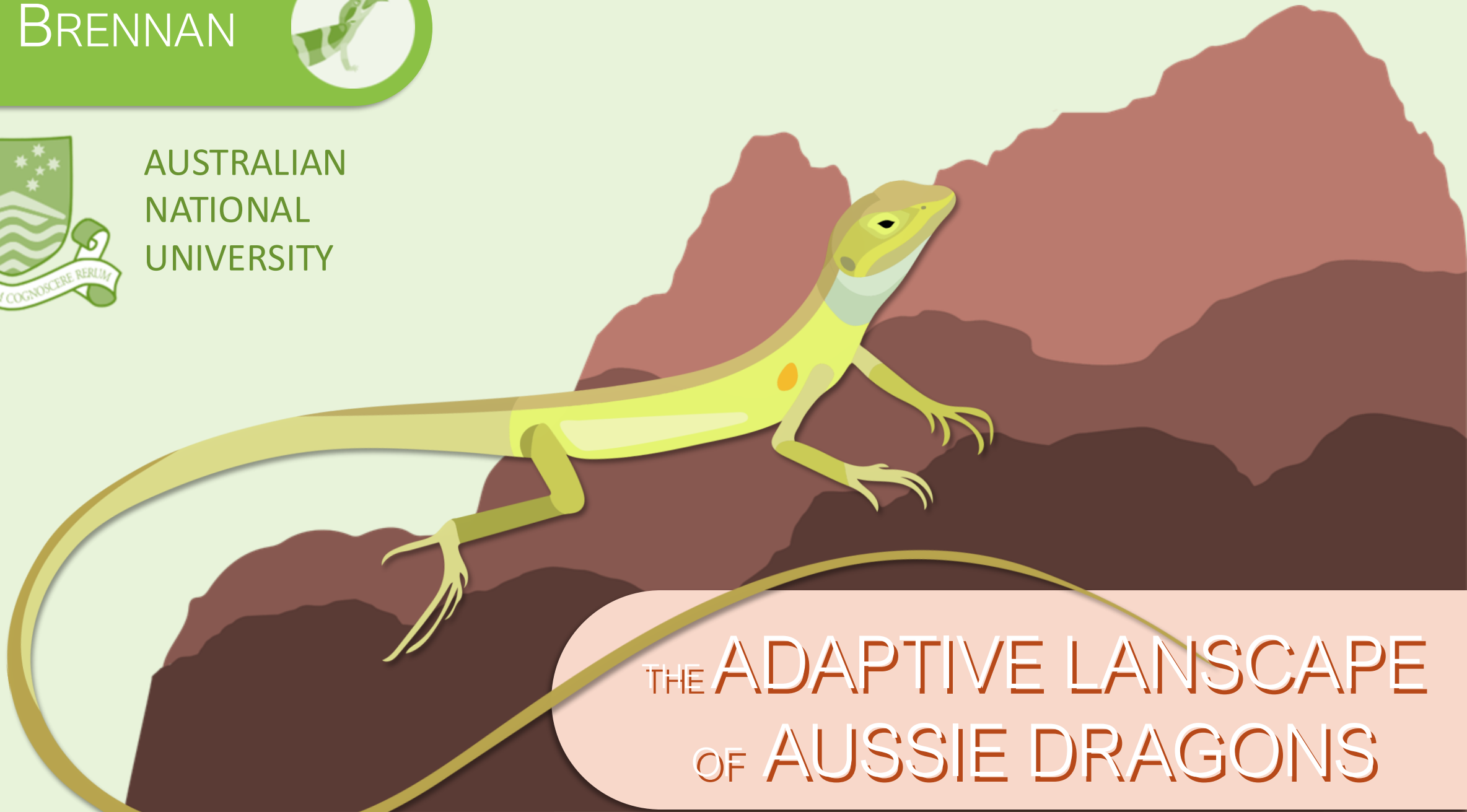
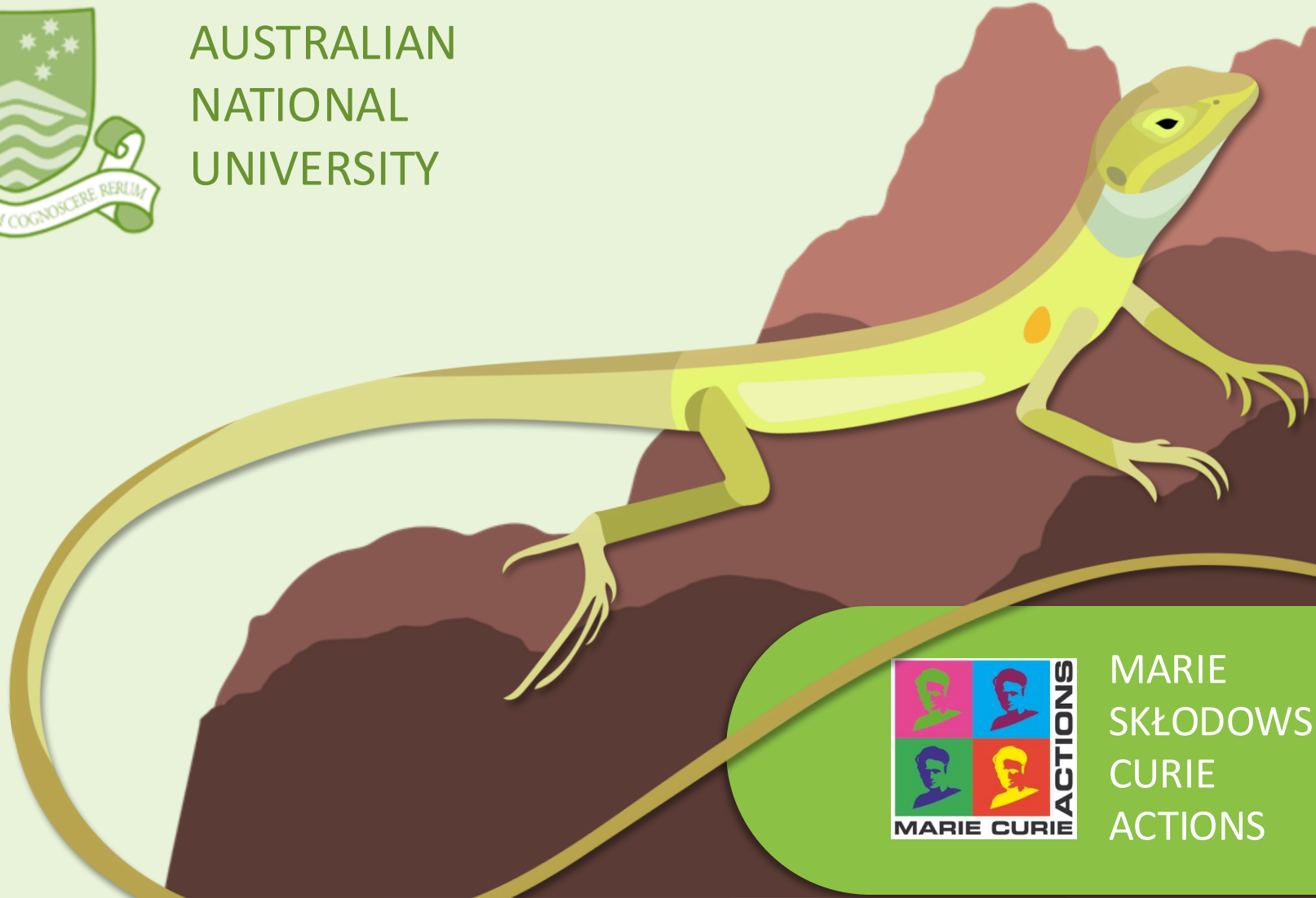
IAN BRENNAN

AUSTRALIAN
NATIONAL
UNIVERSITY



THE ADAPTIVE LANSCAPE OF AUSSIE DRAGONS

Ian Brennan



AUSTRALIAN
NATIONAL
UNIVERSITY

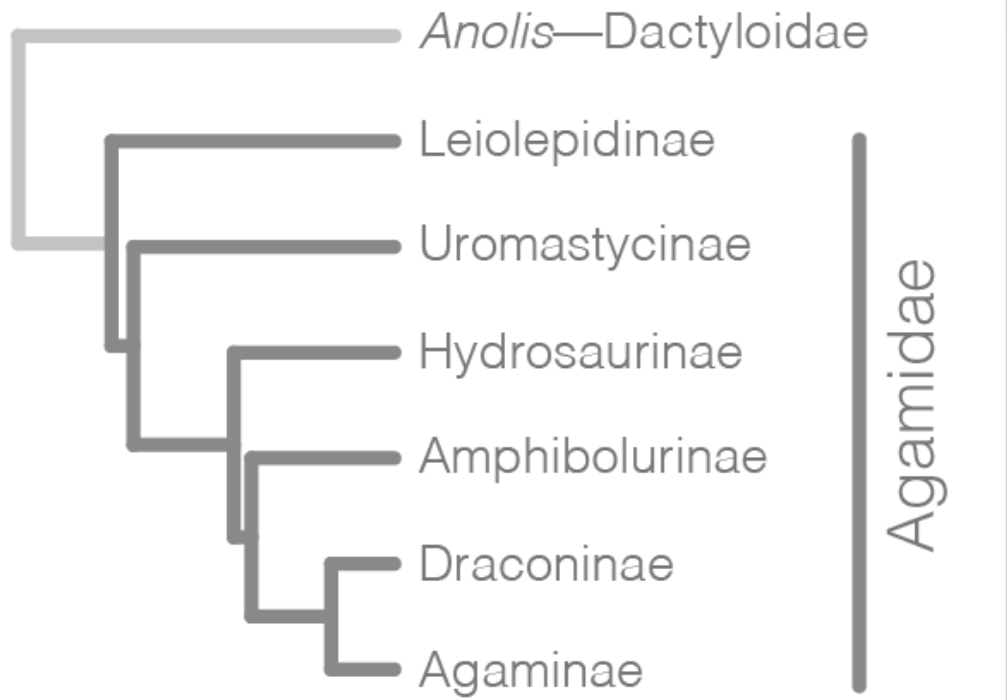
COLLABORATORS:

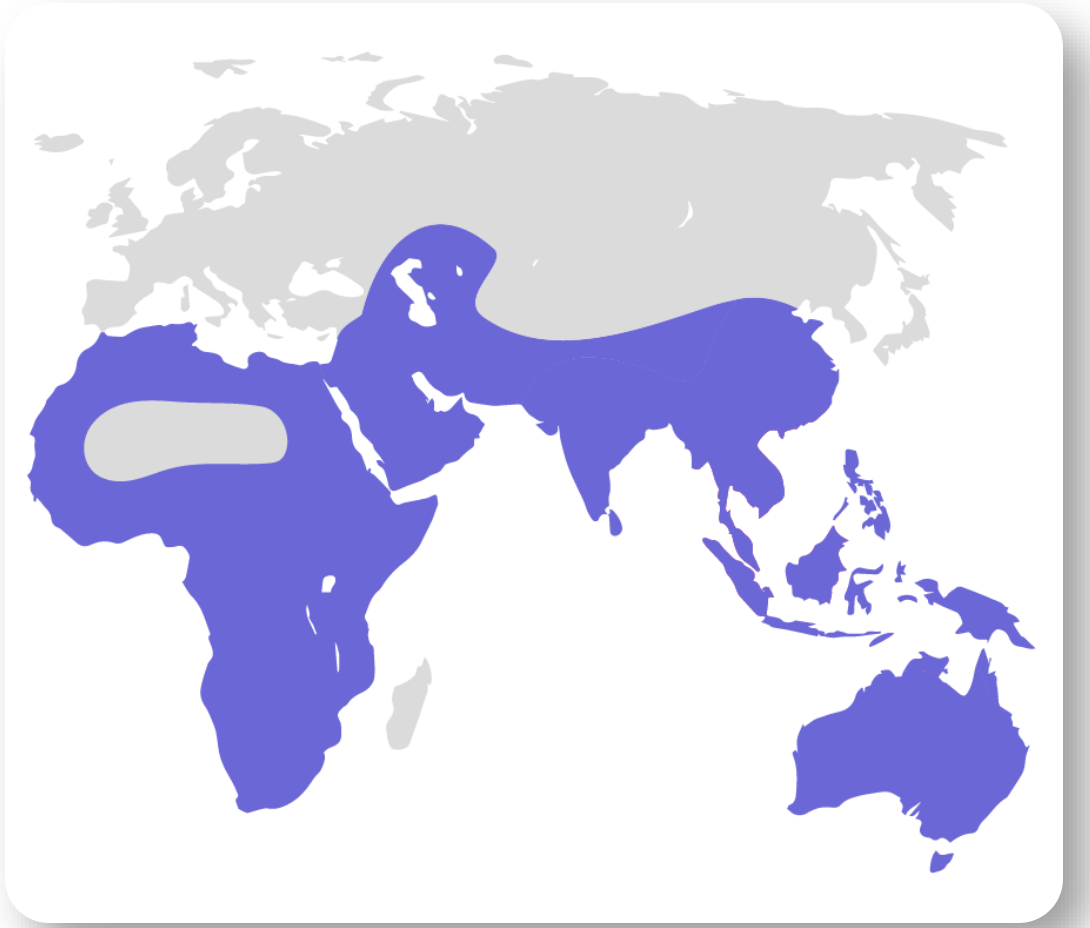
JANE MELVILLE
NATALIE COOPER
JOANNA SUMNER
LEO TEDESCHI
LIZ BRODY
SCOTT KEOGH

MARIE
SKŁODOWSKA
CURIE
ACTIONS

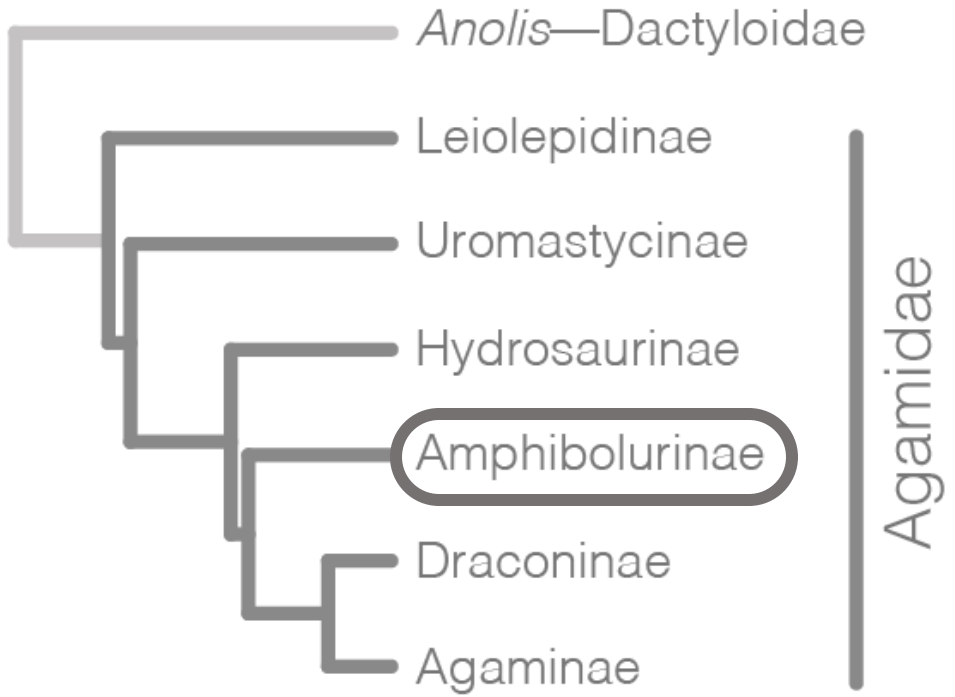
BIOPLATFORMS
AUSTRALIA

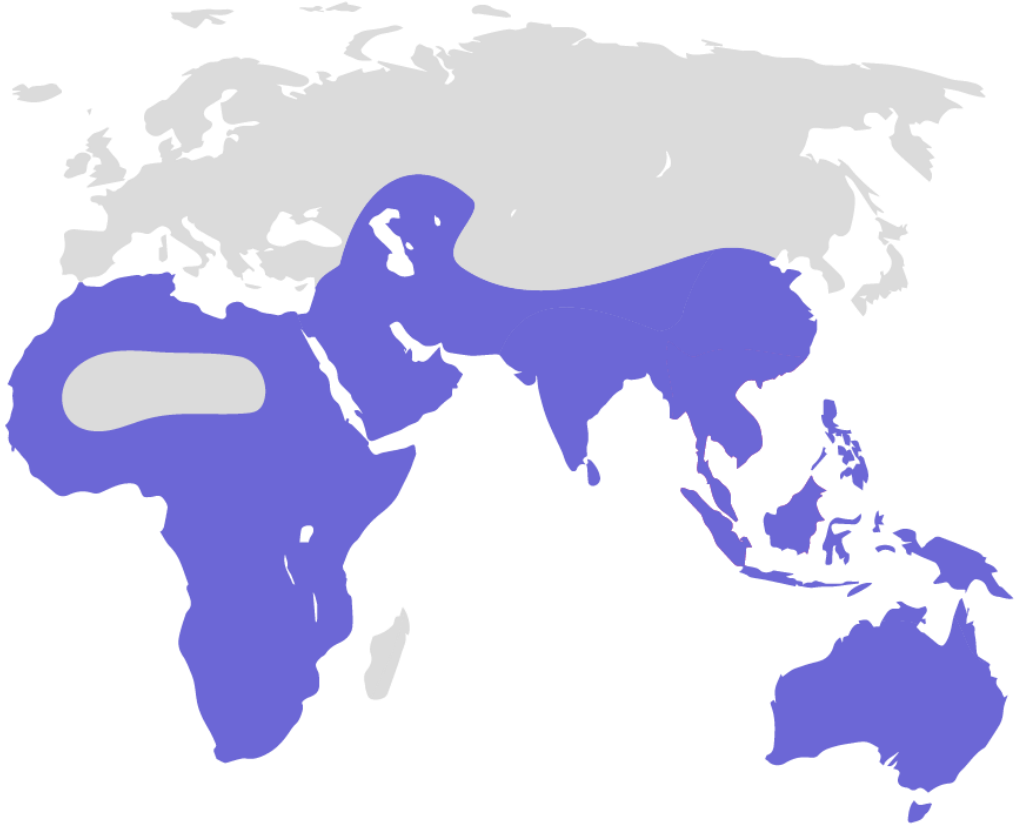
Agamidae Subfamilies



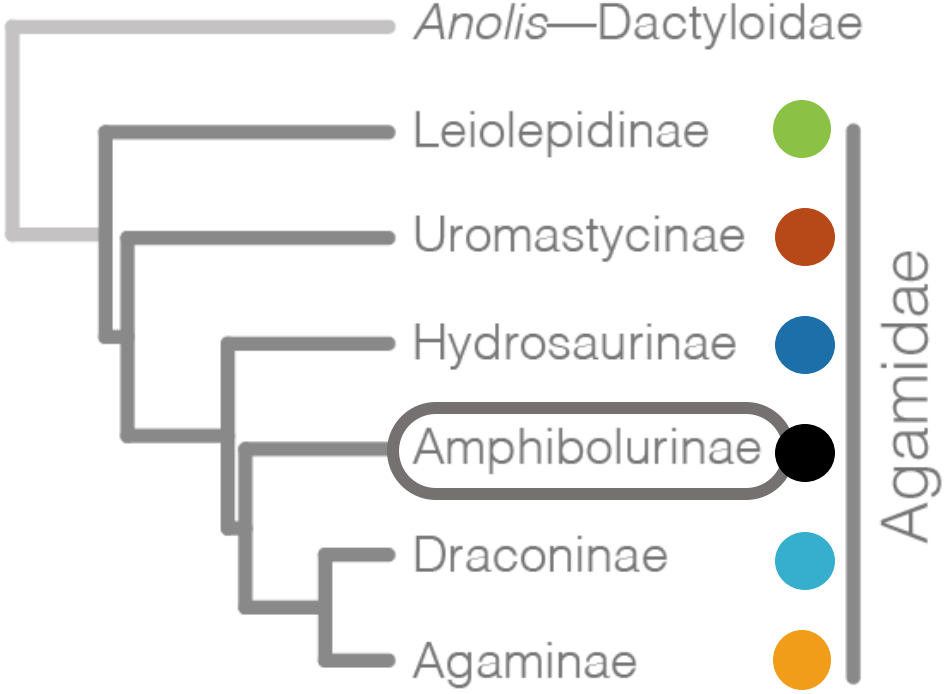


Agamidae Subfamilies





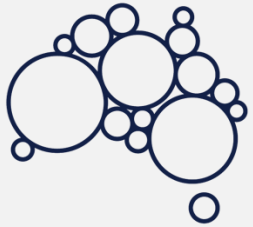
Agamidae Subfamilies



1 BUILD A TREE OF THE AMPHIBOLURINAE

1. BUILD A TREE OF THE AMPHIBOLURINAE

2. EXPLORE THEIR MORPHOLOGICAL EVOLUTION



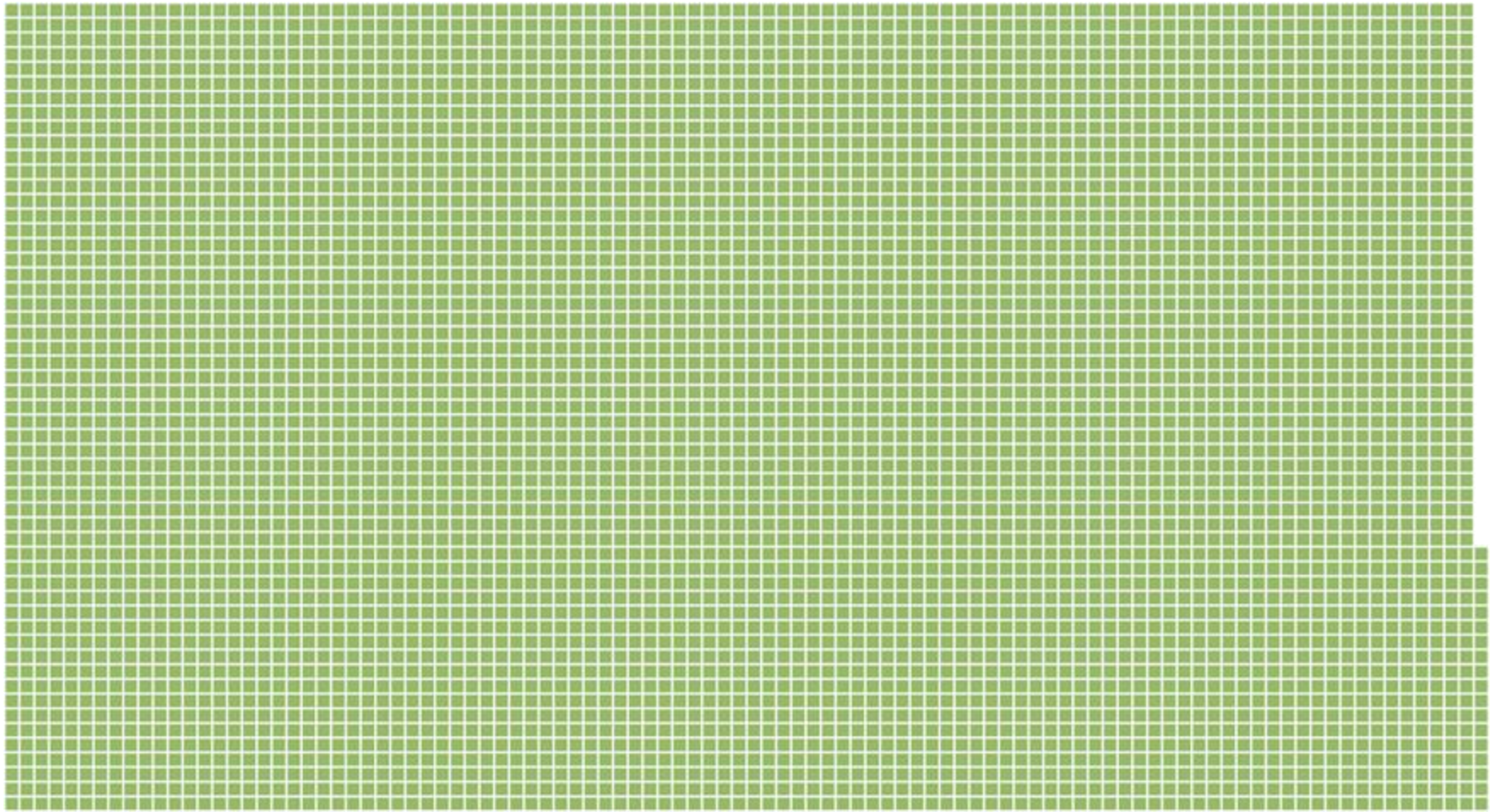
BIOPLATFORMS
AUSTRALIA

AusARG
PHYLOGENOMICS

BIOPLATFORMS
AUSTRALIA

PIPESNAKE

= 1 LOCUS



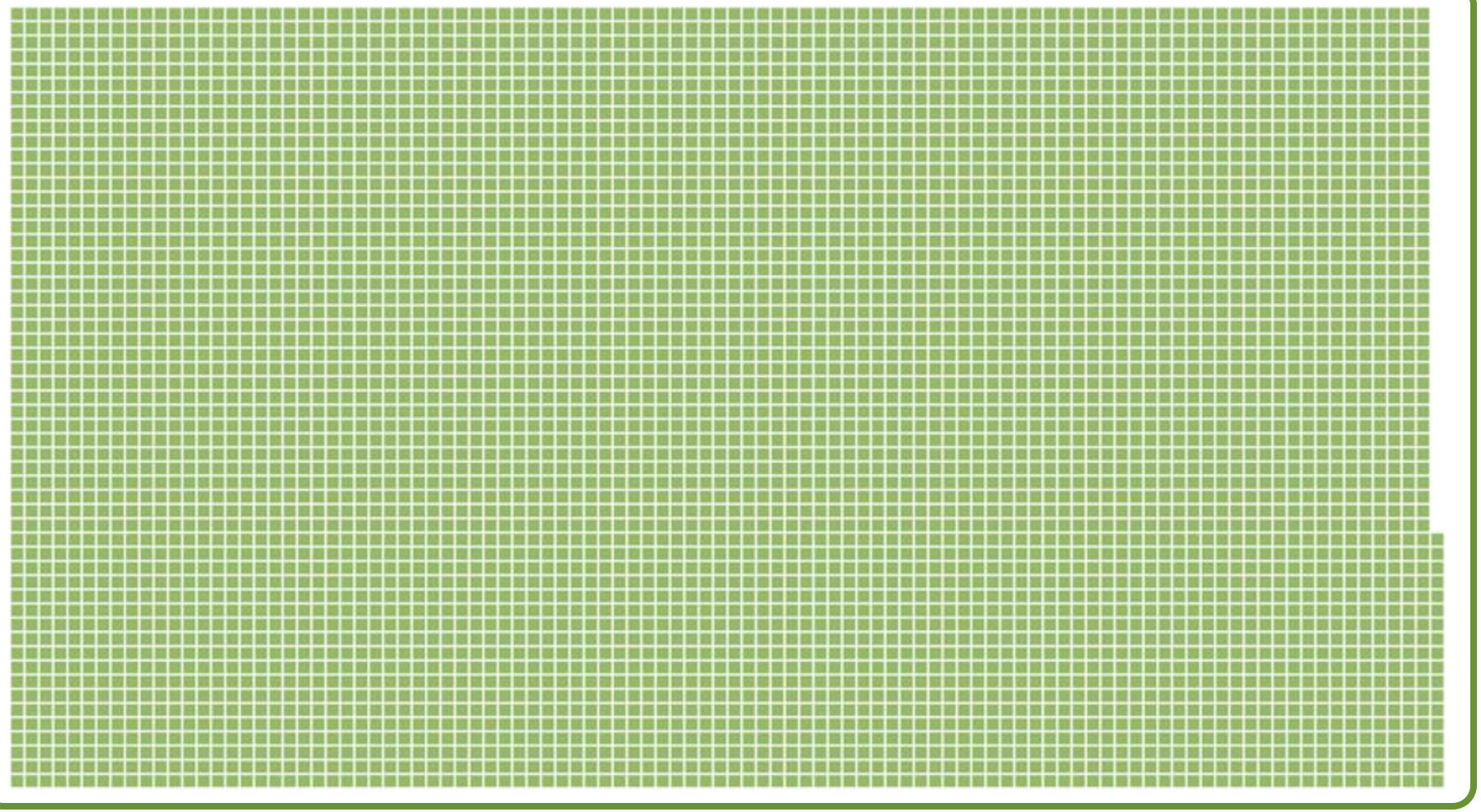
AusARG PHYLOGENOMICS

BIOPLATFORMS AUSTRALIA

PIPESNAKE

■ = 1 LOCUS

5,440 TOTAL LOCI



AusARG PHYLOGENOMICS

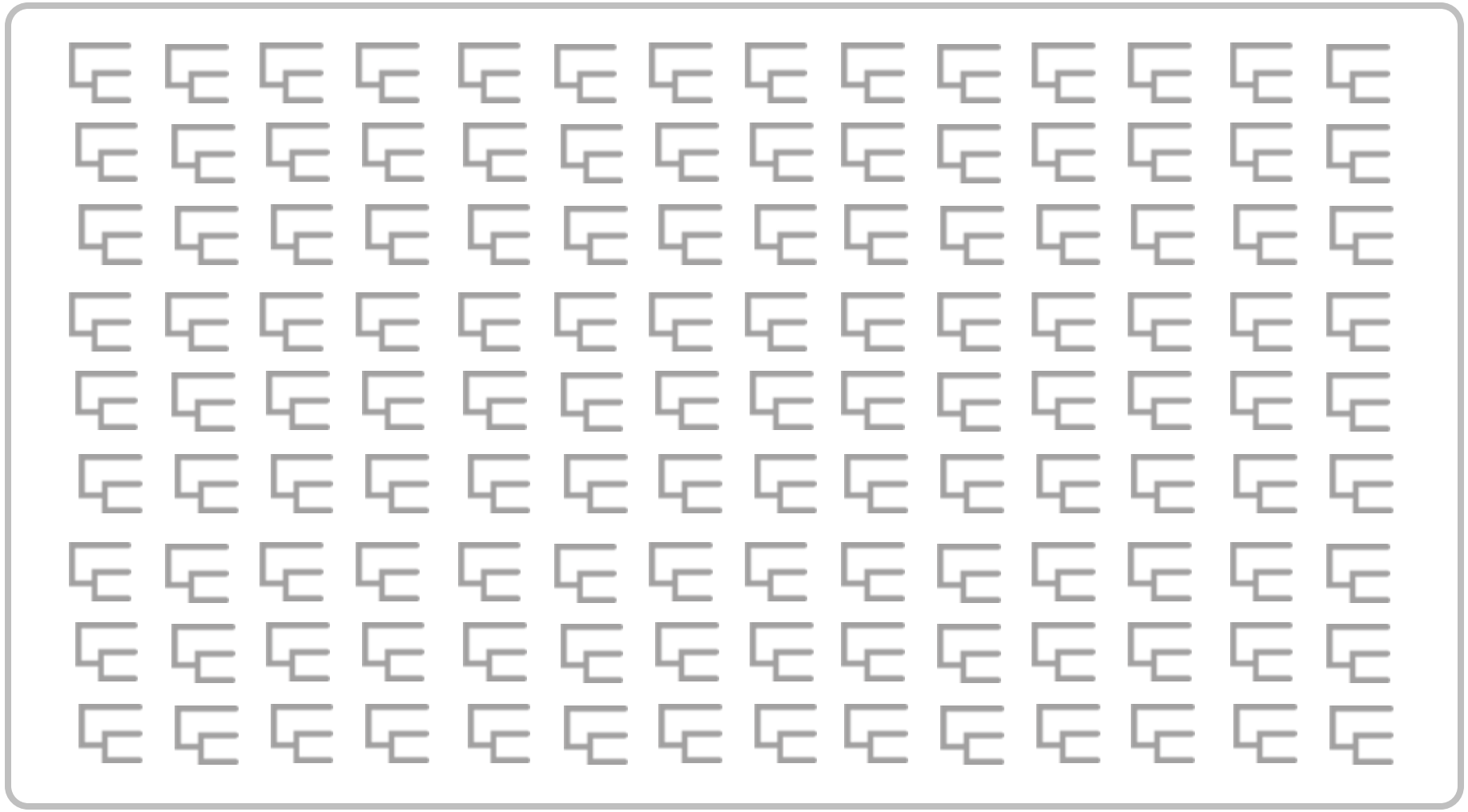
BIOPLATFORMS AUSTRALIA

PIPESNAKE

= 1 LOCUS

5,440 TOTAL LOCI

5,440 GENE TREES



AusARG PHYLOGENOMICS

BIOPLATFORMS AUSTRALIA

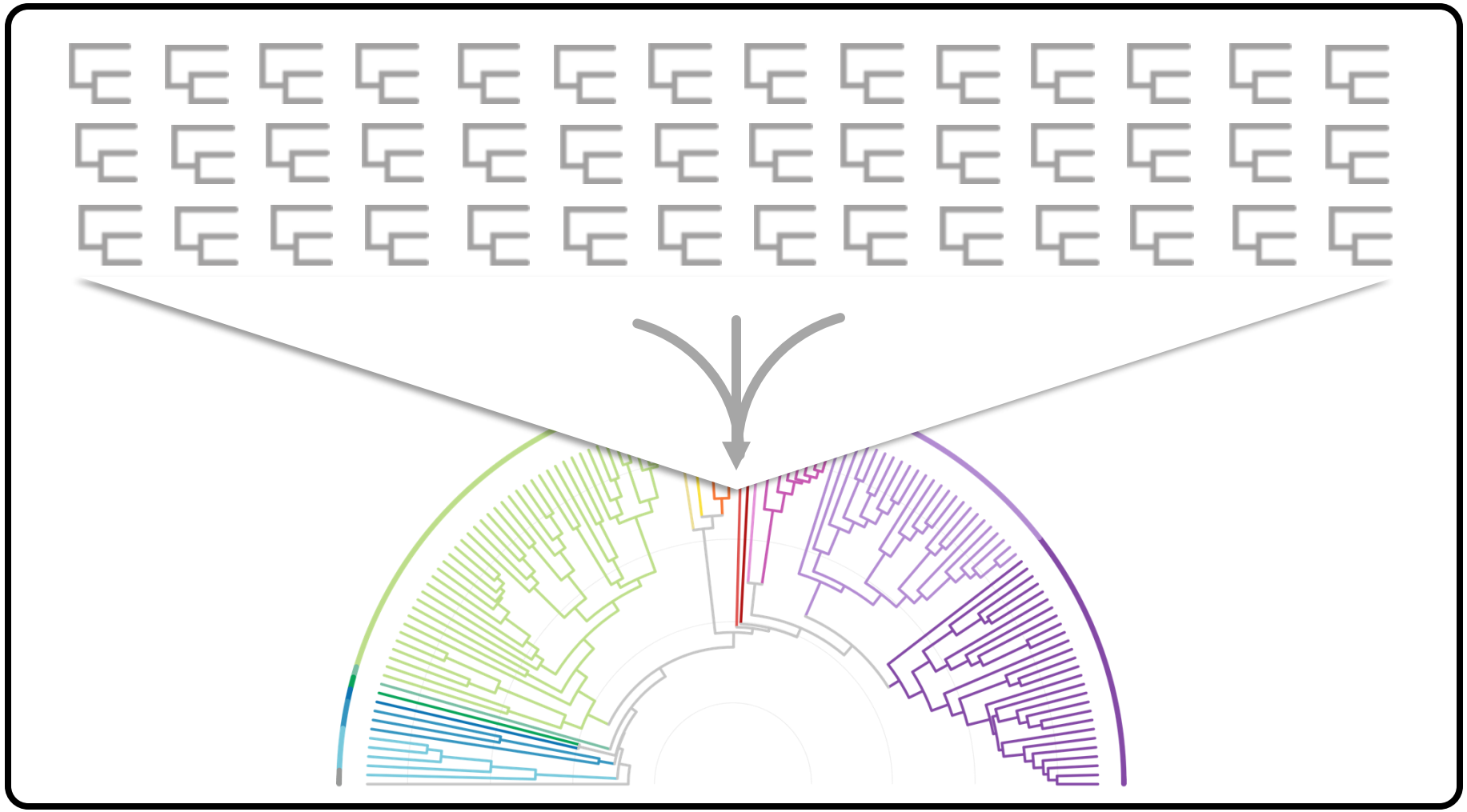
PIPESNAKE

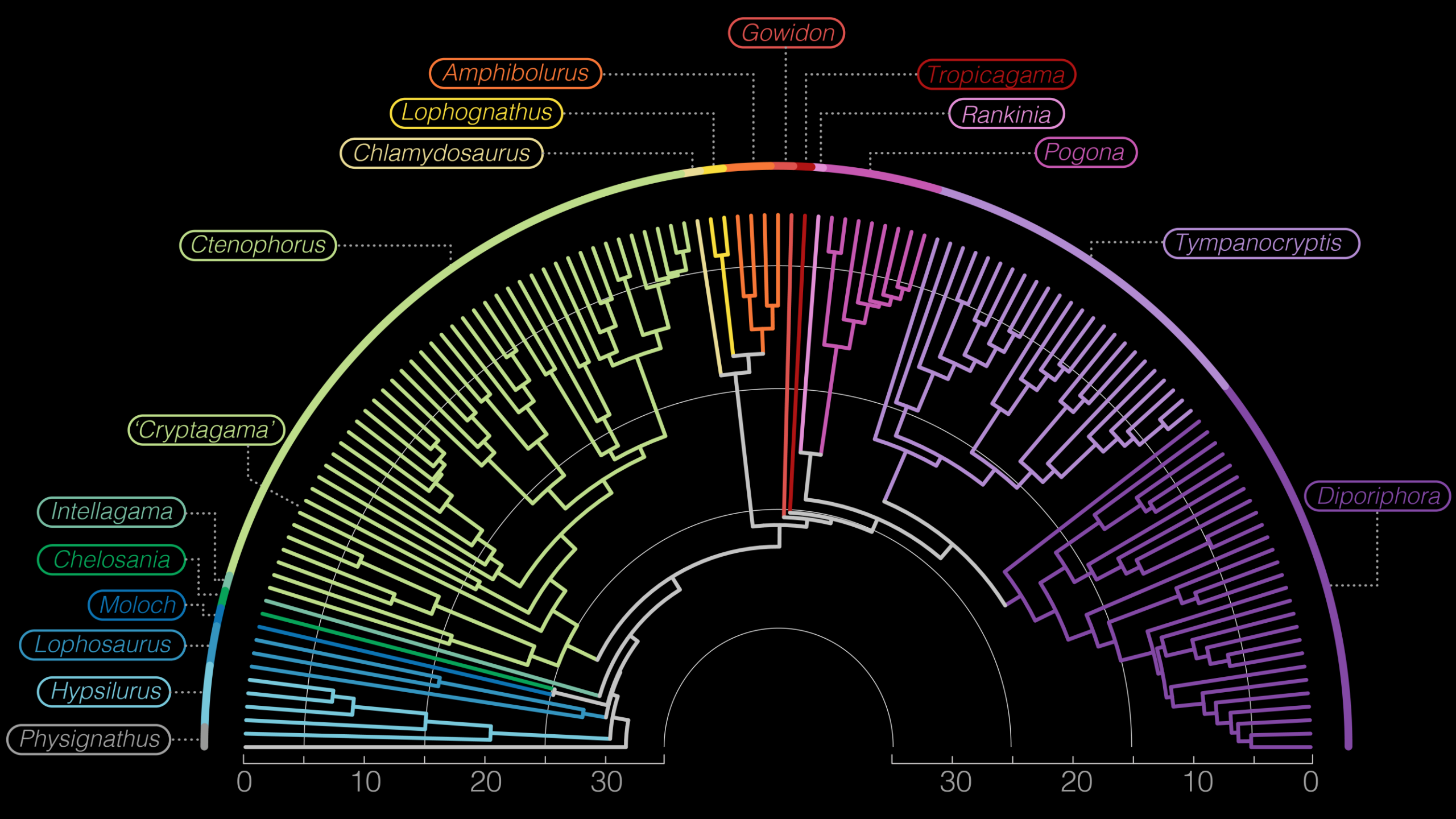
= 1 LOCUS

5,440 TOTAL LOCI

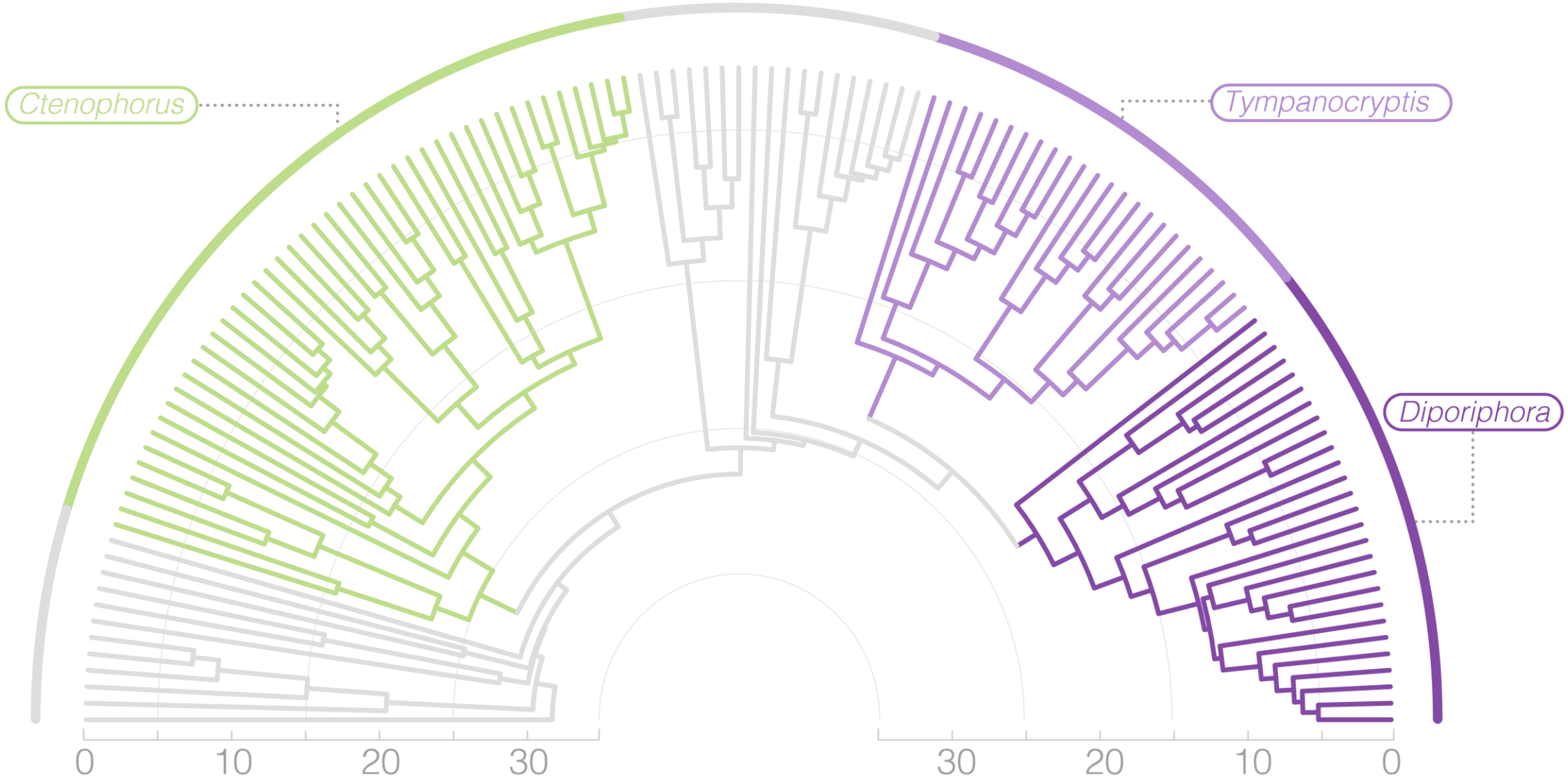
5,440 GENE TREES

1 SPECIES TREE

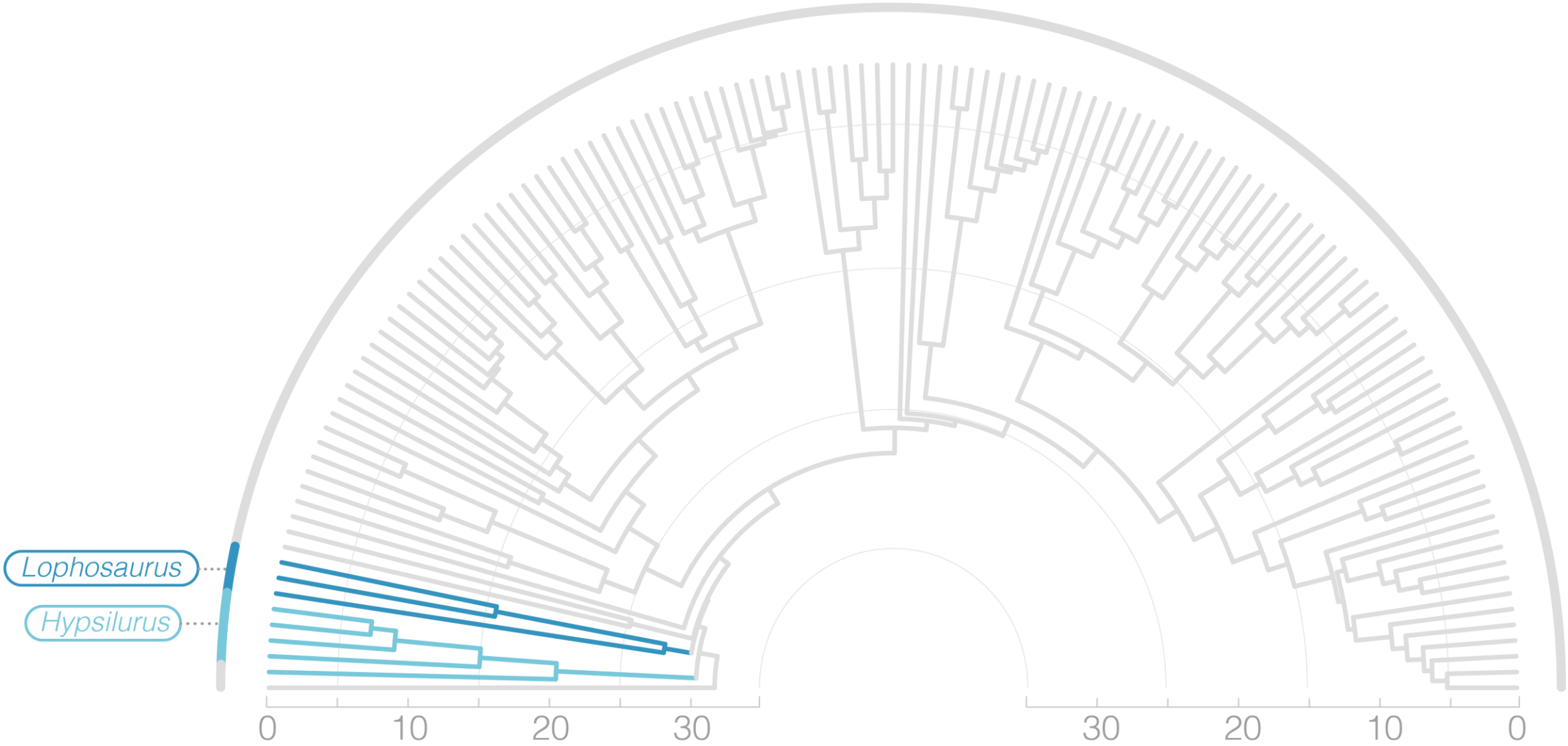



Gowidon
Amphibolurus
Tropicagama
Lophognathus
Rankinia
Chlamydosaurus
Pogona
Ctenophorus
Tympanocryptis
'Cryptagama'
Diporiphora
Intellagama
Chelosania
Moloch
Lophosaurus
Hypsilurus
Physignathus
0
10
20
30
30
20
10
0

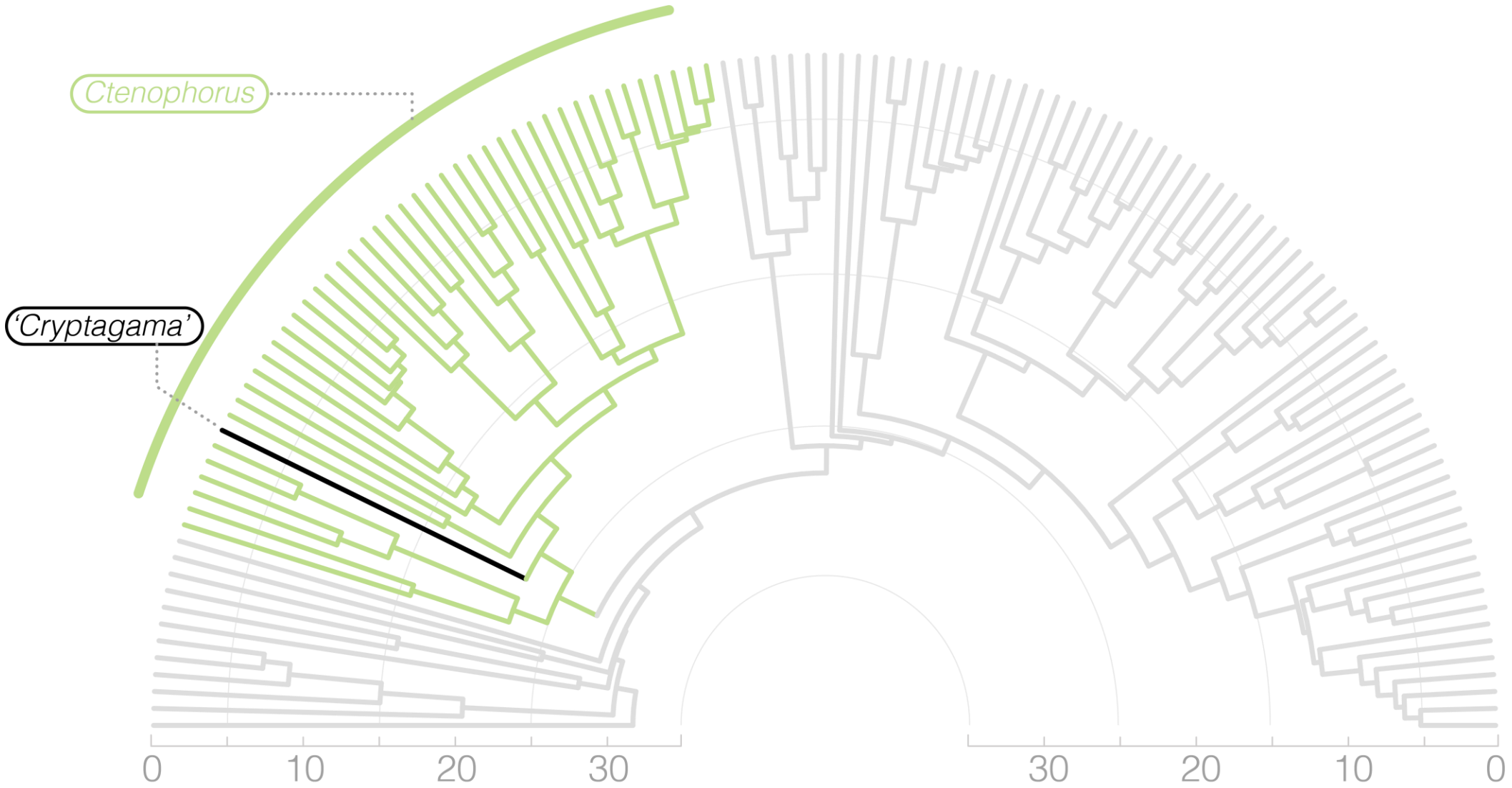
RICHNESS CONCENTRATED IN 3 GENERA

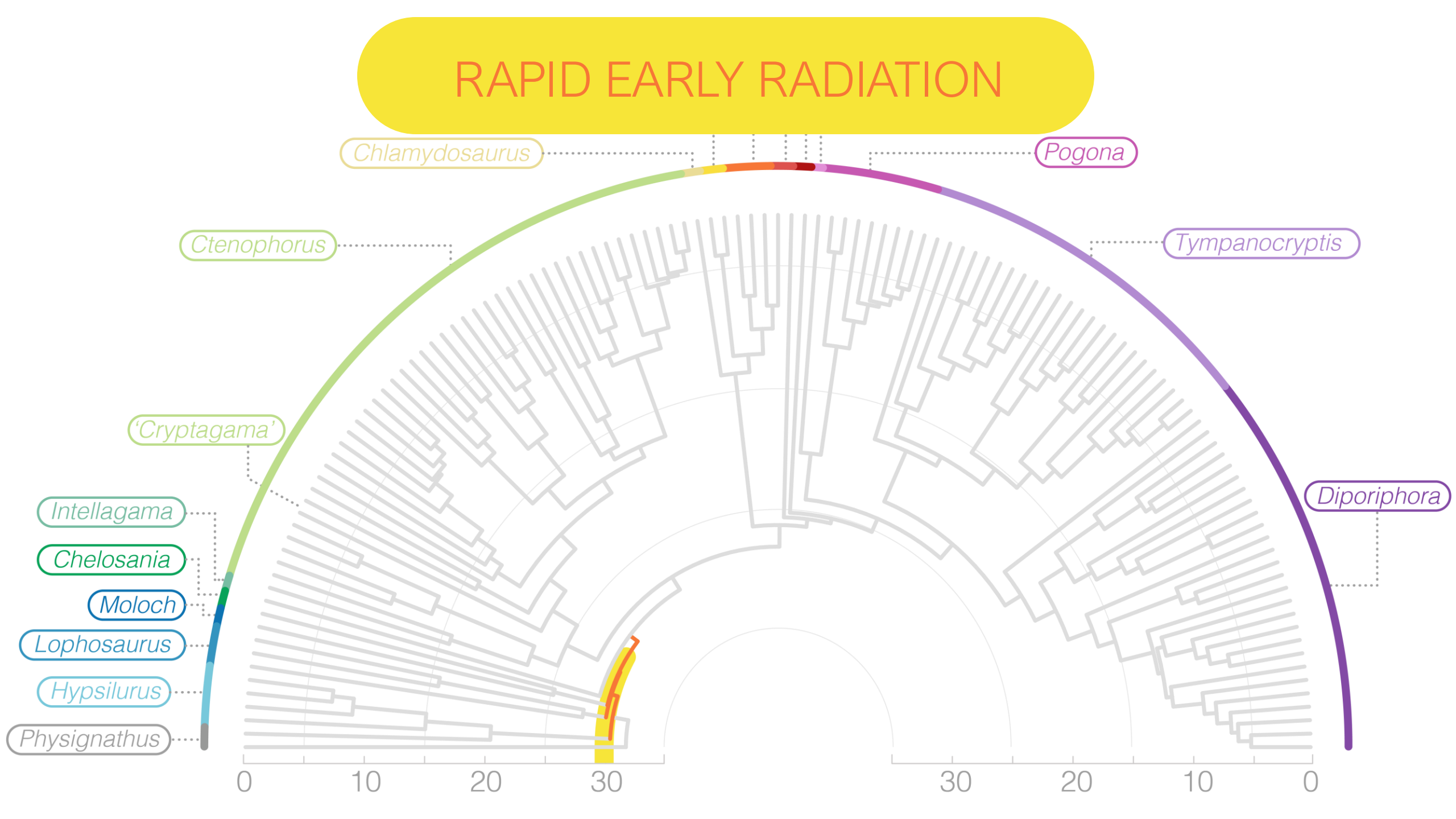


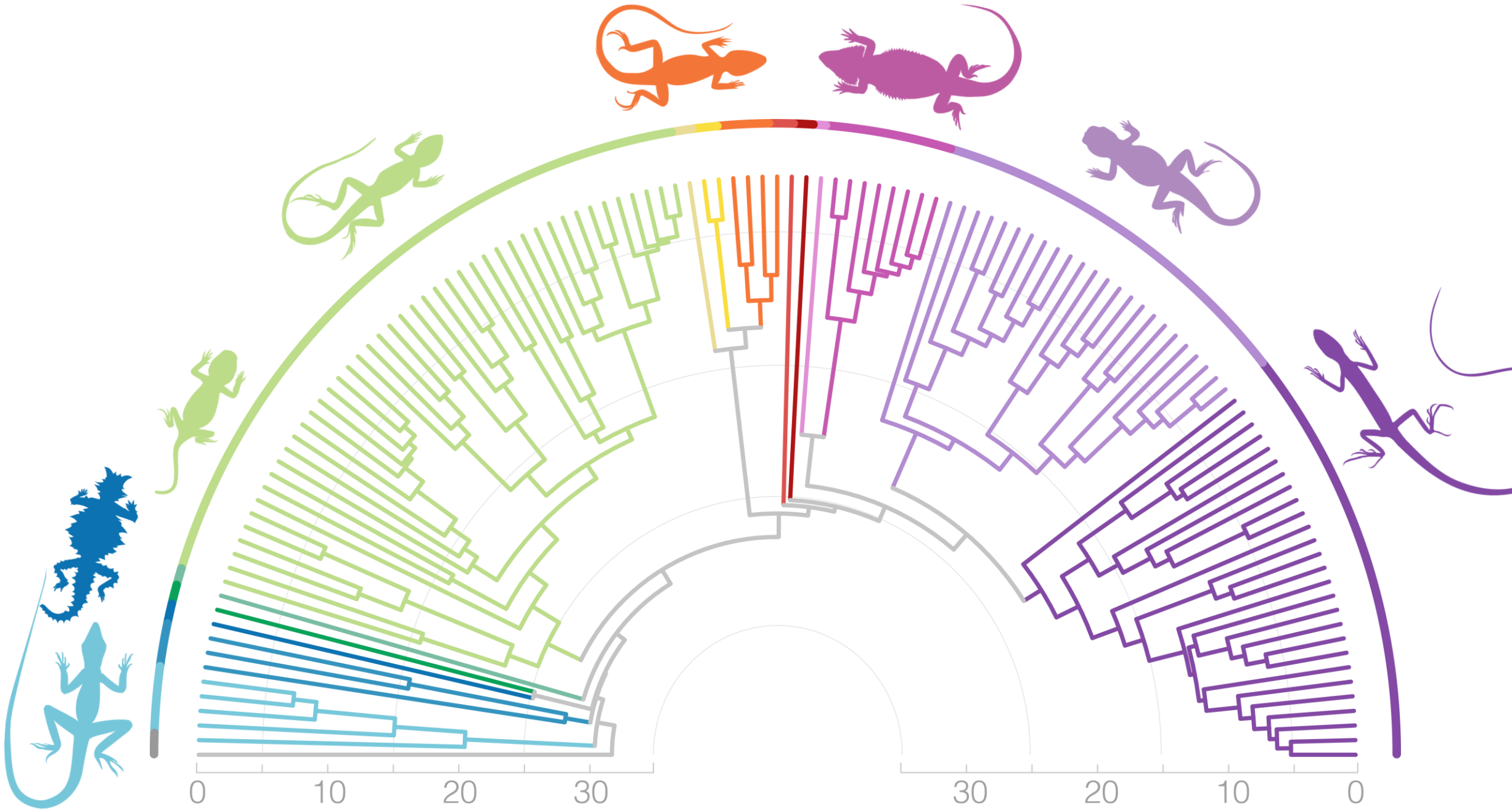
TREE DRAGONS ARE NOT A CLADE

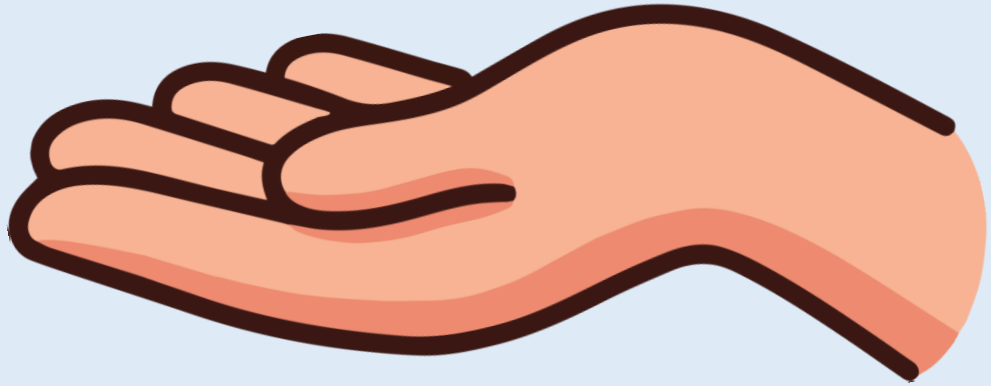


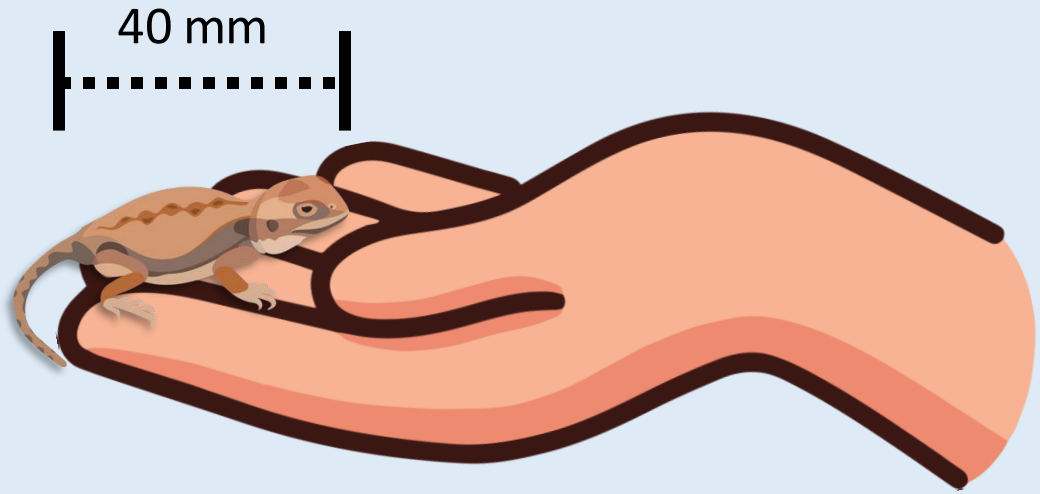
CRYPTAGAMA IS *CTENOPHORUS*

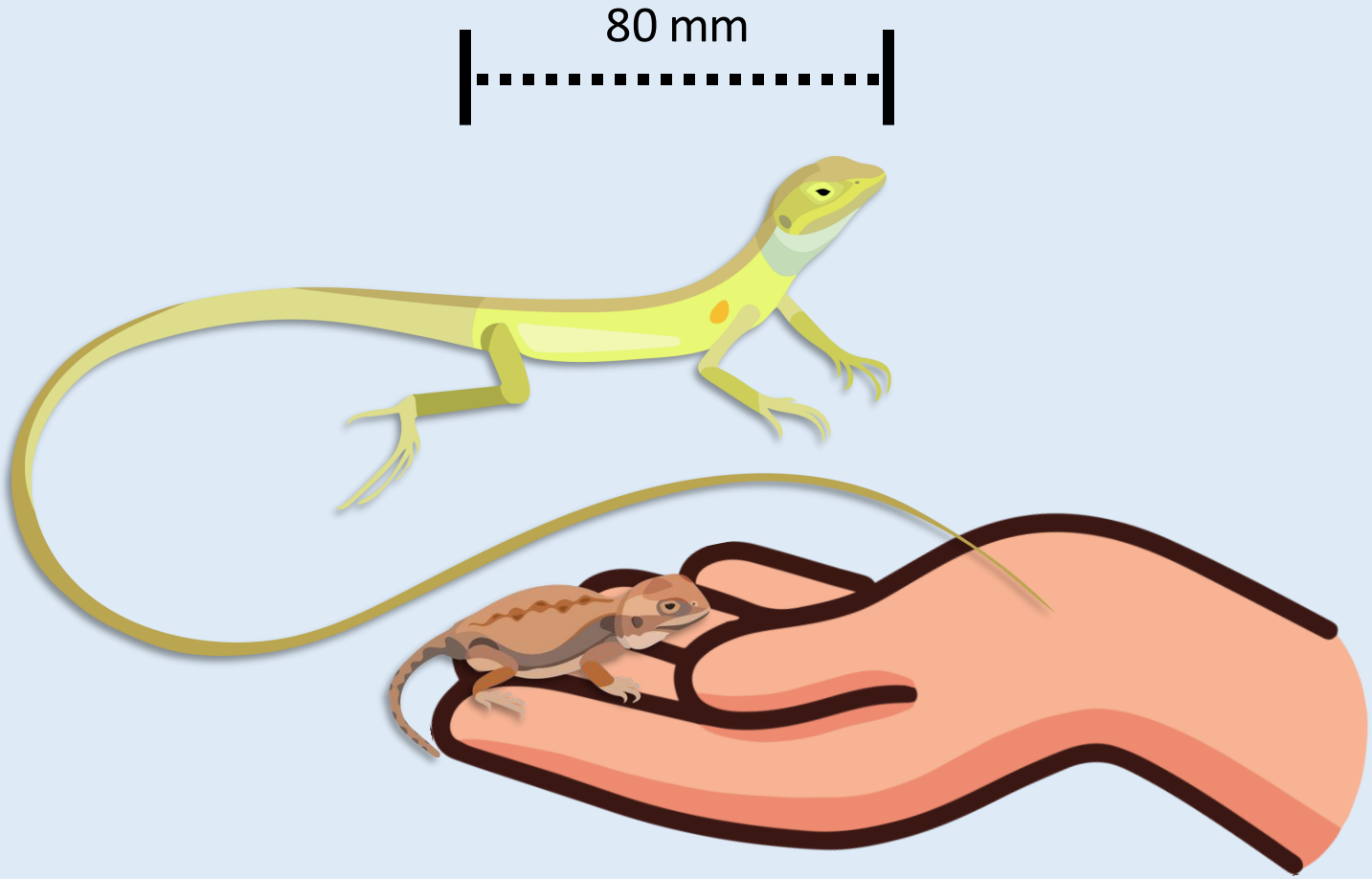


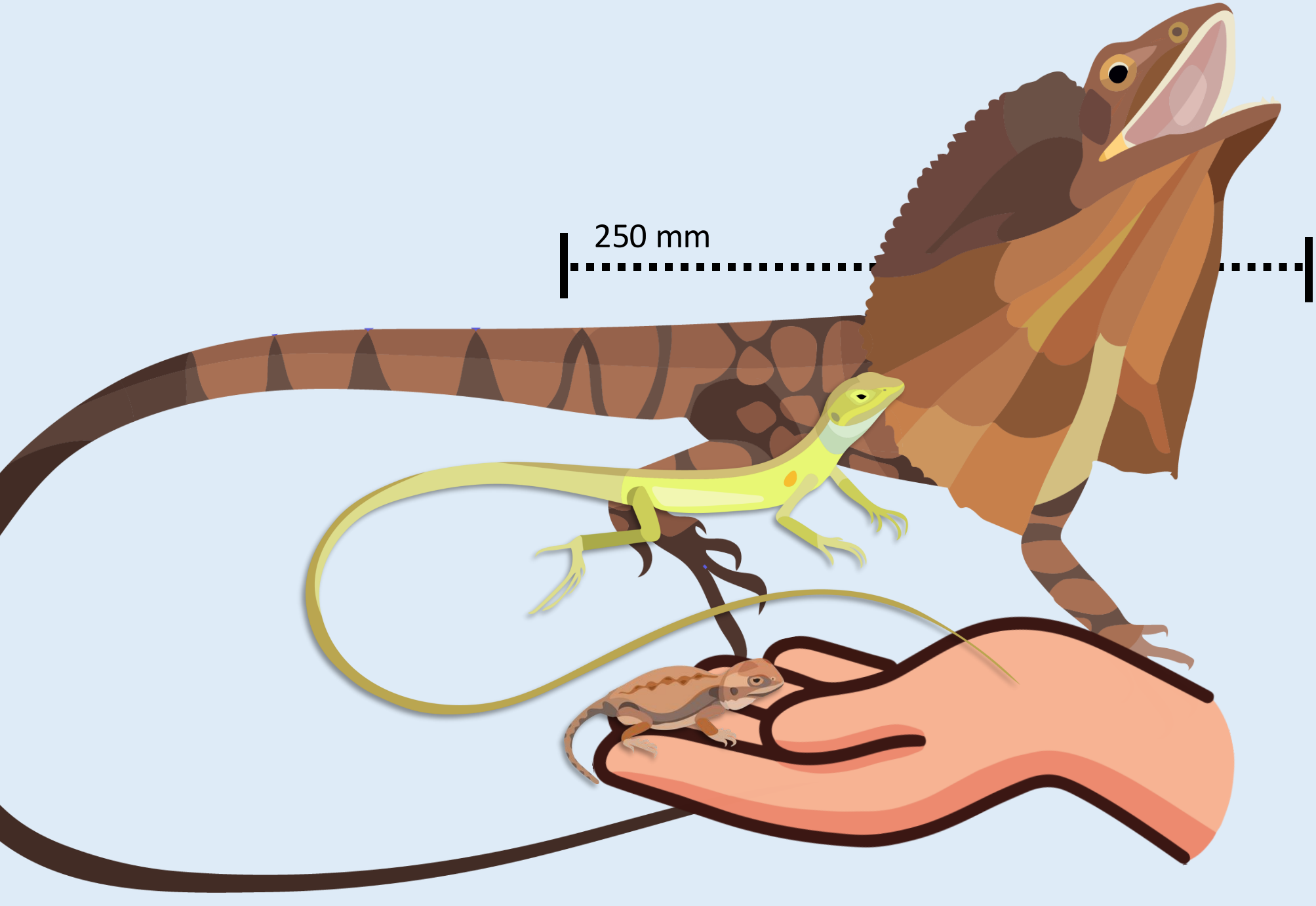

RAPID EARLY RADIATION
Chlamydosaurus
Pogona
Ctenophorus
Tympanocryptis
'Cryptagama'
Diporiphora
Intellagama
Chelosania
Moloch
Lophosaurus
Hypsilurus
Physignathus
0
10
20
30
30
20
10
0

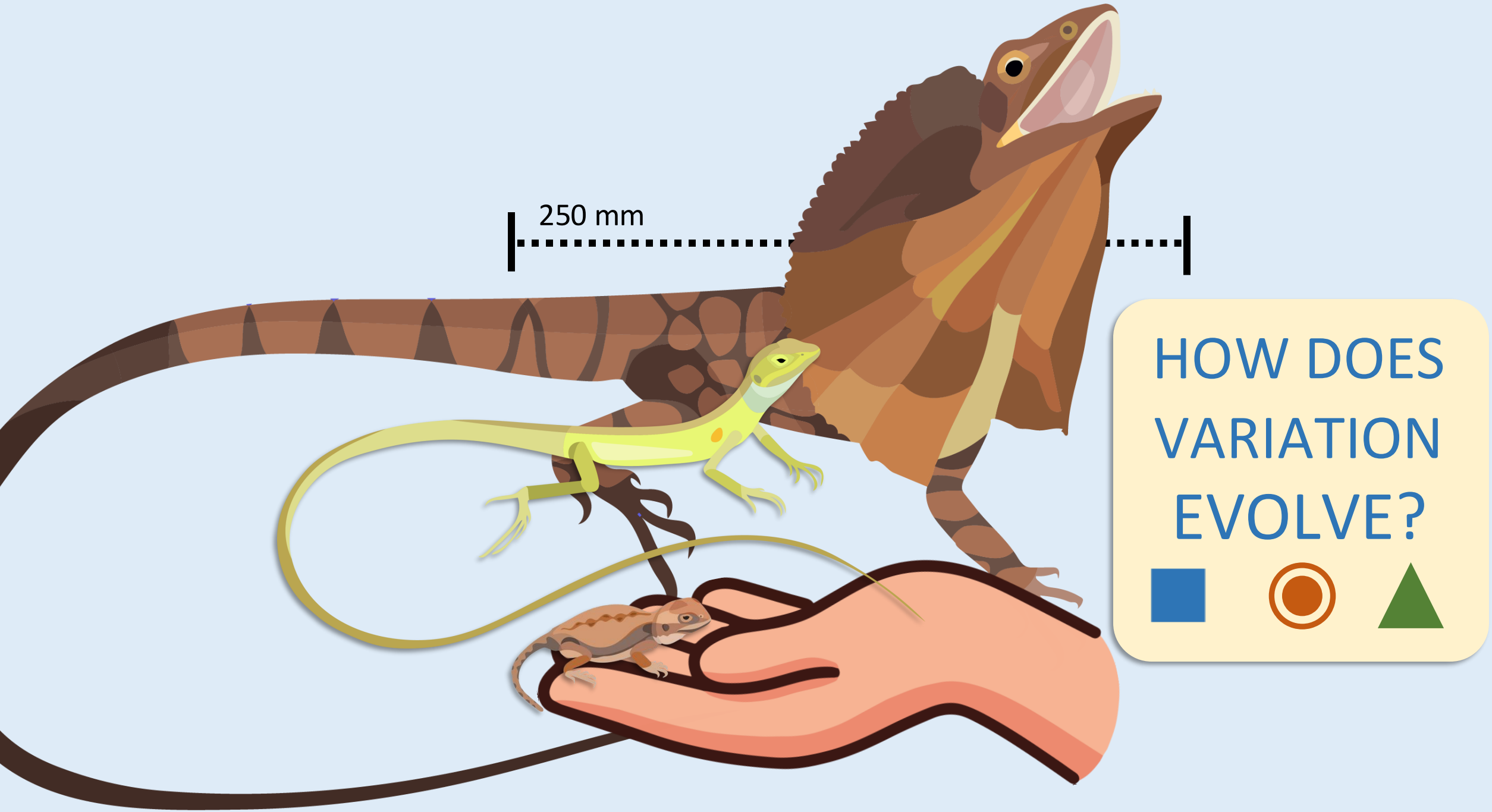

0
10
20
30
30
20
10
0




40 mm


80 mm

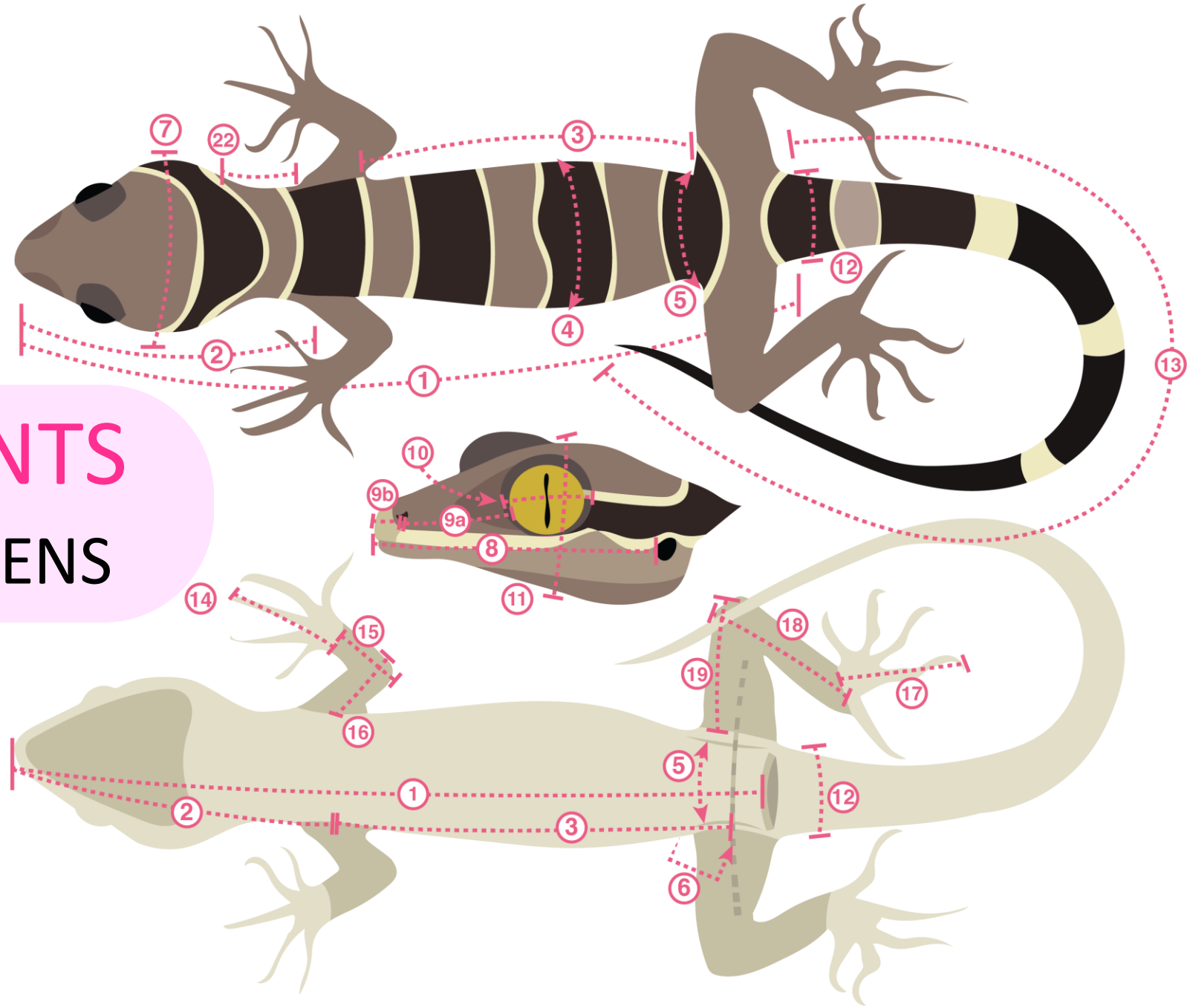

250 mm



HOW DOES VARIATION EVOLVE?

21 MEASUREMENTS

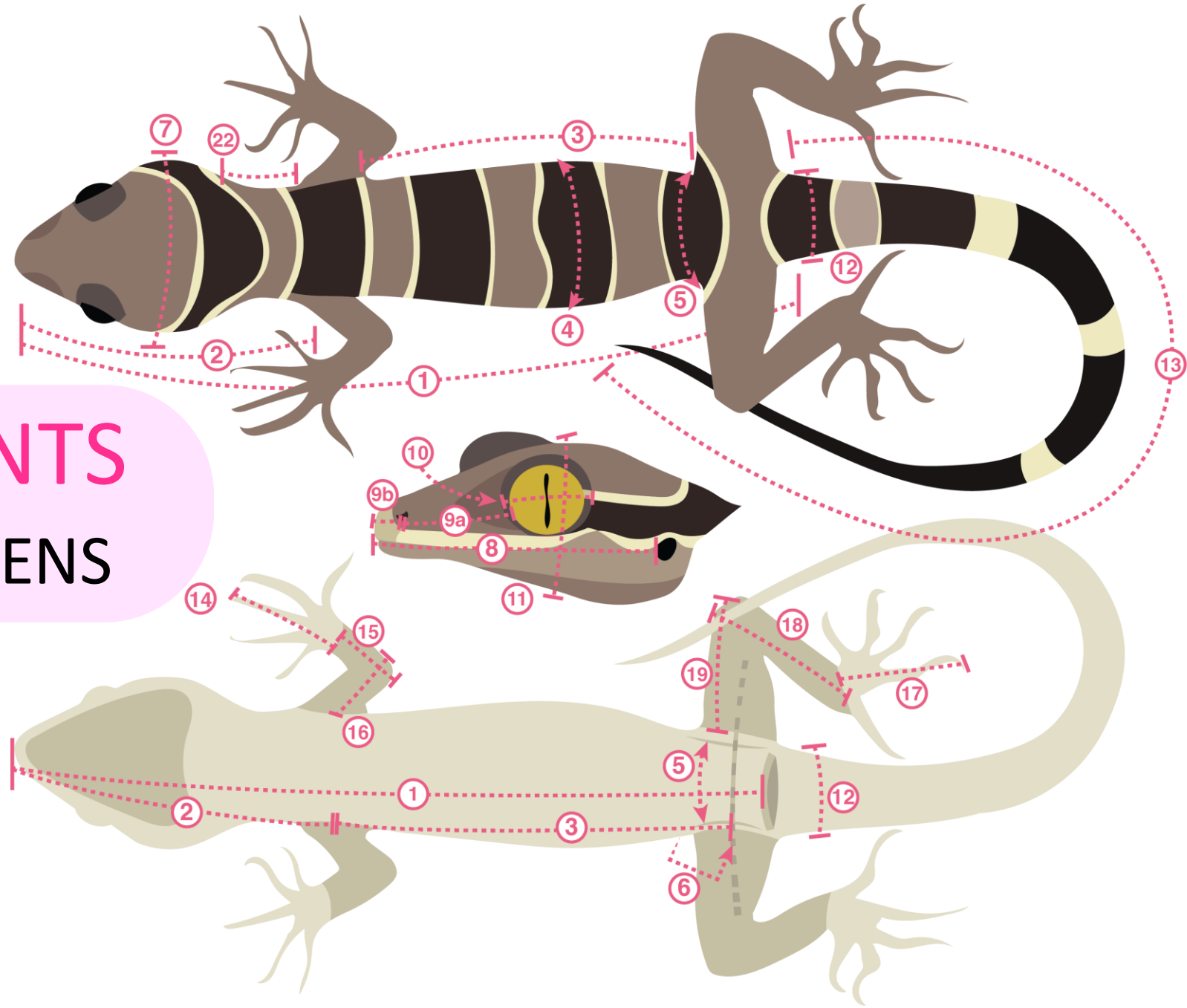
FROM **480+** SPECIMENS

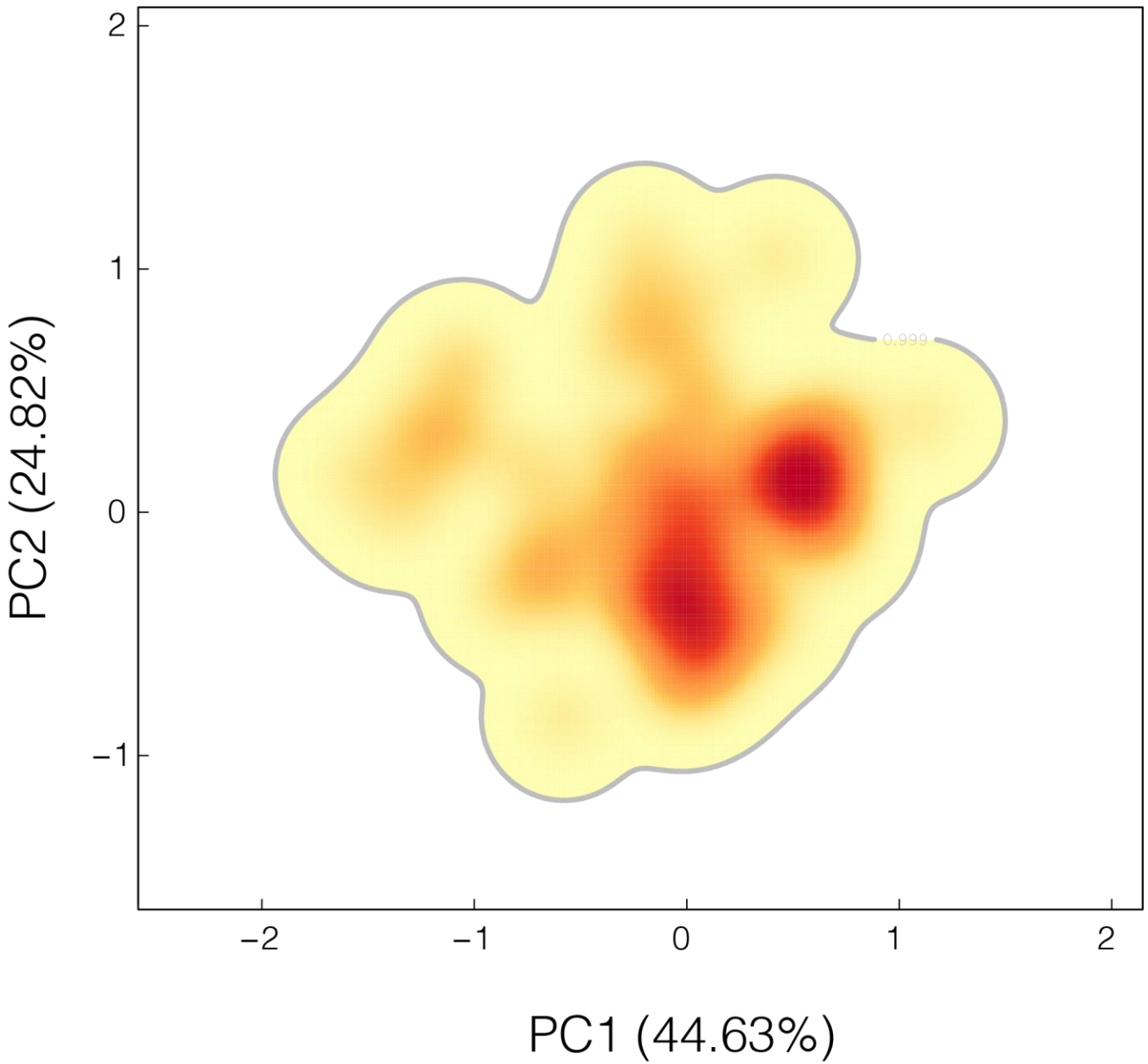


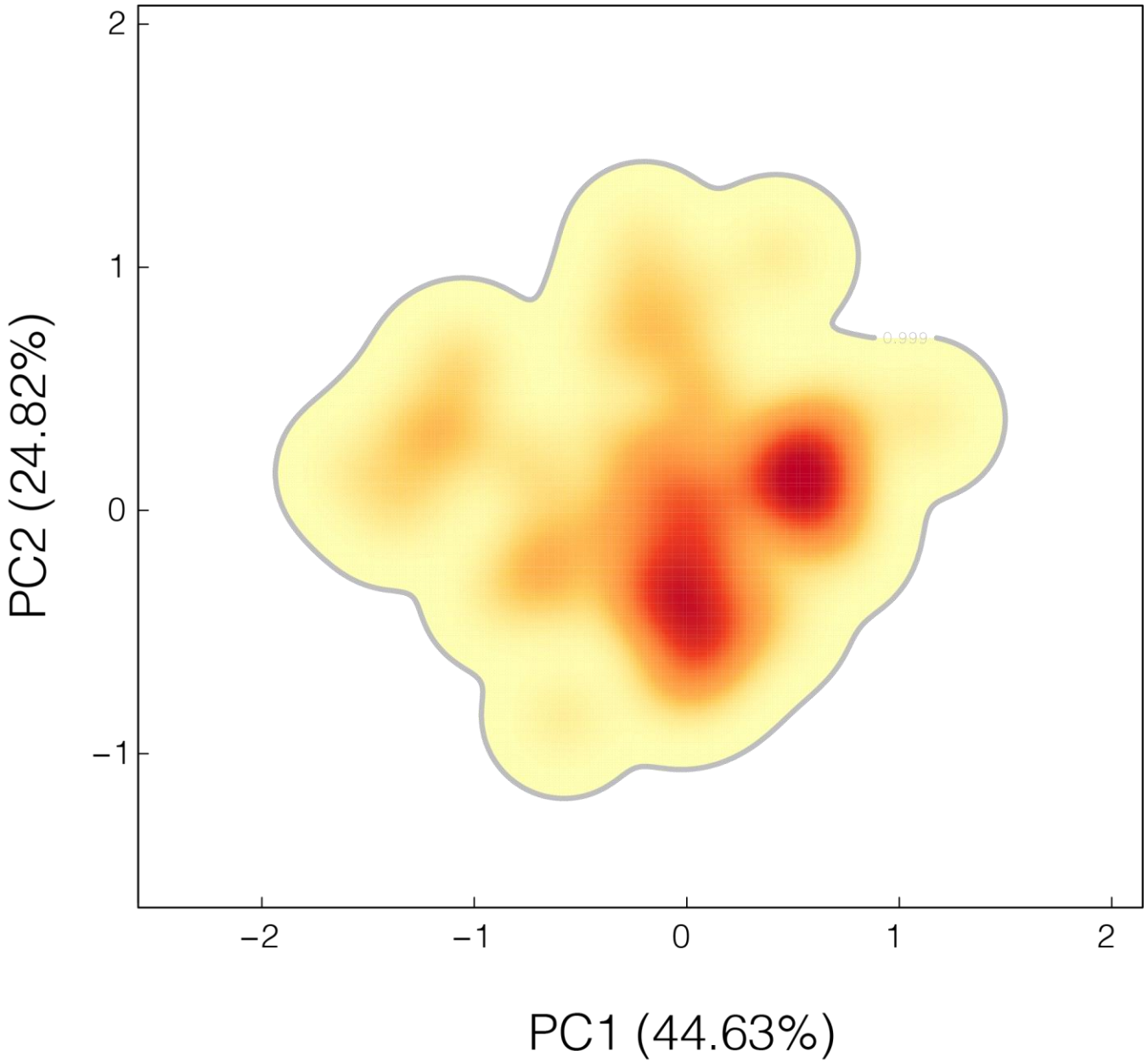
21 MEASUREMENTS

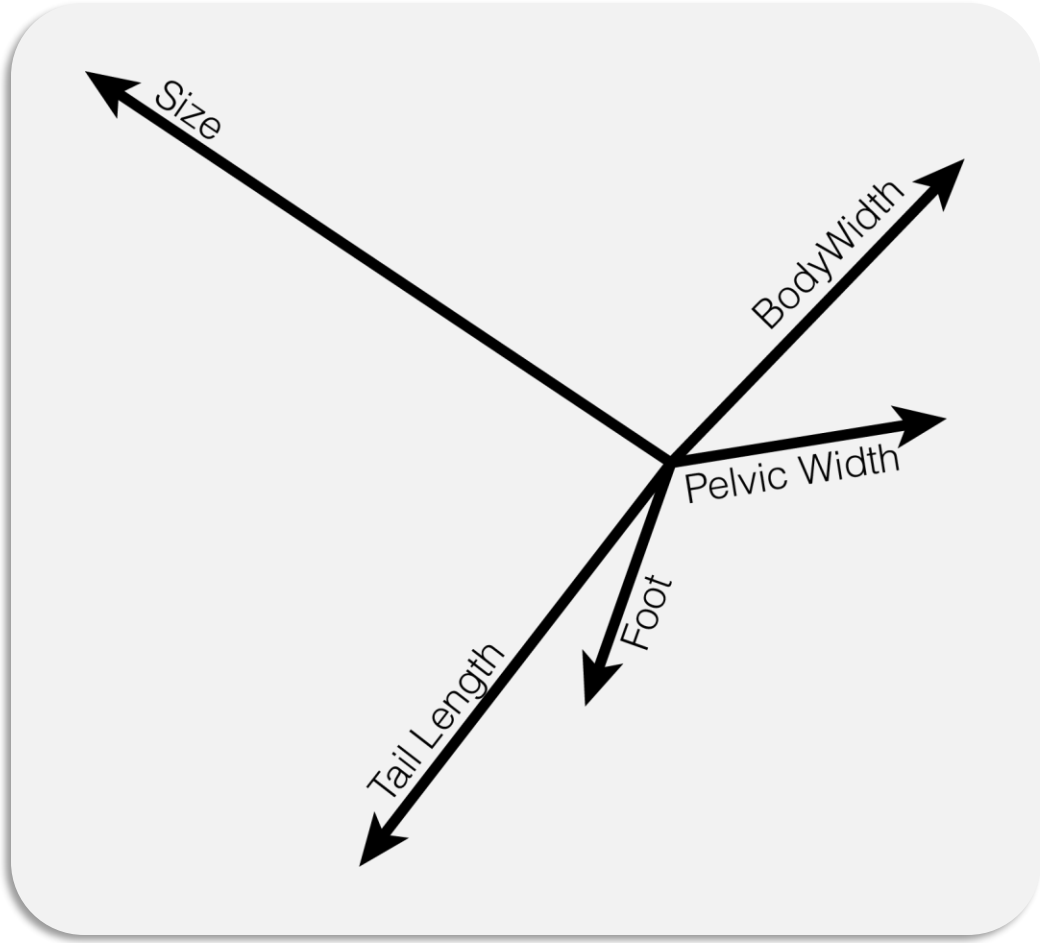
FROM **480+** SPECIMENS

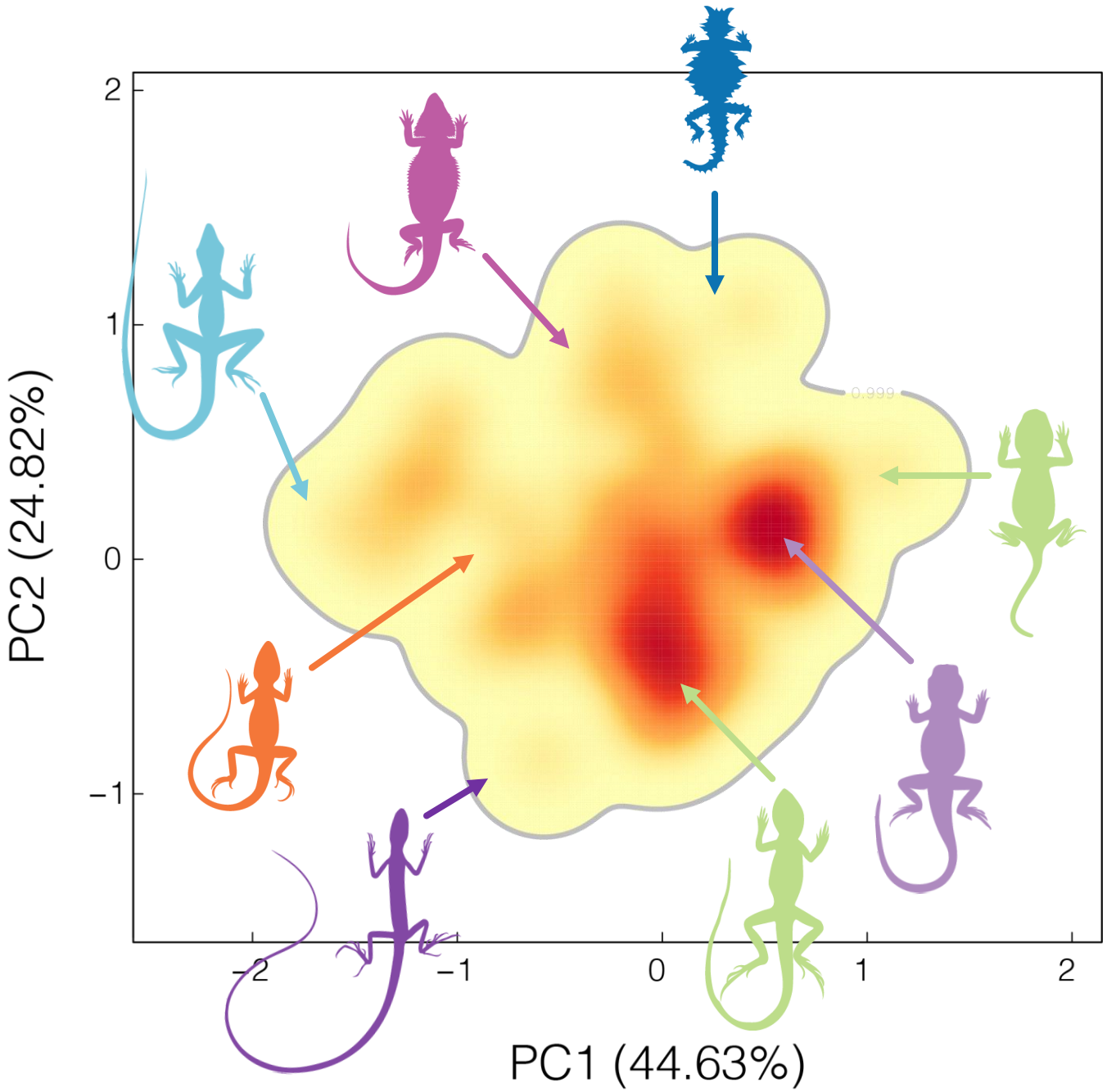
120+ SPECIES

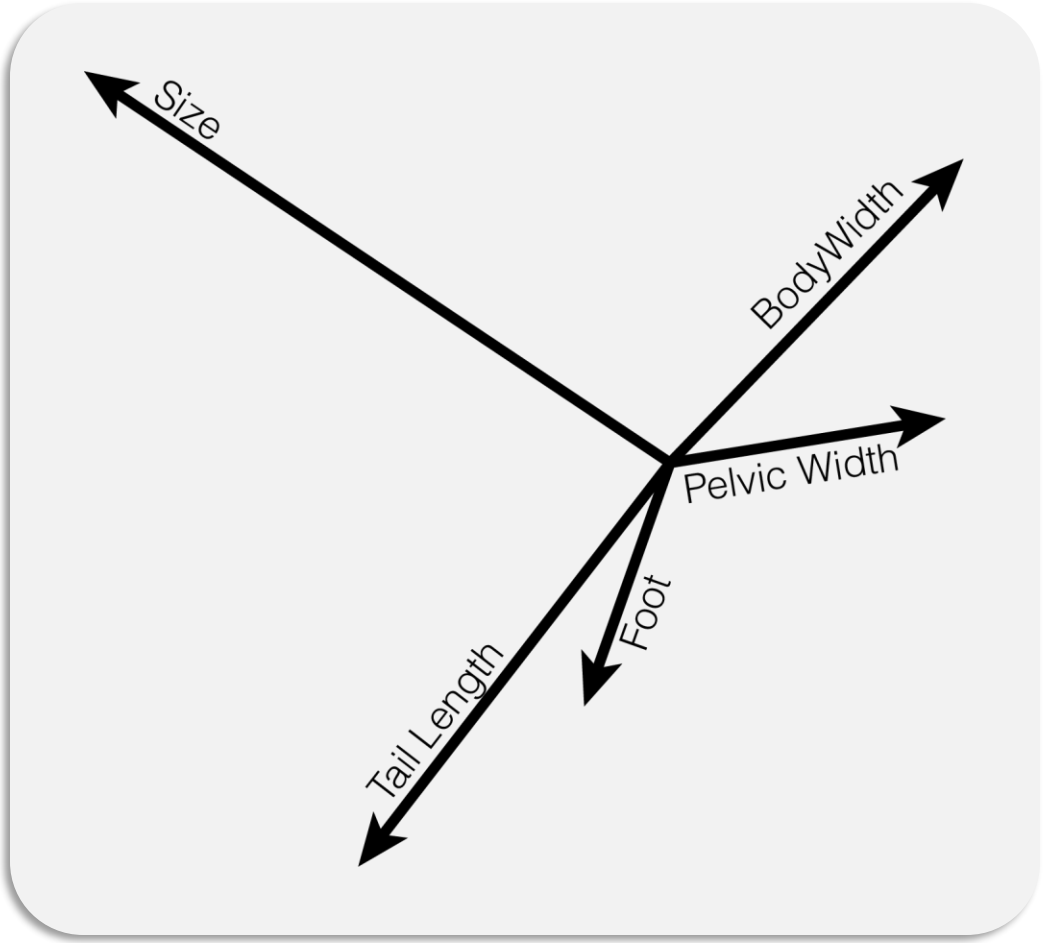


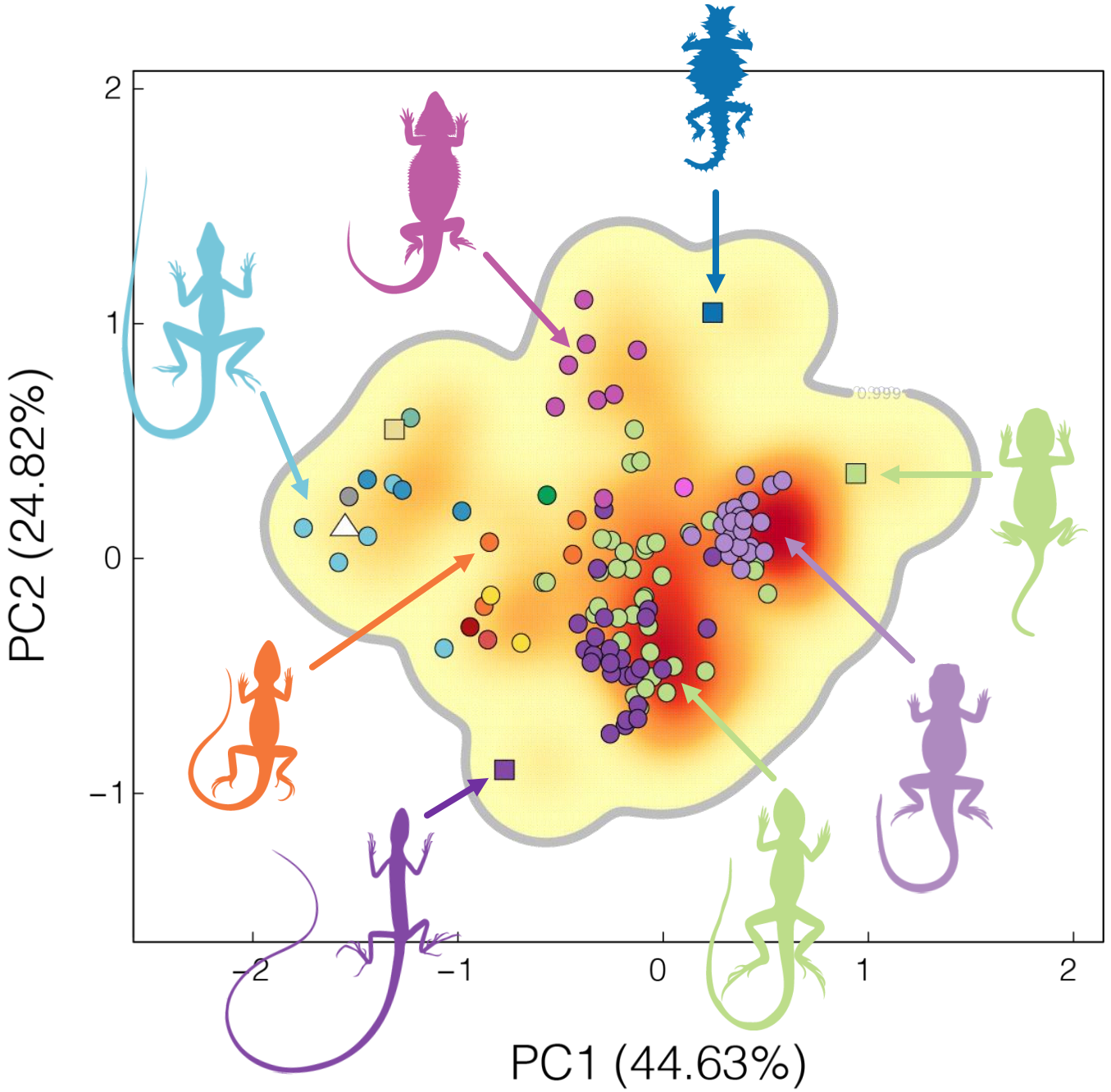

2
1
0
−1
−2
−1
0
1
2
PC2 (24.82%)
PC1 (44.63%)
0.999


2
1
0
−1
−2
−1
0
1
2
PC2 (24.82%)
PC1 (44.63%)
0.999

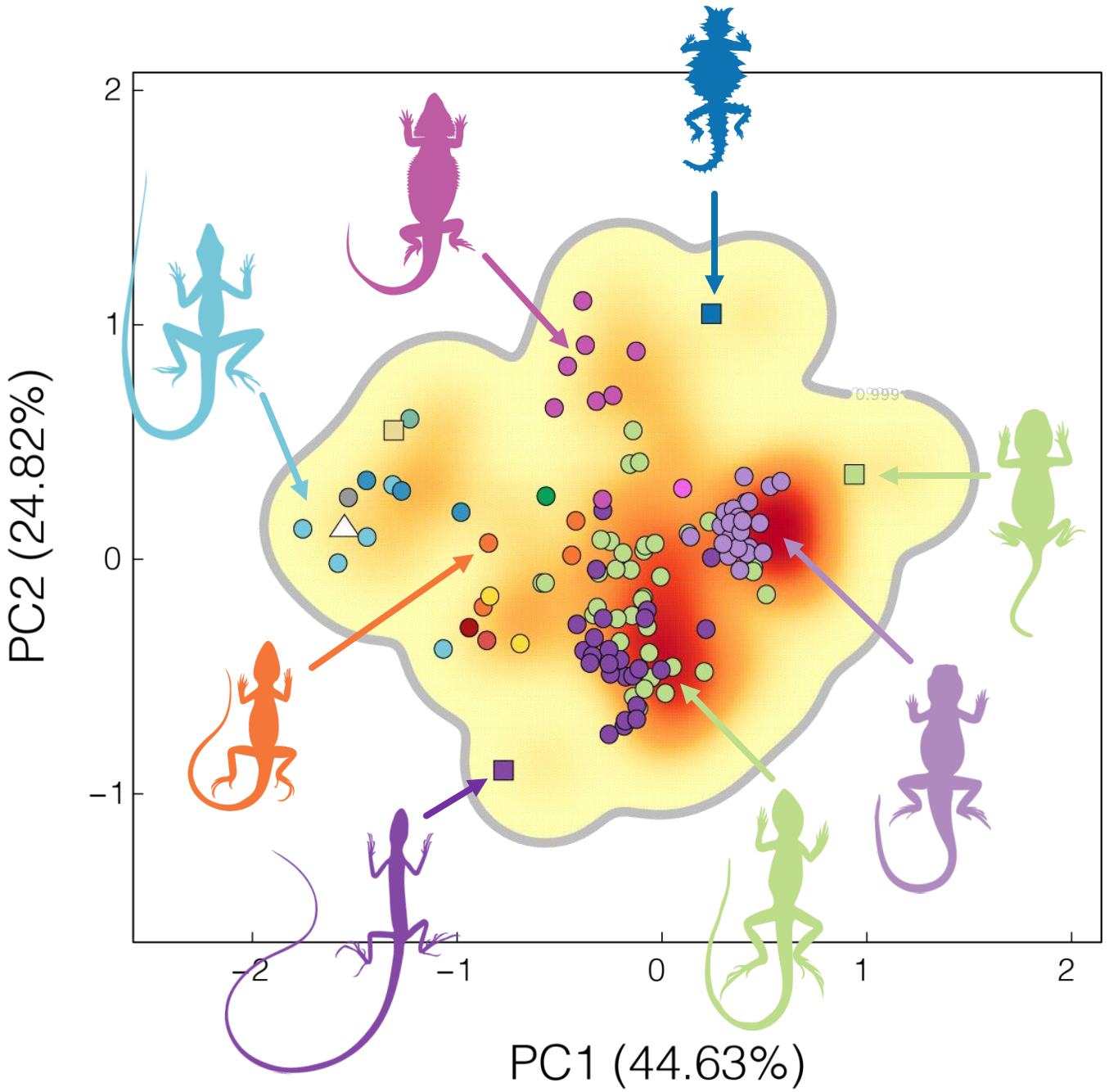

Size
BodyWidth
Pelvic Width
Foot
Tail Length


PC2 (24.82%)
PC1 (44.63%)
2
1
0
−1
−2
−1
0
1
2
0.999


Size
BodyWidth
Pelvic Width
Foot
Tail Length

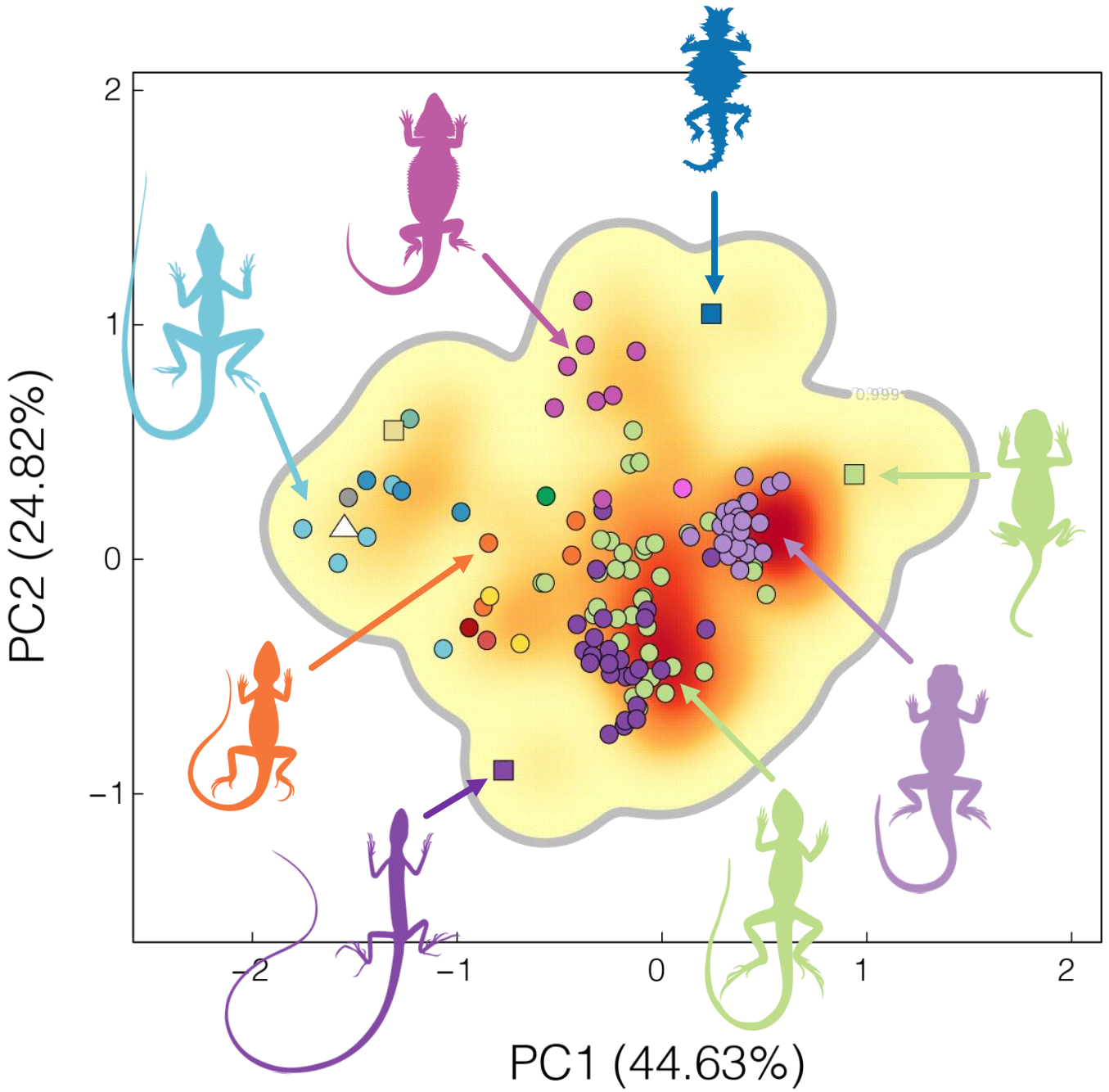


HOW MANY *PEAKS* IN THE LANDSCAPE?



HOW MANY *PEAKS* IN THE LANDSCAPE?

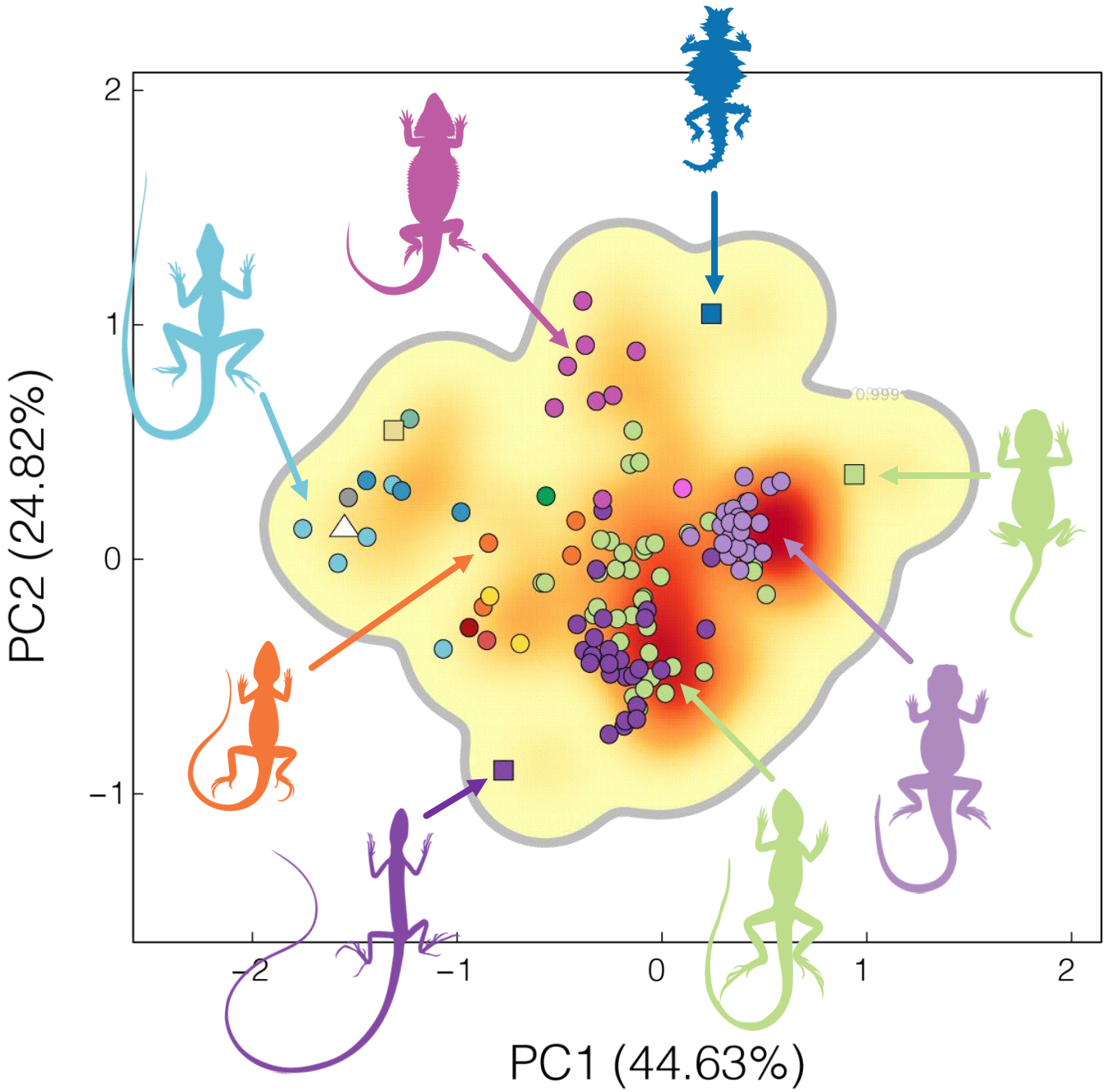
HOW DO *SPECIES* MATCH TO PEAKS?



HOW MANY *PEAKS* IN THE LANDSCAPE?

HOW DO *SPECIES* MATCH TO PEAKS?

DO *ANCESTORS* MATCH TO PEAKS?



HOW MANY *PEAKS* IN THE LANDSCAPE?

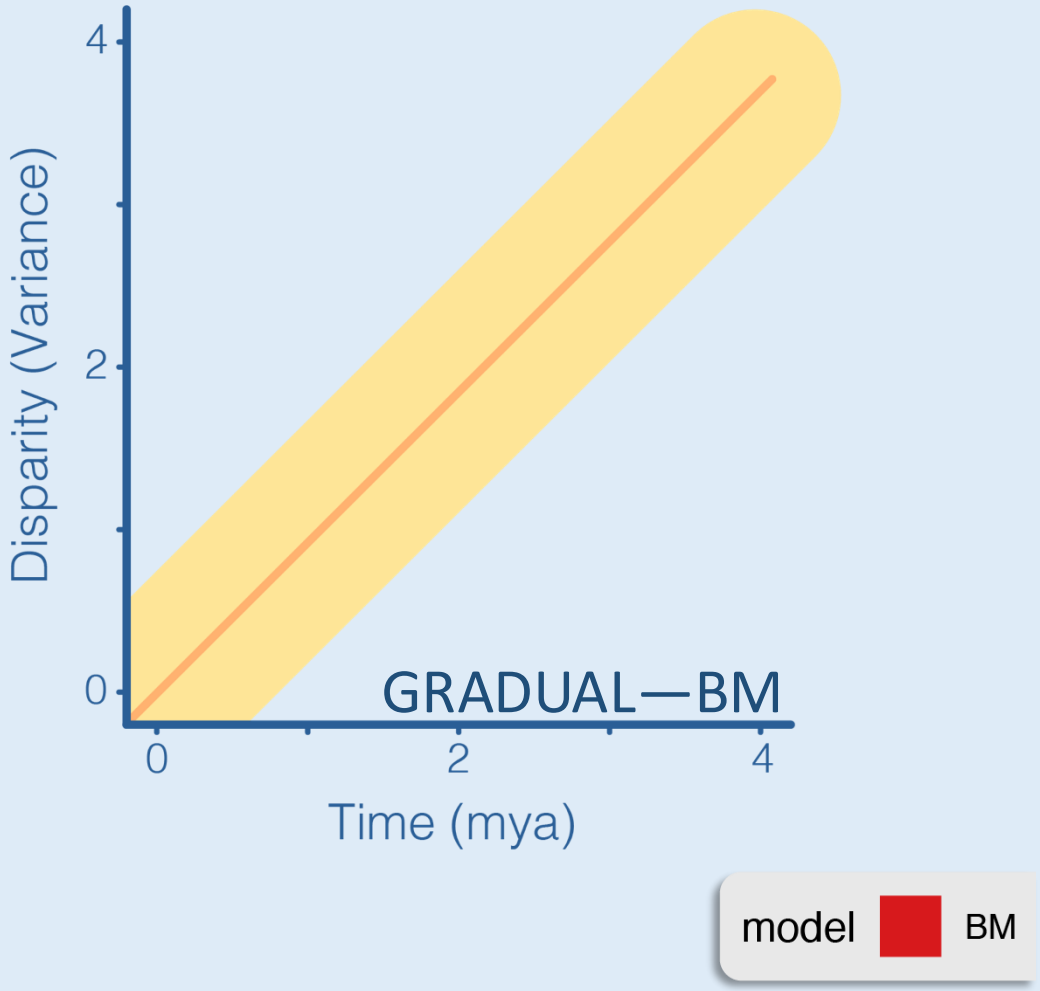
HOW DO *SPECIES* MATCH TO PEAKS?

DO *ANCESTORS* MATCH TO PEAKS?

WHAT'S THE PATH TO *NEW* PEAKS?

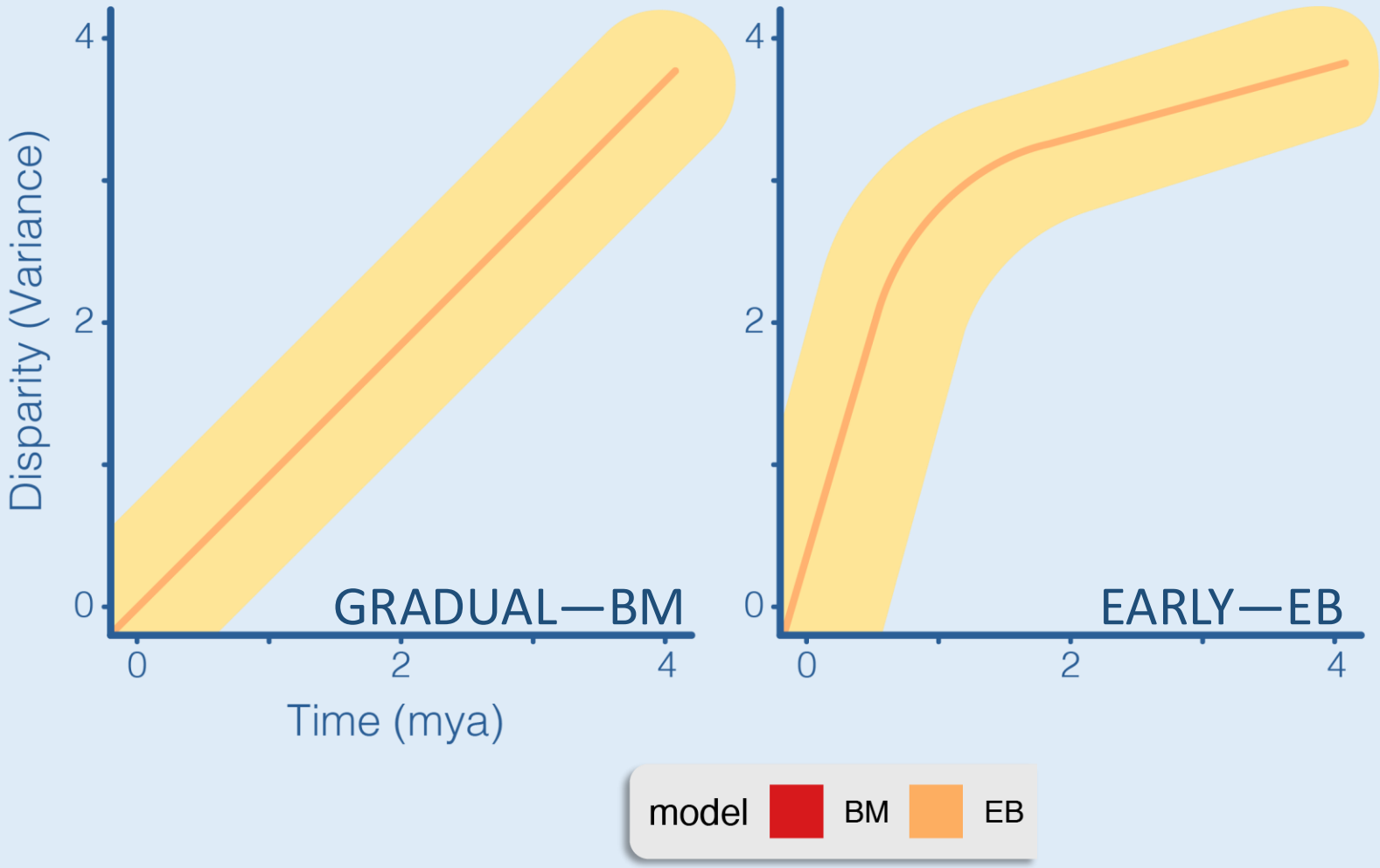
TRAIT MODEL FITTING

SUPPORTS BRANCH-SPECIFIC RATES



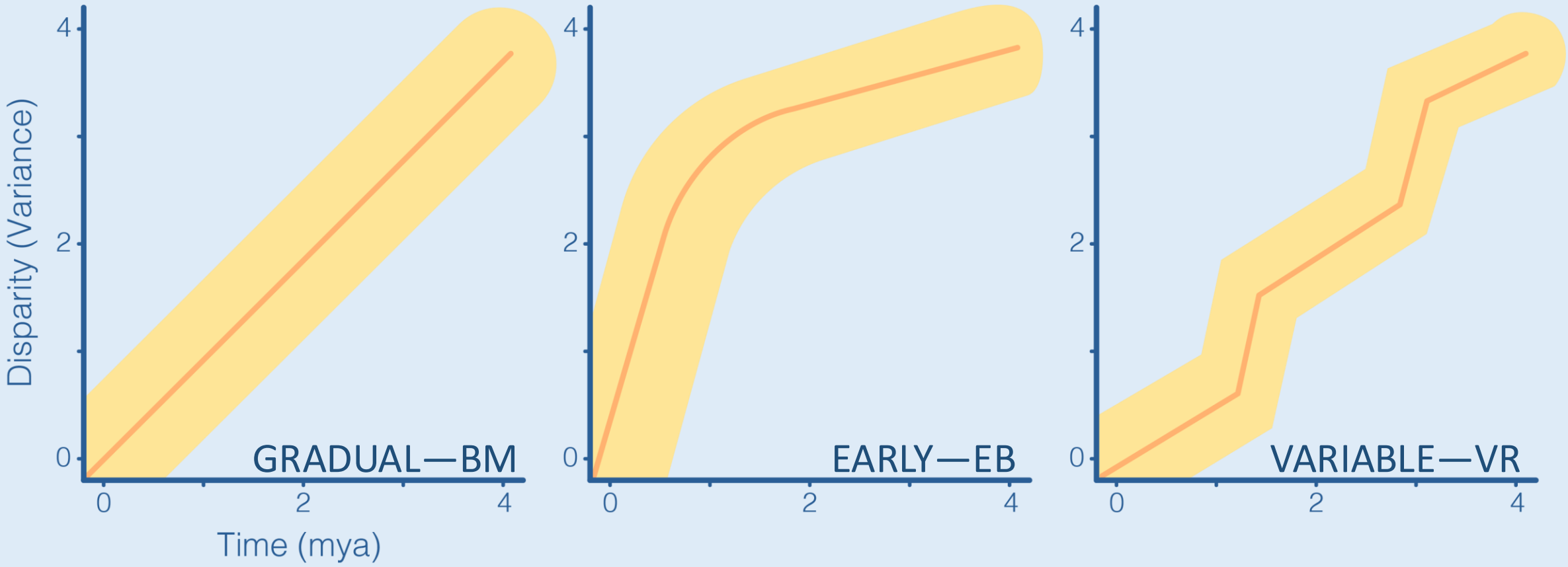
TRAIT MODEL FITTING

SUPPORTS BRANCH-SPECIFIC RATES



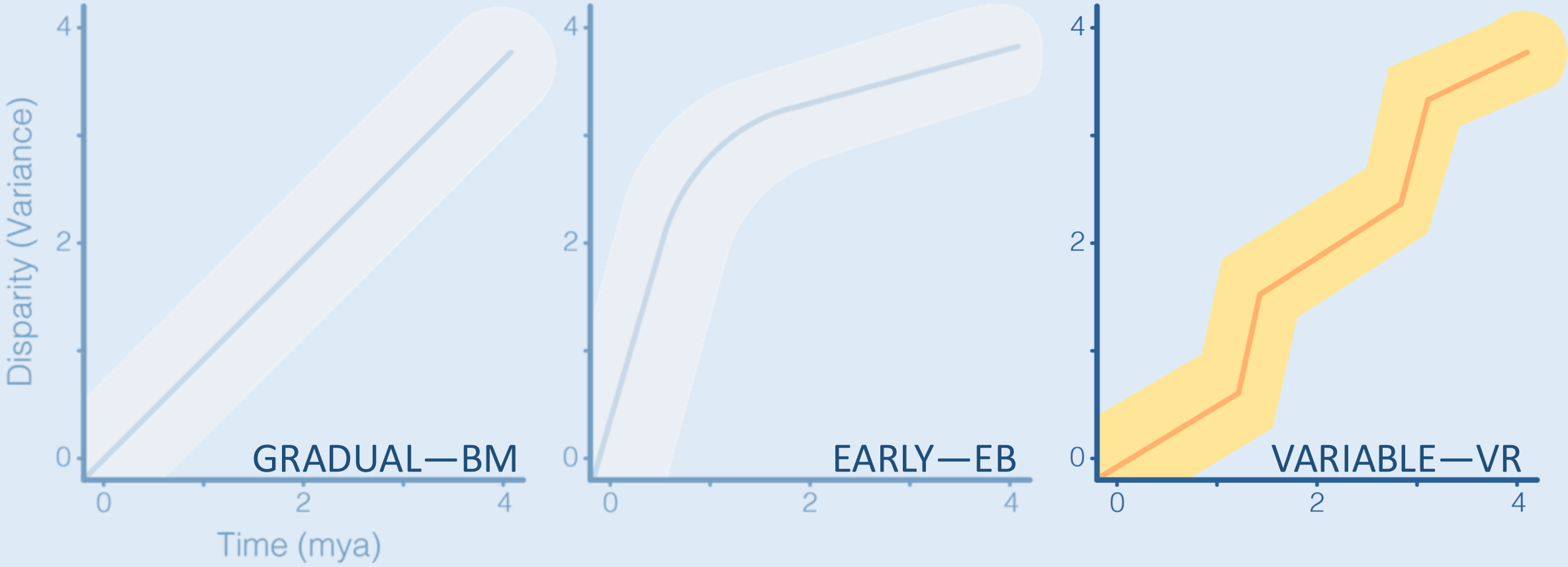
TRAIT MODEL FITTING

SUPPORTS BRANCH-SPECIFIC RATES



TRAIT MODEL FITTING

SUPPORTS BRANCH-SPECIFIC RATES

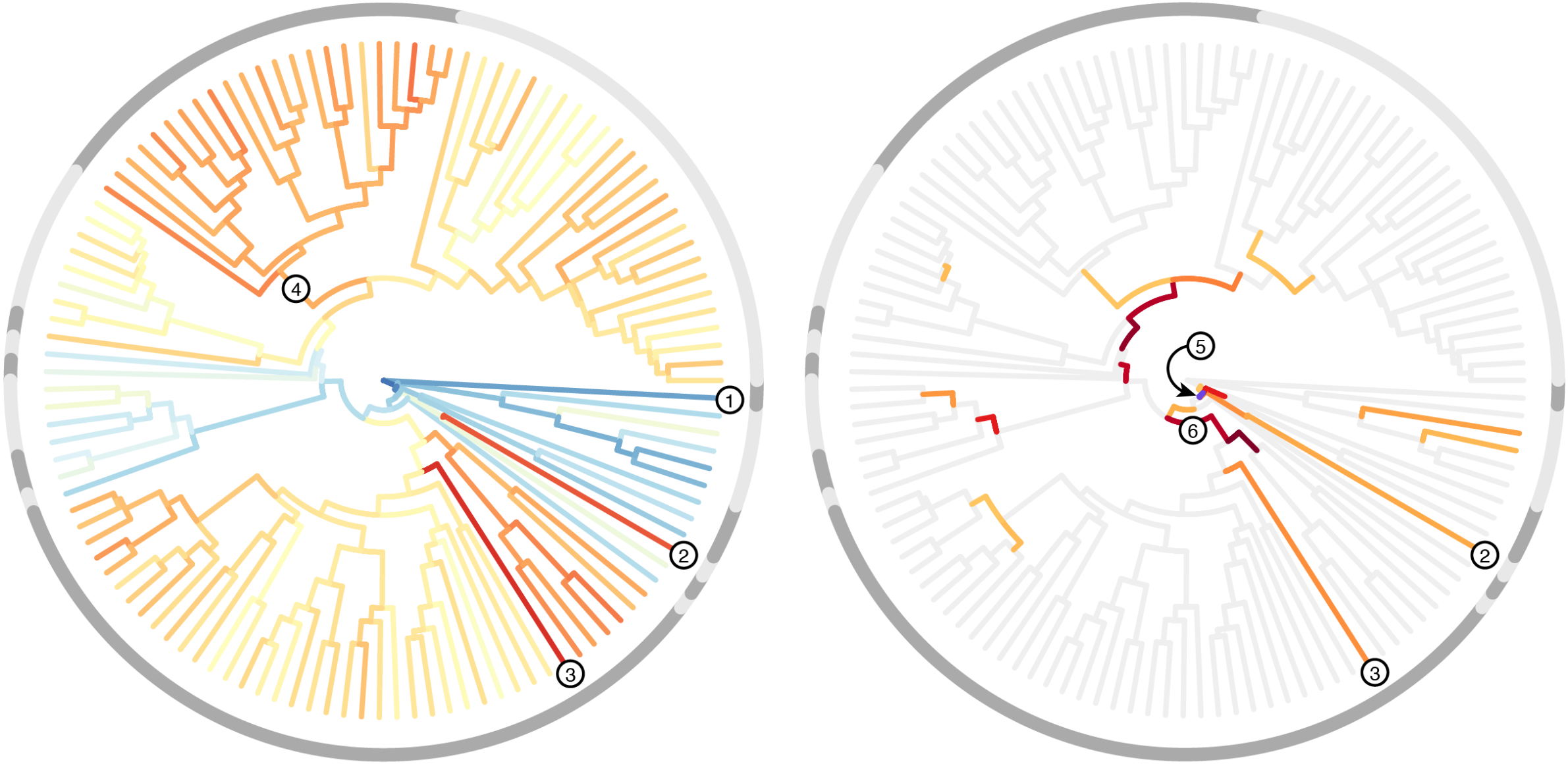


DISTANCE FROM MRCA

① *Physignathus* ② *Moloch* ③ *Cryptagama* ④ *Tympanocryptis* ⑤ MRCA Australia ⑥ *Ctenophorus*

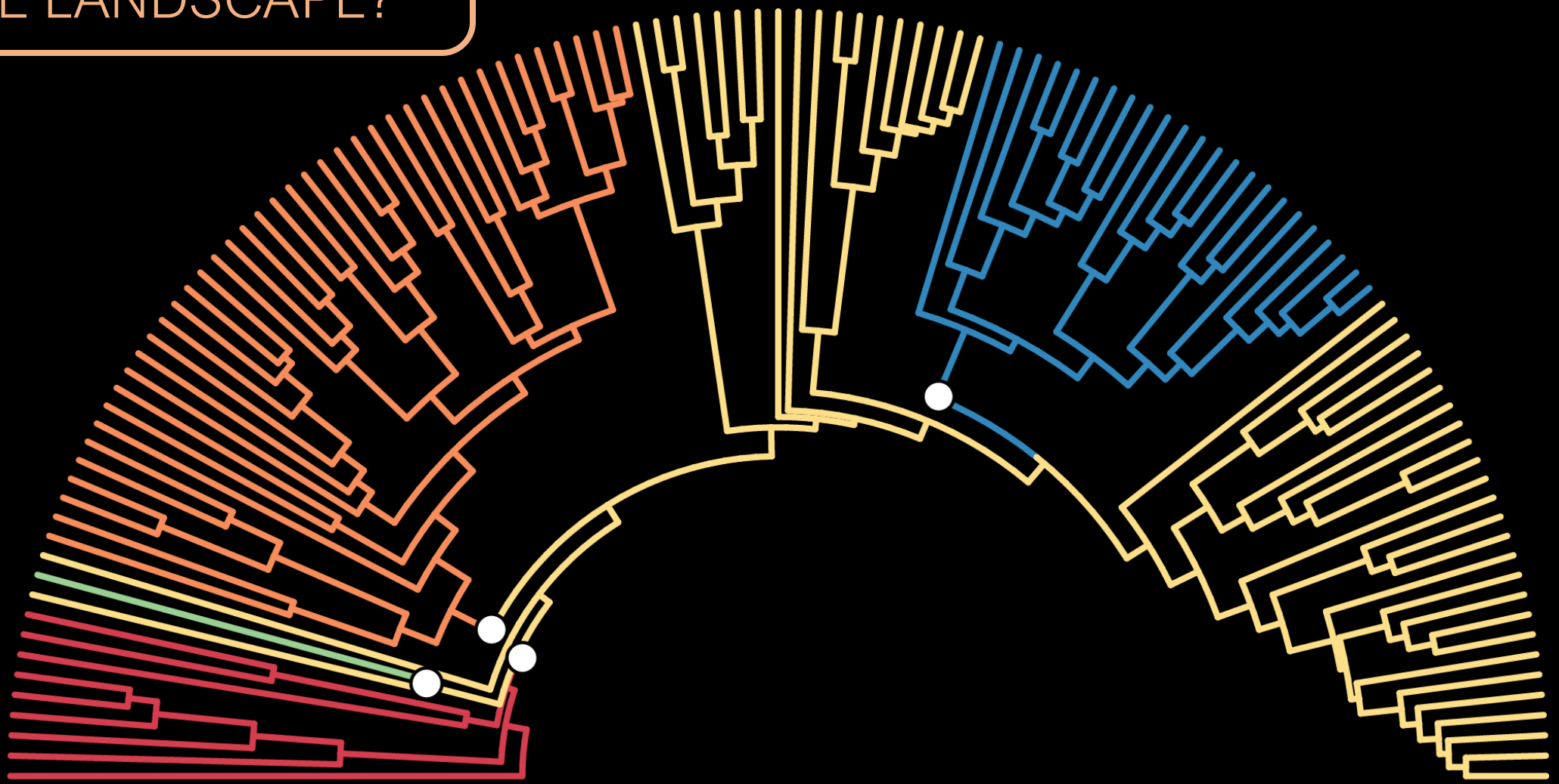
DISTANCE FROM MRCA

EXCEPTIONAL CHANGE



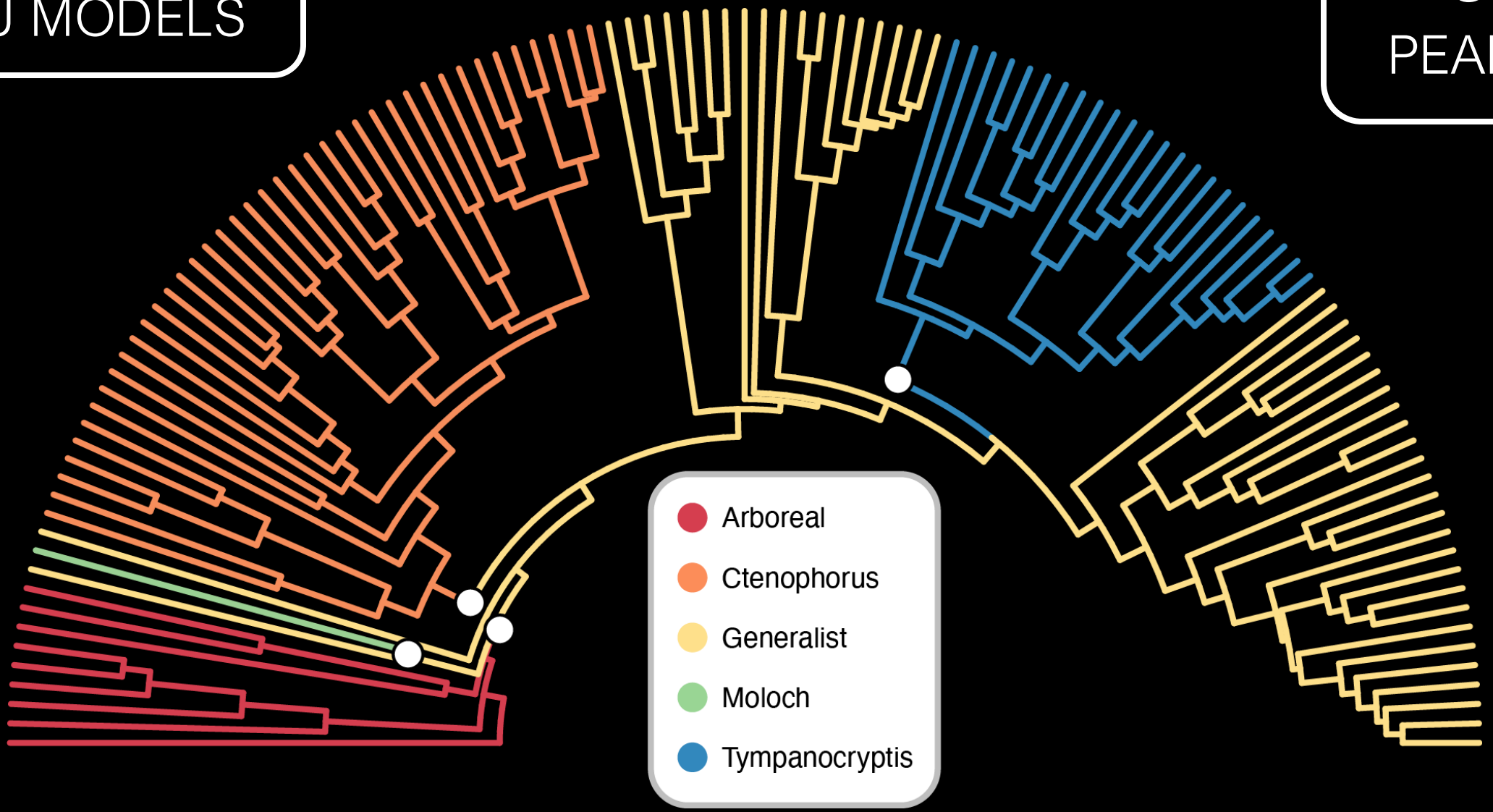
① *Physignathus* ② *Moloch* ③ *Cryptagama* ④ *Tympanocryptis* ⑤ MRCA Australia ⑥ *Ctenophorus*

HOW MANY *PEAKS* IN THE LANDSCAPE?



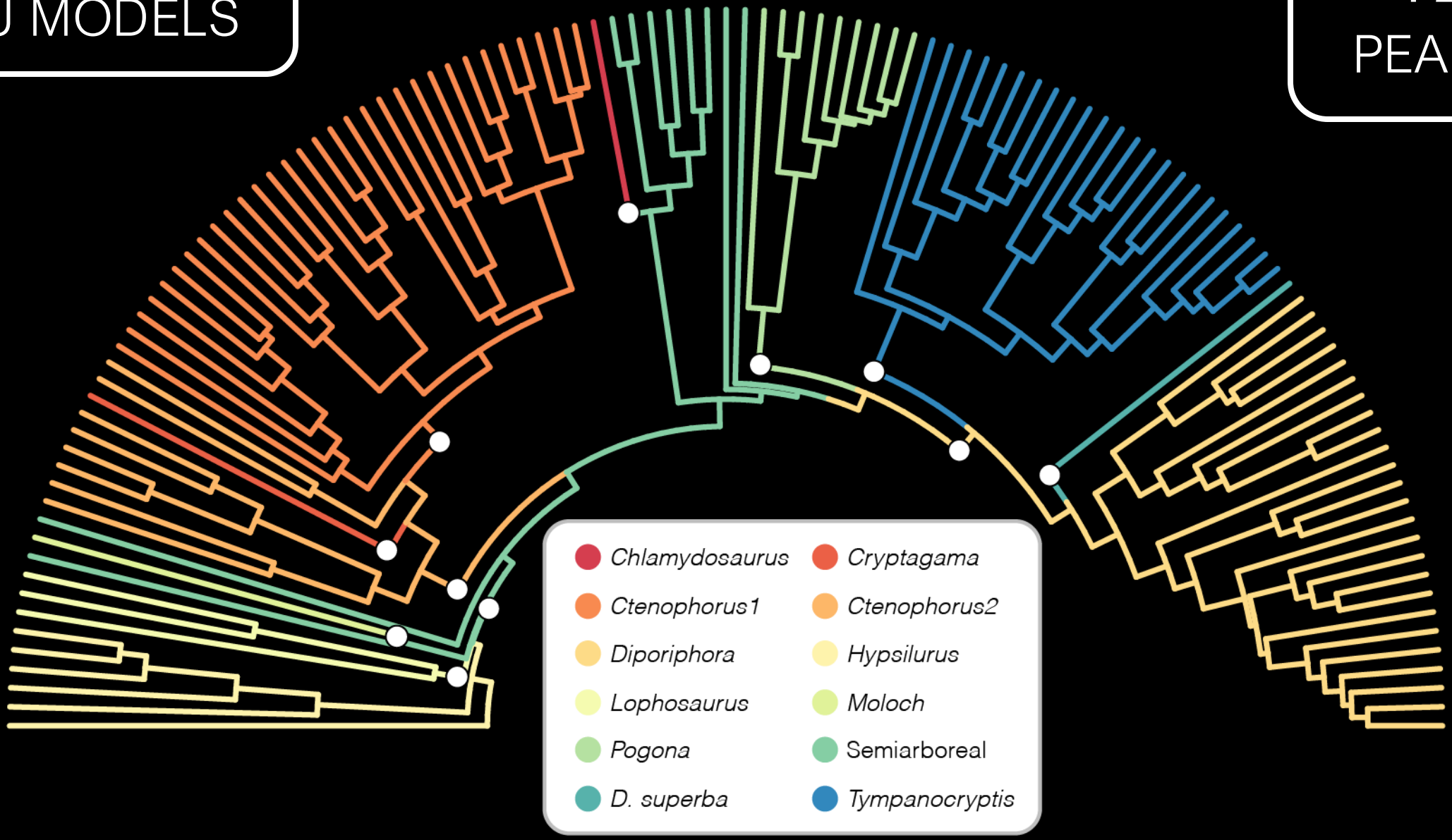
MULTI OPTIMA
OU MODELS

5
PEAKS

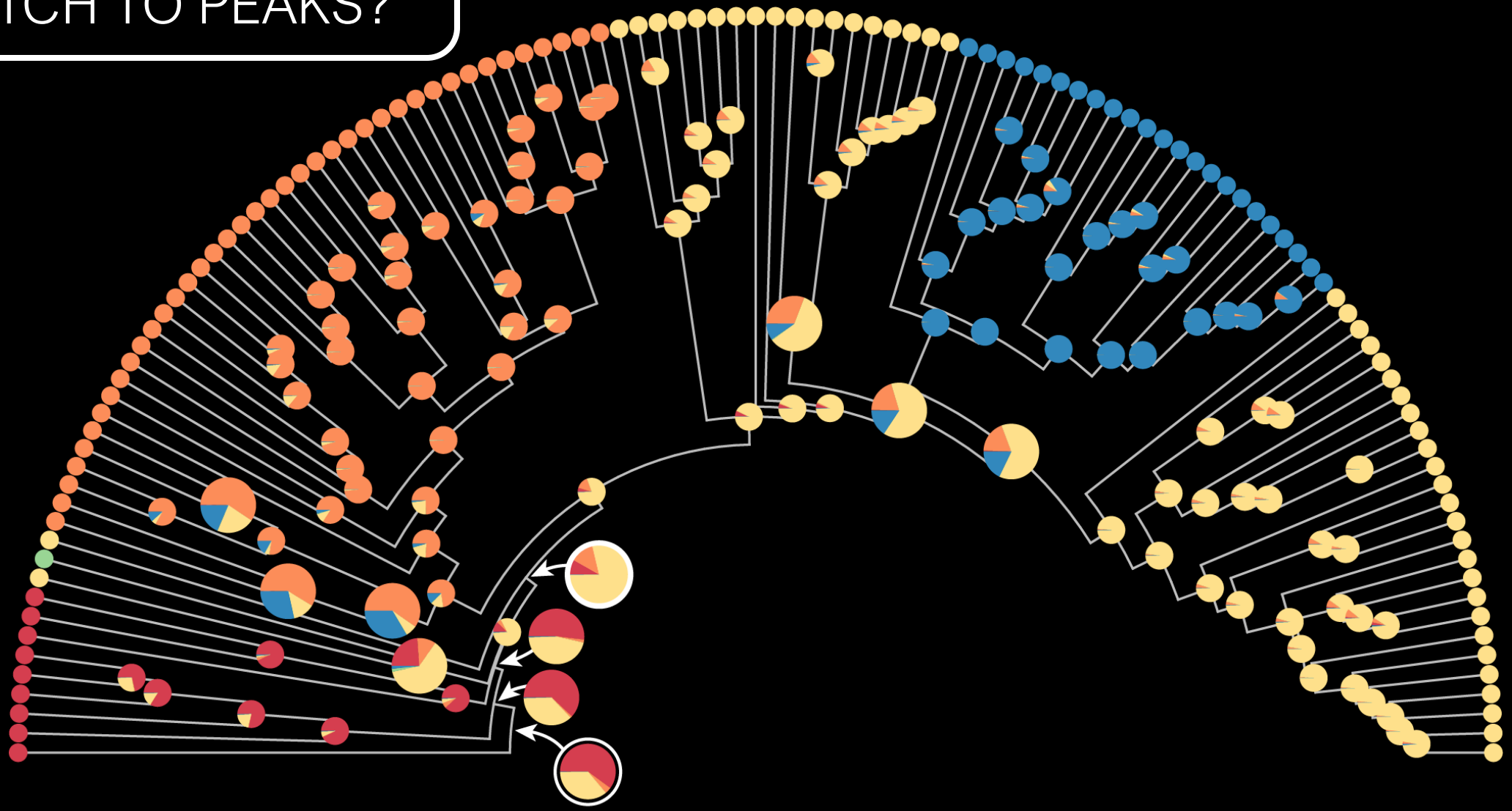


MULTI OPTIMA
OU MODELS

12
PEAKS

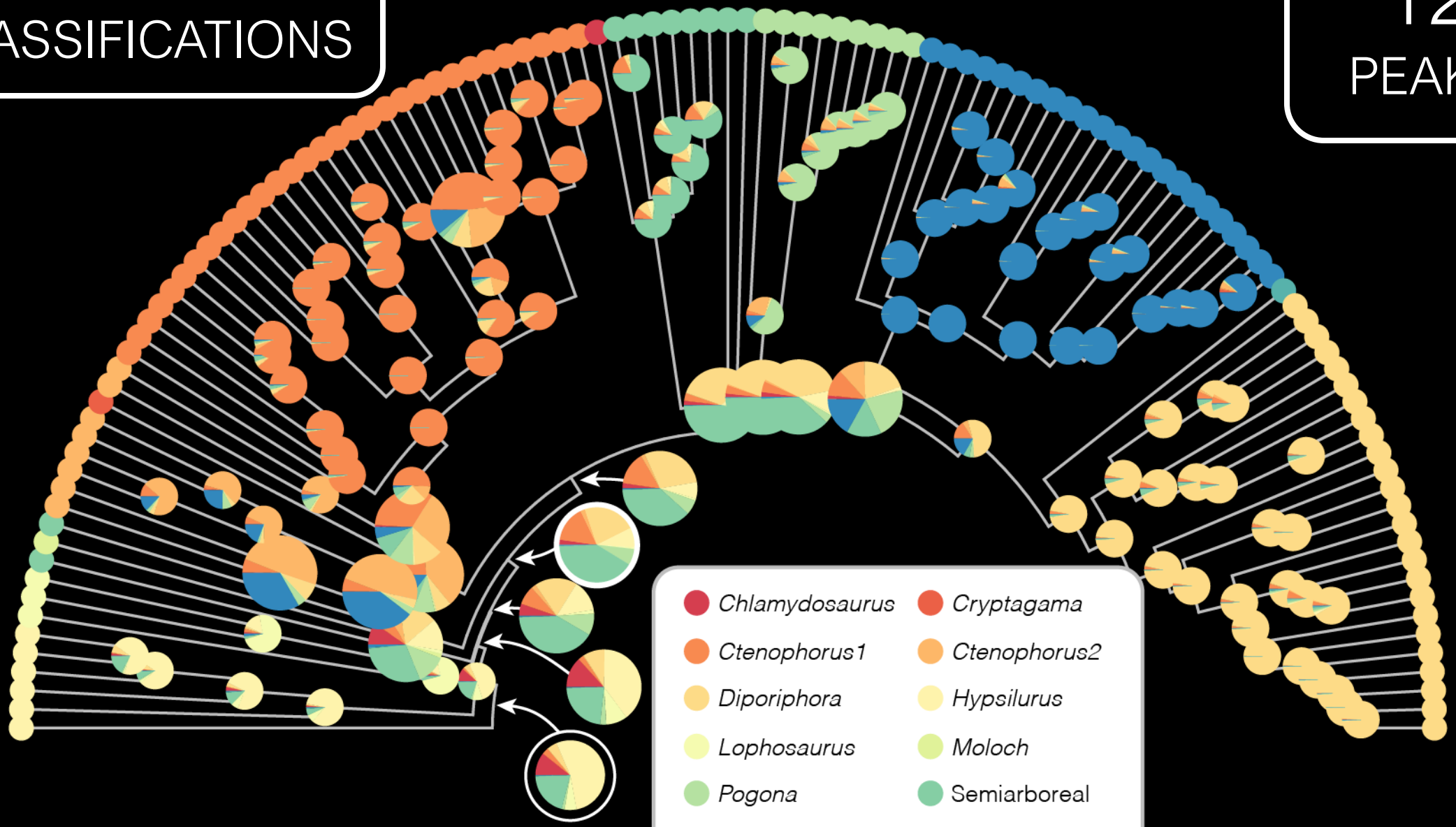


DO *ANCESTORS*
MATCH TO PEAKS?



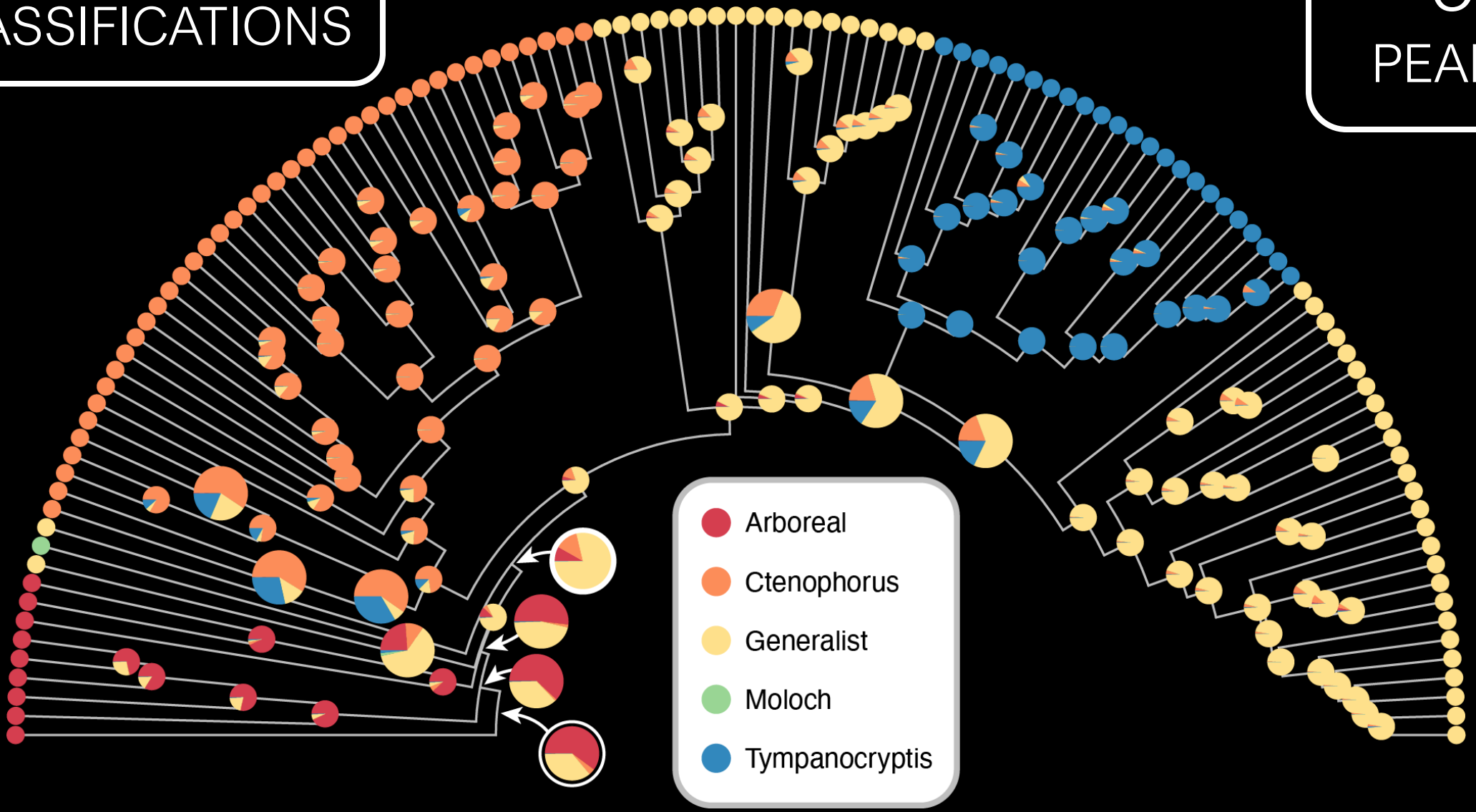
RANDOM FOREST
CLASSIFICATIONS

12
PEAKS



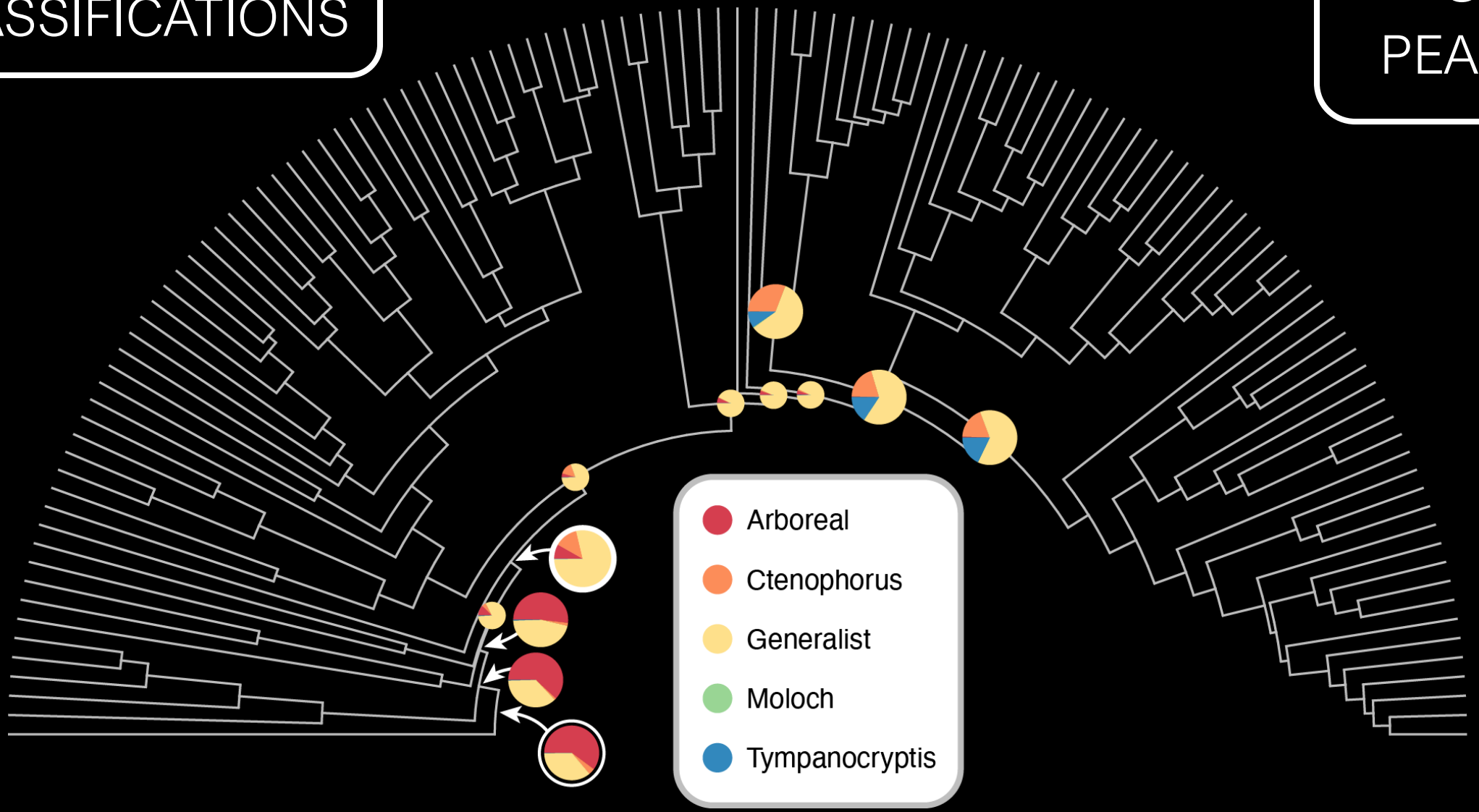
RANDOM FOREST
CLASSIFICATIONS

5
PEAKS



RANDOM FOREST
CLASSIFICATIONS

5
PEAKS

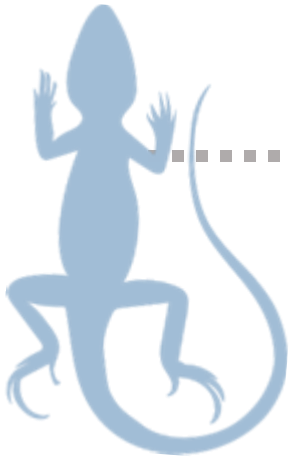


HOW DO WE GET

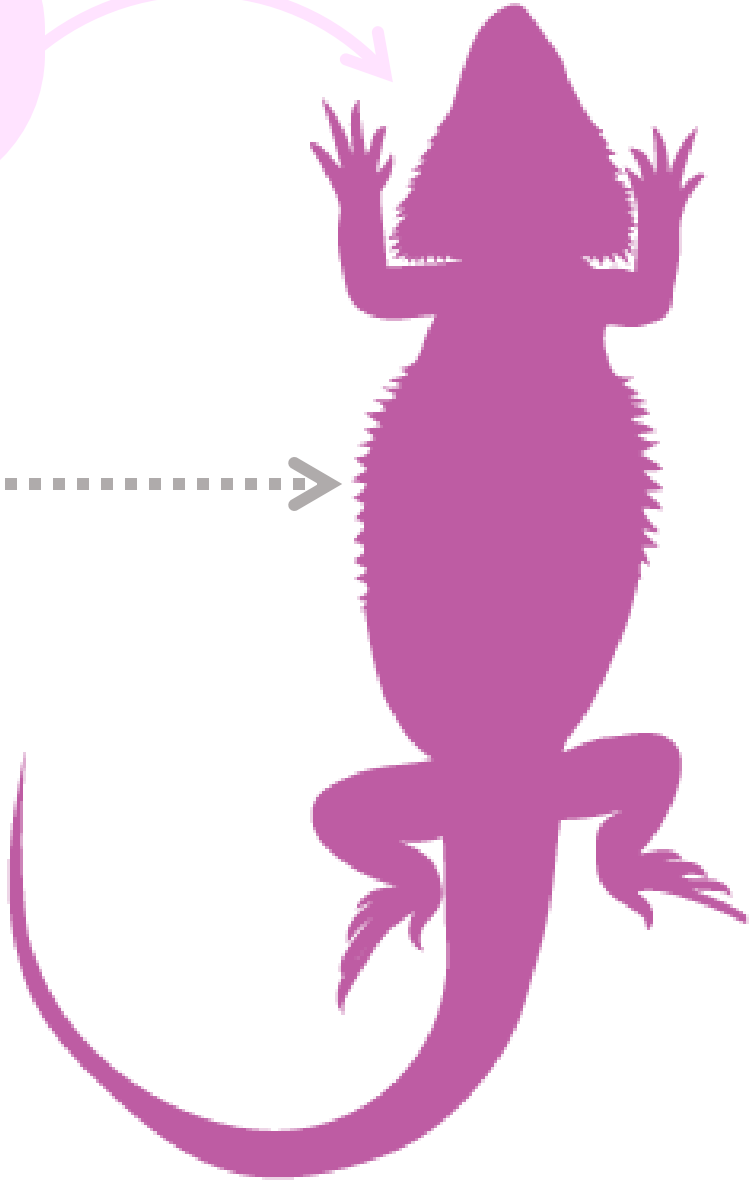
FROM THIS

HOW DO WE GET

FROM THIS → TO THIS

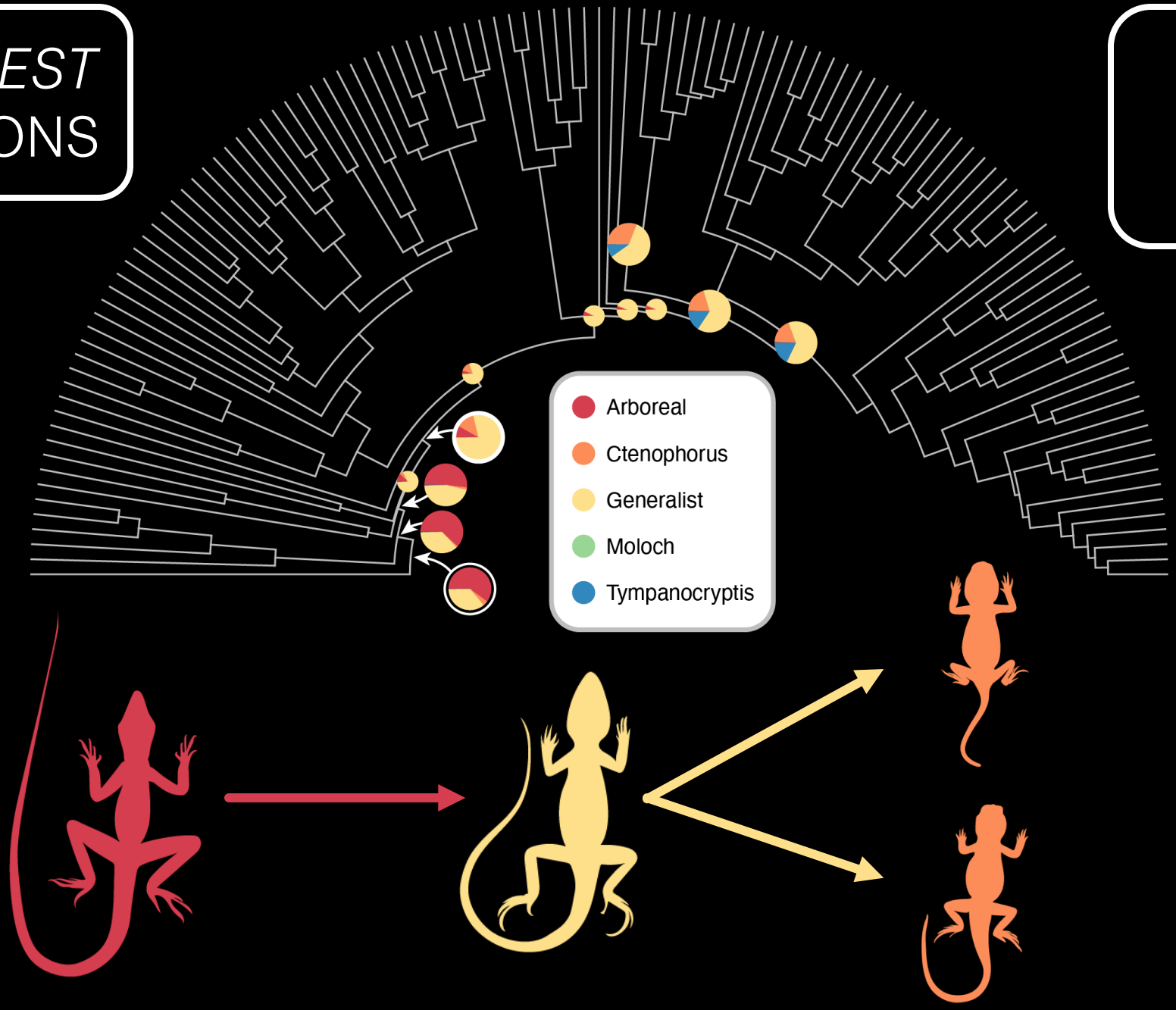


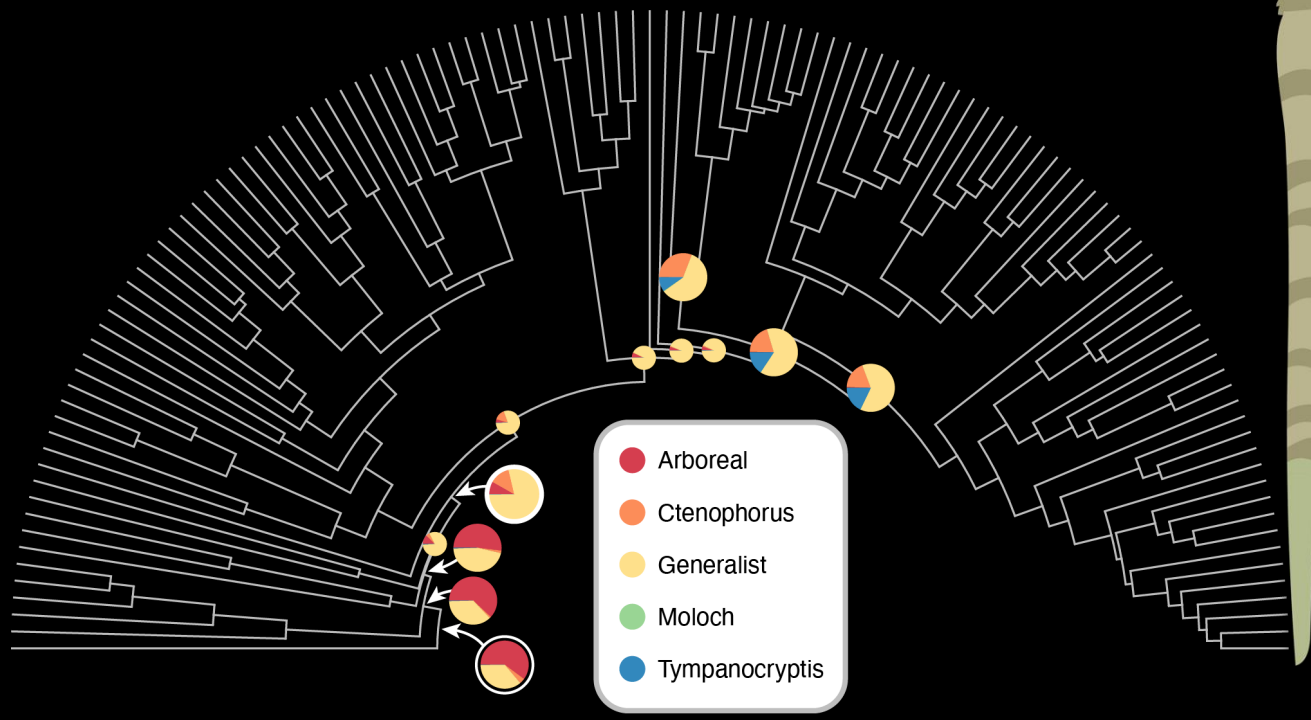
?



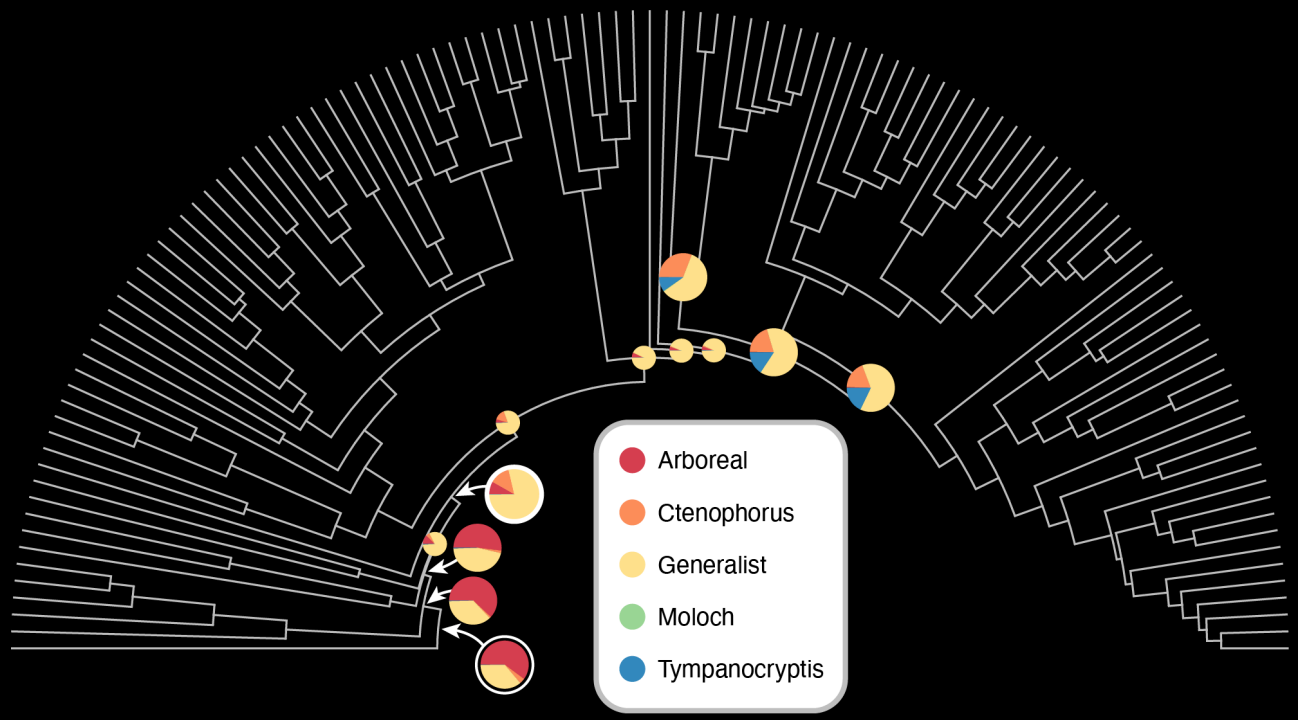
RANDOM FOREST
CLASSIFICATIONS

5
PEAKS



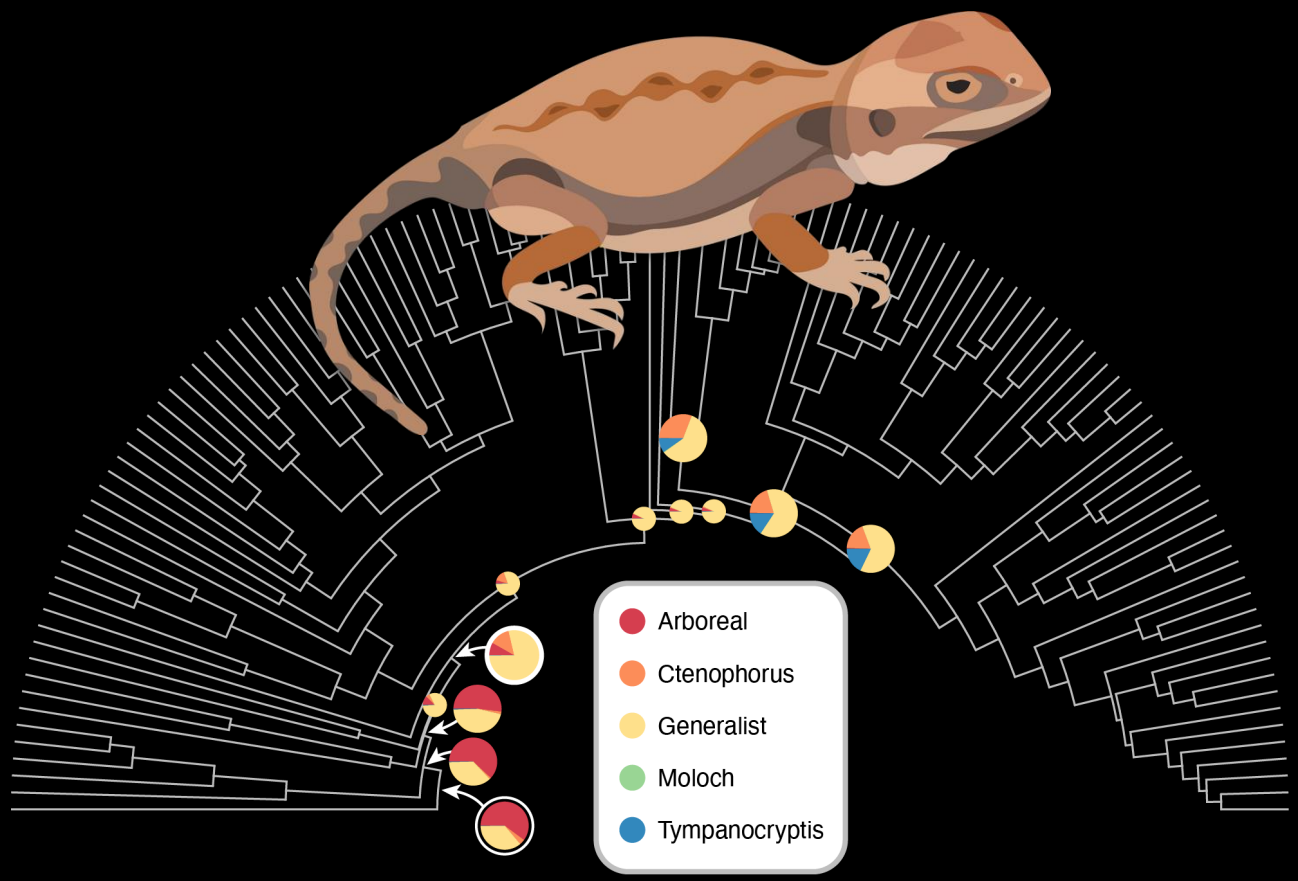


ANCESTRAL DRAGON
WAS *ARBOREAL*



ANCESTRAL DRAGON
WAS *ARBOREAL*

AUSTRALIAN ANCESTOR
WAS *GENERALIST*



ANCESTRAL DRAGON
WAS *ARBOREAL*

AUSTRALIAN ANCESTOR
WAS *GENERALIST*

SPECIALISTS EVOLVE FROM
GENERALIST ANCESTORS