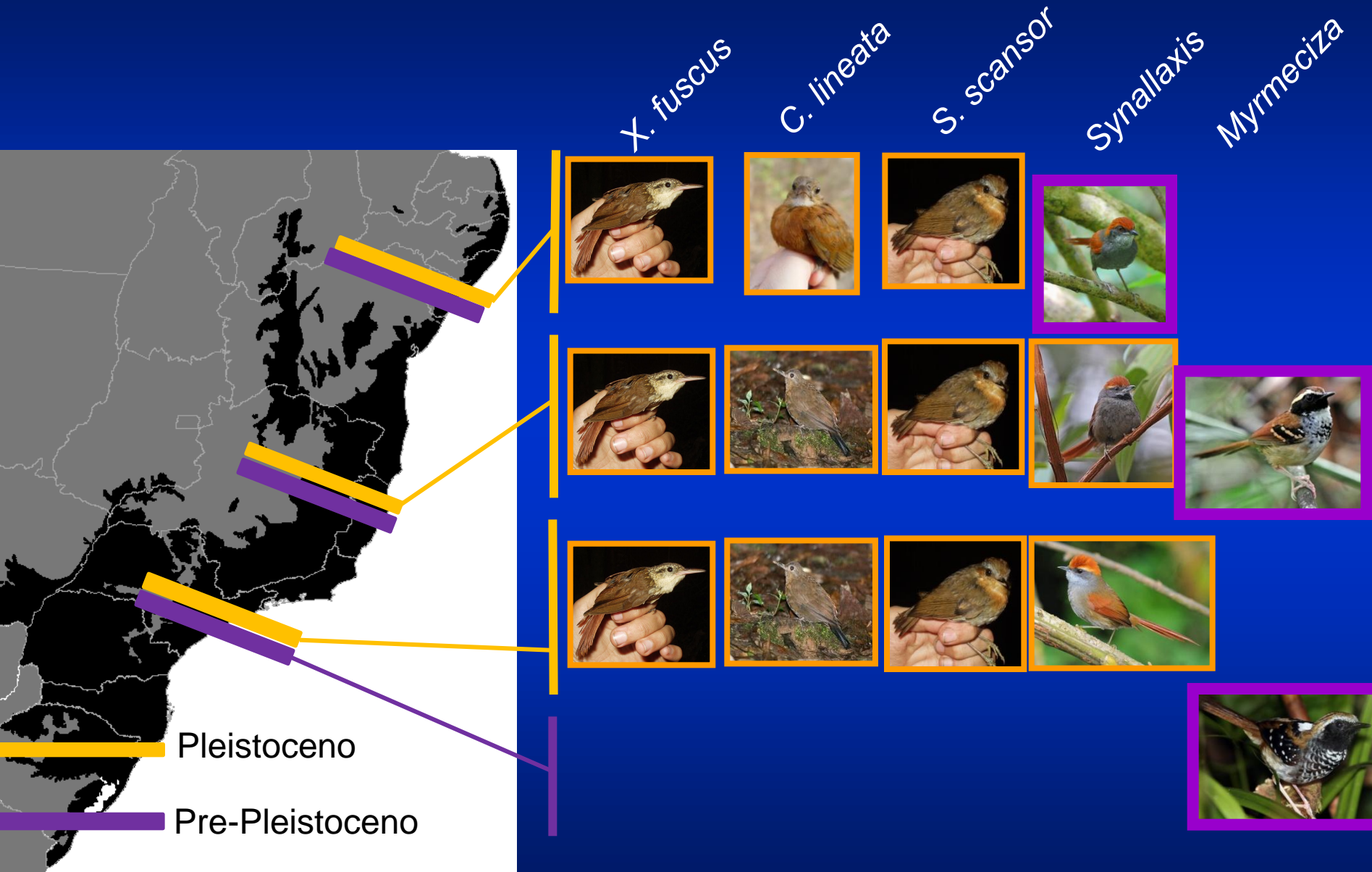
Carlos Rivero  
  
*Cerdocyon thous*  
 Tchaicka et al., 2007

Ryan photographic  
  
*Desmodus rotundus*  
 Martins et al., 2010

Pleistocene

Pre-Pleistocene

# Filogeografia de aves da Mata Atlântica



# Conclusões Finais

- História dos organismos da MA: complexa no espaço e no tempo.
- Espécies distintas = resultados diferentes
  - ✓ estrutura populacional
  - ✓ expansão populacional
- Conservação: brejos do Ceará

# Mata Atlântica

Existem padrões biogeográficos gerais?  
Quais os processos que geraram sua alta diversidade?





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