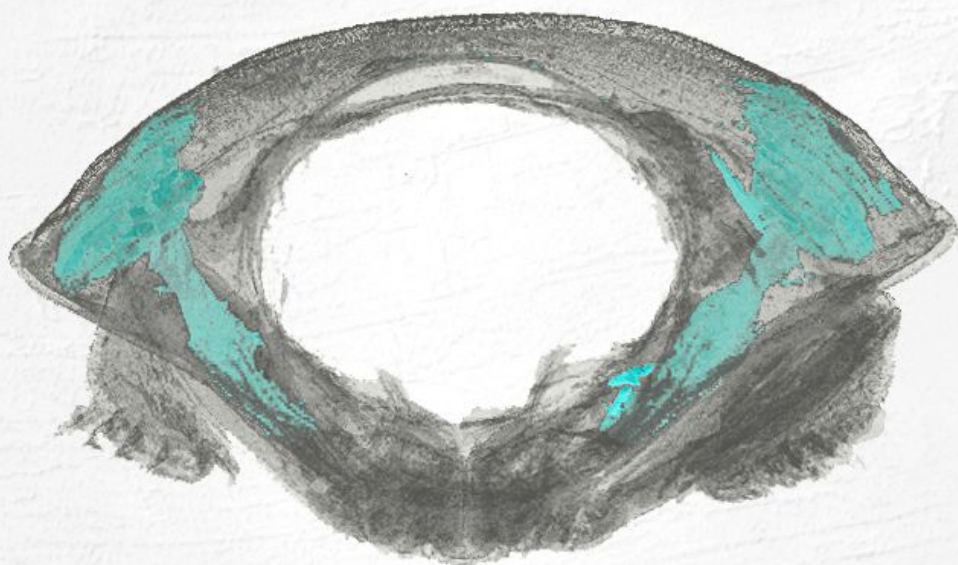


Phylogeny, biogeography and generic classification of the *Ectateus* generic group (Coleoptera: Tenebrionidae: Platynotina)

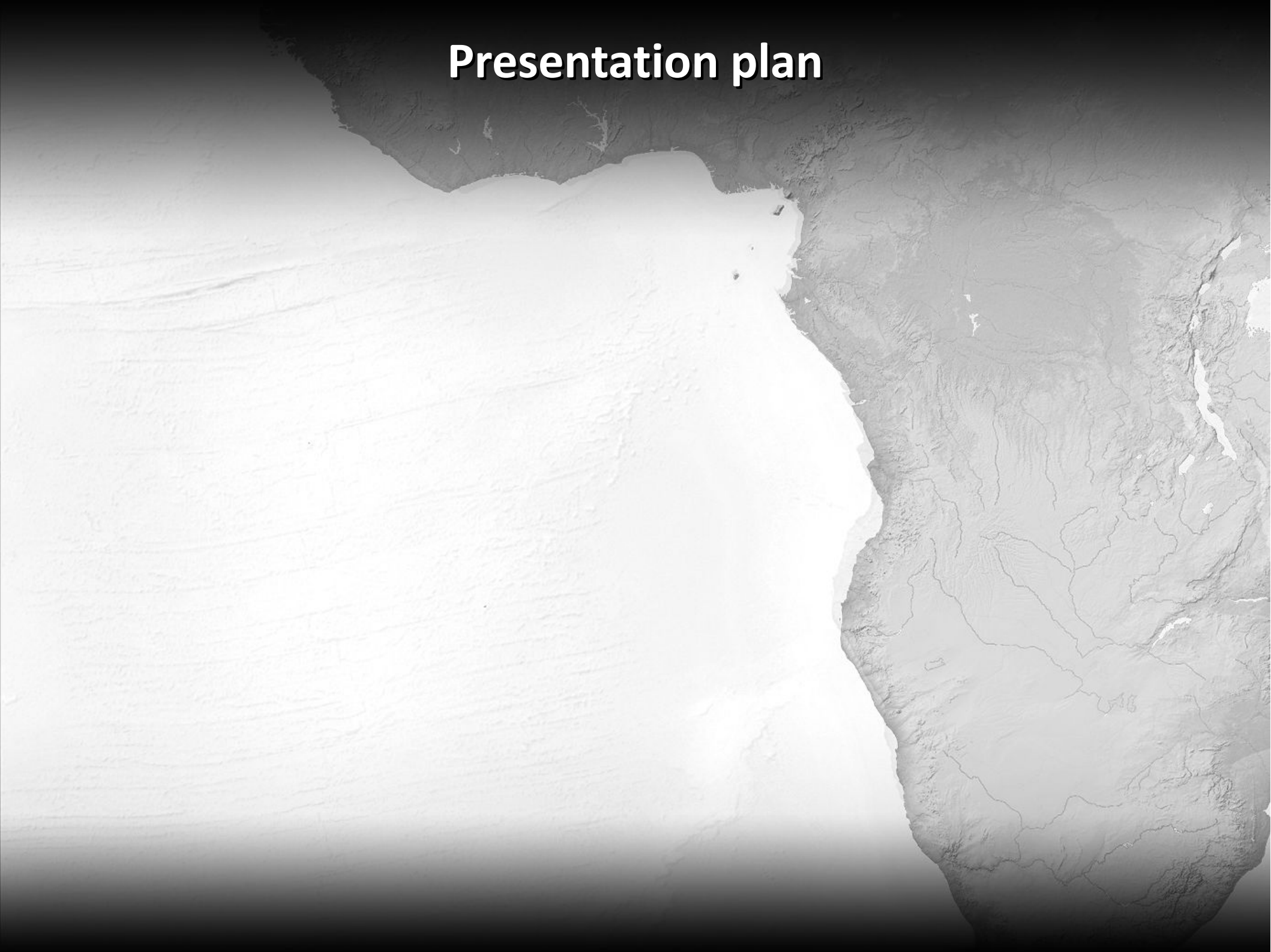


Marcin Jan Kamiński

**Museum and Institute of Zoology
Polish Academy of Sciences**



Presentation plan



Presentation plan

- “*Ectateus* generic group”?

Presentation plan

- “*Ectateus* generic group”?
- What are the problems?

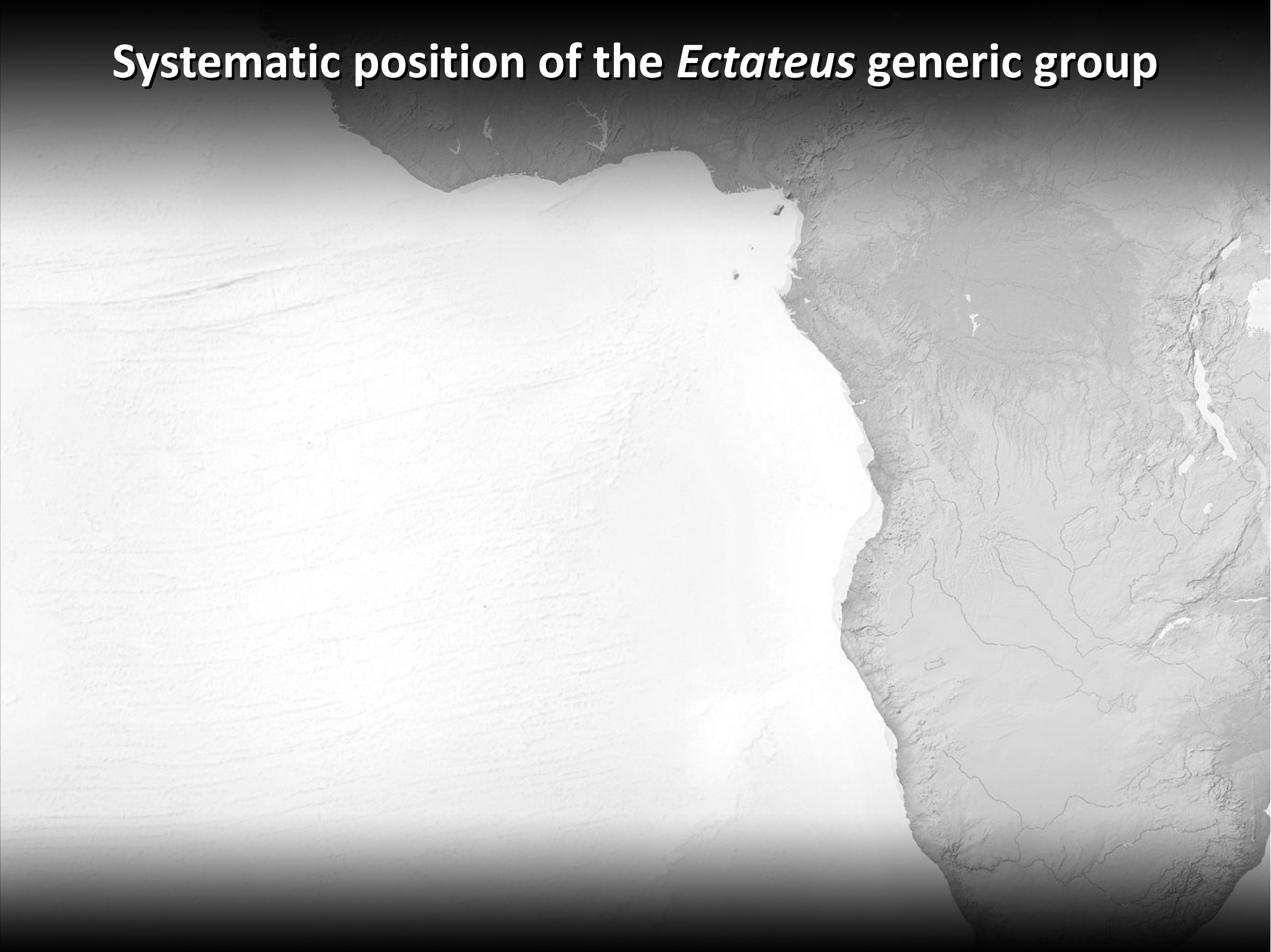
Presentation plan

- “*Ectateus* generic group”?
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- M&M

Presentation plan

- “*Ectateus* generic group”?
- What are the problems?
- M&M
- Results (phylogeny, biogeography)

Systematic position of the *Ectateus* generic group

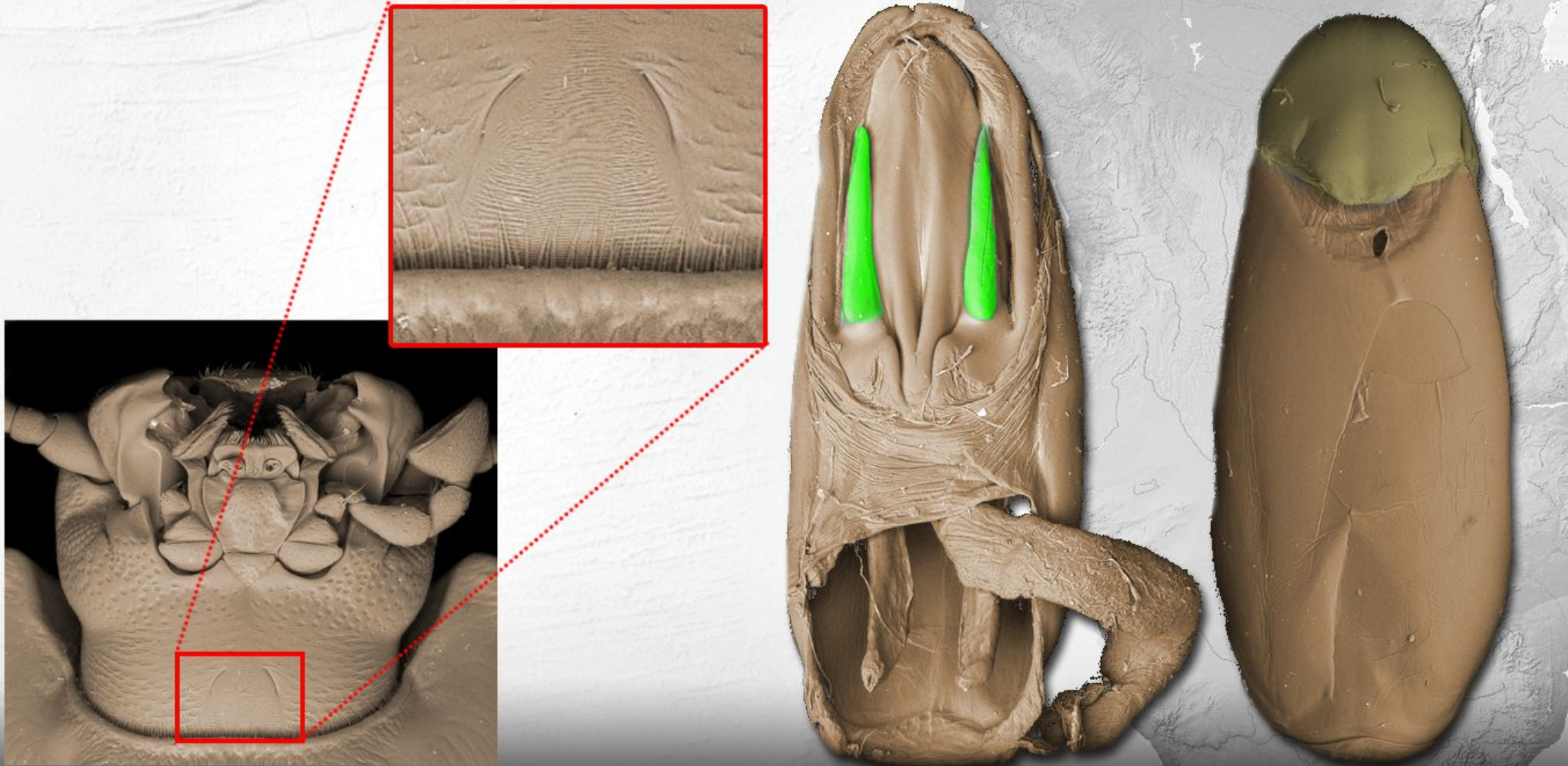


Systematic position of the *Ectateus* generic group

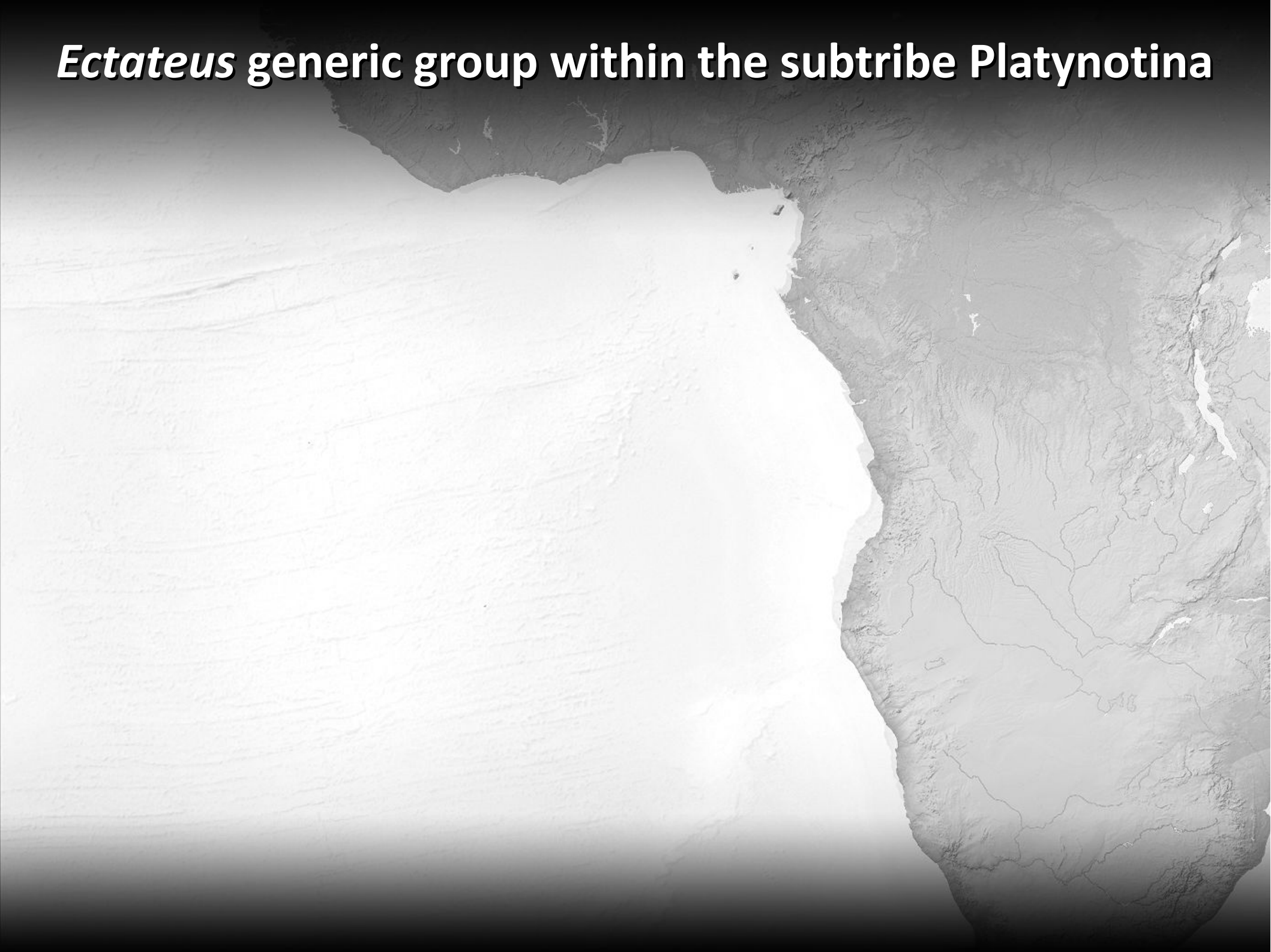
Tenebrioninae: Pedinini: **Platynotina**

Systematic position of the *Ectateus* generic group

Tenebrioninae: Pedinini: **Platynotina**



***Ectateus* generic group within the subtribe Platynotina**

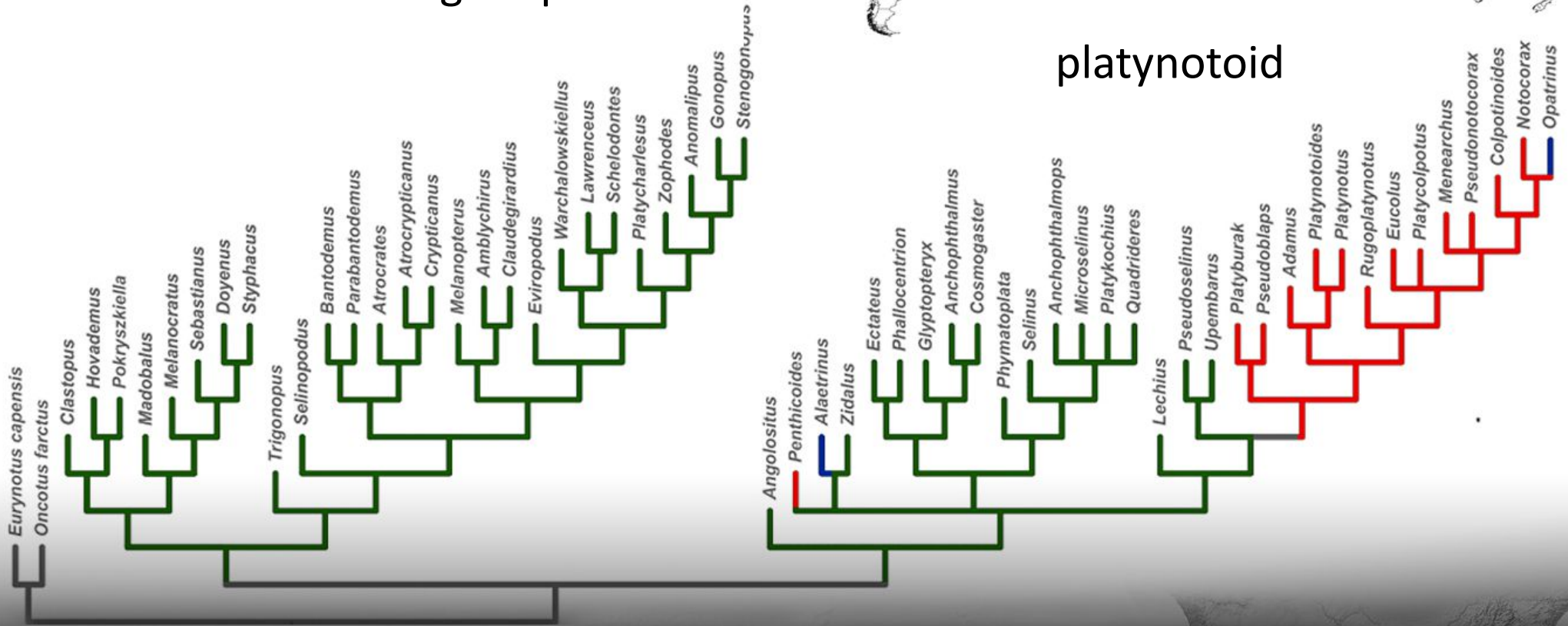


Ectateus generic group within the subtribe Platynotina

melanocratoid

trigonopoid

platynotoid

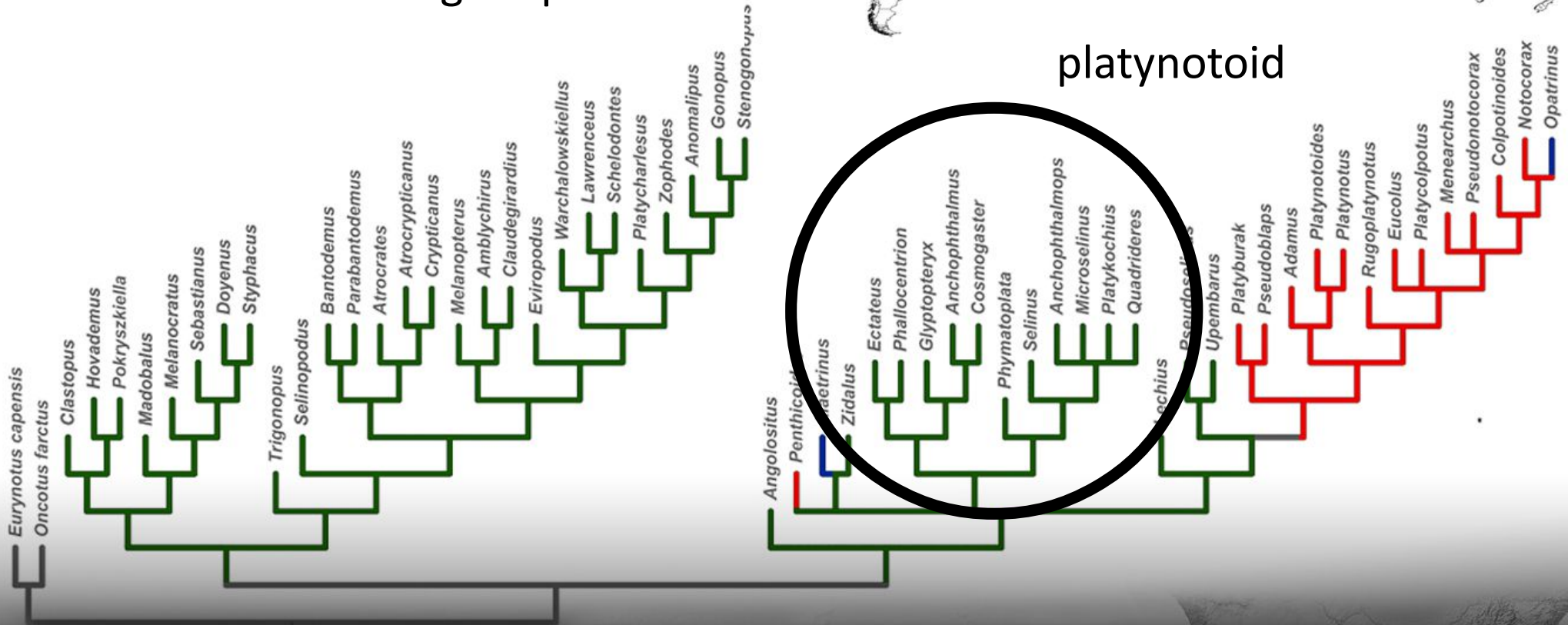


Ectateus generic group within the subtribe Platynotina

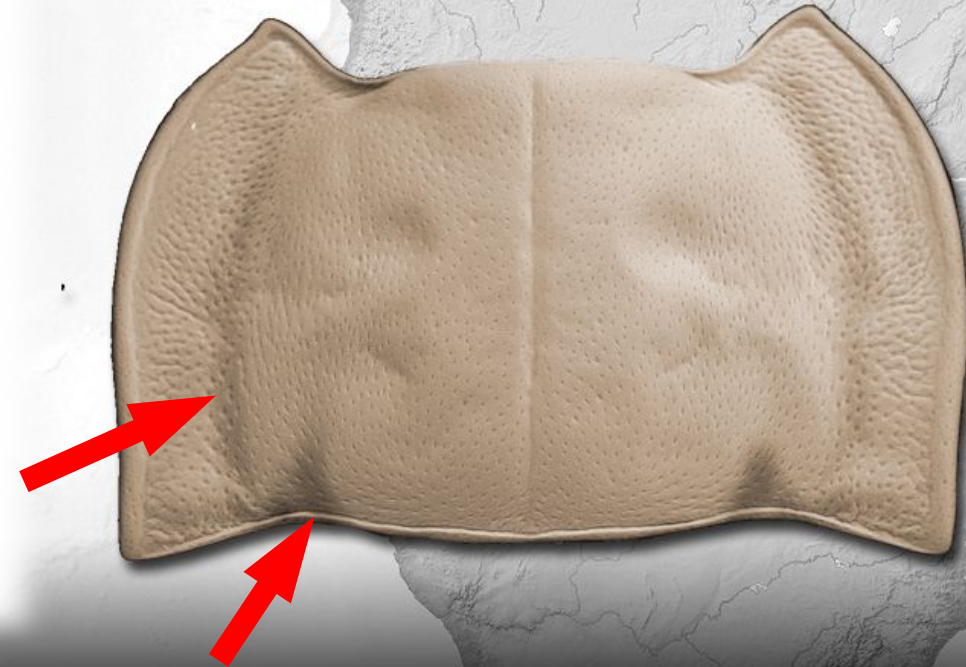
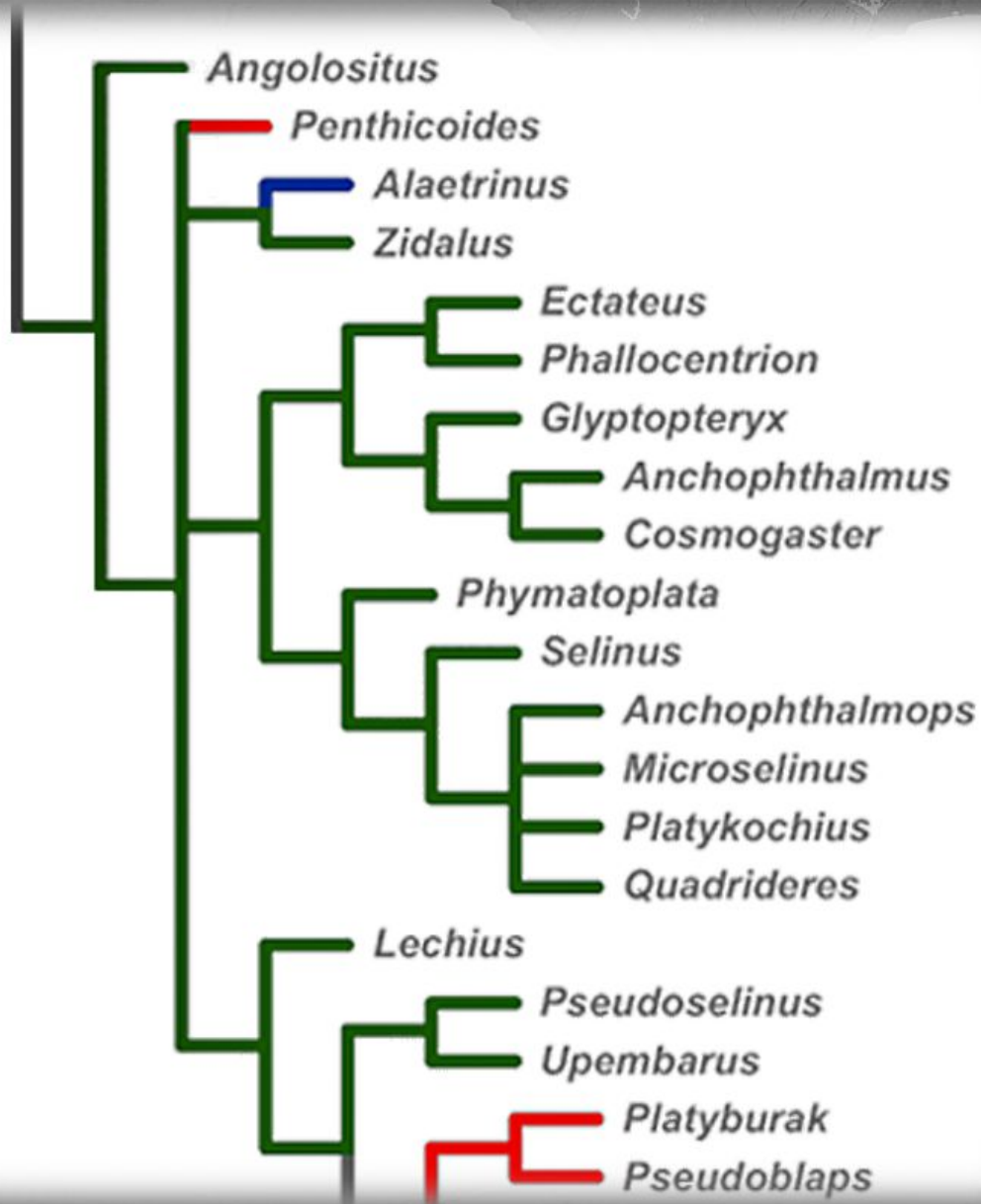
melanocratoid

trigonopoid

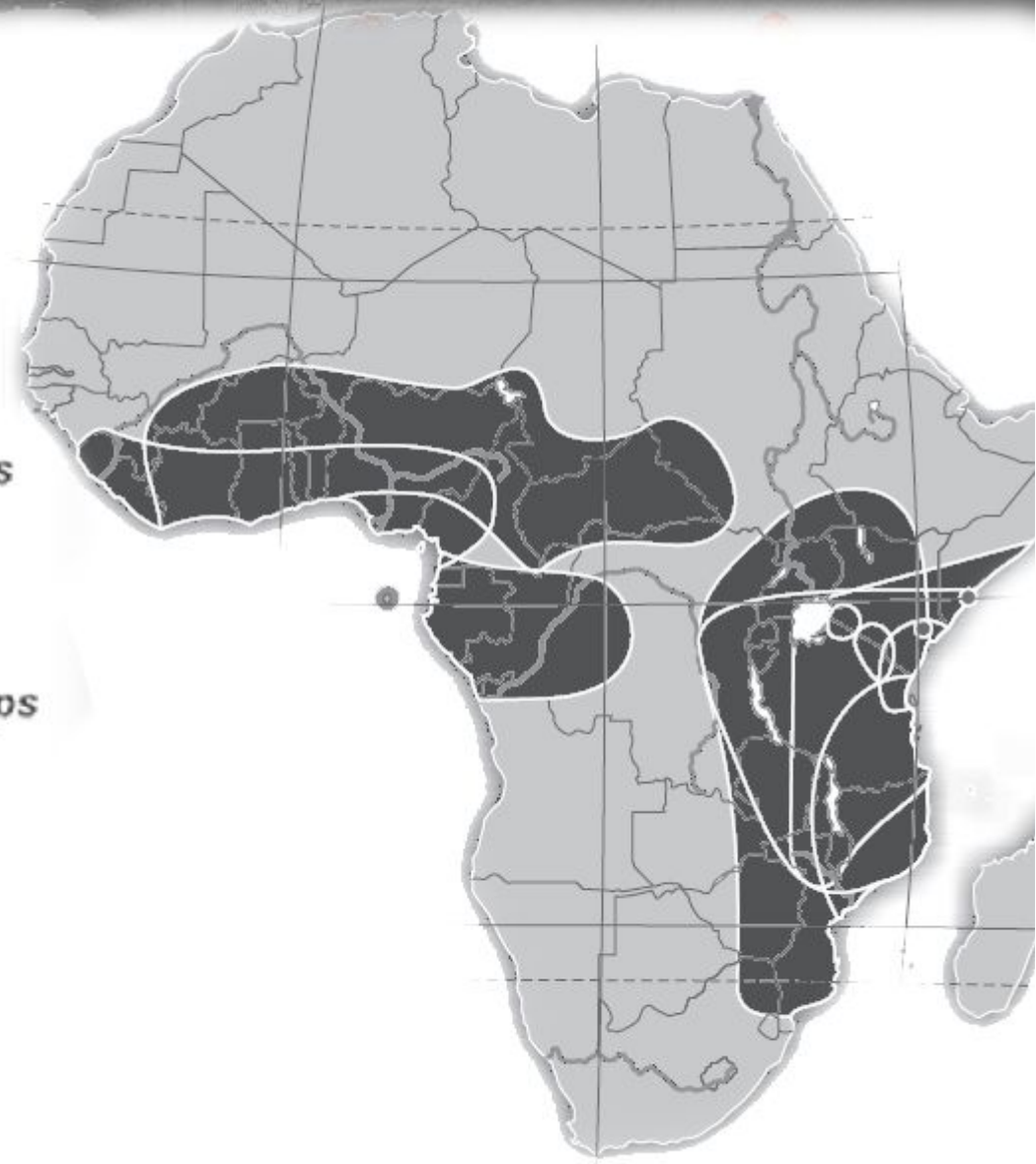
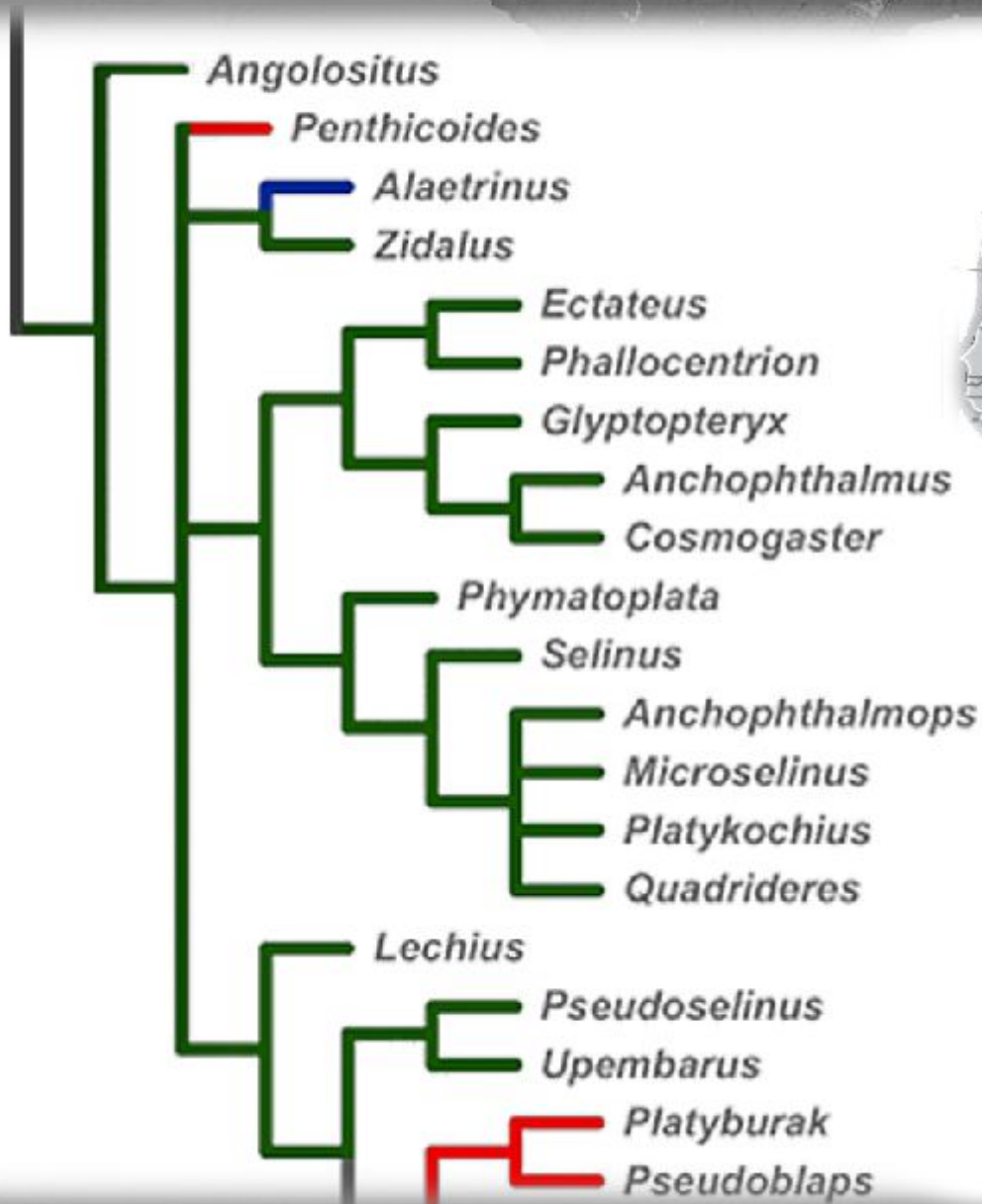
platynotoid



Taxonomic concept of the *Ectateus* generic group



Taxonomic concept of the *Ectateus* generic group



Ectateus generic group – general information



Phallocentrion edentatum (Gebien 1938)

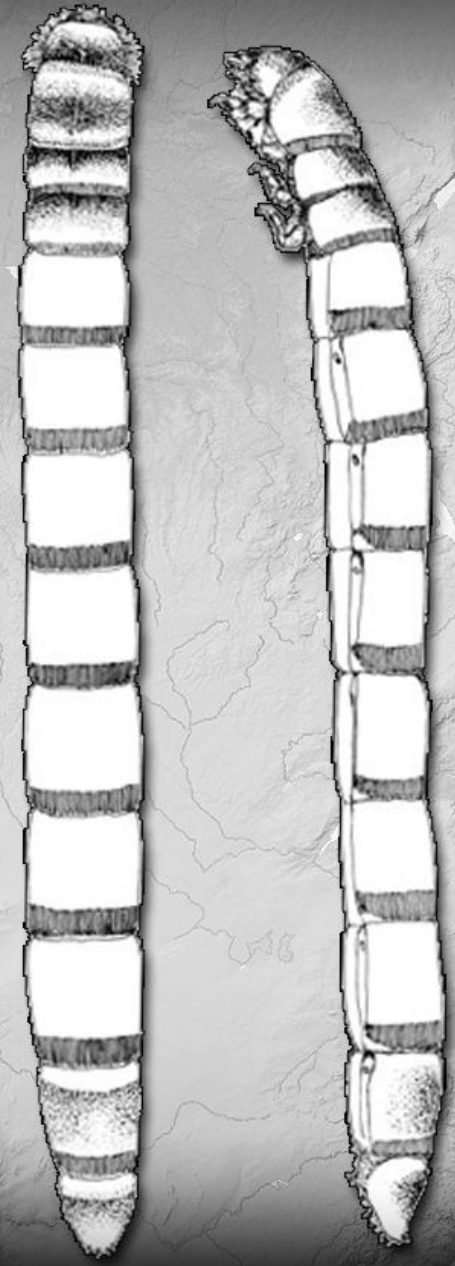
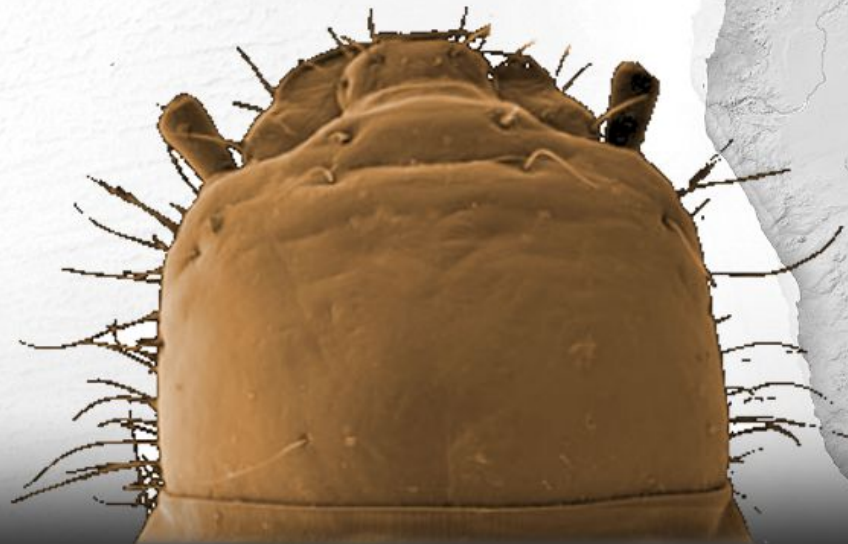
Ectateus generic group – general information

- larvae:

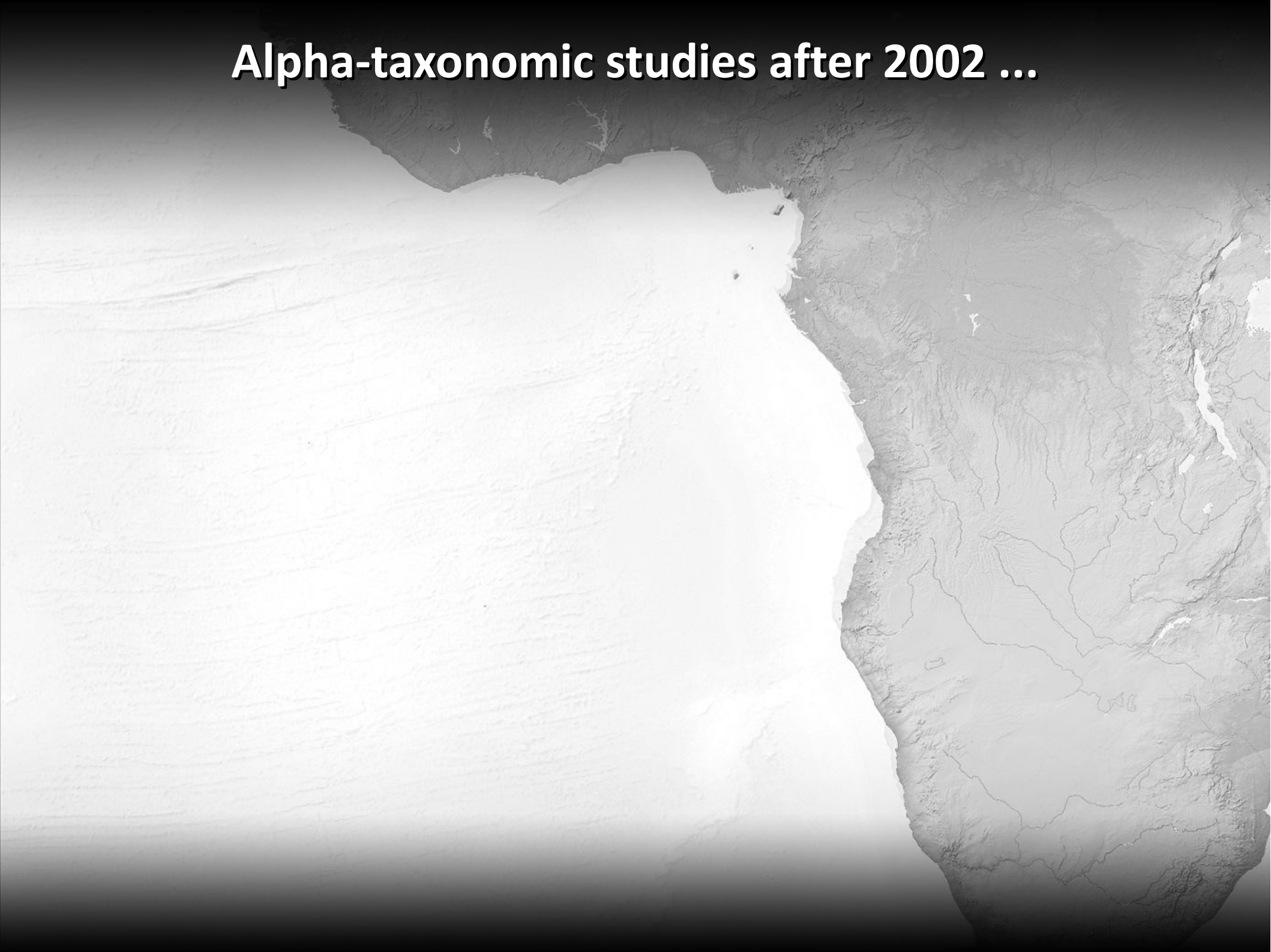
Anchophthalmus algoensis

Anchophthalmus silphoides

Quadrideres femineus



Alpha-taxonomic studies after 2002 ...



Alpha-taxonomic studies after 2002 ...

genus *Synquadrideres*

- lack of pronotal indentations

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Alpha-taxonomic studies after 2002 ...

genus *Synquadrideres*

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Quadrideres interioris

Alpha-taxonomic studies after 2002 ...

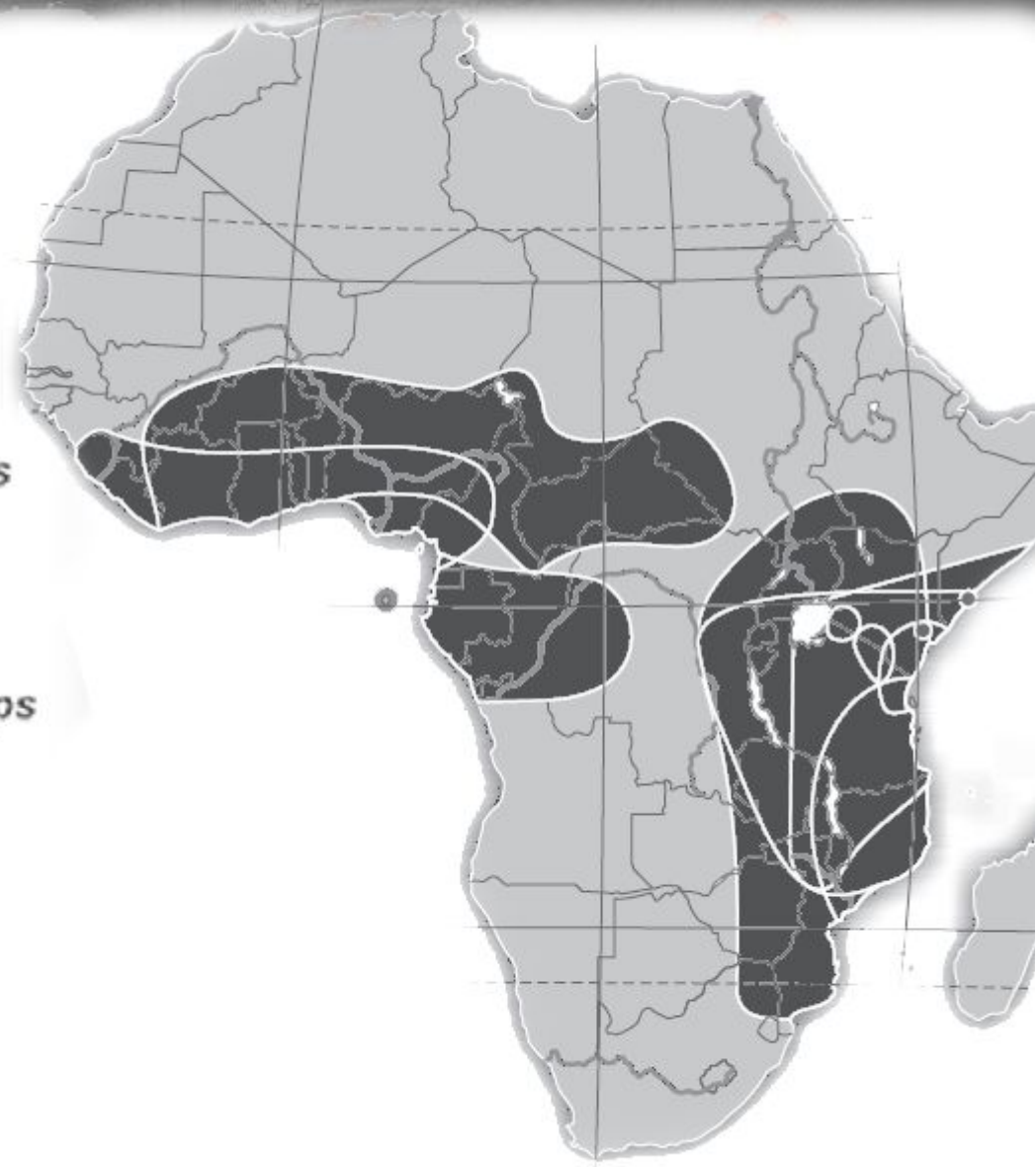
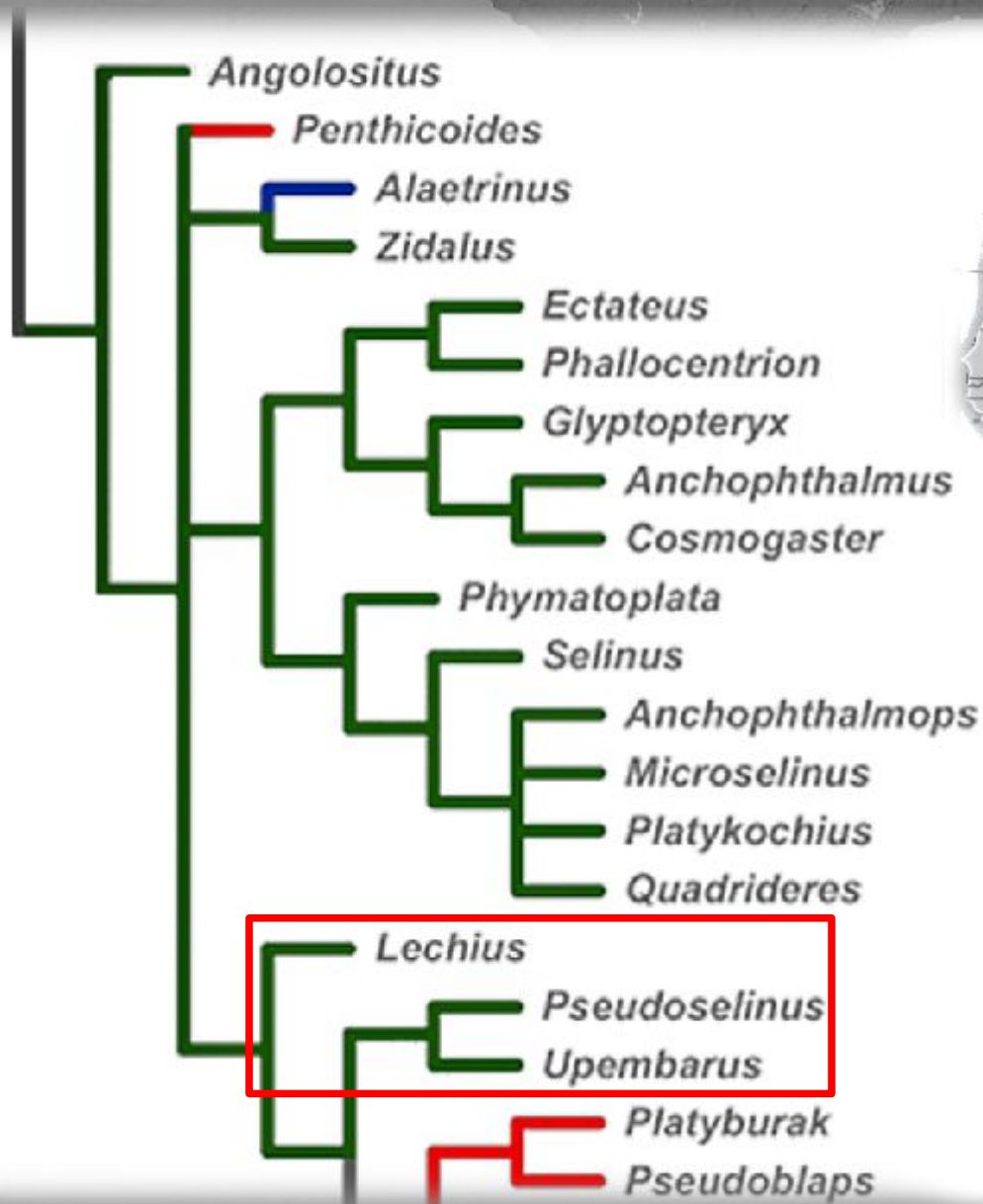
genus *Synquadrideres*

- lack of pronotal indentations

genera *Lechius*, *Pseudoselinus* and *Upembarus*

- included in the *Ectateus* generic group

Alpha-taxonomic studies after 2002 ...



Alpha-taxonomic studies after 2002 ...

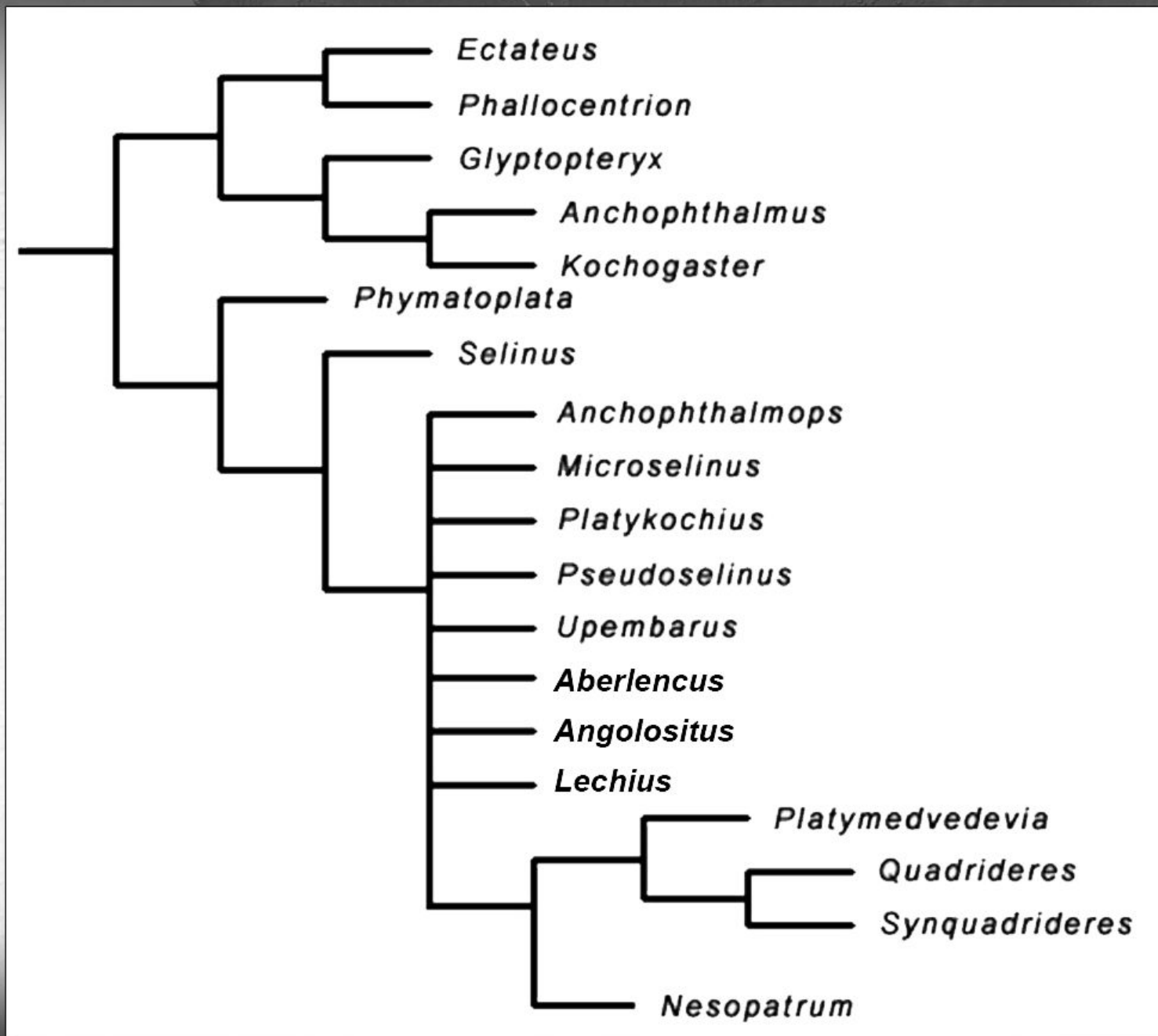
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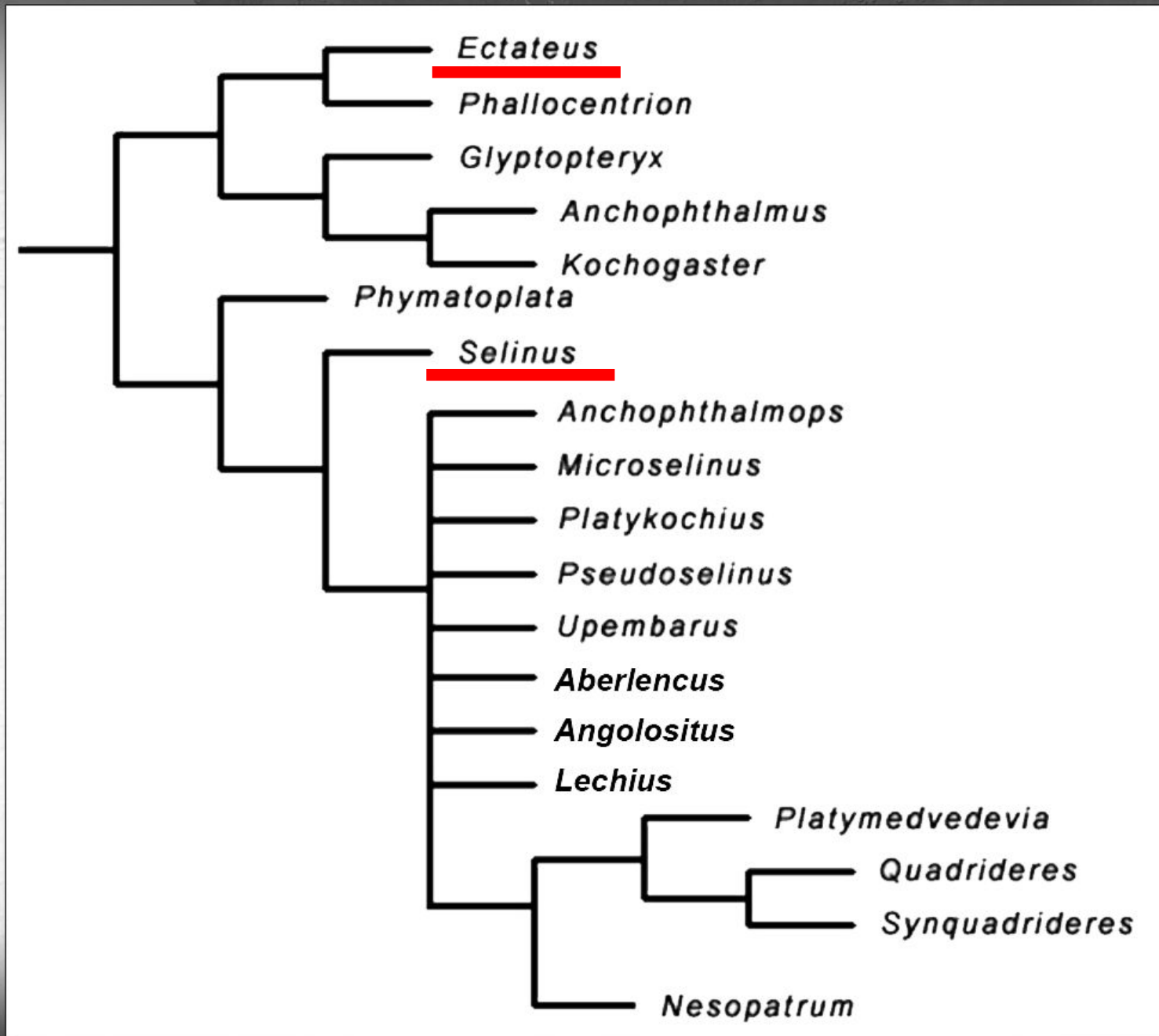
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Alpha-taxonomic studies after 2002 ...



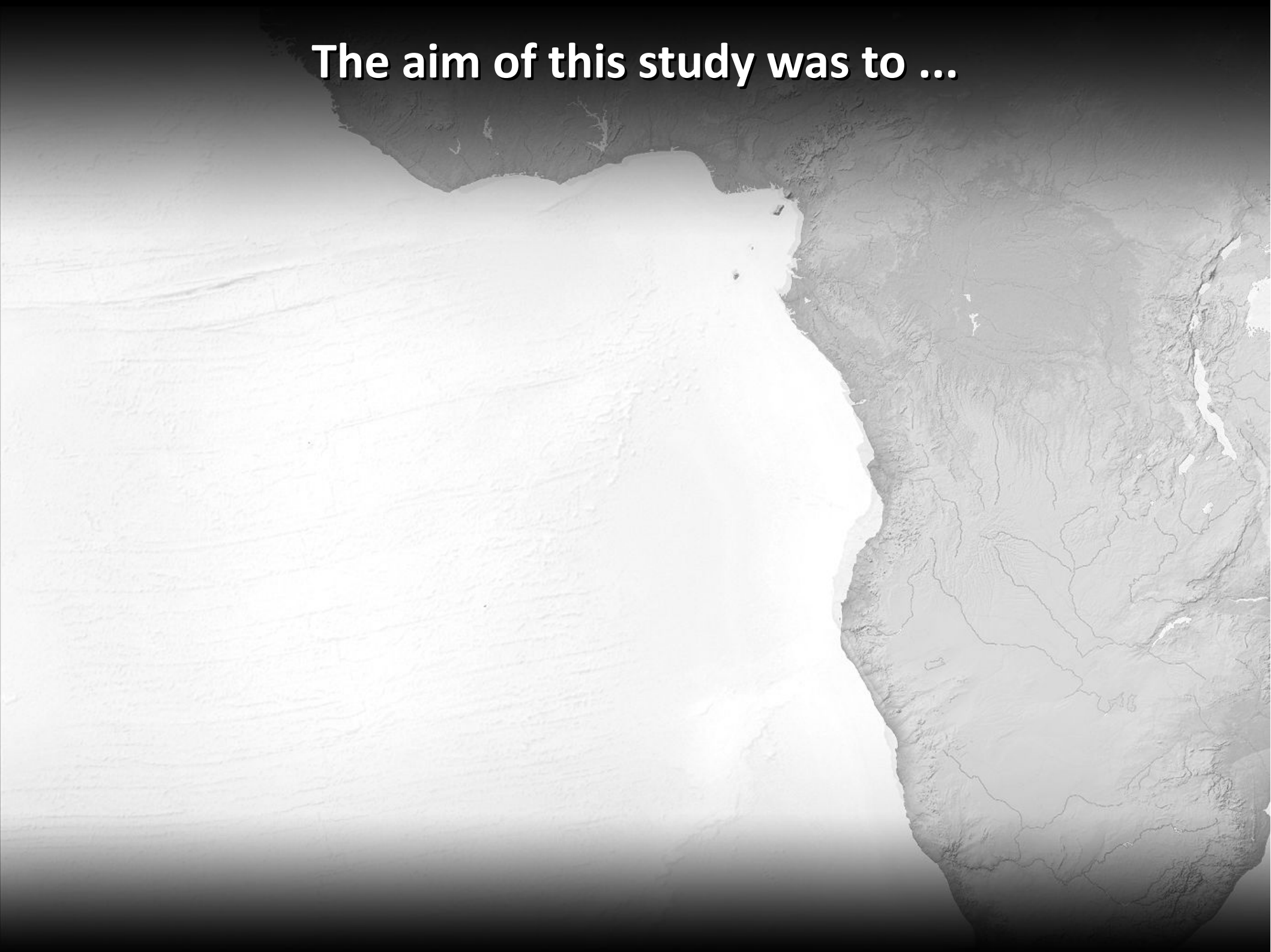
Iwan 2003, Iwan et Banaszekiewicz 2005, Kamiński et Raś 2011 ...

Alpha-taxonomic studies after 2002 ...



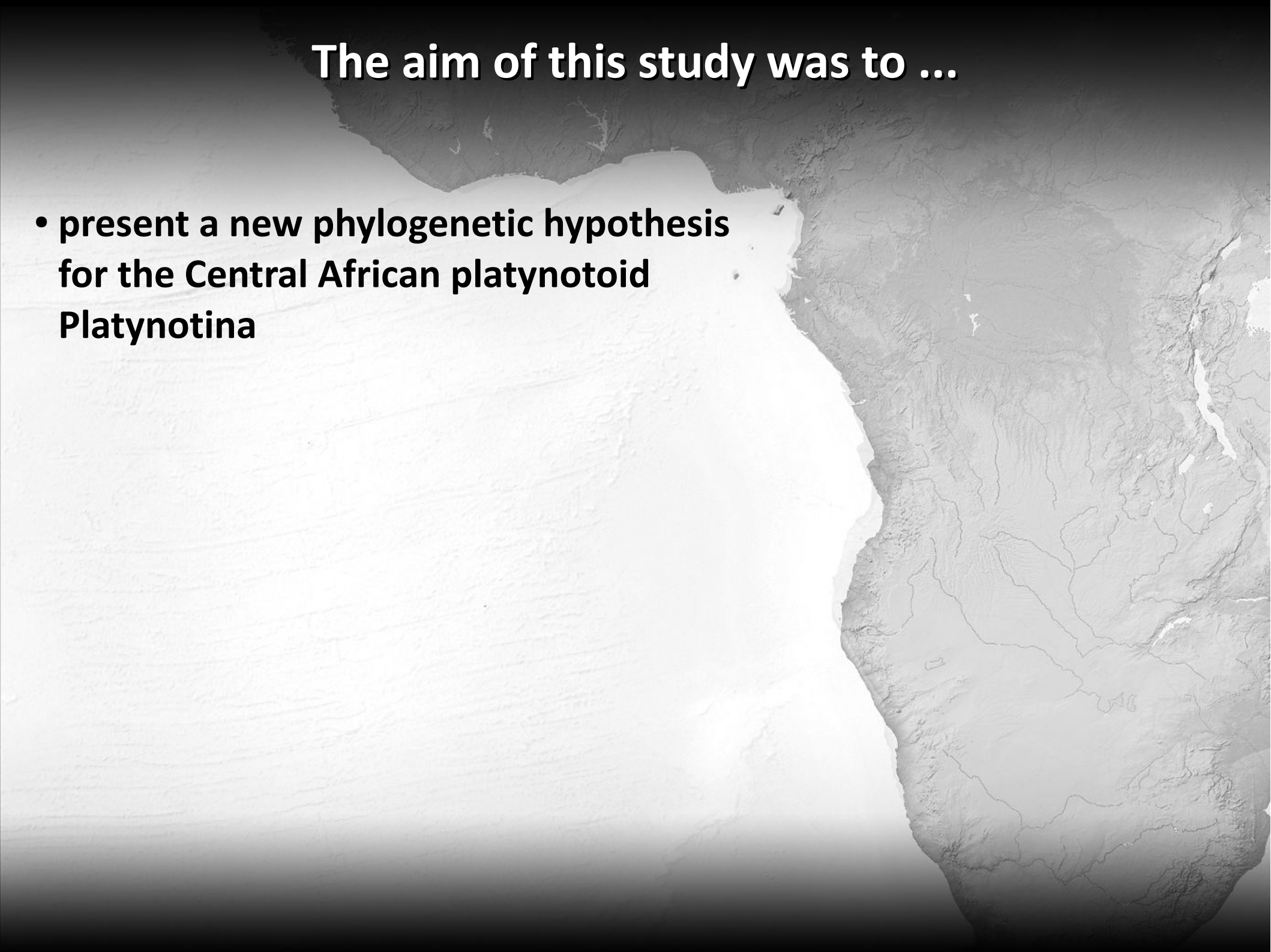
Iwan 2003, Iwan et Banaszekiewicz 2005, Kamiński et Raś 2011 ...

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The aim of this study was to ...

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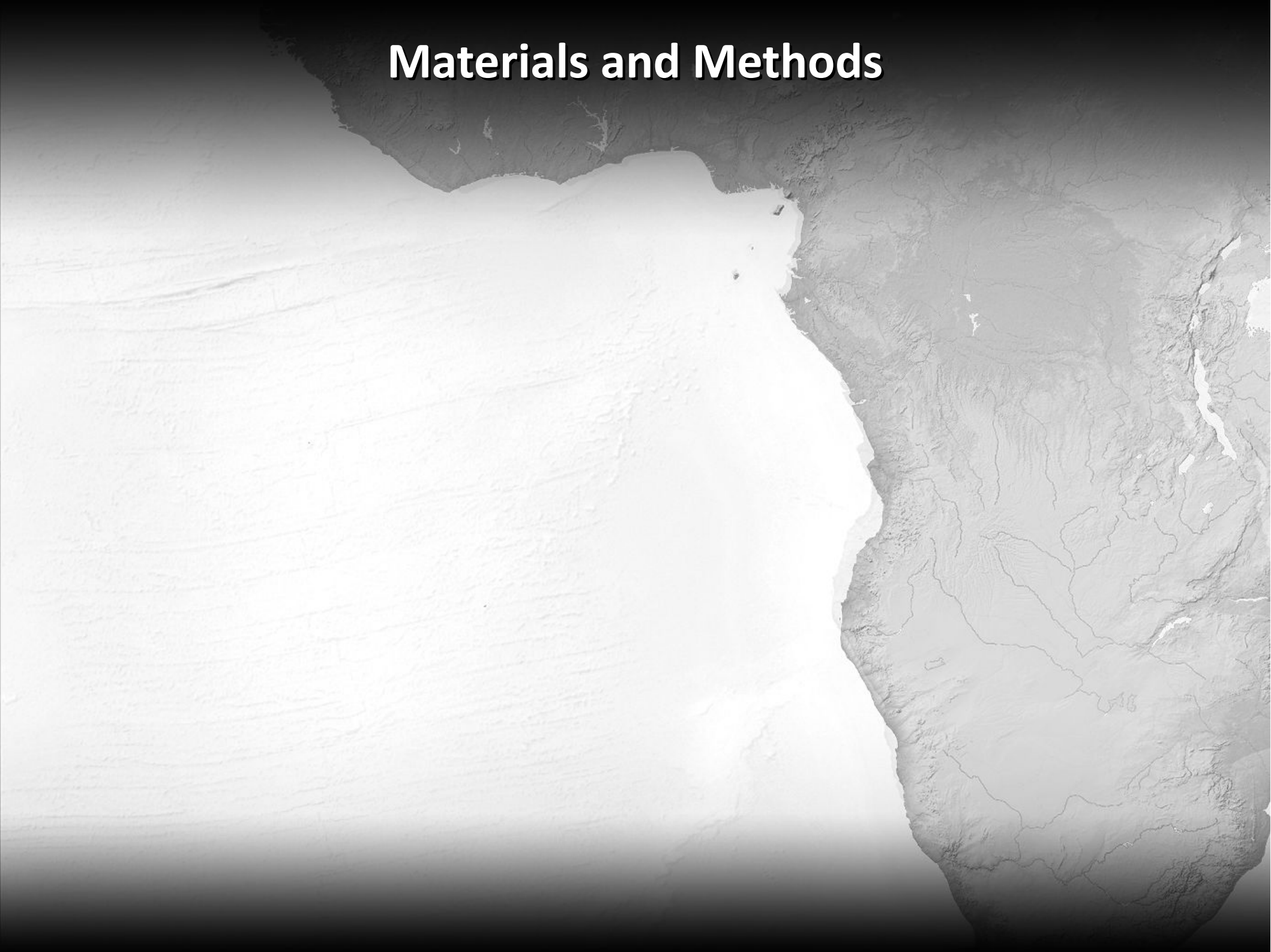
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- propose a new classification for the *Ectateus* generic group
- **prepare taxonomic revisions of all genera and species**

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- prepare taxonomic revisions of all genera and species
- test the Iwan`s (2004) biogeographic hypothesis

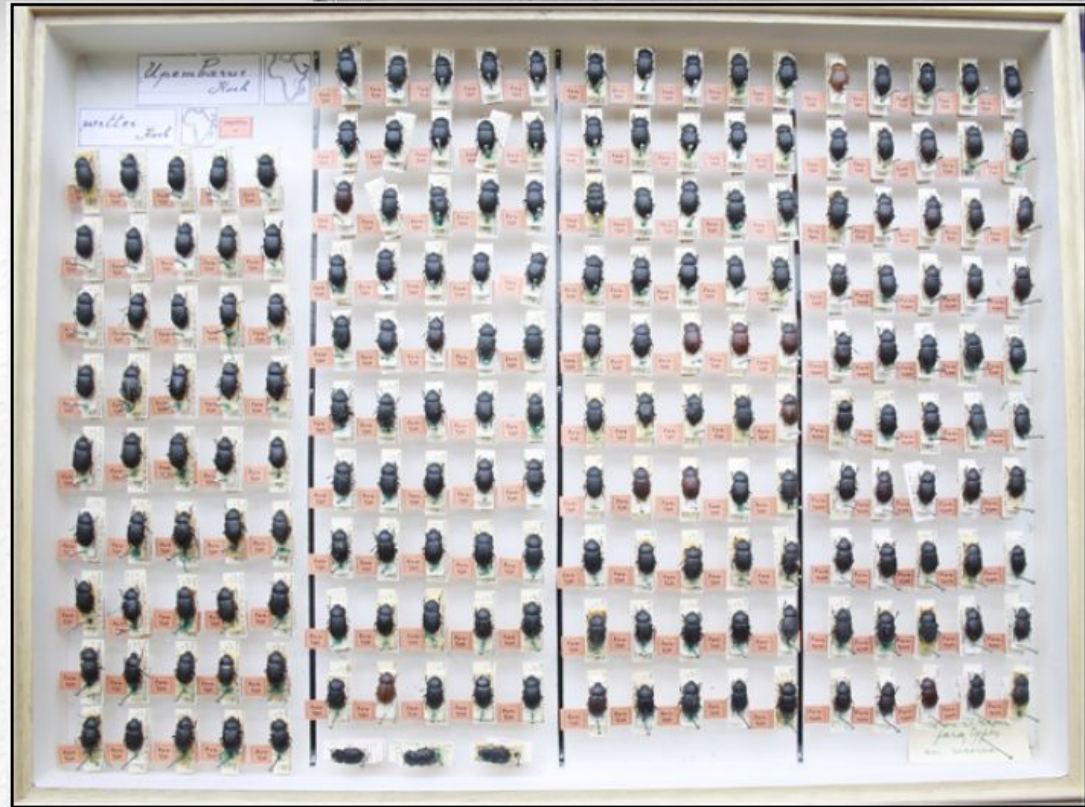
Materials and Methods



Materials and Methods

Dried specimens

- 21 collections



Upembarus wittei wittei Koch, 1956

Materials and Methods

Dried specimens

- 21 collections

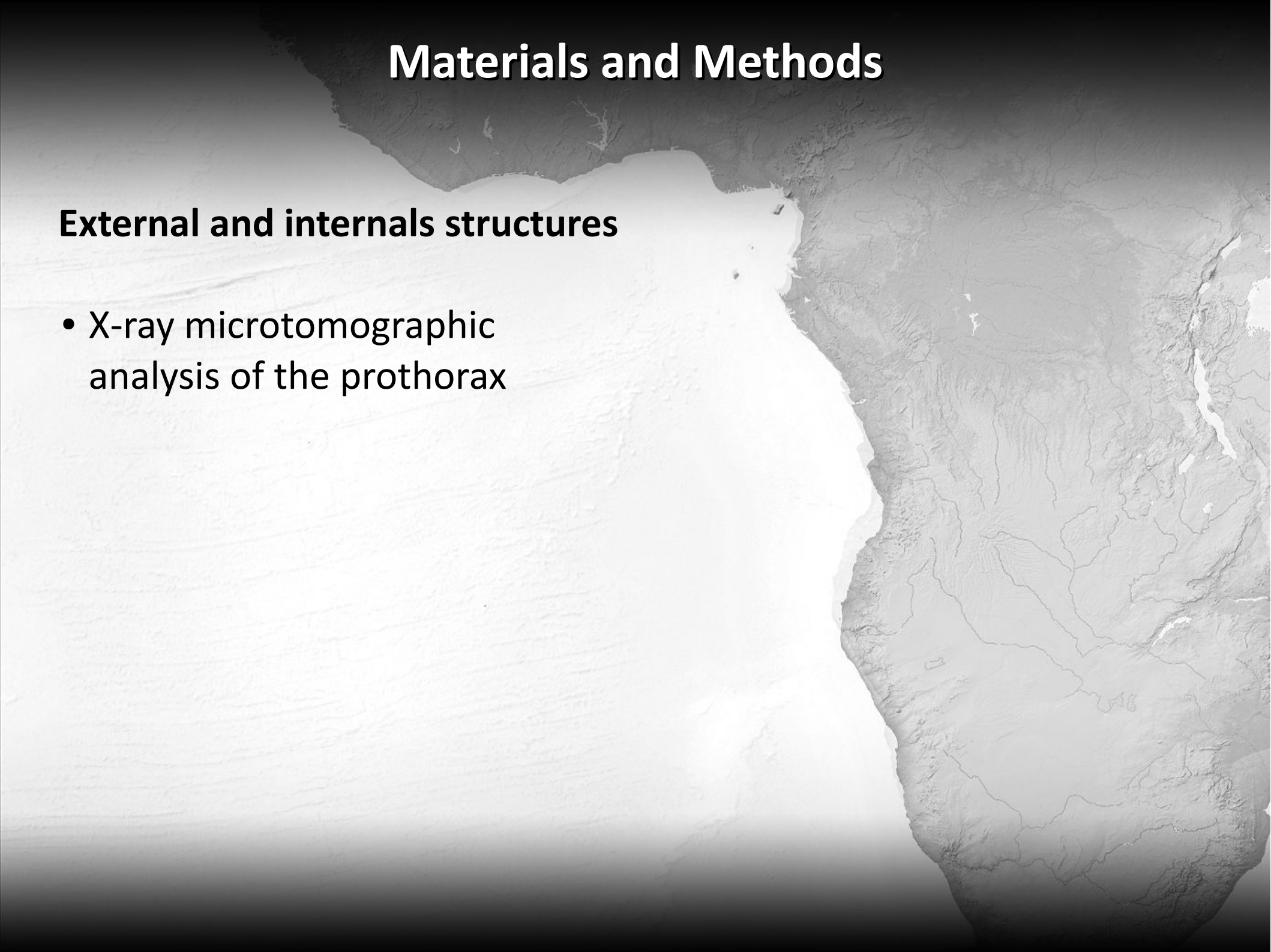
External and internal structures



Materials and Methods

External and internal structures

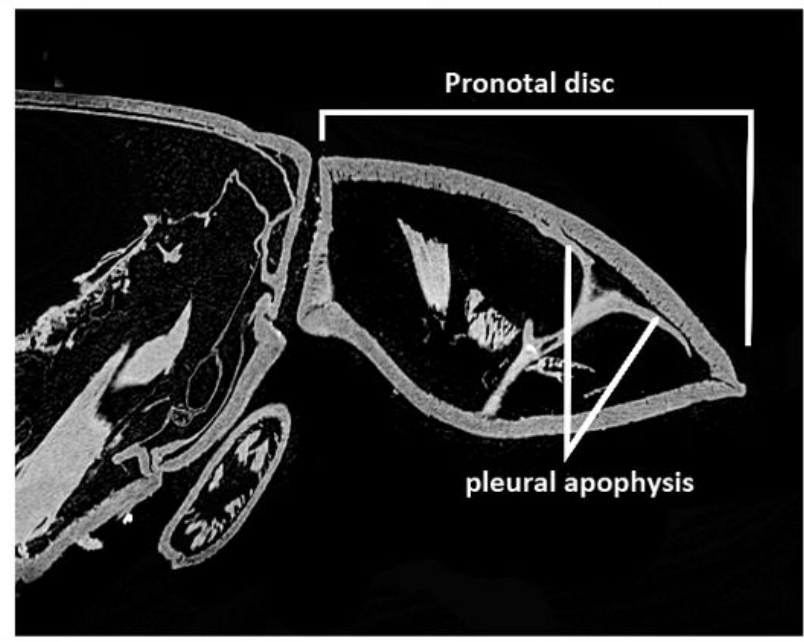
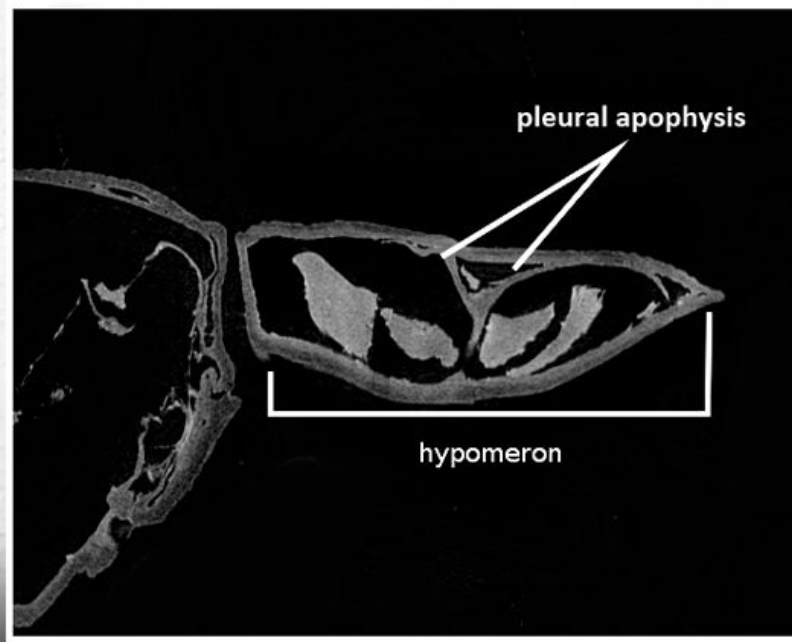
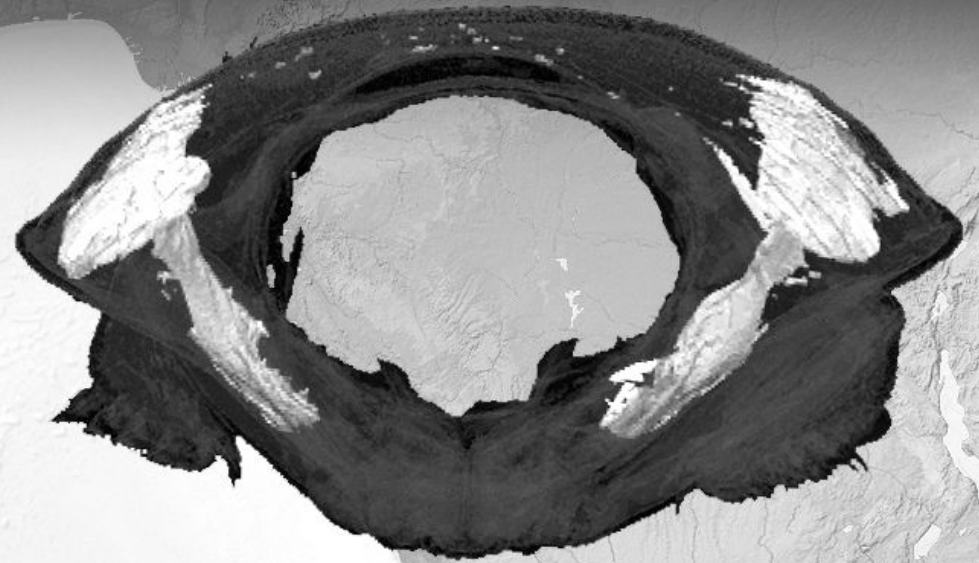
- X-ray microtomographic analysis of the prothorax



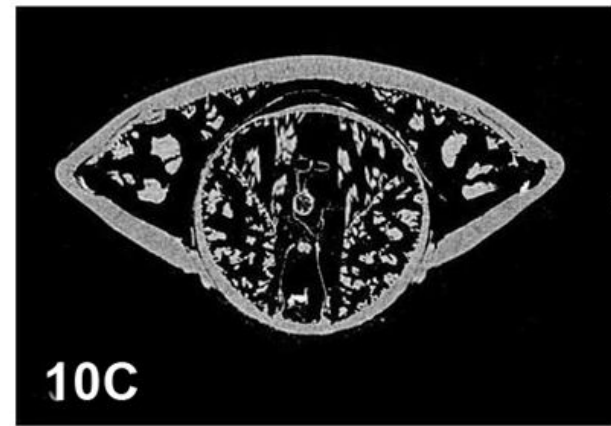
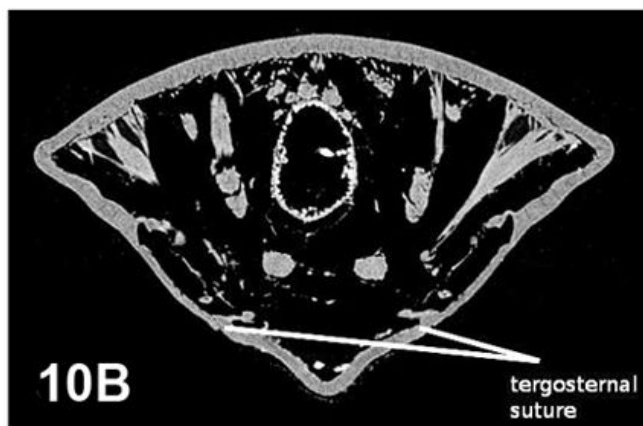
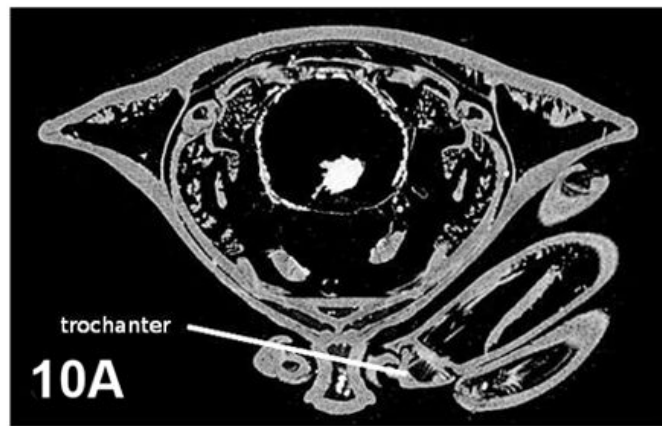
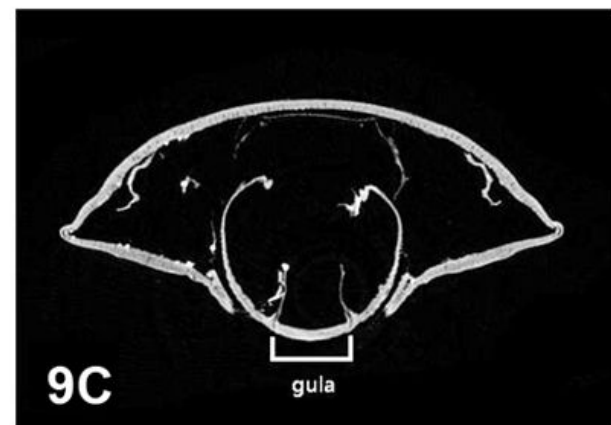
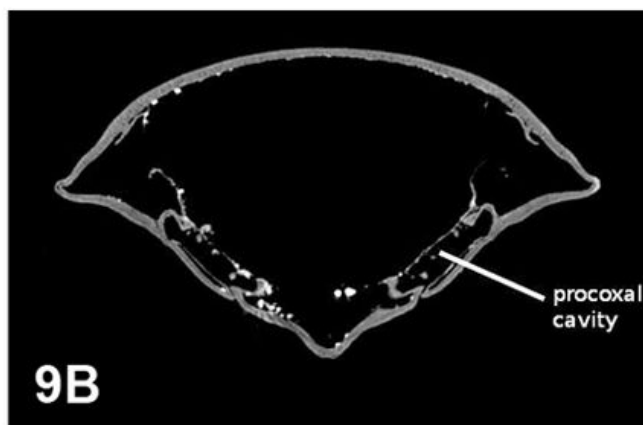
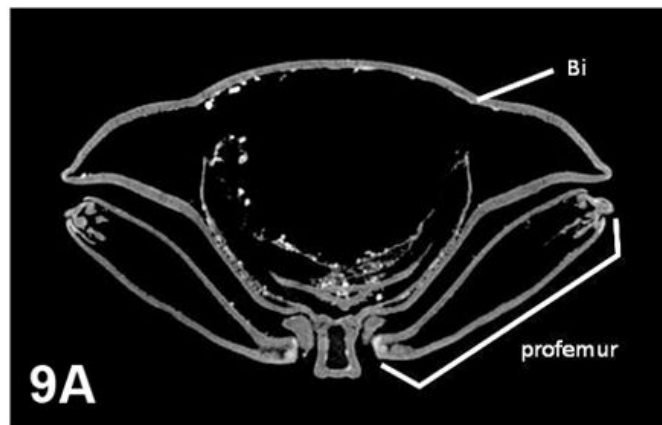
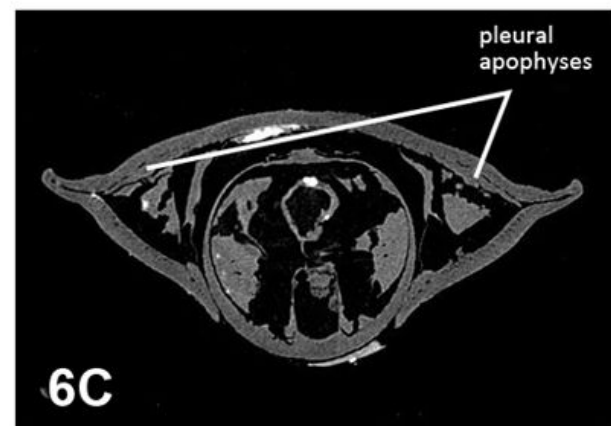
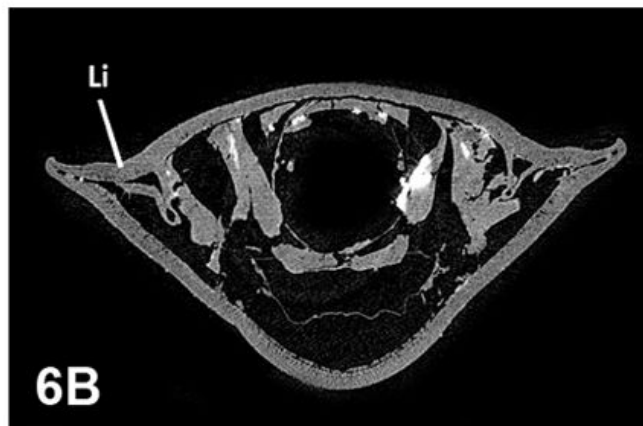
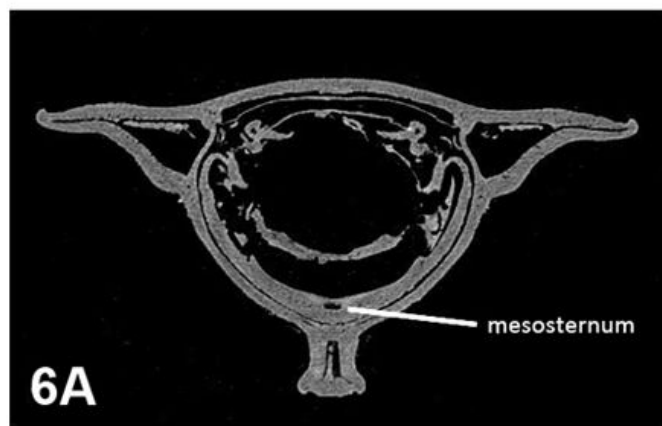
Materials and Methods

External and internal structures

- X-ray microtomographic analysis of the prothorax



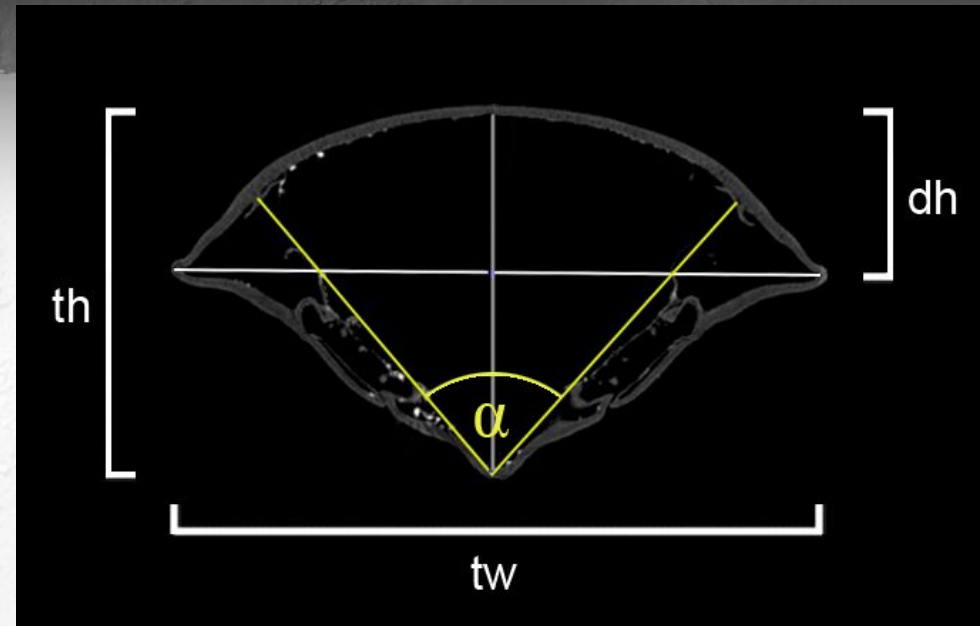
Materials and Methods



Materials and Methods

External and internal structures

- X-ray microtomographic analysis of the prothorax

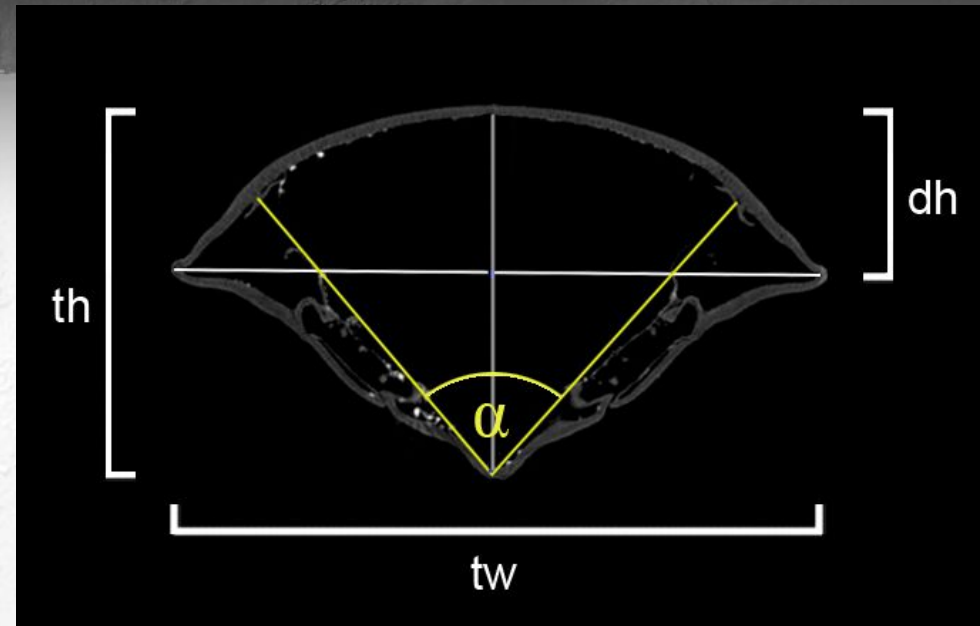


| Species name | tw / th | tw / dh | dh / th | α (°) |
|---------------------------------------|---------|---------|---------|--------------|
| <i>Tenebrio molitor</i> | 1.7 | 4.1 | 0.42 | 94.7 |
| <i>Ectateus modestus</i> | 1.9 | 21.9 | 0.08 | 71.6 |
| <i>Quadrideres scutatus</i> | 1.8 | 9.3 | 0.2 | 74.9 |
| <i>Anchophthalmops menouxi</i> | 1.6 | 7.0 | 0.22 | 68.3 |
| <i>Selinus convexipennis</i> | 1.8 | 7.3 | 0.25 | 74.7 |
| <i>Synquadrideres merkli</i> | 1.7 | 3.9 | 0.44 | 82.9 |
| <i>Lechius abacoides</i> | 1.6 | 4.8 | 0.33 | 79.2 |
| <i>Pseudoselinus punctatostriatus</i> | 1.7 | 4.2 | 0.42 | 84.5 |

Materials and Methods

External and internal structures

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Materials and Methods

Phylogenetic analysis:

Materials and Methods

Phylogenetic analysis:

- Tree analysis using New Technology

Materials and Methods

Phylogenetic analysis:

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Character matrix:

Materials and Methods

Phylogenetic analysis:

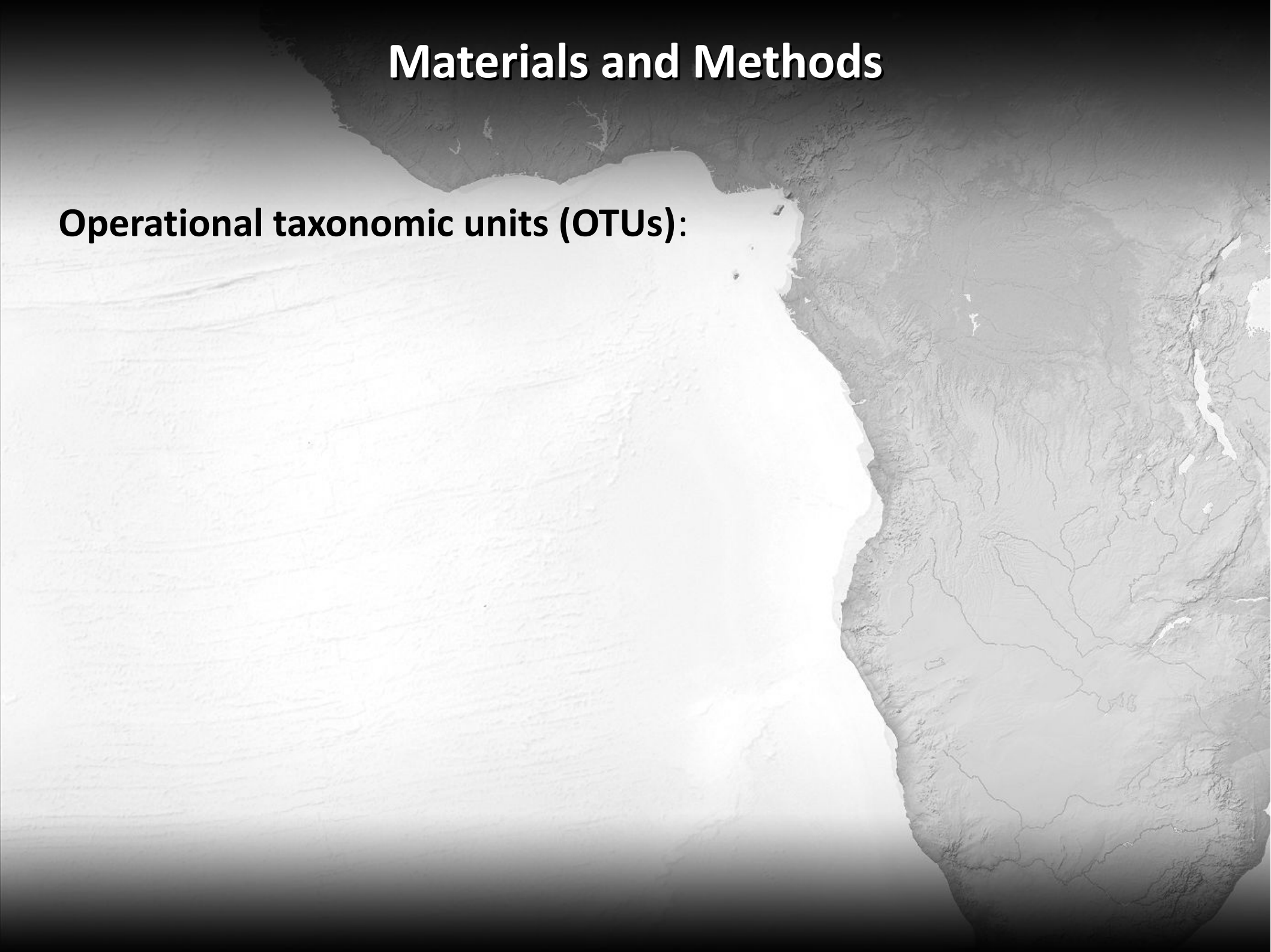
- Tree analysis using New Technology

Character matrix:

- Mesquite
- 72 characters
(prothorax – 26, head – 19, elytra – 15, ...)

Materials and Methods

Operational taxonomic units (OTUs):



Materials and Methods

Operational taxonomic units (OTUs):

- comparative morphological analysis

Materials and Methods

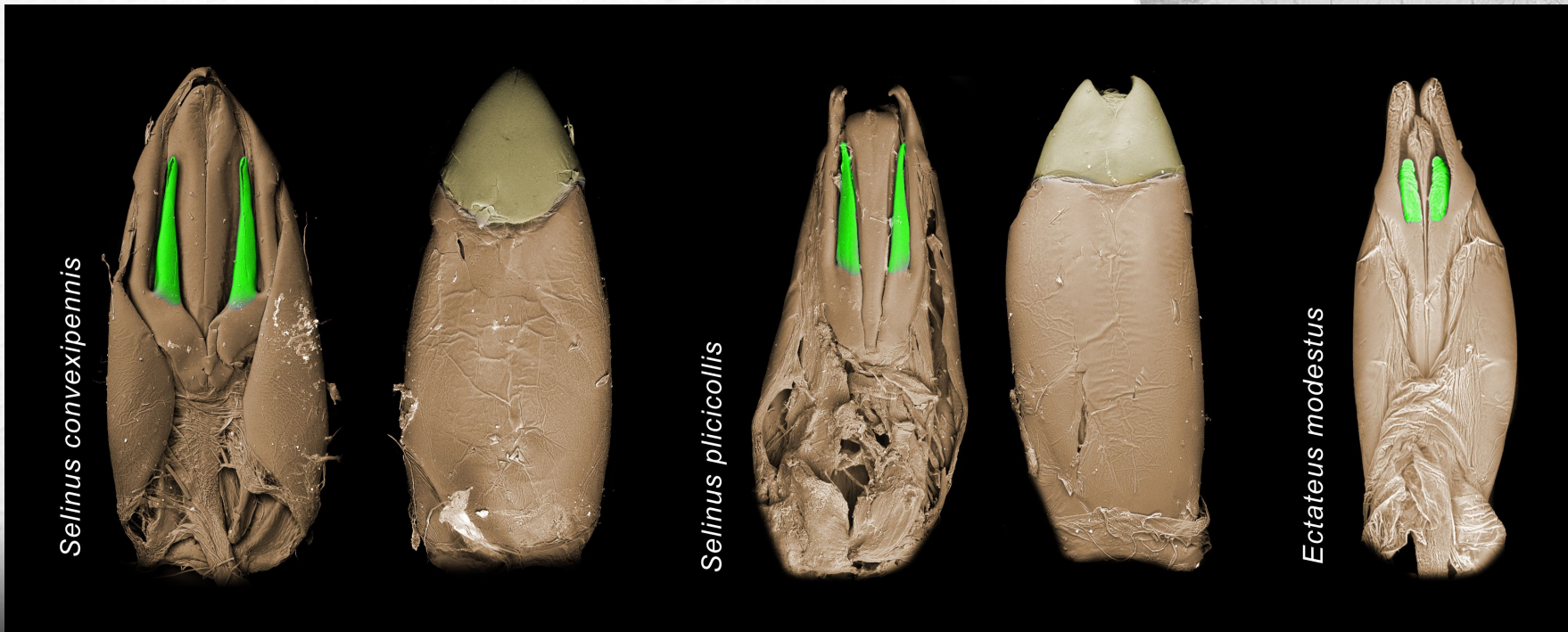
Operational taxonomic units (OTUs):

- comparative morphological analysis
- unique characters

Materials and Methods

Operational taxonomic units (OTUs):

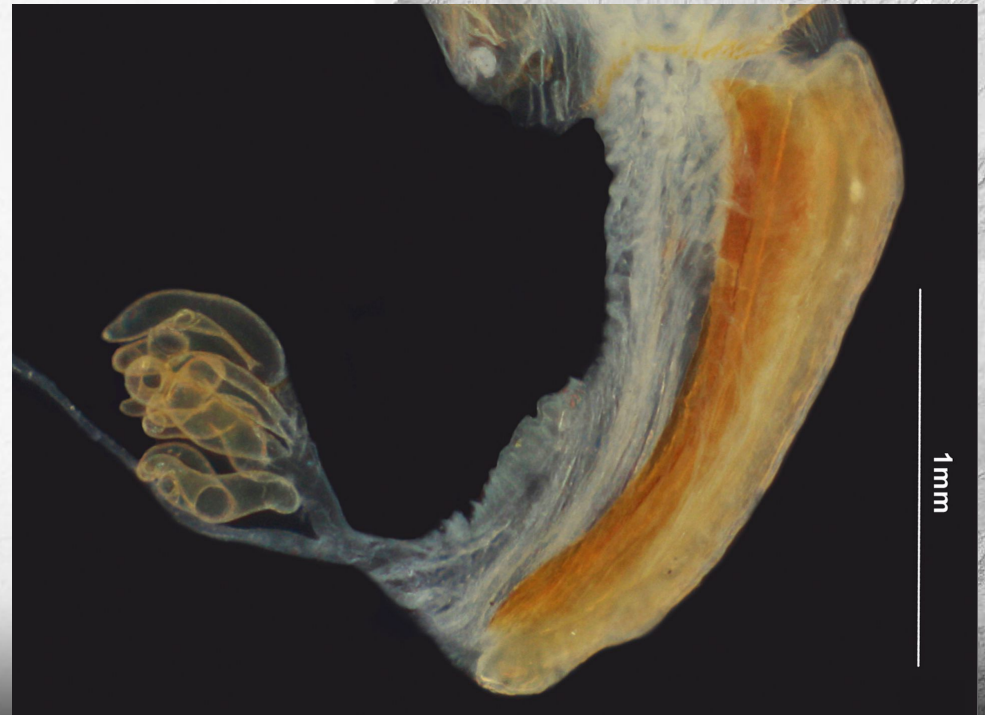
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Materials and Methods

Operational taxonomic units (OTUs):

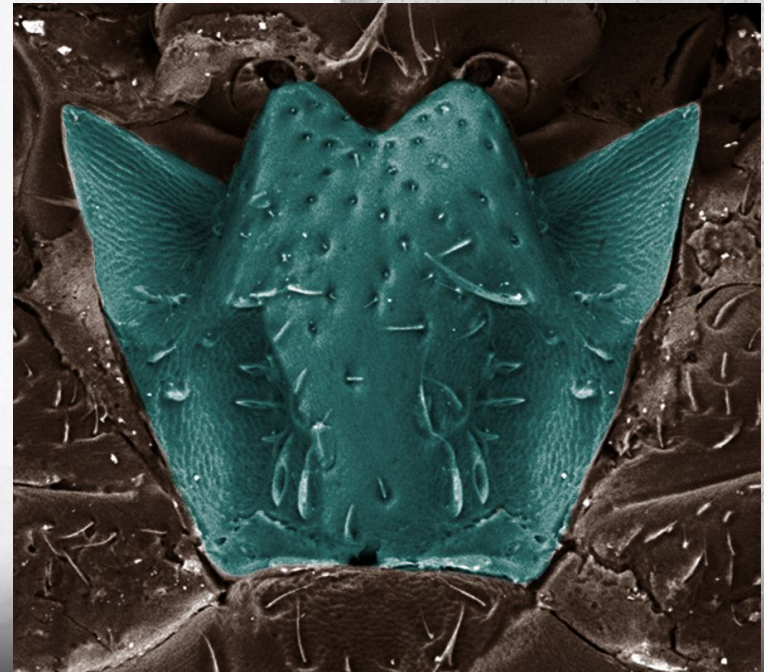
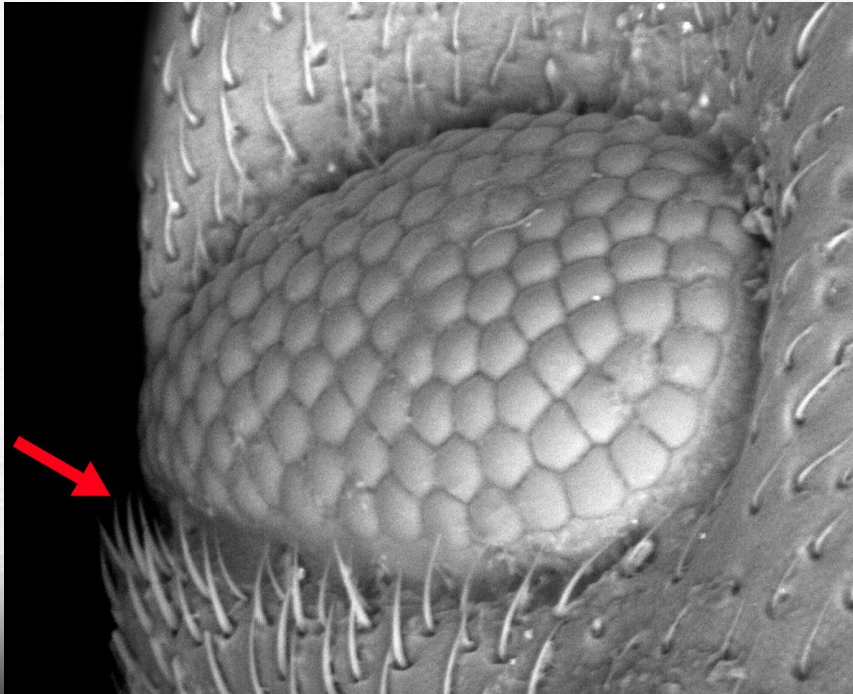
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Materials and Methods

Operational taxonomic units (OTUs):

- comparative morphological analysis
- unique characters



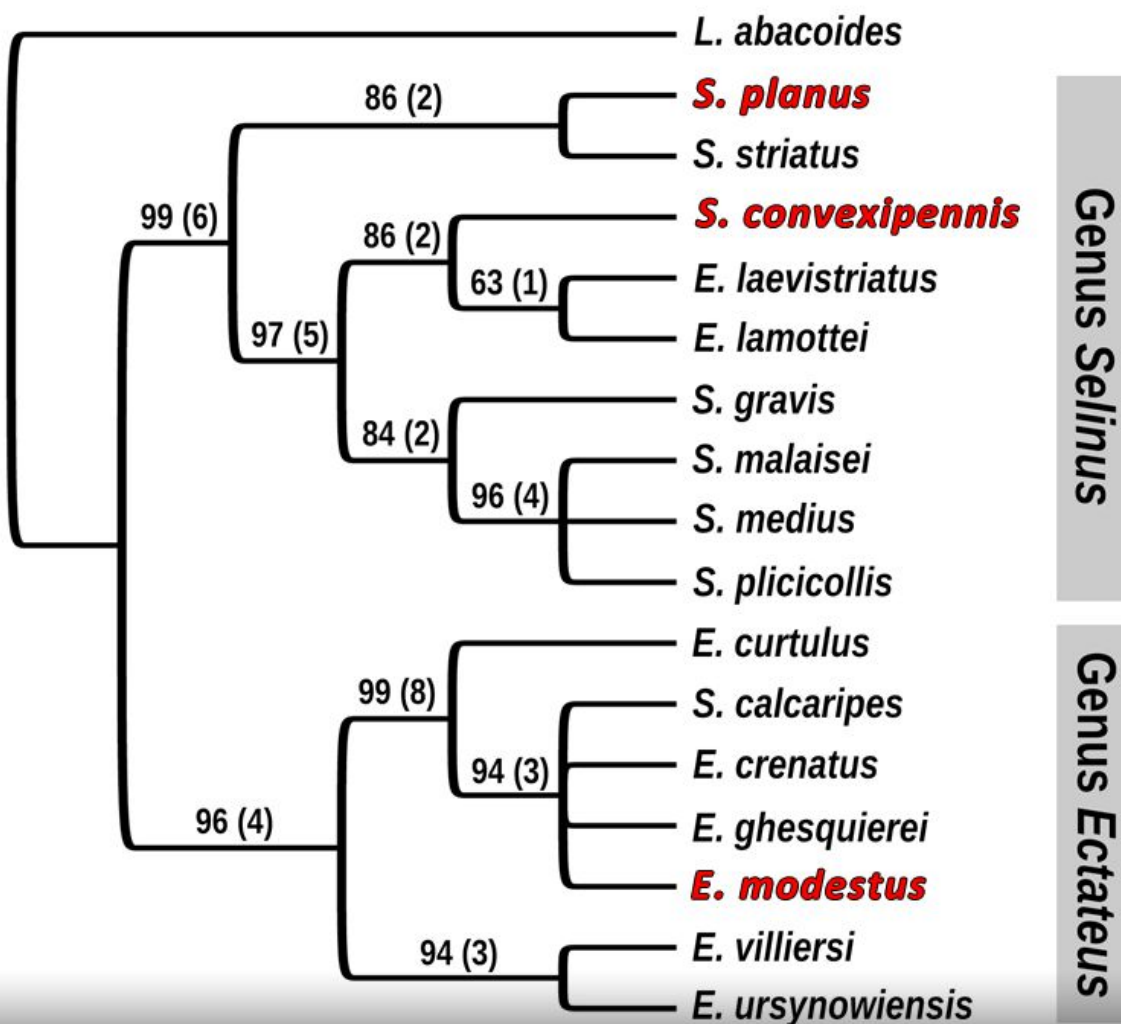
Materials and Methods

Operational taxonomic units (OTUs):

- comparative morphological analysis
- unique characters
- phylogenetic analyses

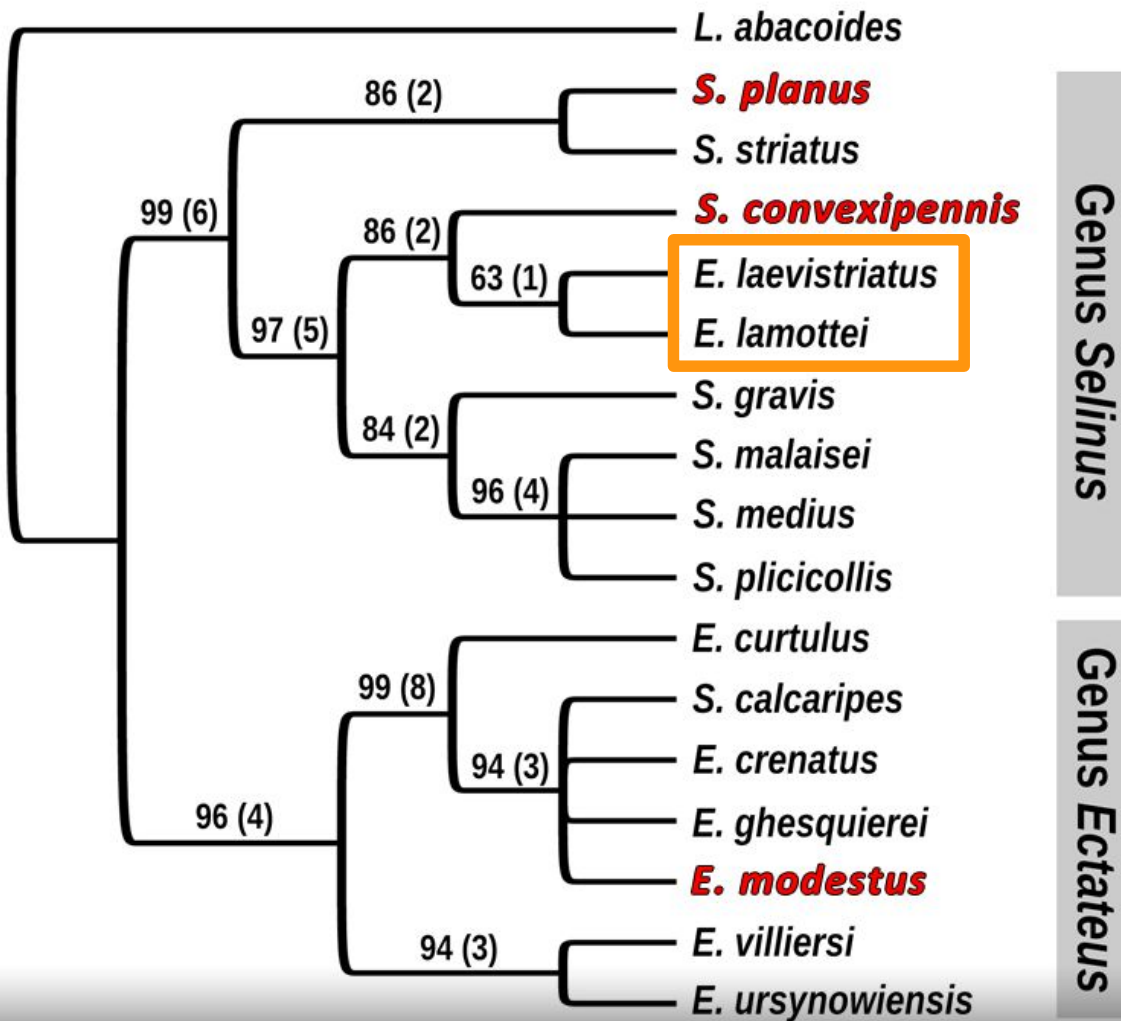
Materials and Methods

Operational taxonomic units (OTUs):



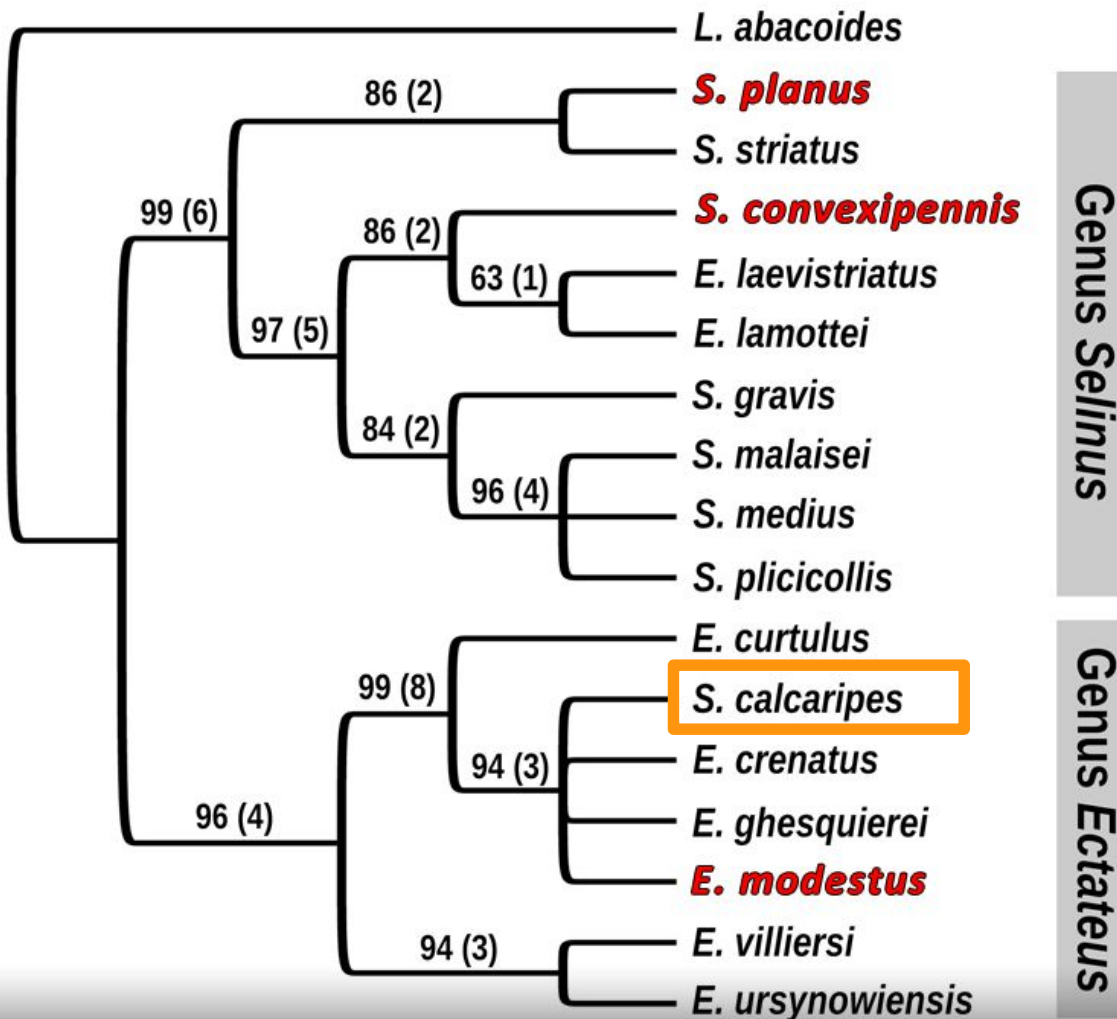
Materials and Methods

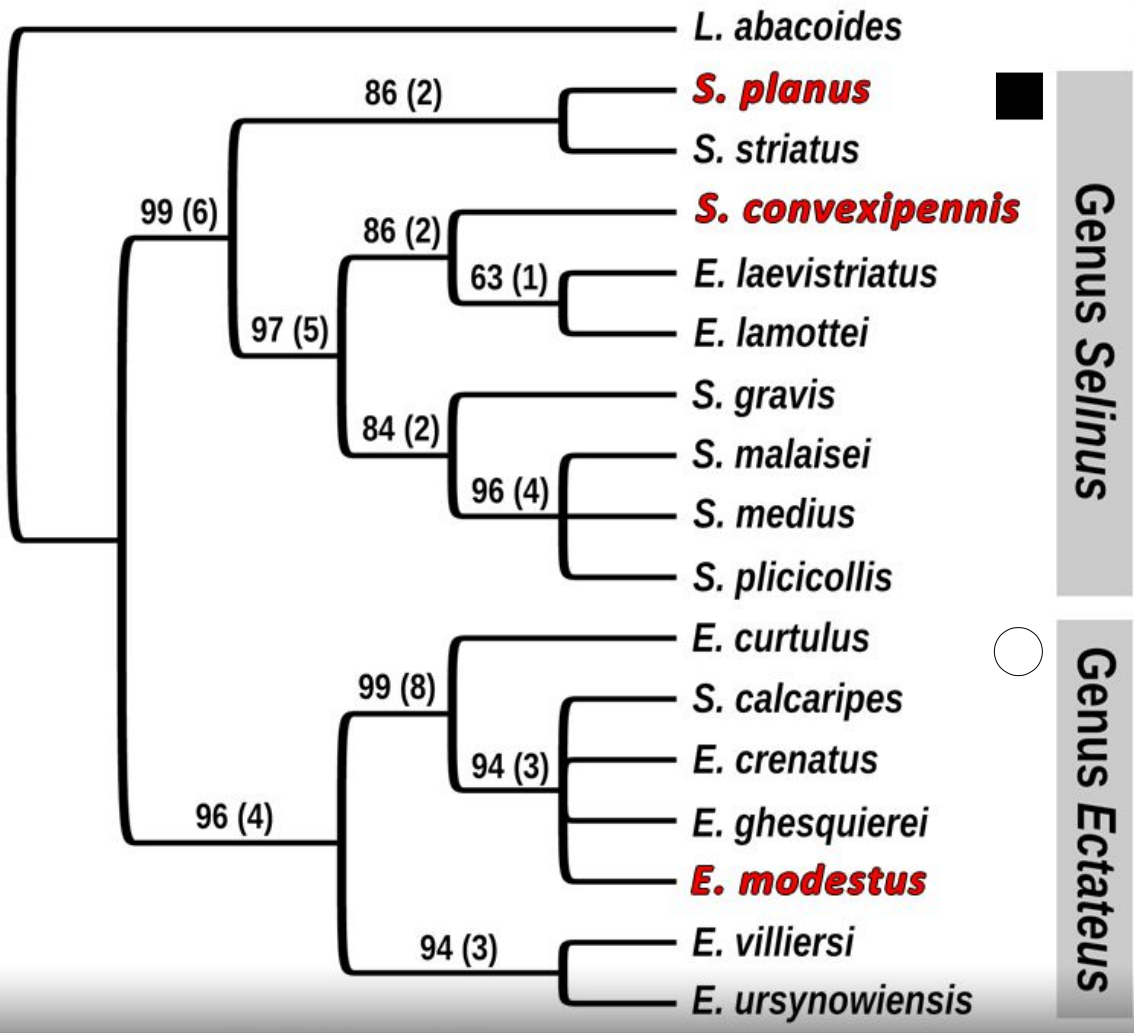
Operational taxonomic units (OTUs):



Materials and Methods

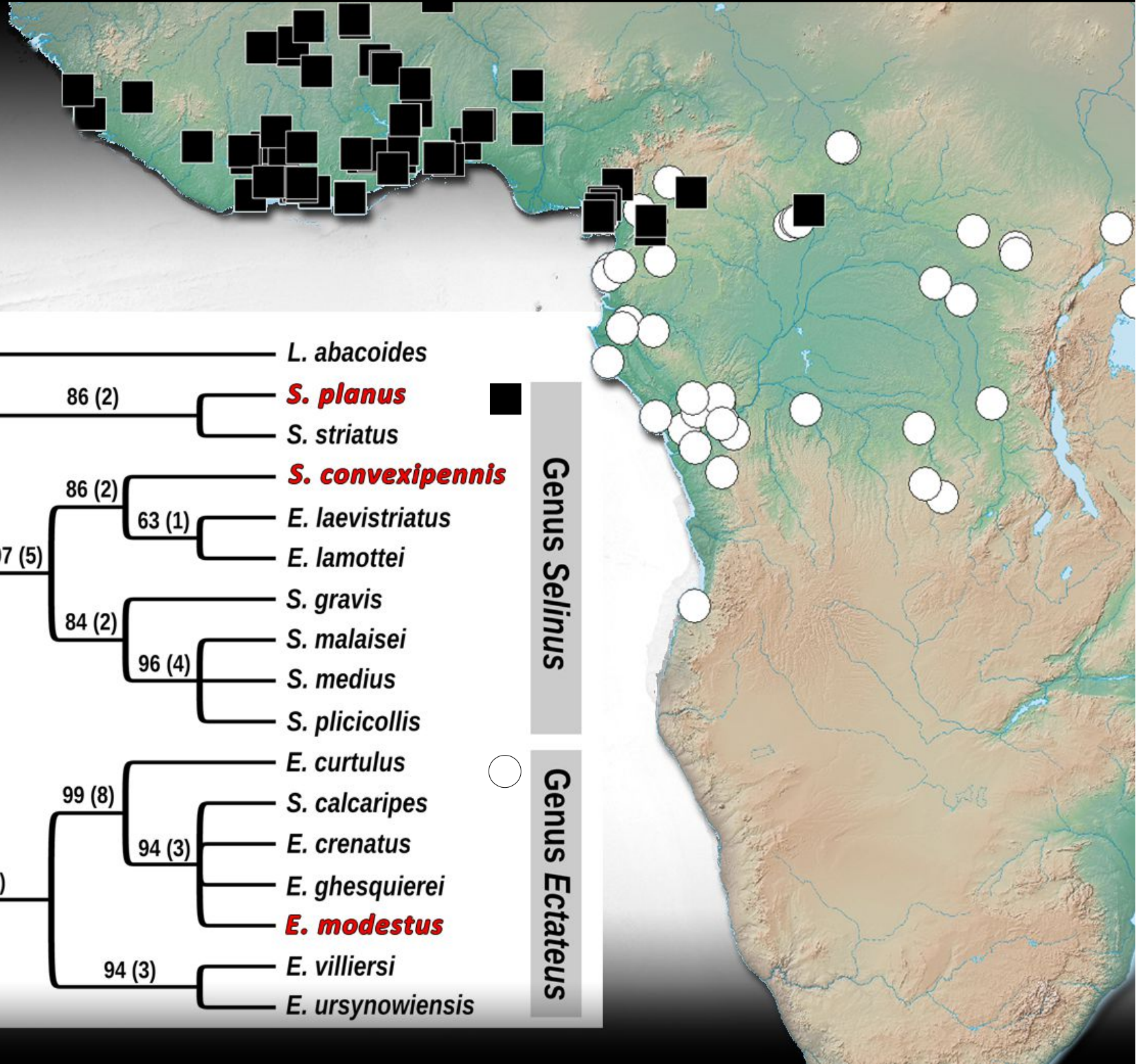
Operational taxonomic units (OTUs):





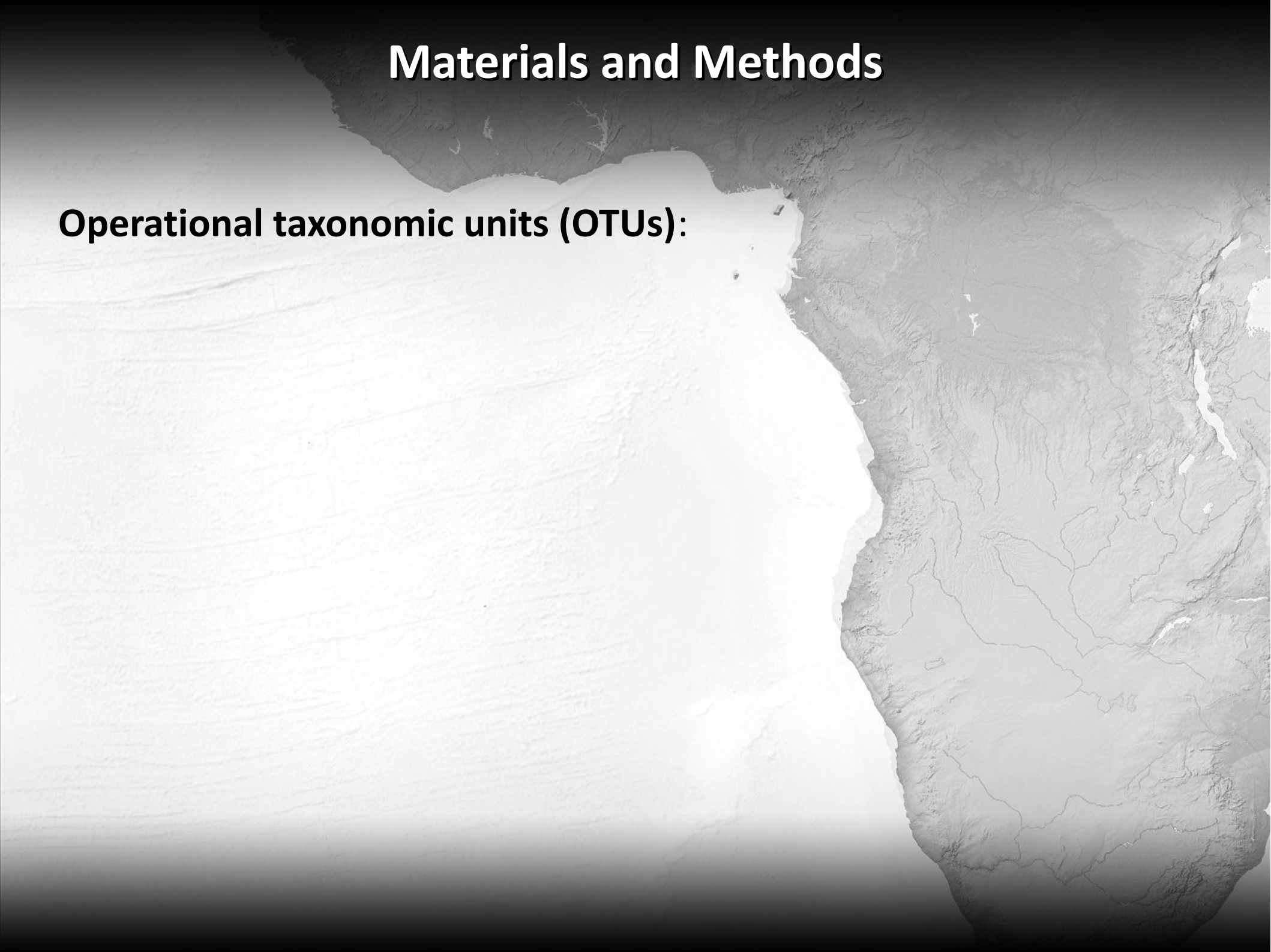
Genus *Selinus*

Genus *Ectateus*



Materials and Methods

Operational taxonomic units (OTUs):



Materials and Methods

Operational taxonomic units (OTUs):

Anchophthalmops

Anchophthalmus

Angolositus

Kochogaster

Lechius

Phallocentrion

Phymatoplata

Platykochius

Pseudoselinus

Quadrideres

Synquadrideres

Upembarus

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Operational taxonomic units (OTUs):

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Phymatoplata

Platykochius

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Synquadrideres

Upembarus

Aberlencus

Glyptopteryx

Microselinus

Nesopartum

“Paraselinus”

Platymedvedevia

Materials and Methods

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Upembarus

Aberlencus

Glyptopteryx

Microselinus

Nesopartum

“Paraselinus”

Platymedvedevia

modestus group

villiersi group

“Monodius”

“Selinus”

Zidalus insularis

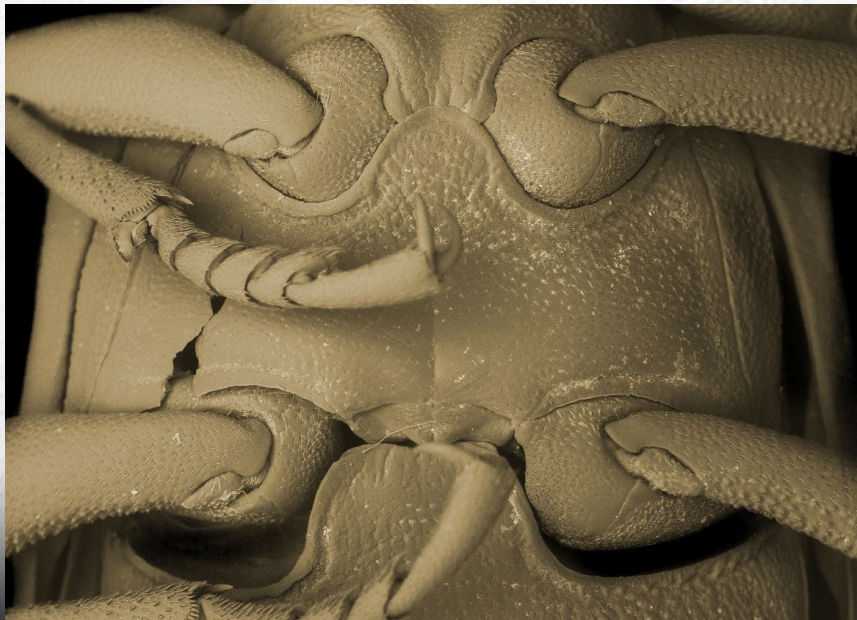
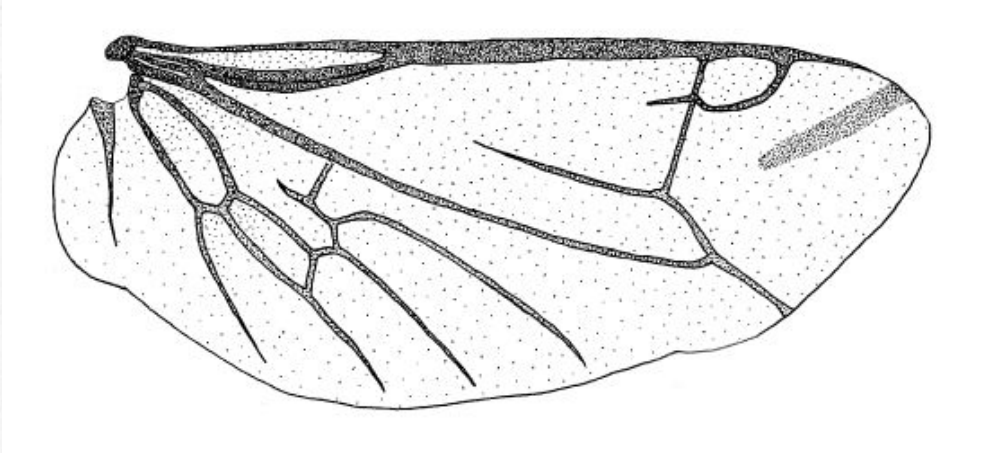
corvinus group

servus group

latipes group

Materials and Methods

Operational taxonomic units (OTUs):



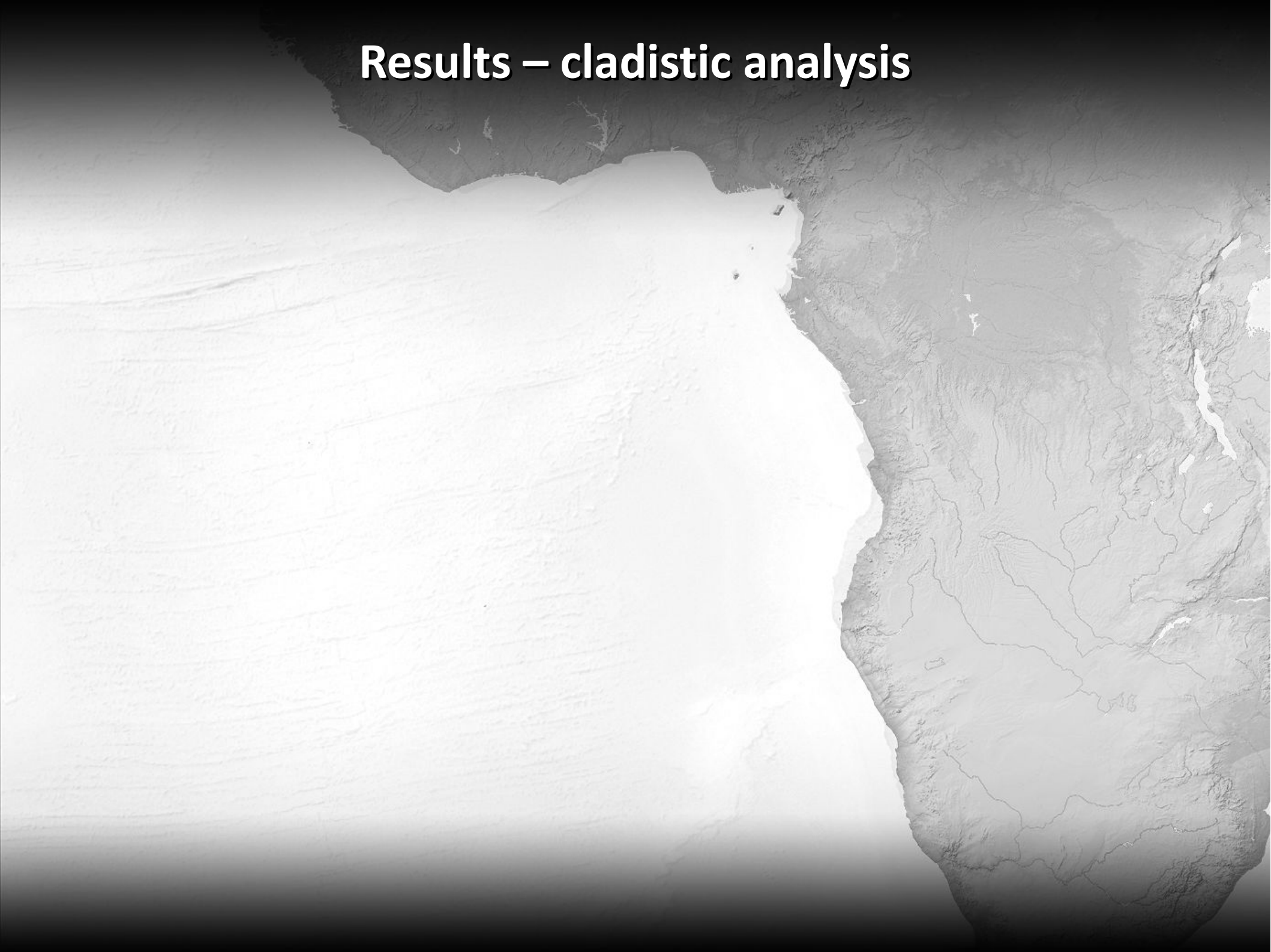
modestus group
villiersi group

“*Monodius*”
“*Selinus*”

Zidalus insularis
corvinus group
servus group

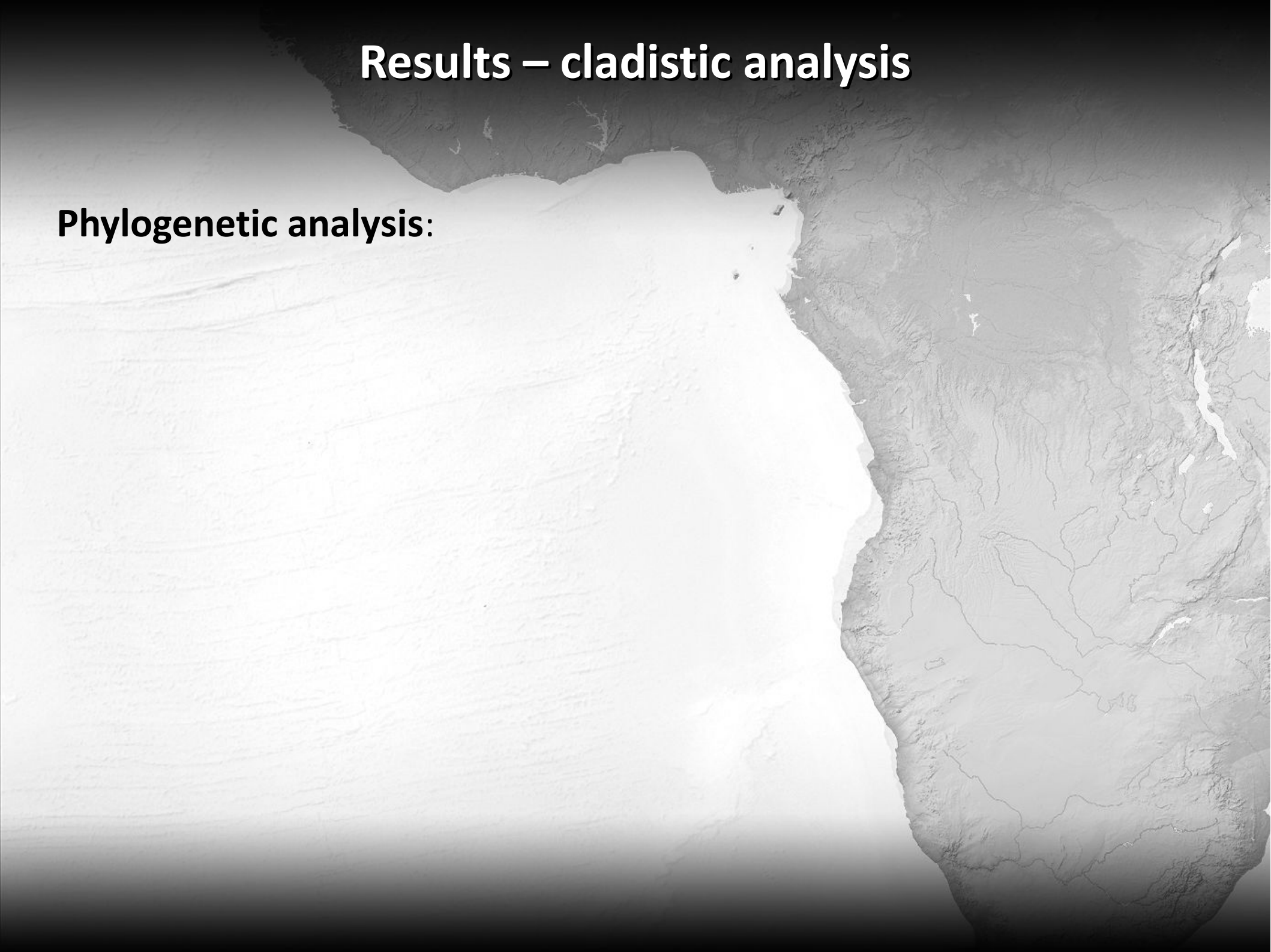
latipes group

Results – cladistic analysis



Results – cladistic analysis

Phylogenetic analysis:



Results – cladistic analysis

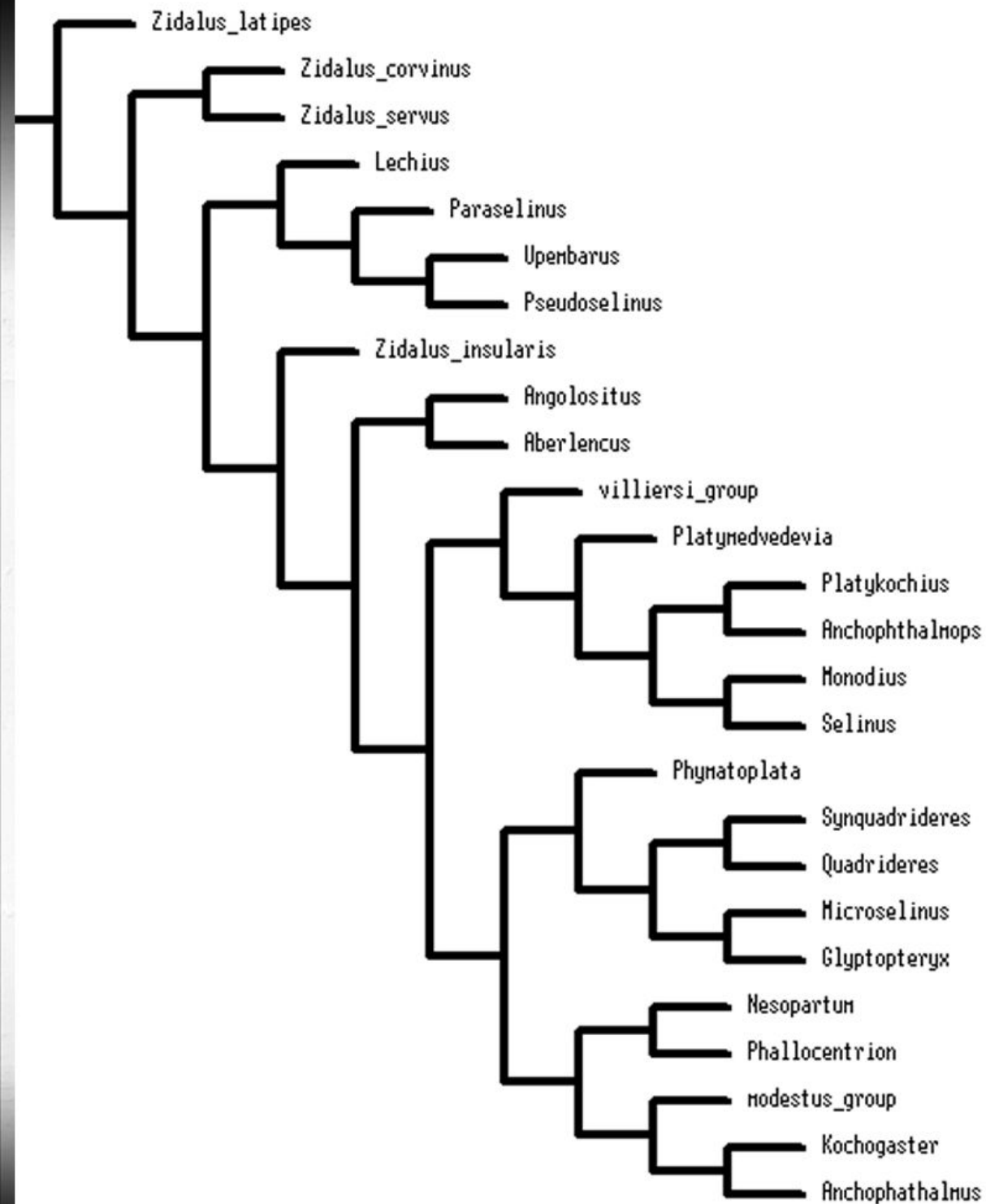
Phylogenetic analysis:

- 10 most parsimonious trees
- shortest tree: 114 steps

Results – cladistic analysis

Implicit enumeration:

- 10 most parsimonious trees
- shortest tree: 114 steps
- implied weighting



Results – cladistic analysis

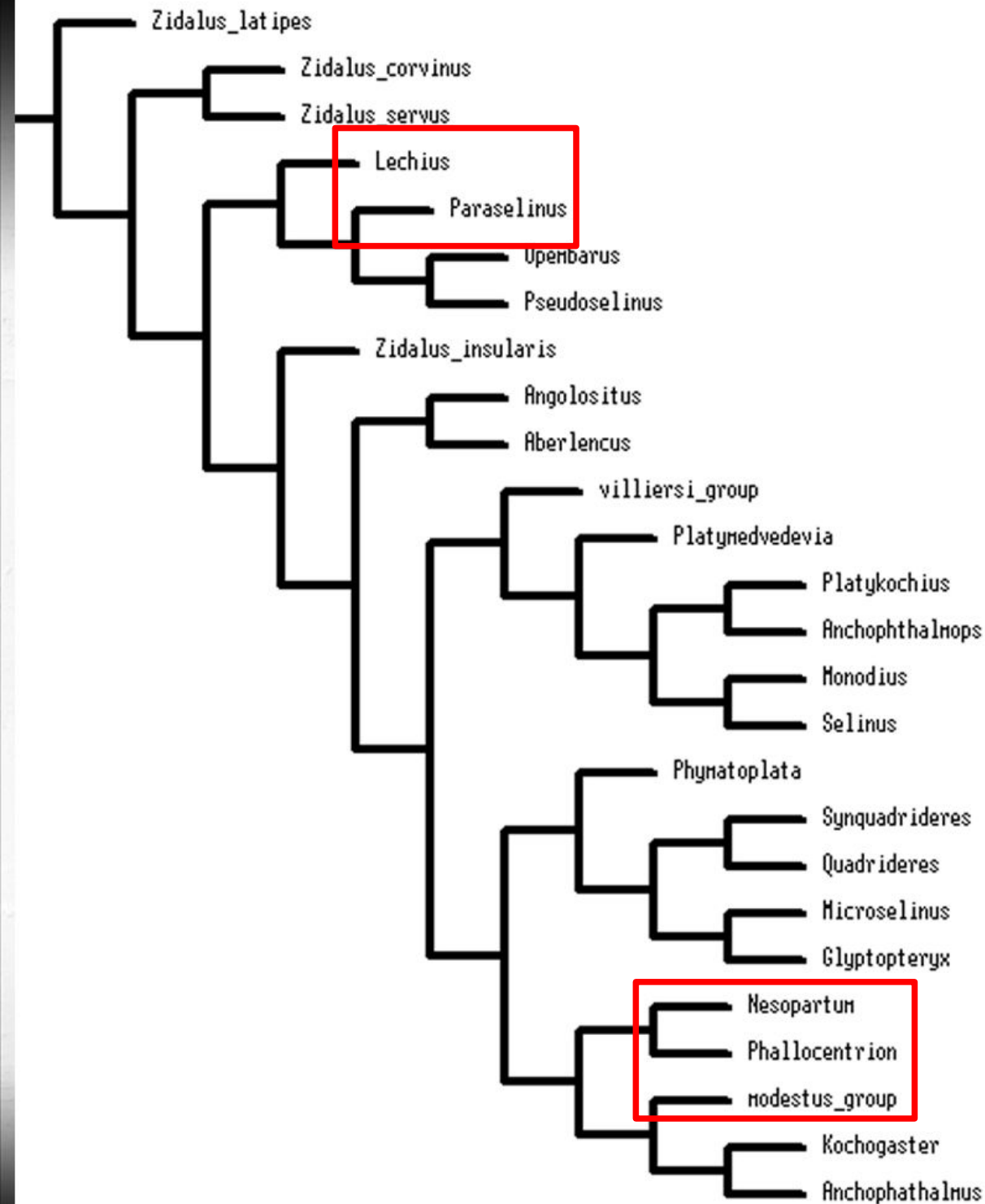
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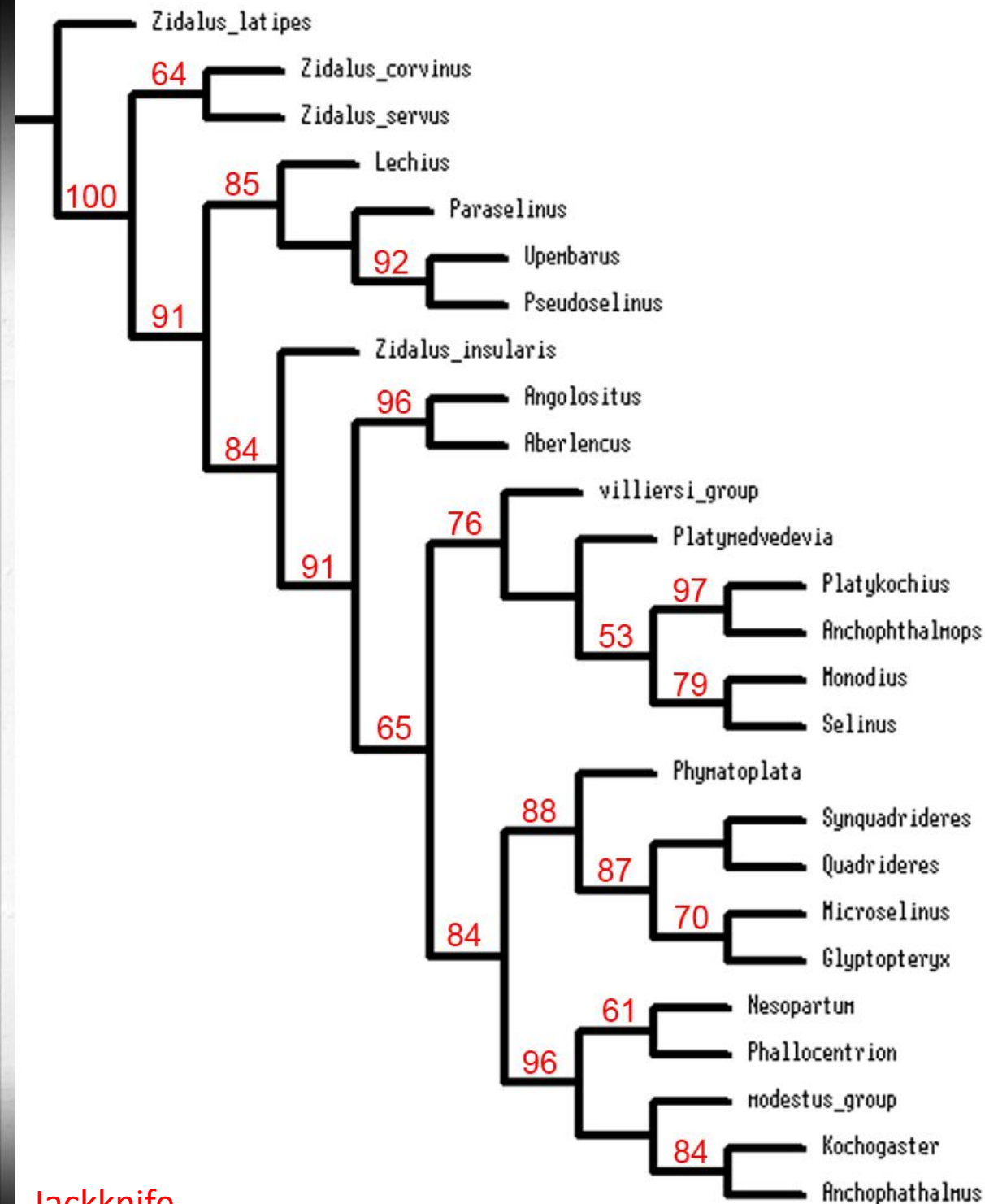
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Results – cladistic analysis

Implicit enumeration:

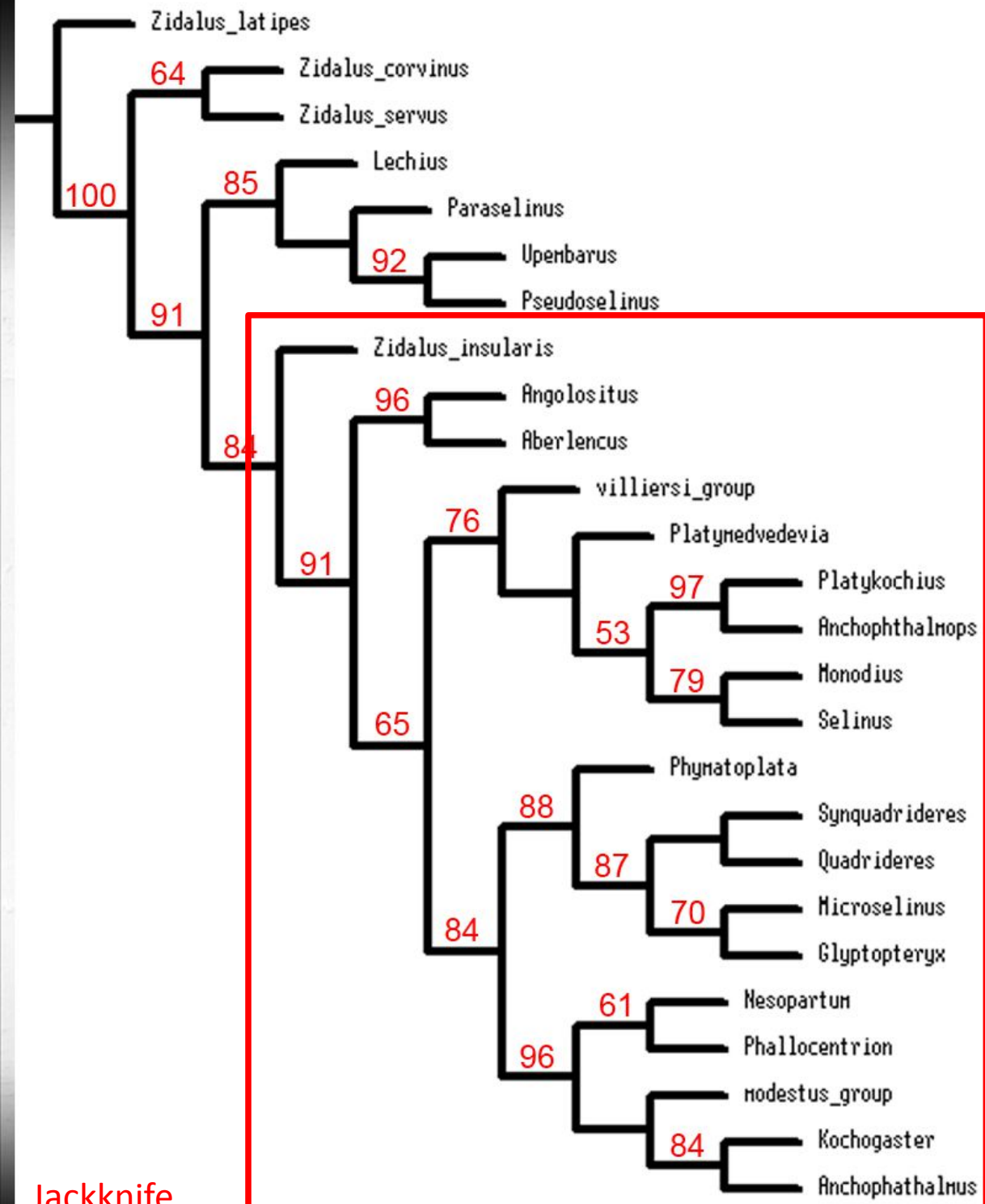
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Results – cladistic analysis

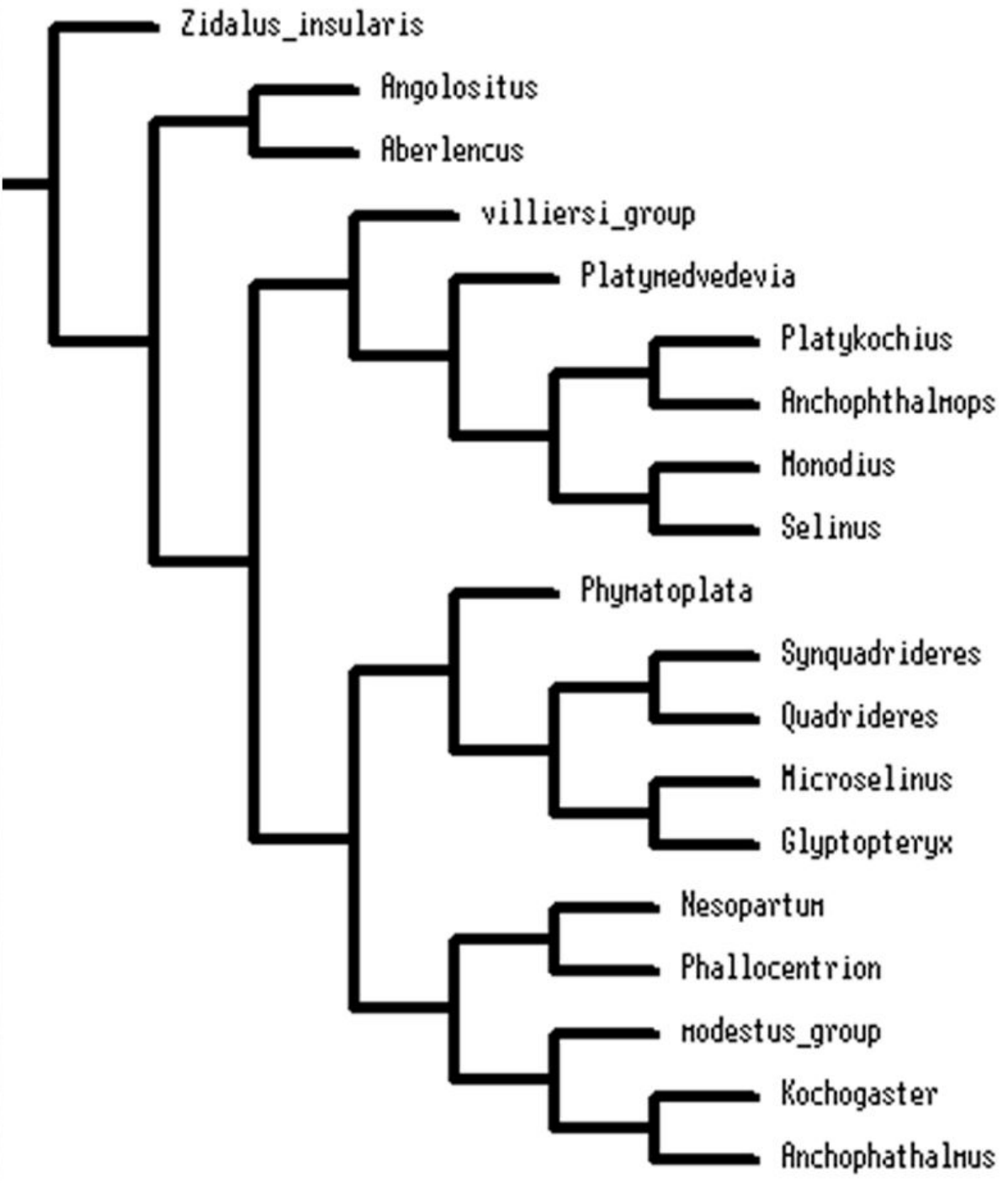
Implicit enumeration:

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Results – cladistic analysis

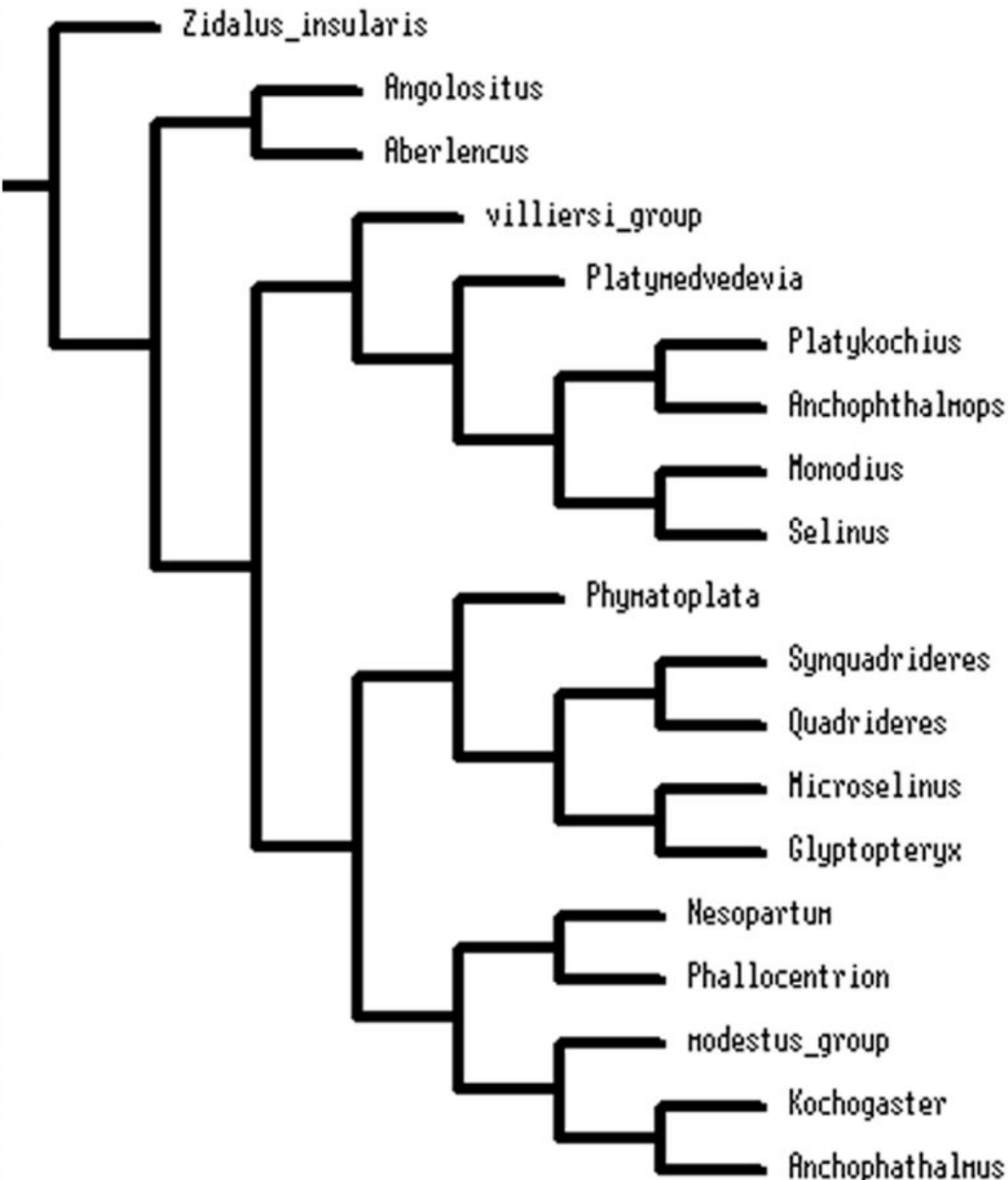
Ectateus generic group:

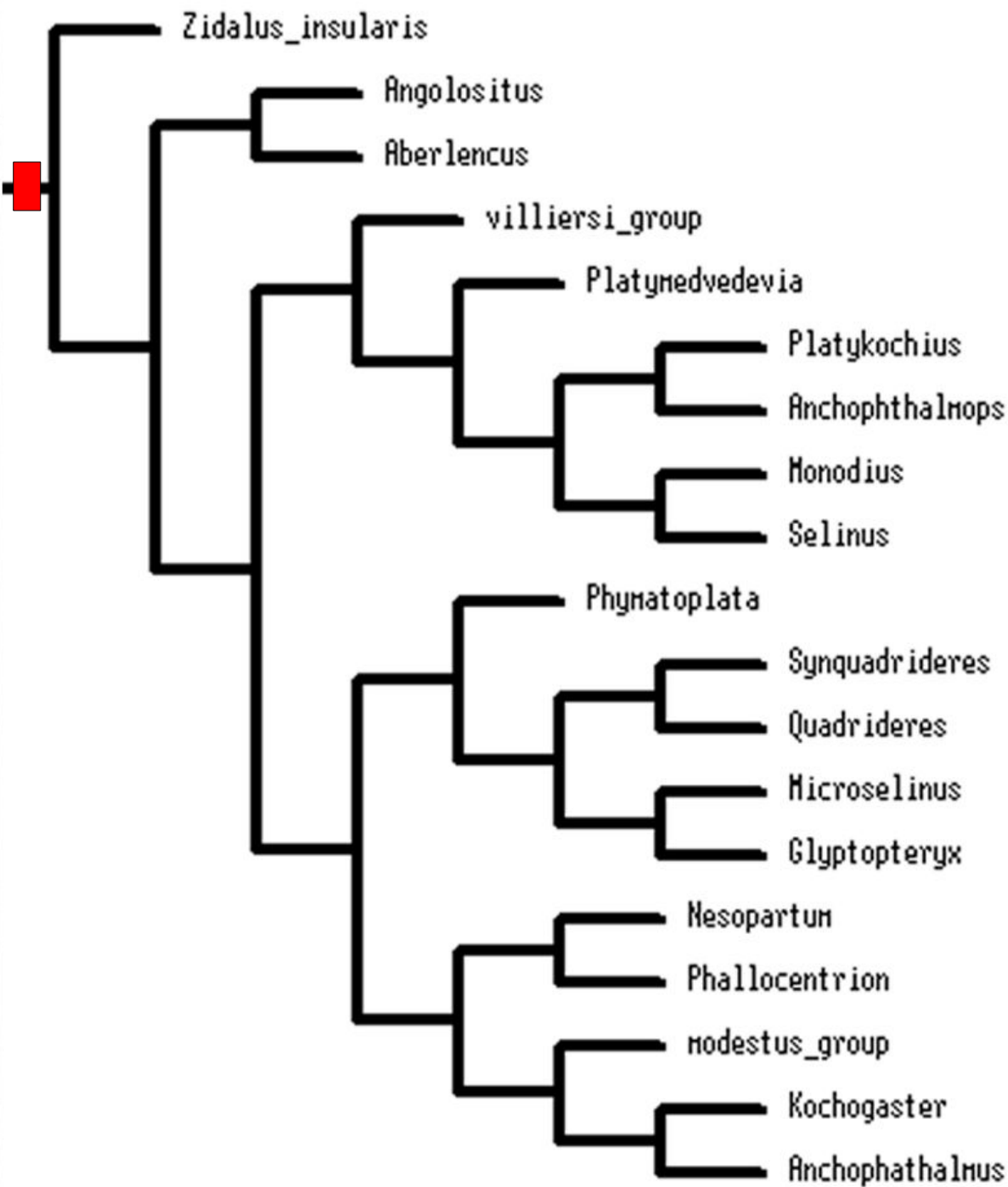


Results – cladistic analysis

Ectateus generic group:


- 19 genera and 90 species

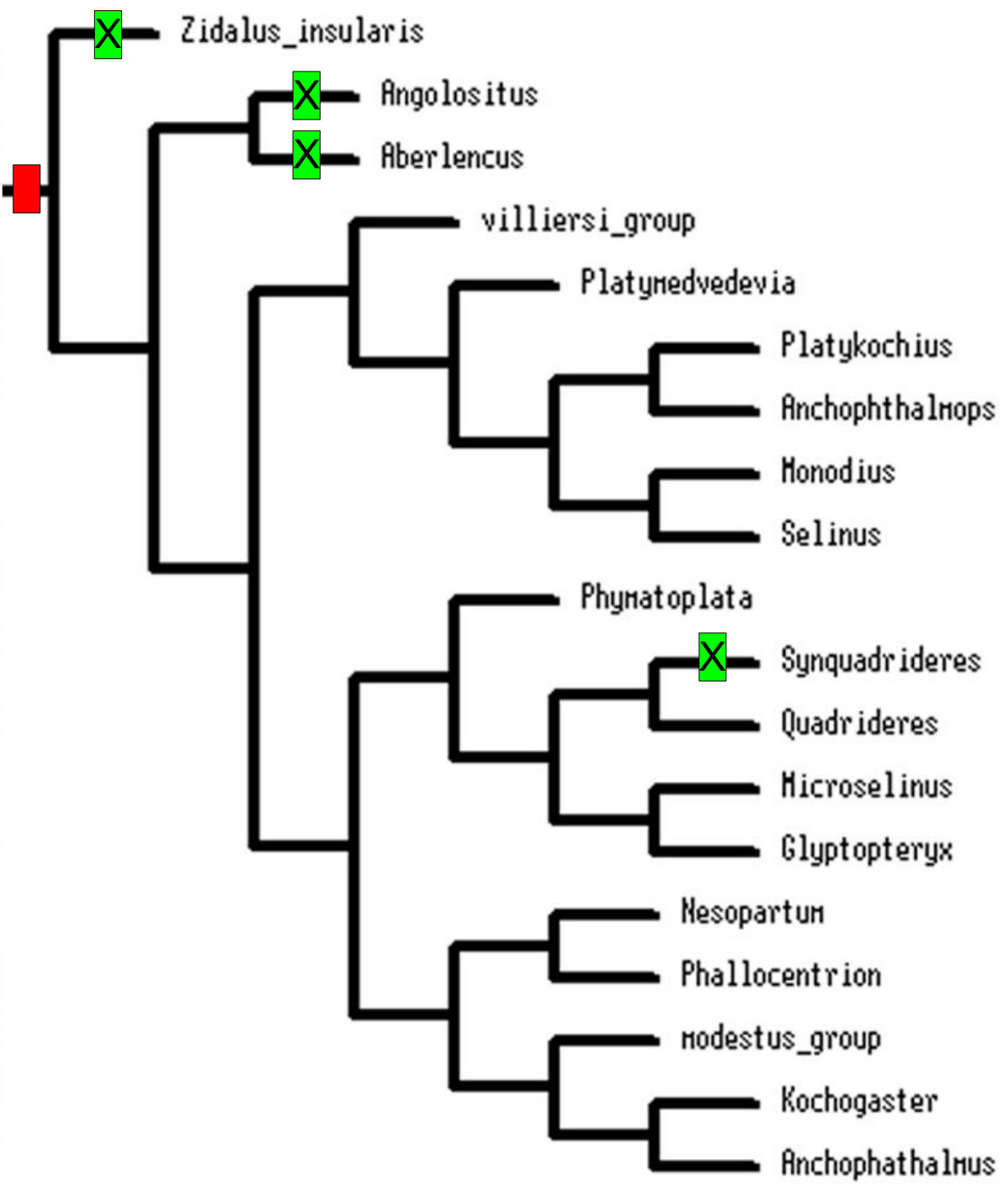




Results – cladistic analysis

Ectateus generic group:

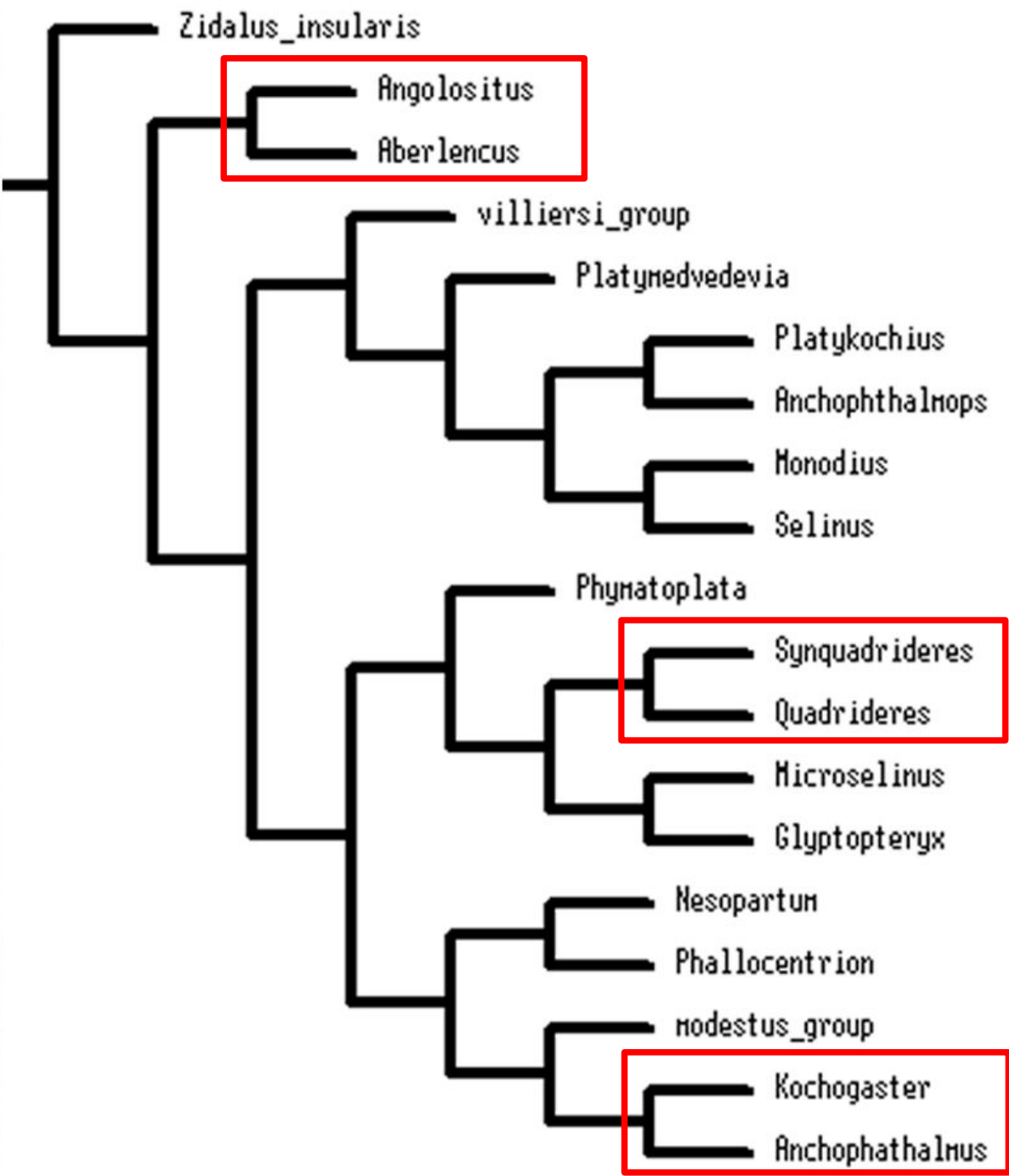
- 19 genera and 90 species
- basal depressions  – unambiguous marker



Results – cladistic analysis

Ectateus generic group:

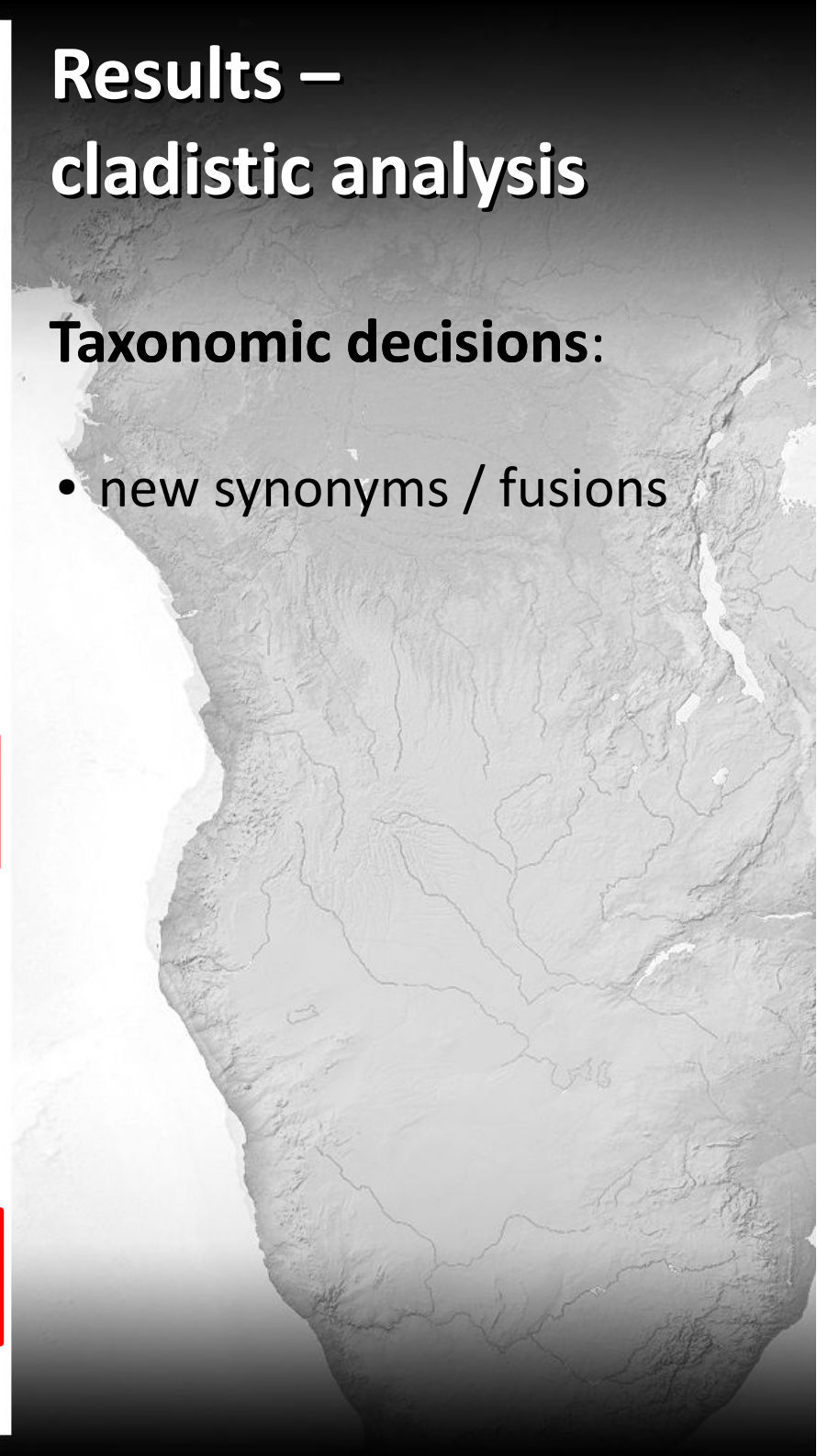
- 19 genera and 90 species
- basal depressions ■ – unambiguous marker
- apophyseal depressions – absent in X

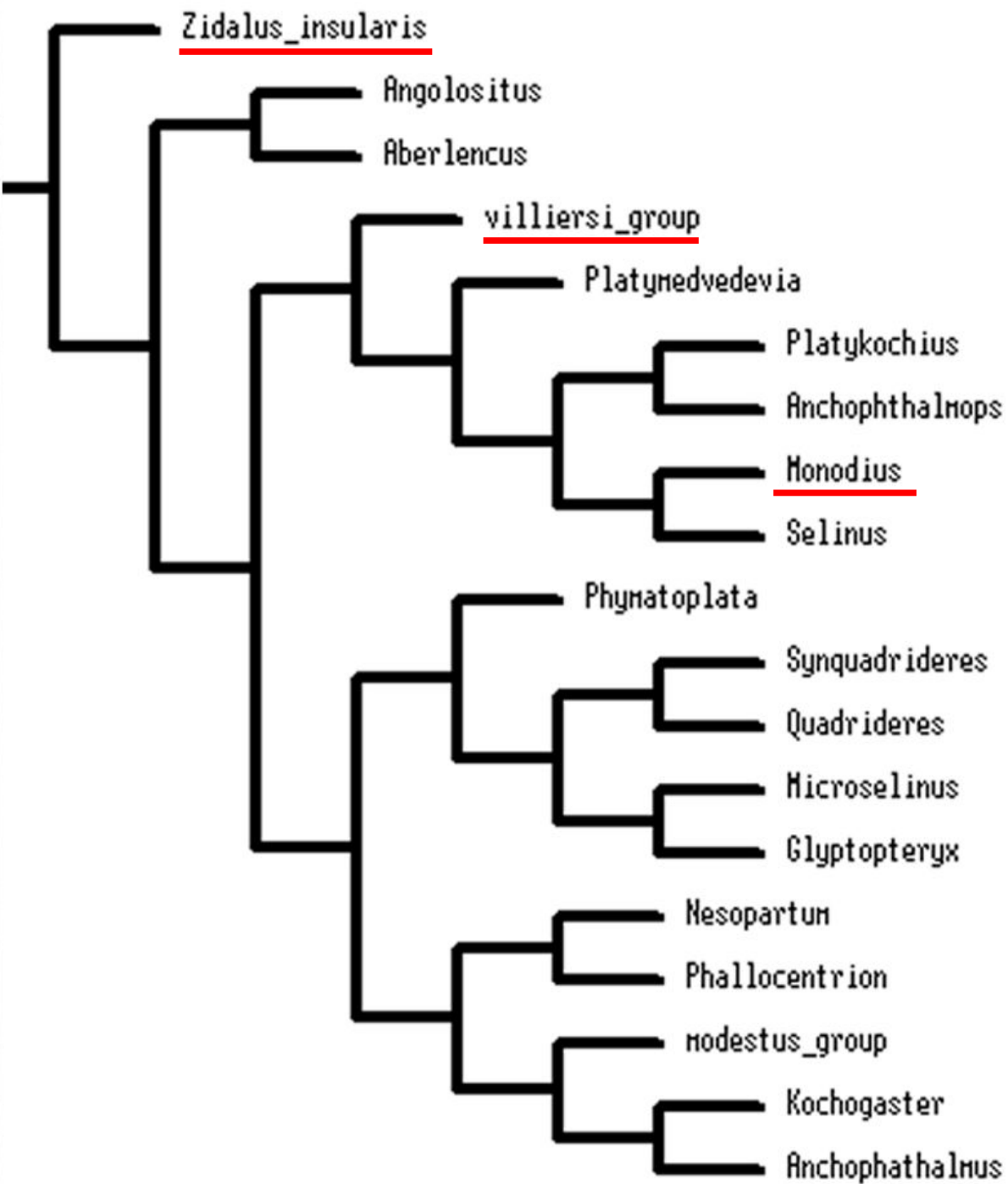


Results – cladistic analysis

Taxonomic decisions:

- new synonyms / fusions

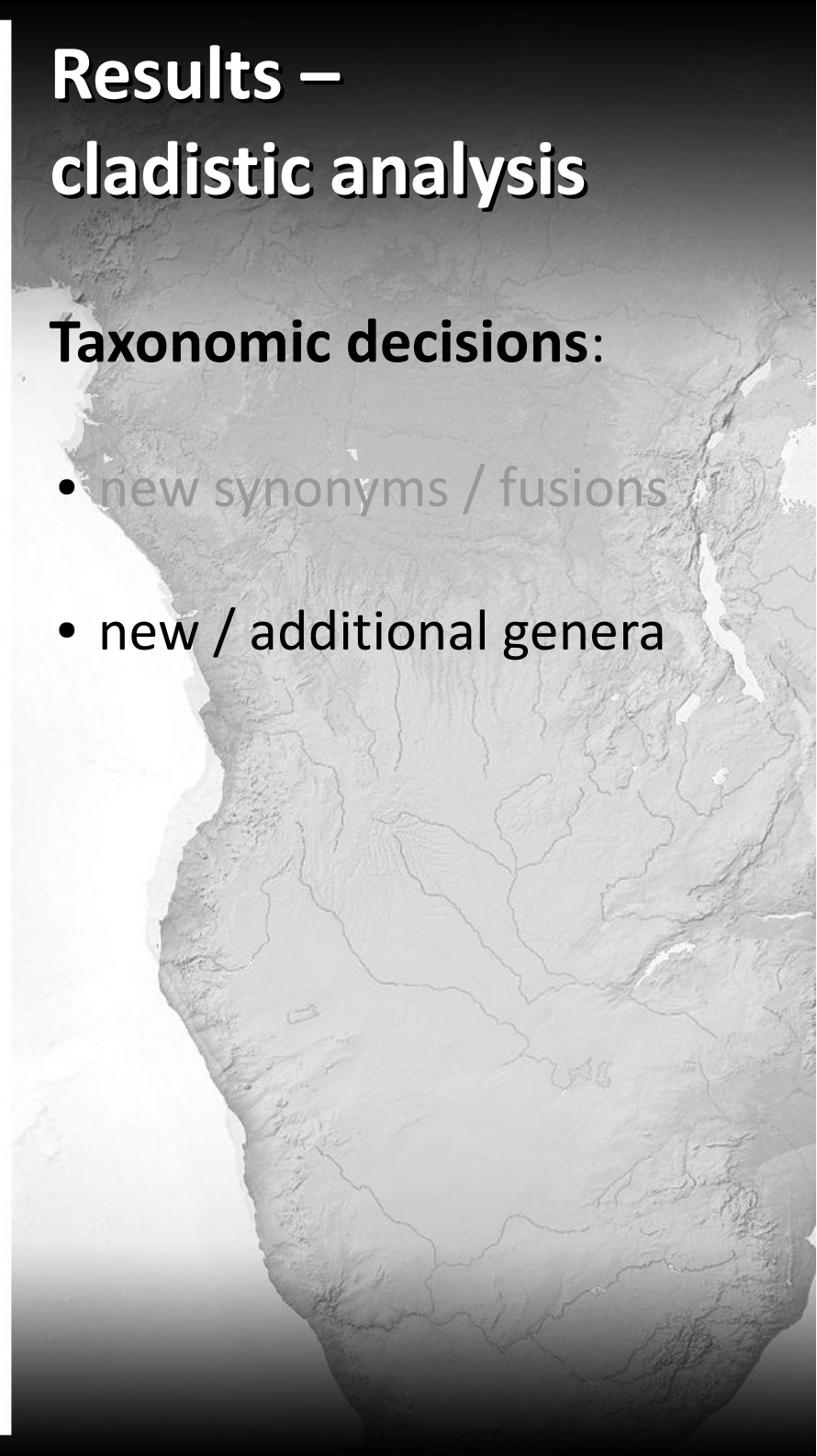




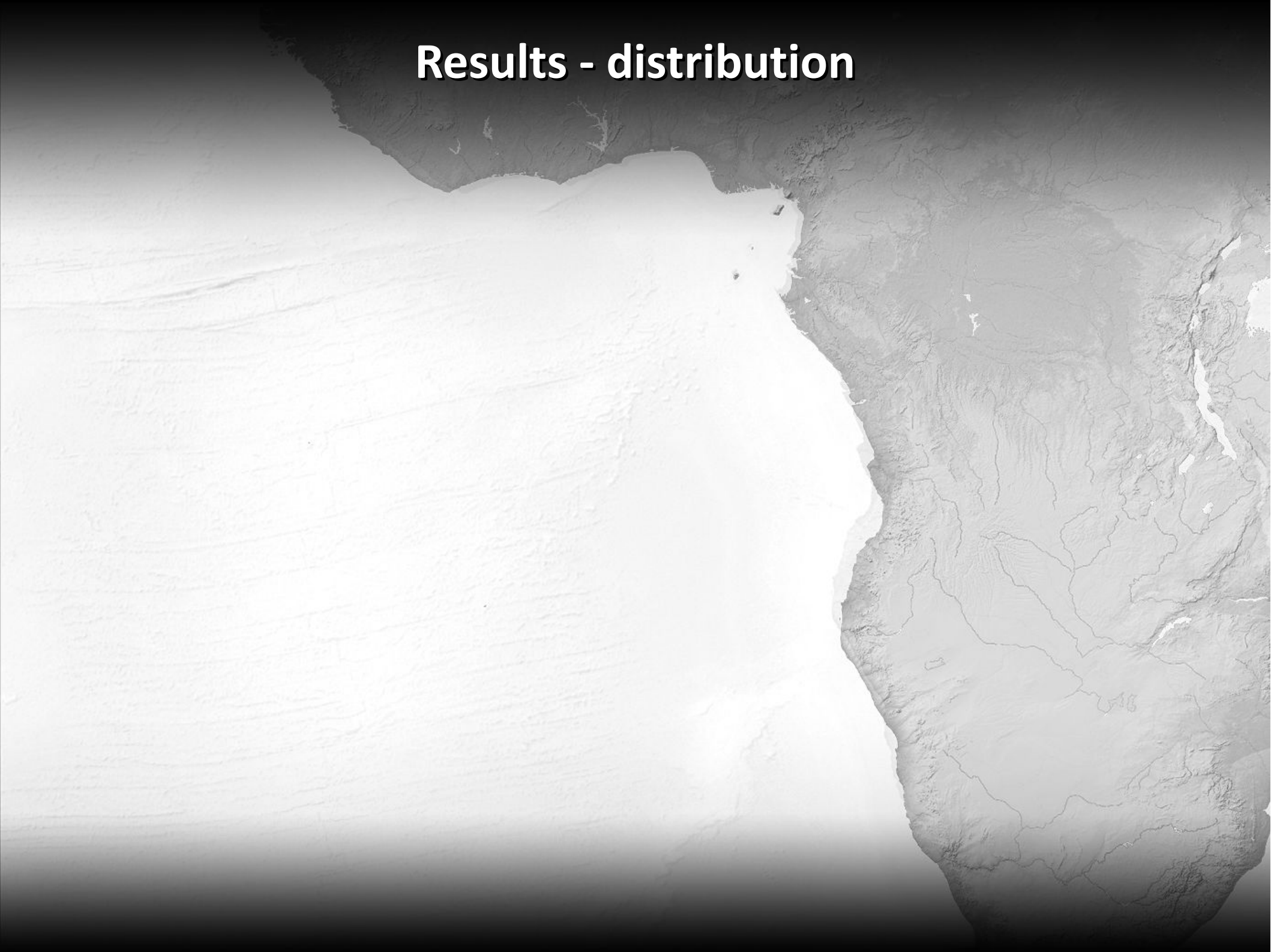
Results – cladistic analysis

Taxonomic decisions:

- new synonyms / fusions
- new / additional genera

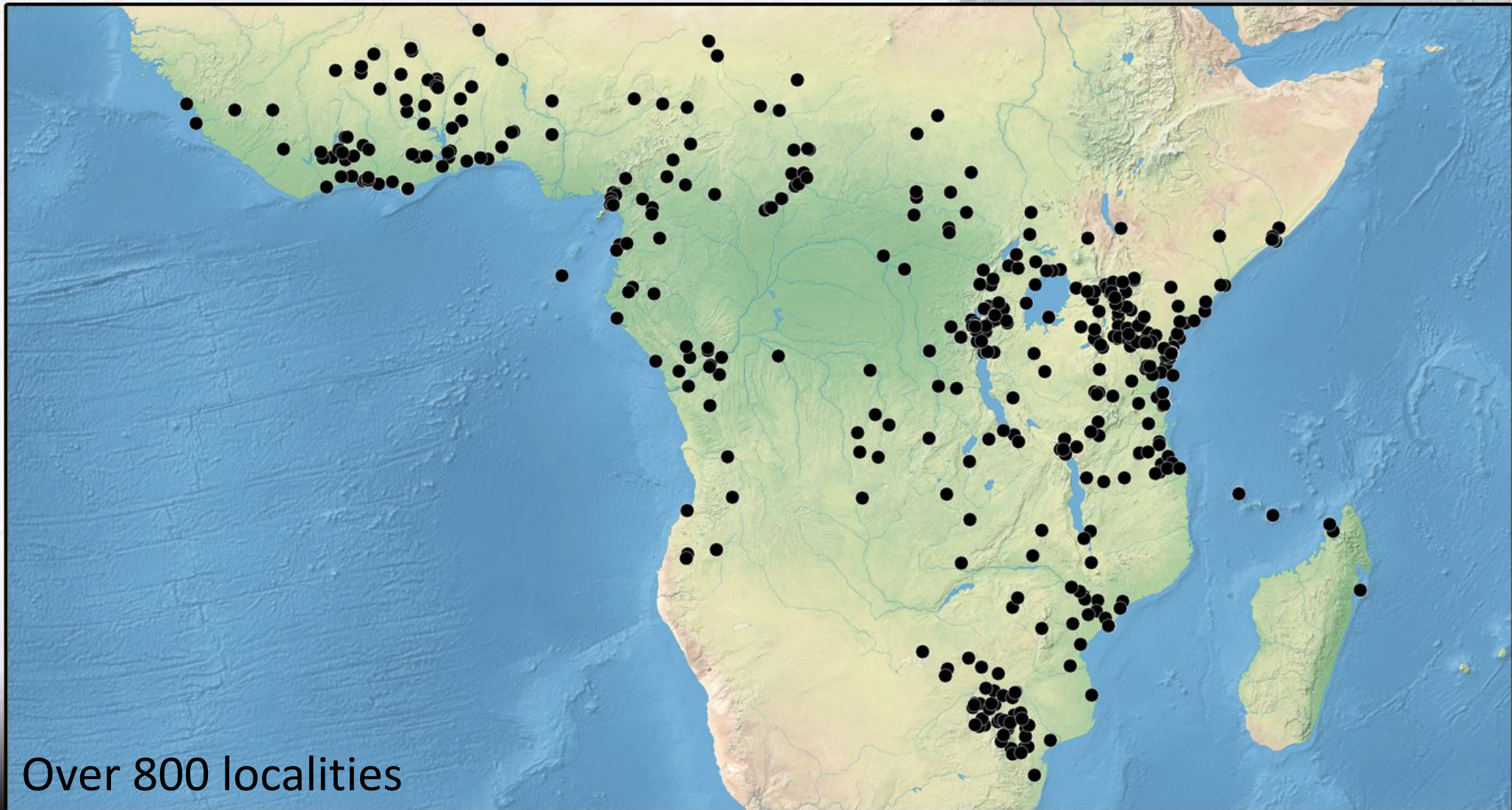


Results - distribution



Results - distribution

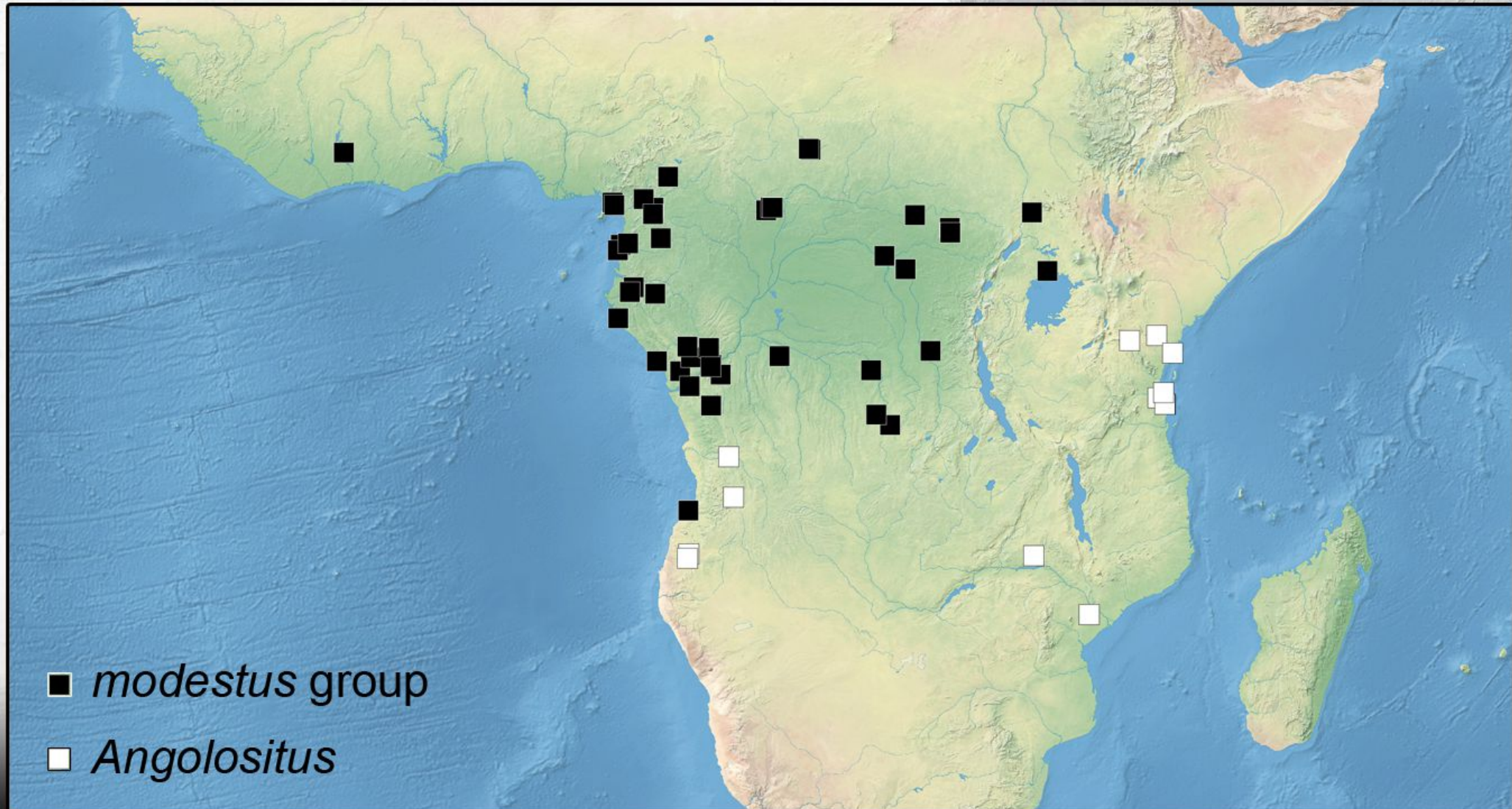
- *Ectateus* generic group – collection places:



Over 800 localities

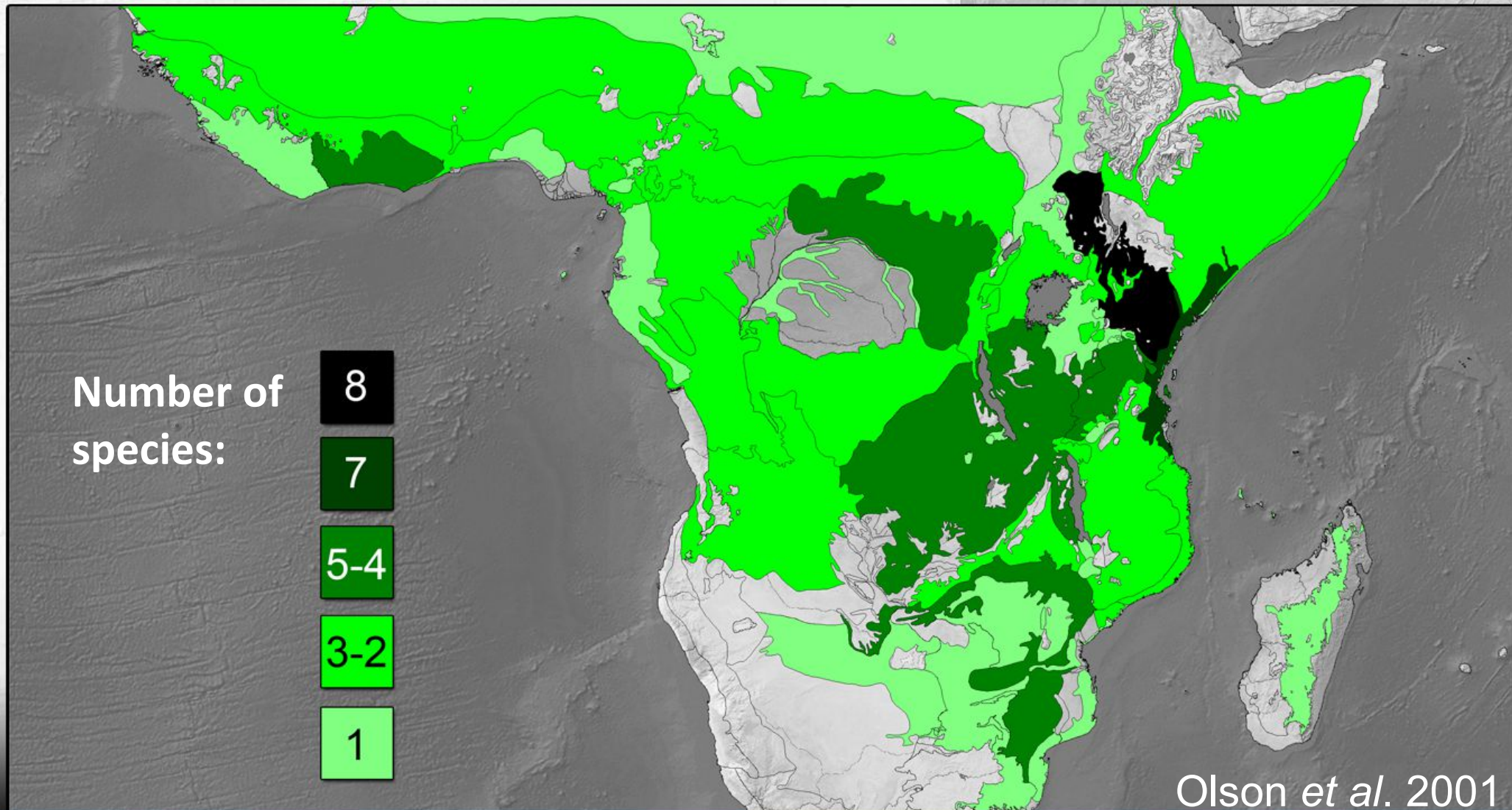
Results - distribution

- *Ectateus* generic group – new faunistic data:



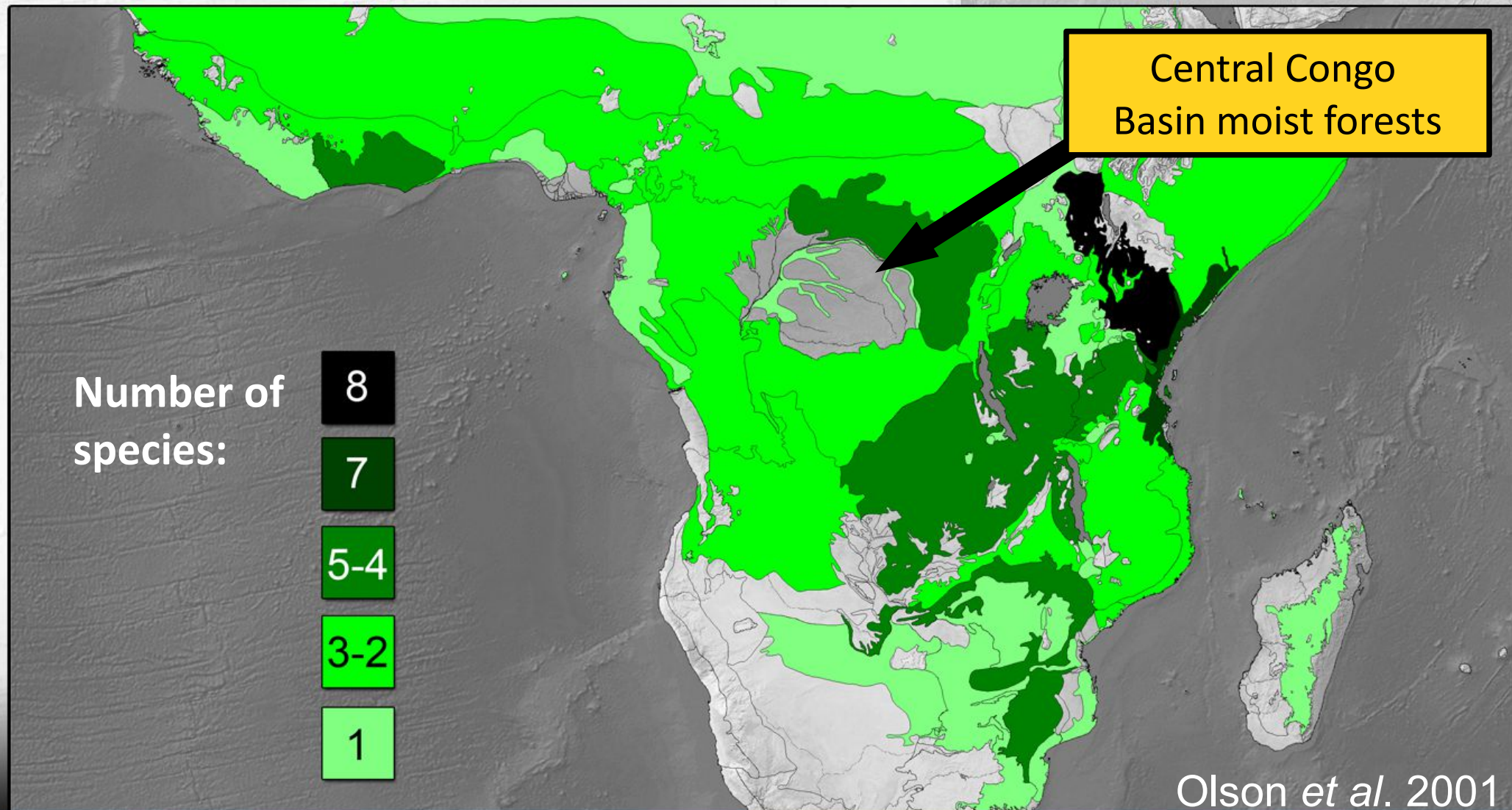
Results - distribution

- Species diversity – WWF ecoregions:

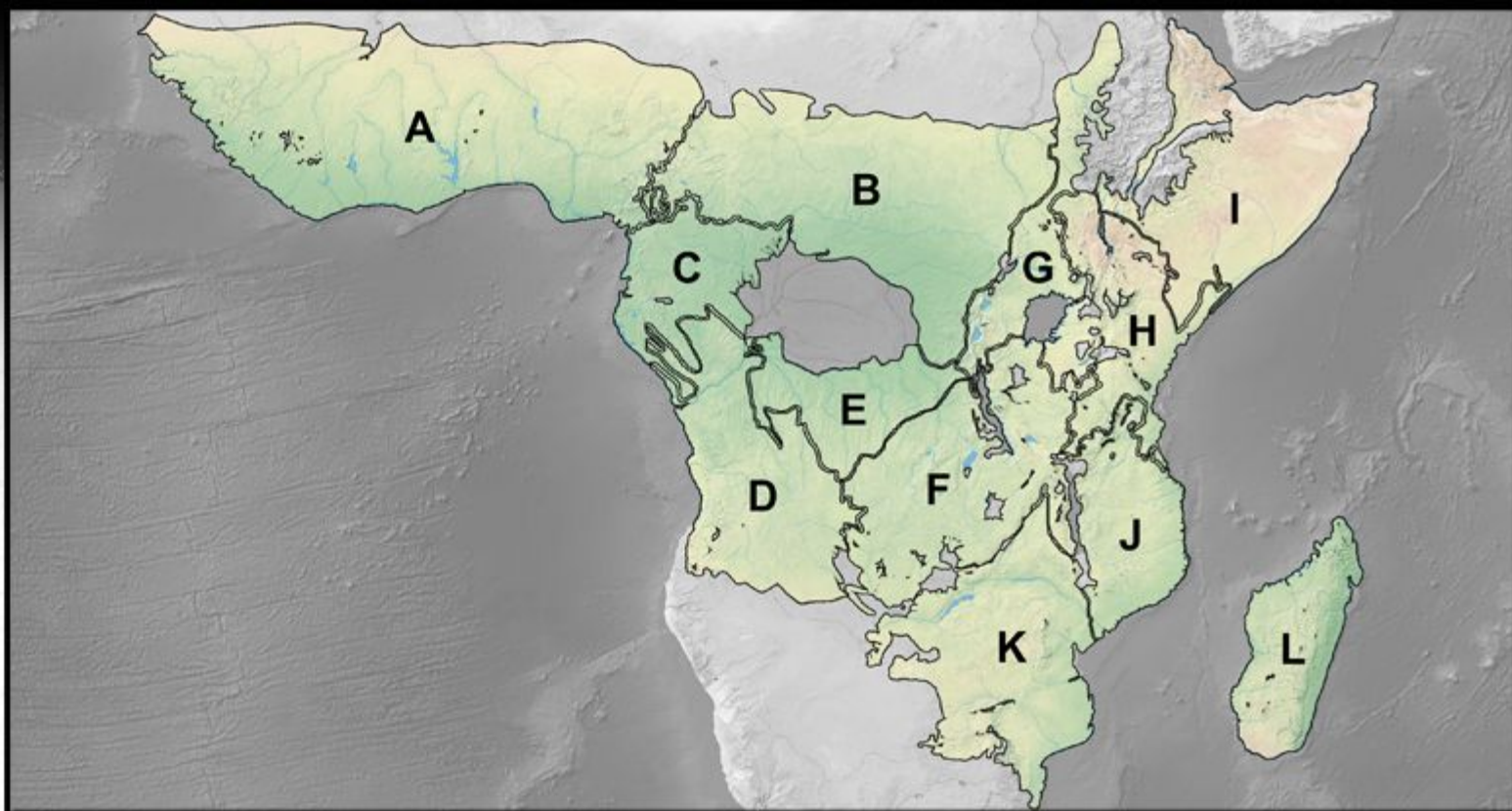


Results - distribution

- Species diversity – WWF ecoregions:



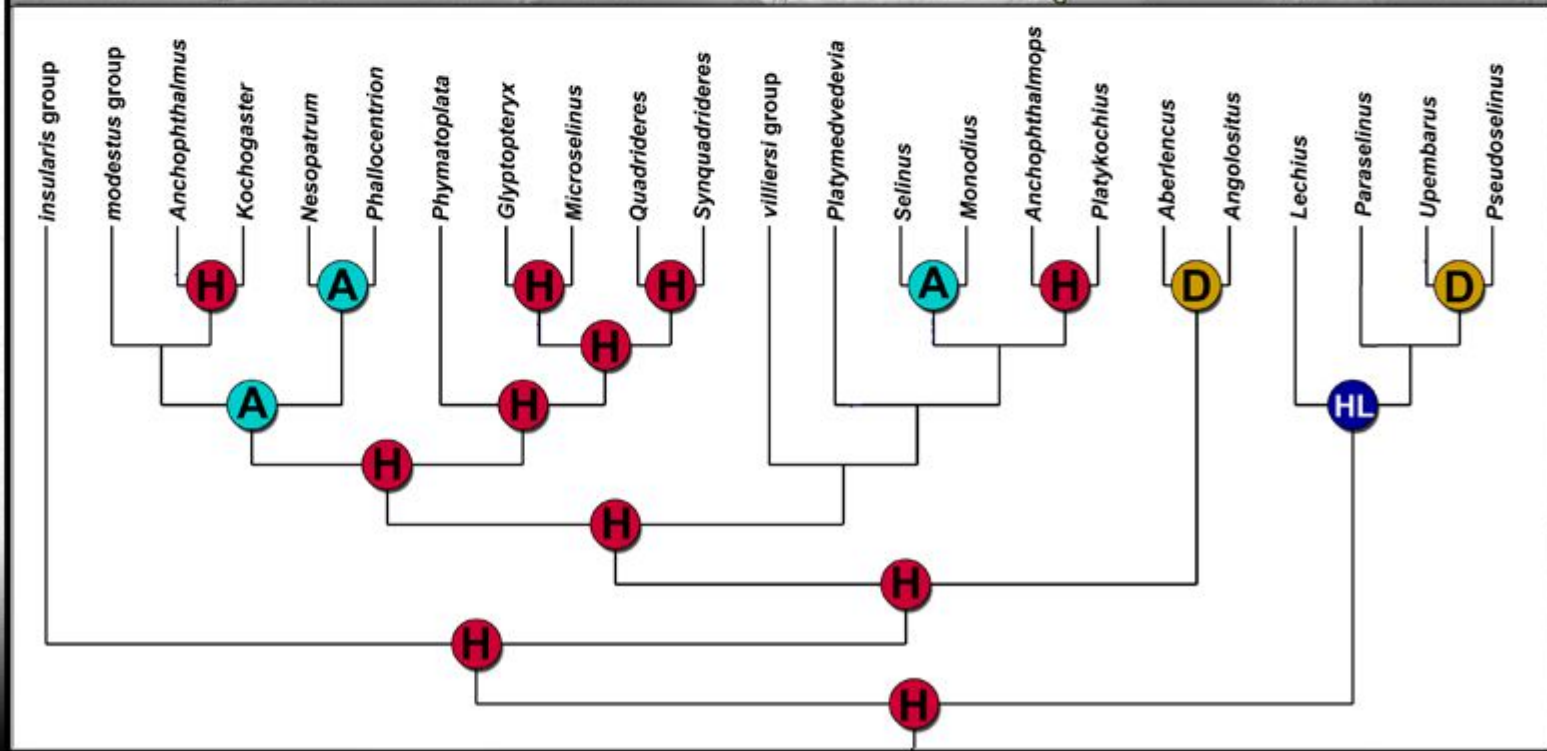
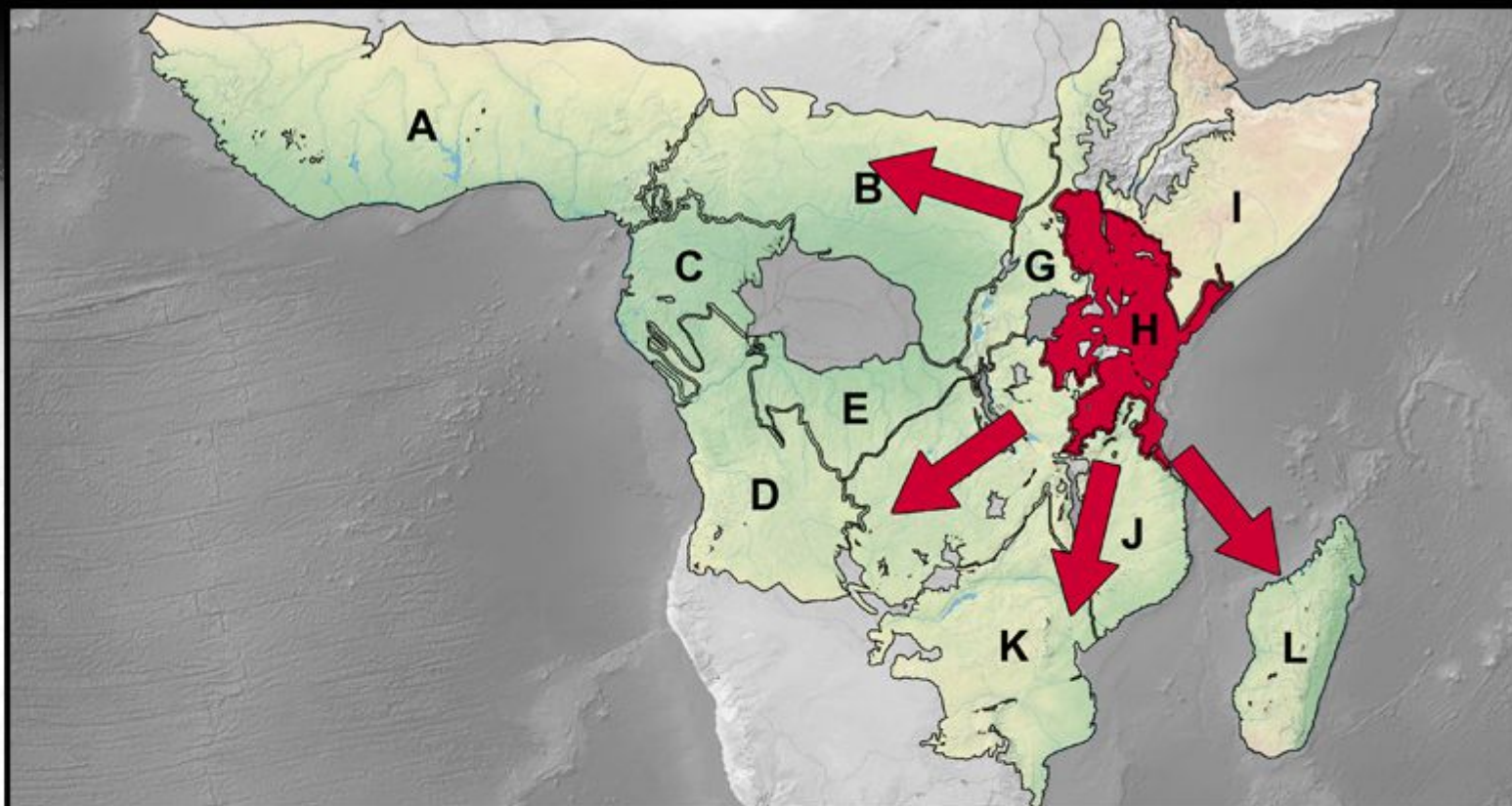
Results - distribution



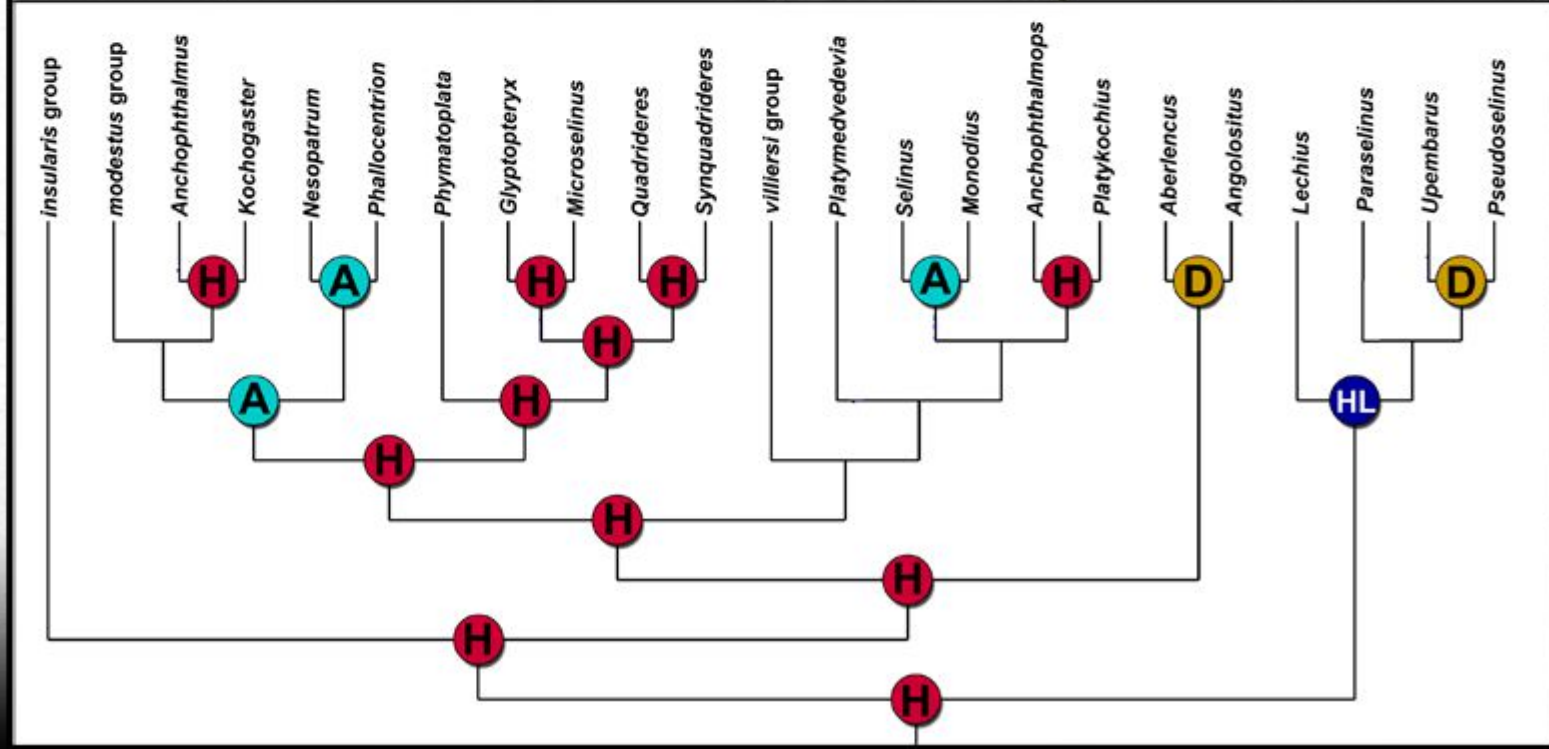
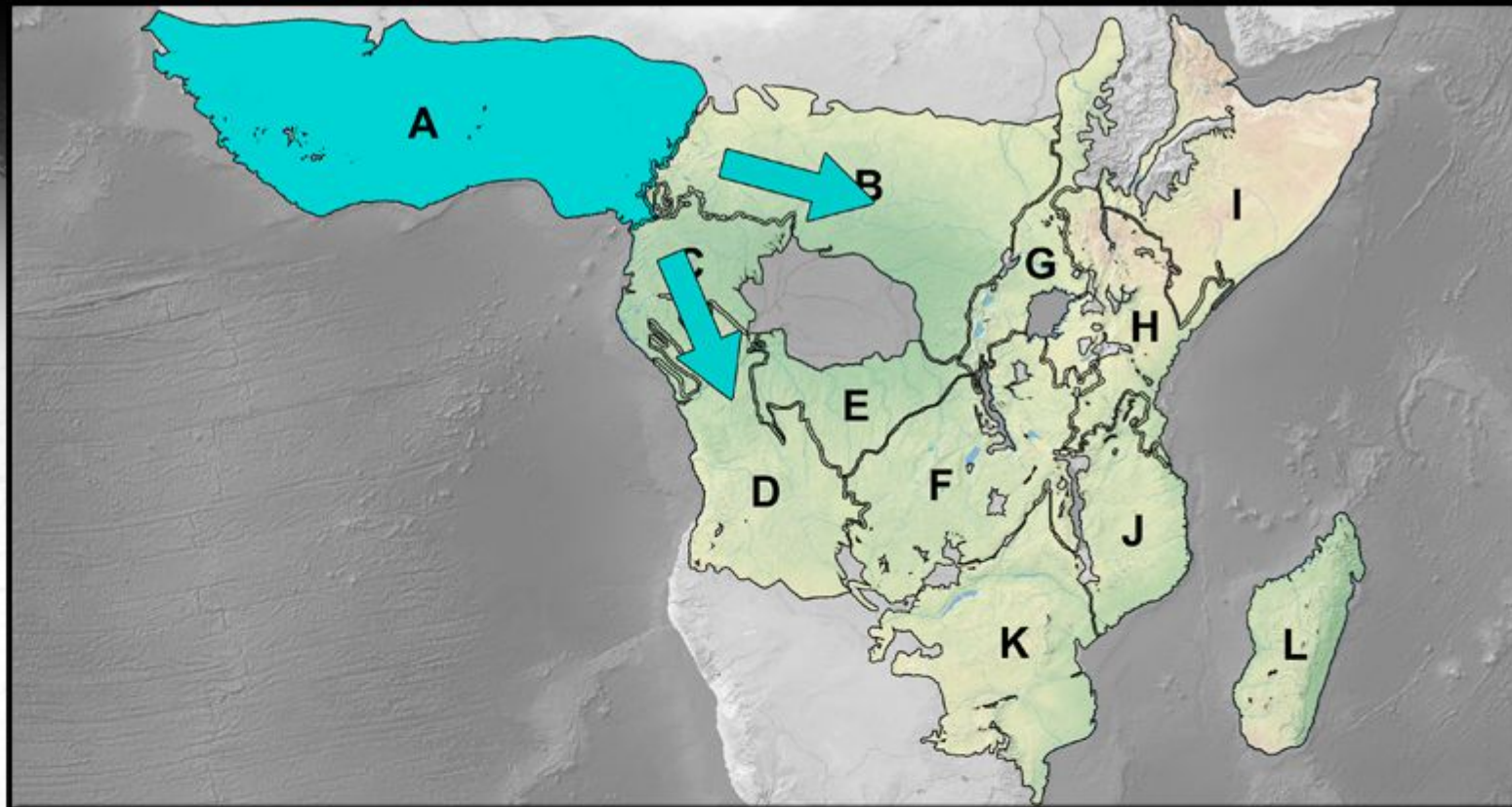
Regions were designated based on:

- the WWF ecoregions
- observed species distribution

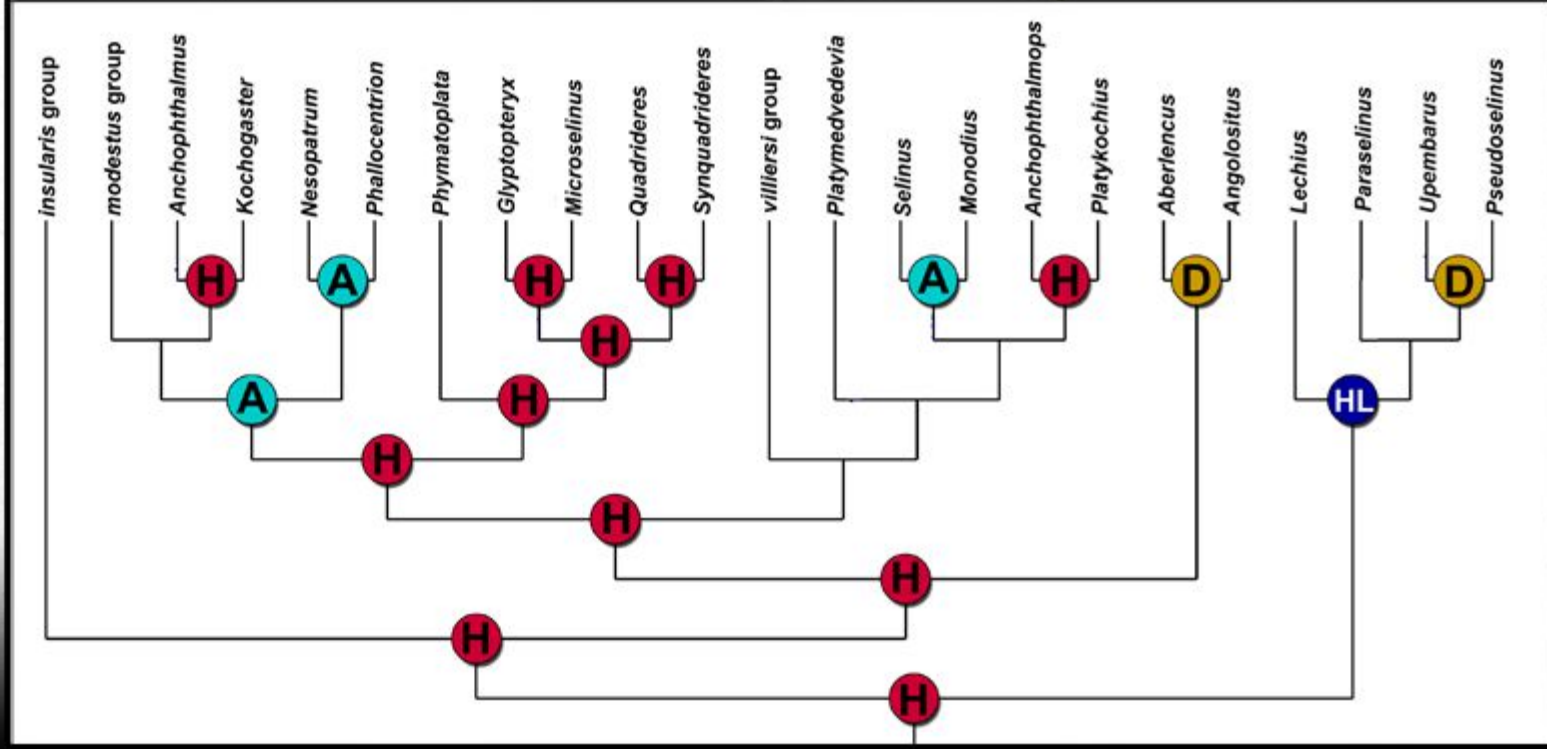
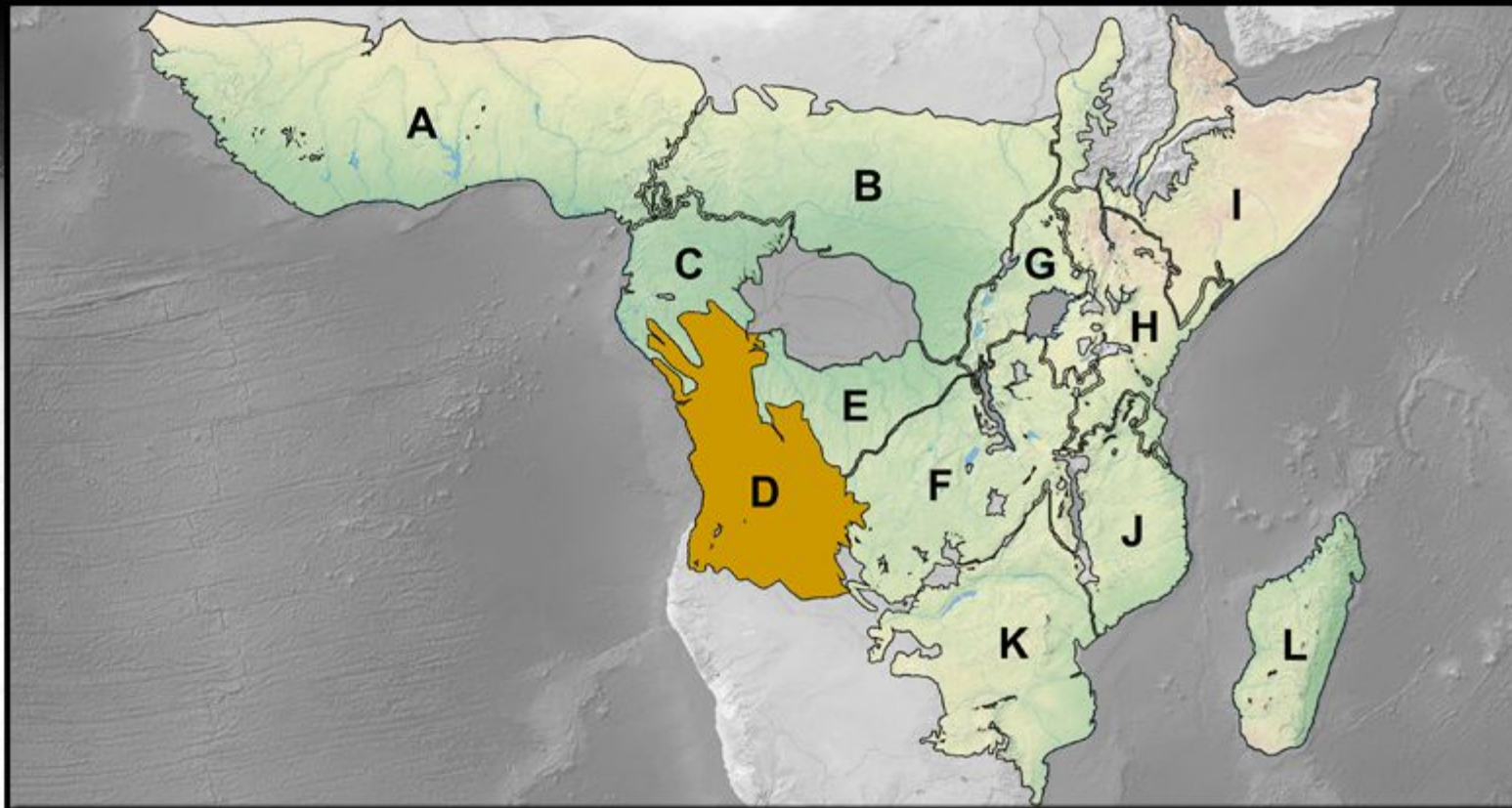
Results - distribution

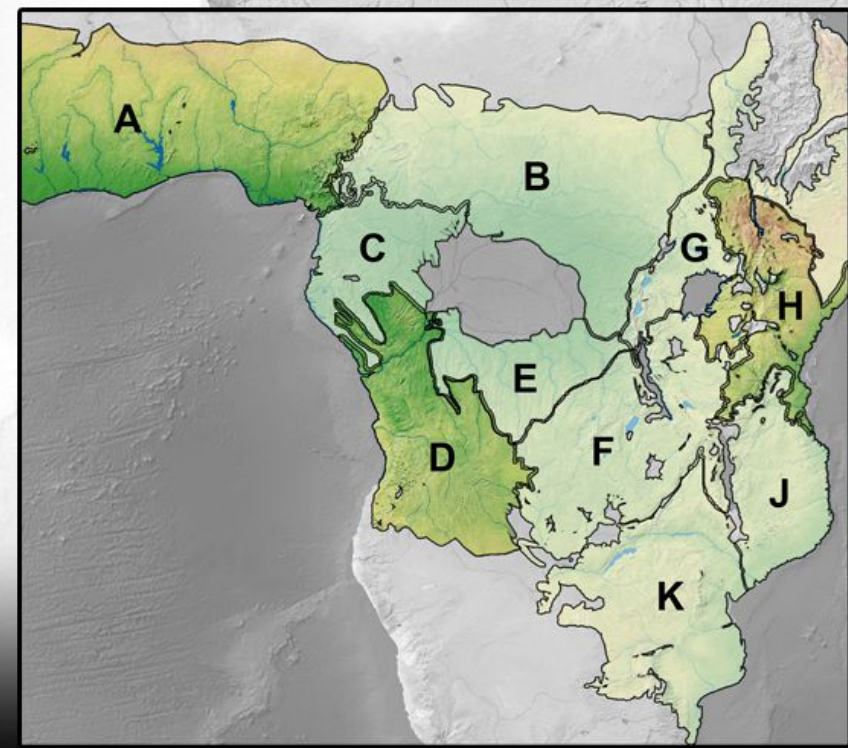
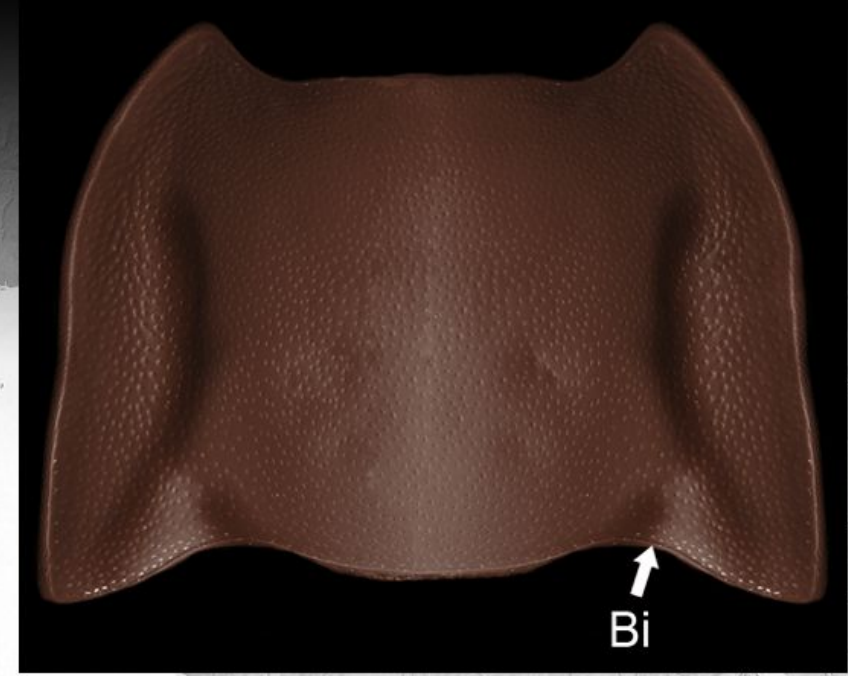
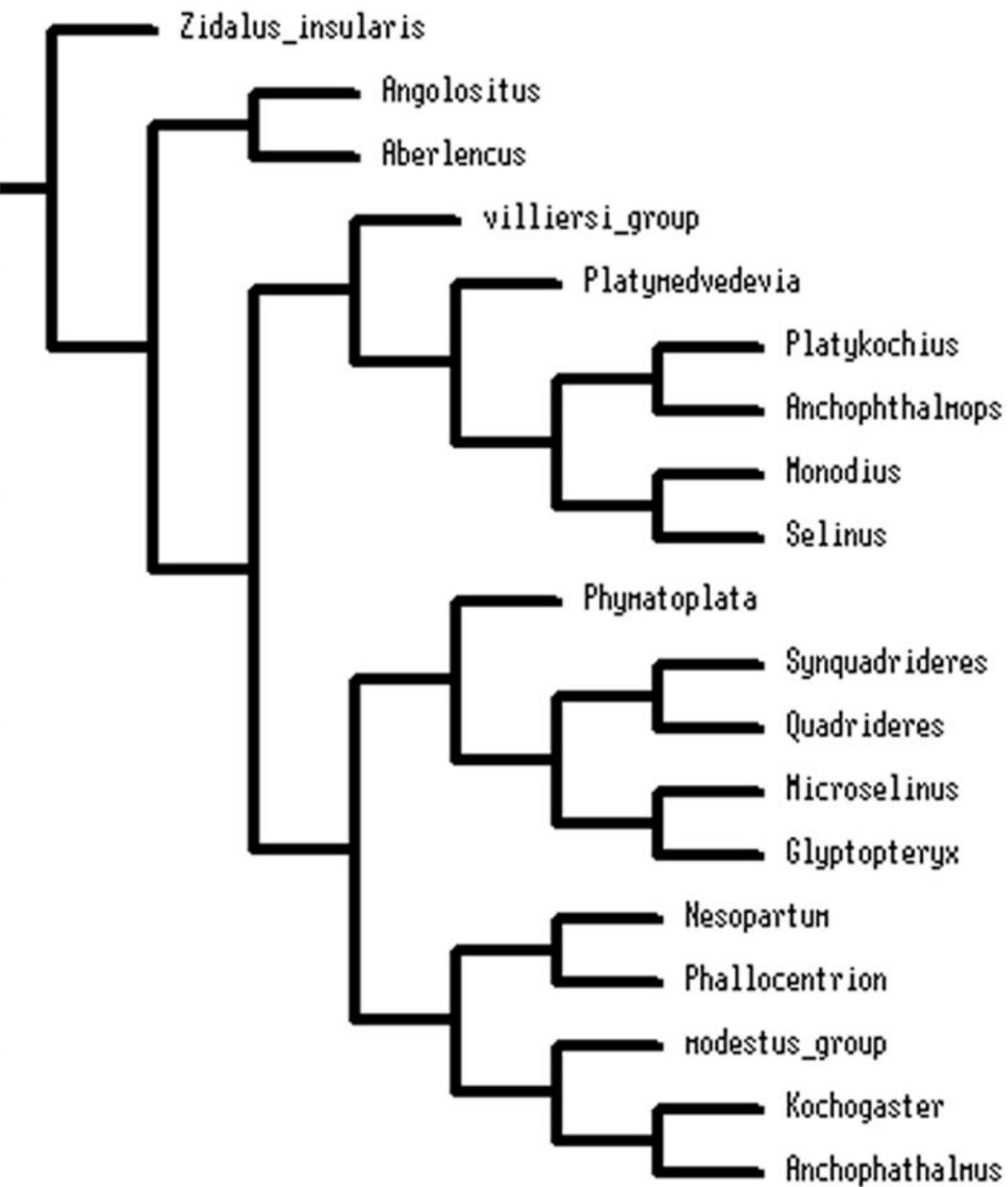


Results - distribution



Results - distribution





Conclusions