

Top 10 disparity metrics

Thomas Guillerme

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Top 10 disparity metrics

Stay until the end, top 1 might surprise you!

Thomas Guillerme

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• 1 -

I don't know.



```
install.packages("dispRity")
```



```
tguillerme.shinyapps.io/moms/
```

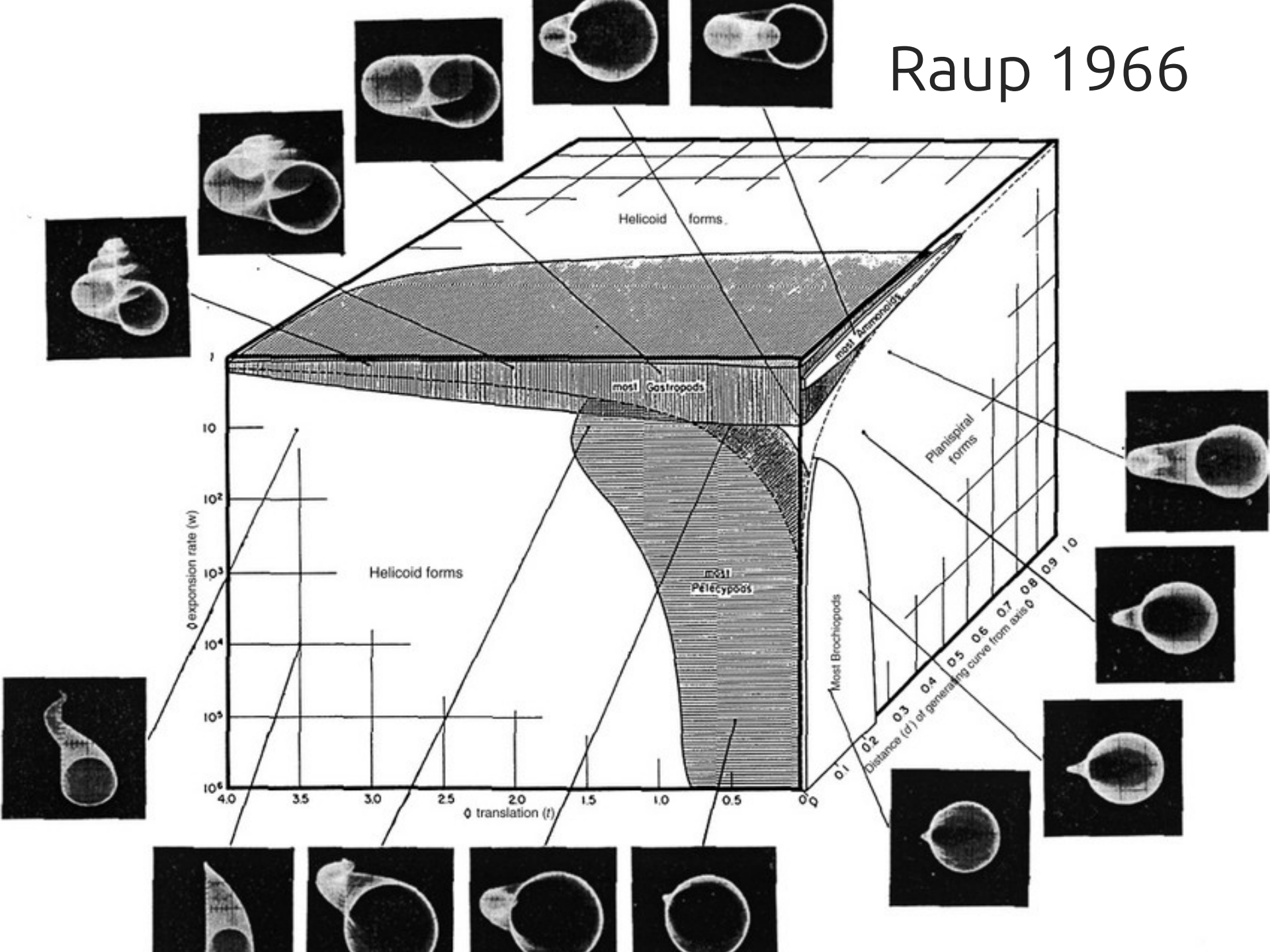
Acknowledgments



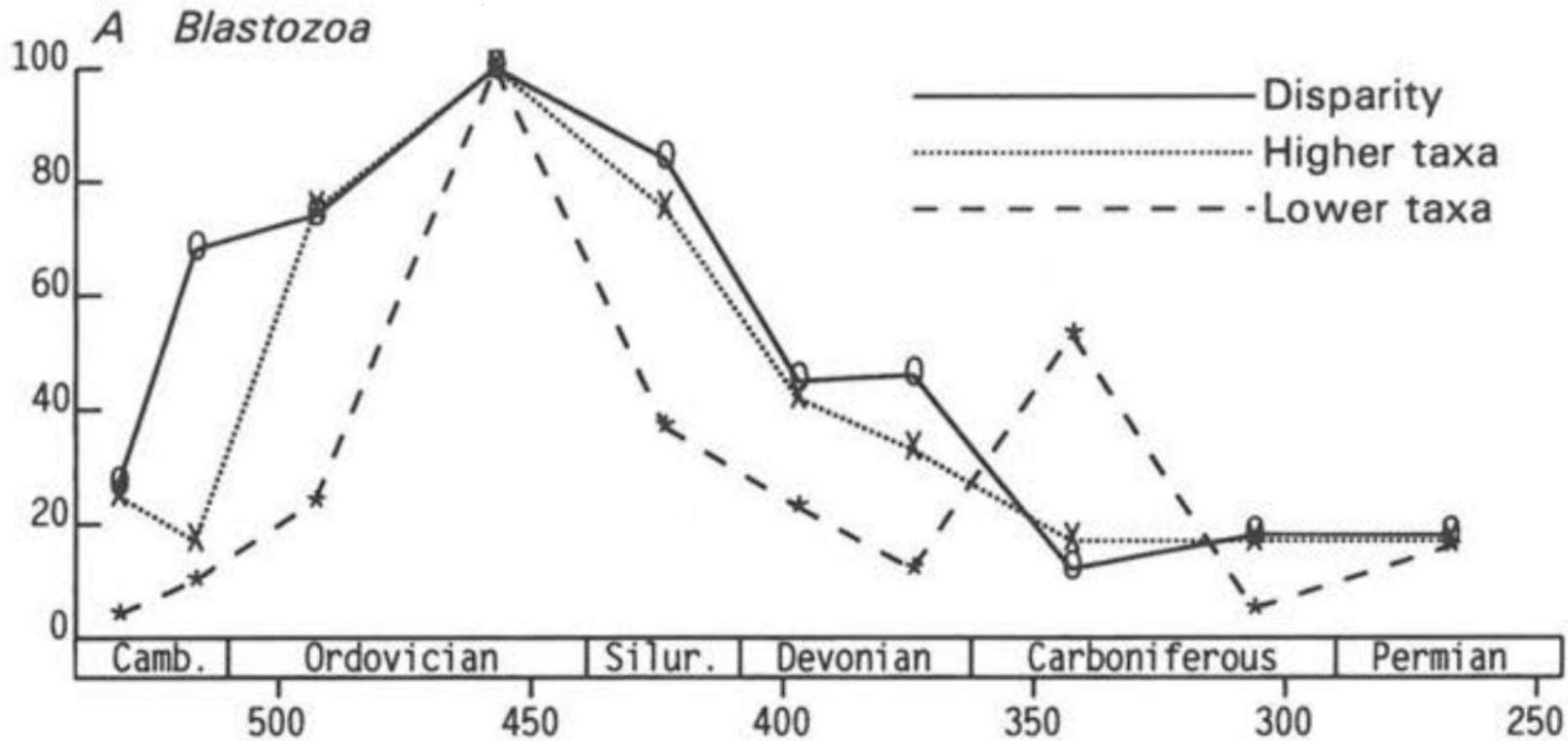
Pedro Cardoso
Carlos Carmona
Natalie Cooper
Maria Jørgensen
Stefano Mammola
Tom Matthews
Ariel Marcy
Mark Puttick
Vera Weisbecker

What are we measuring
with disparity?

Raup 1966

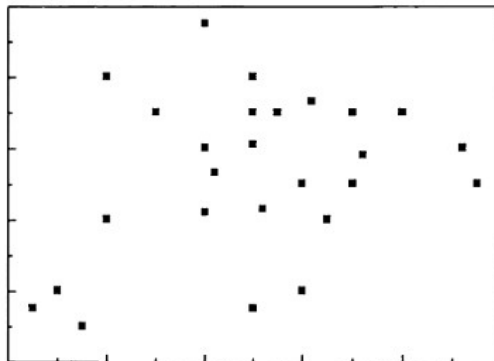


Disparity



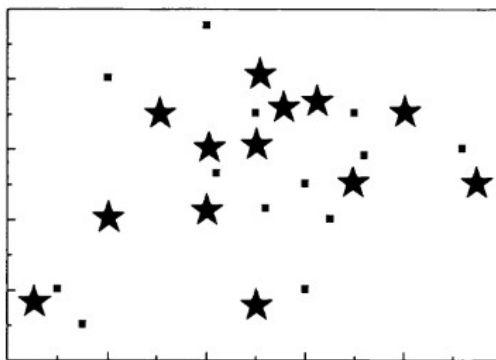
Which disparity metric do
I choose?

Initial Distribution

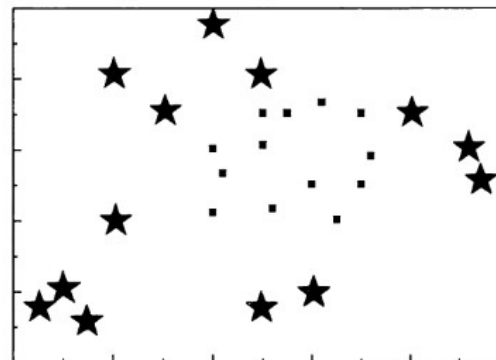


A

Random Extinction

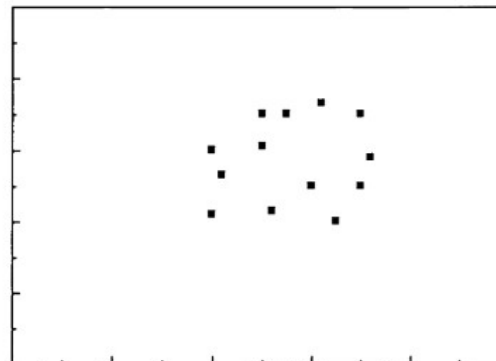
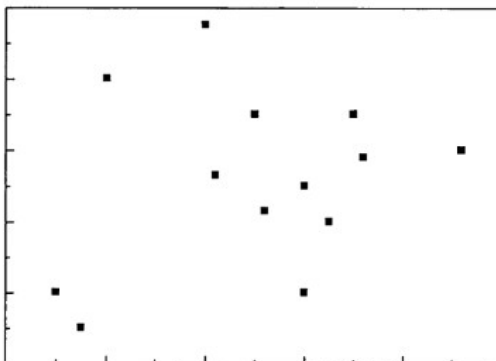


Selective Extinction



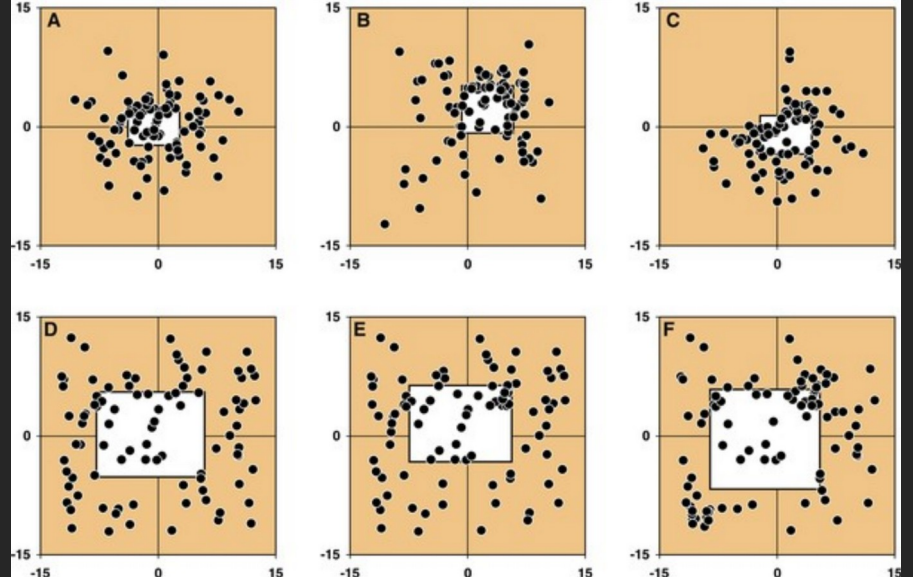
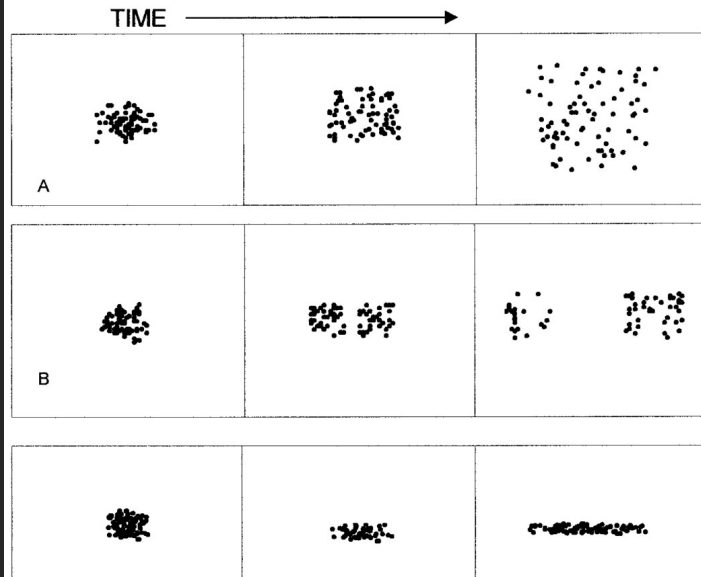
B

Resulting Distribution



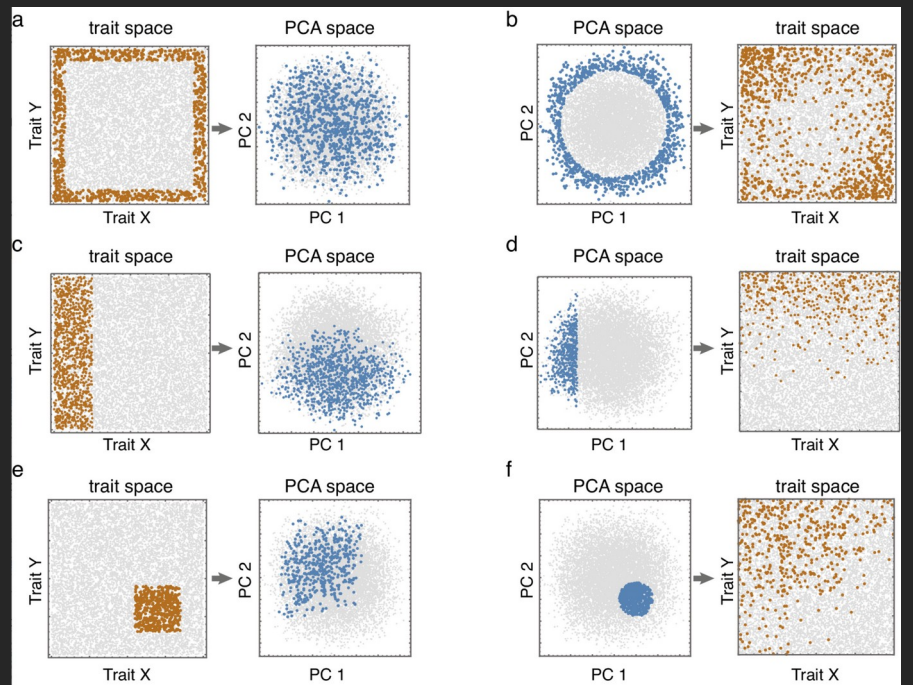
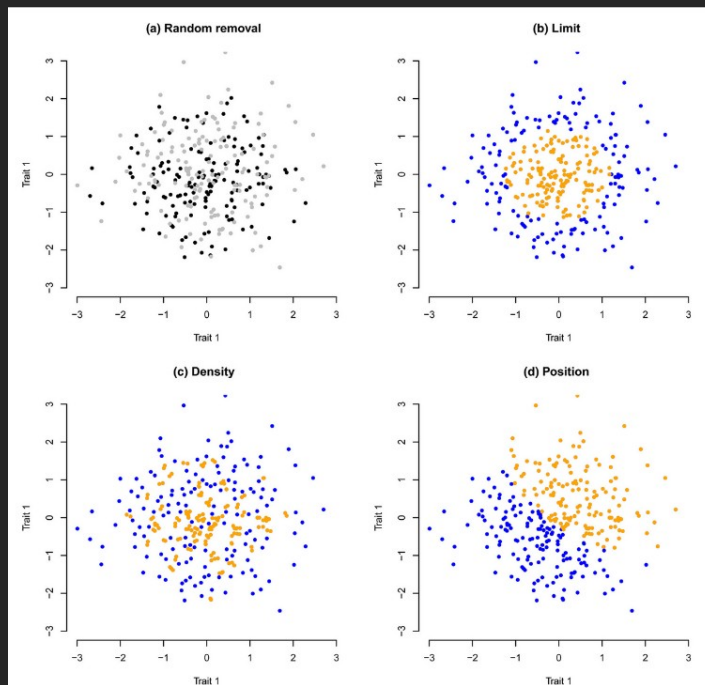
C

Surviving ■
Extinct ★



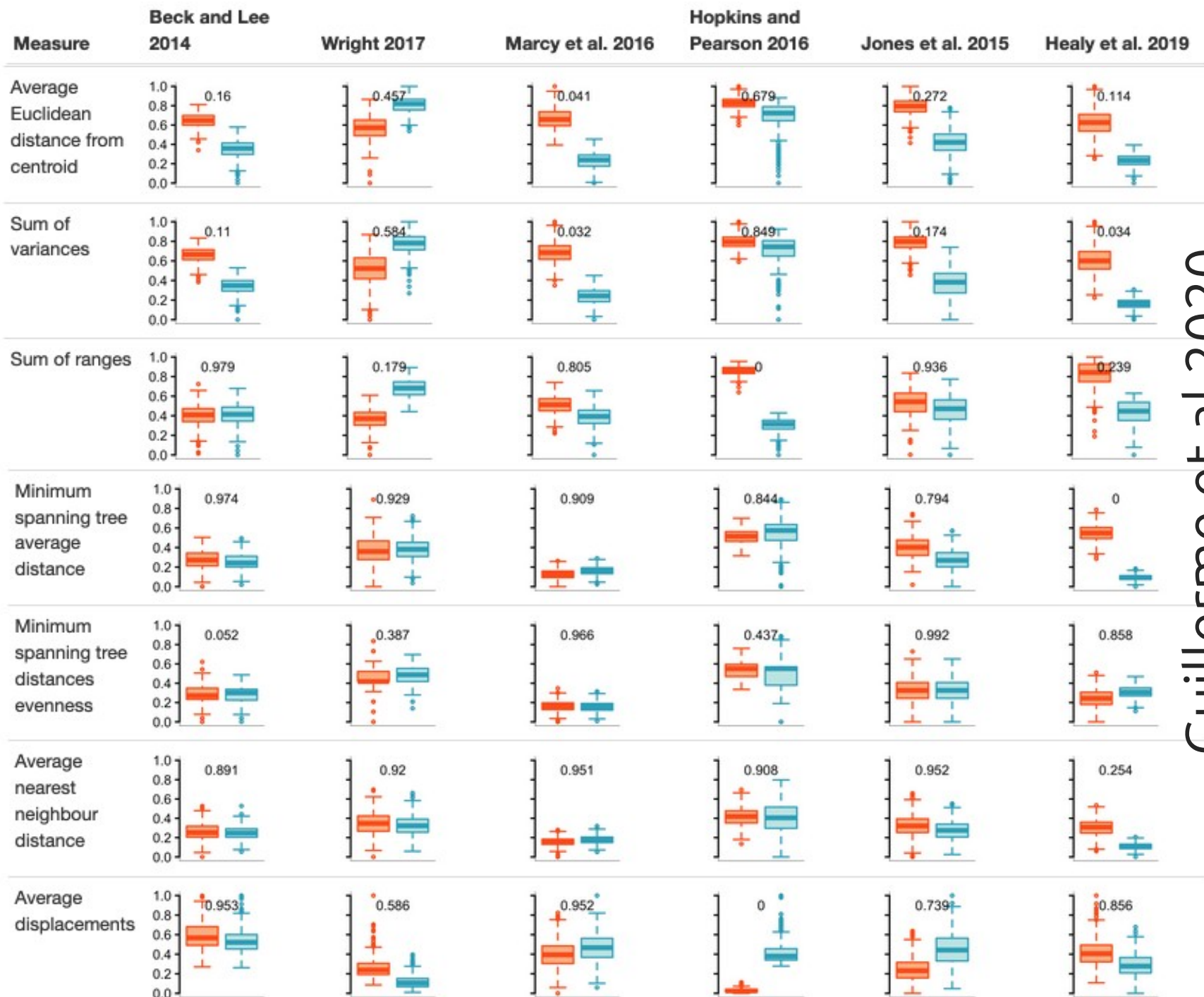
Ciampaglio et al 2001

Korn et al 2013



Guillerme et al 2020

Polly 2023

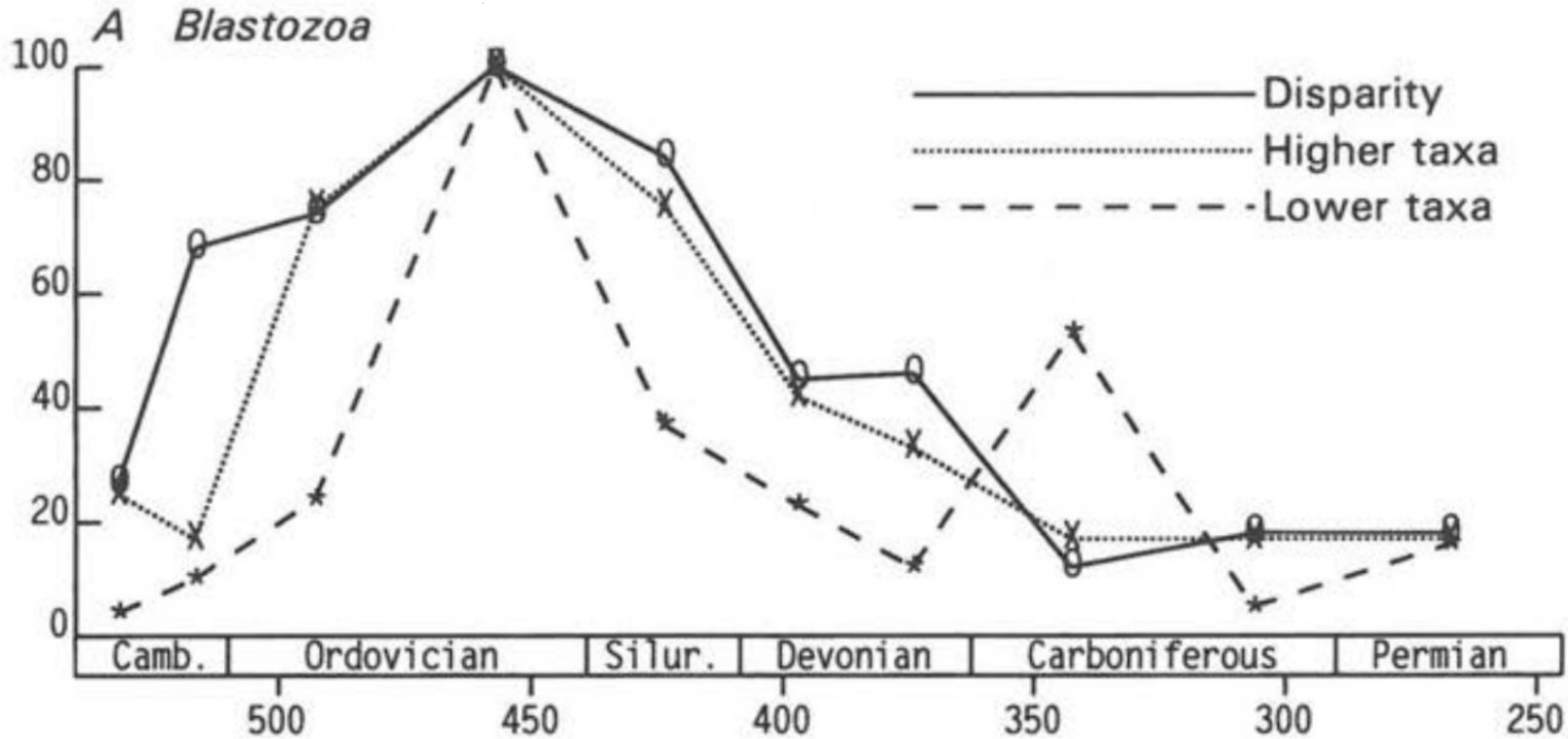


Guillermo et al 2020

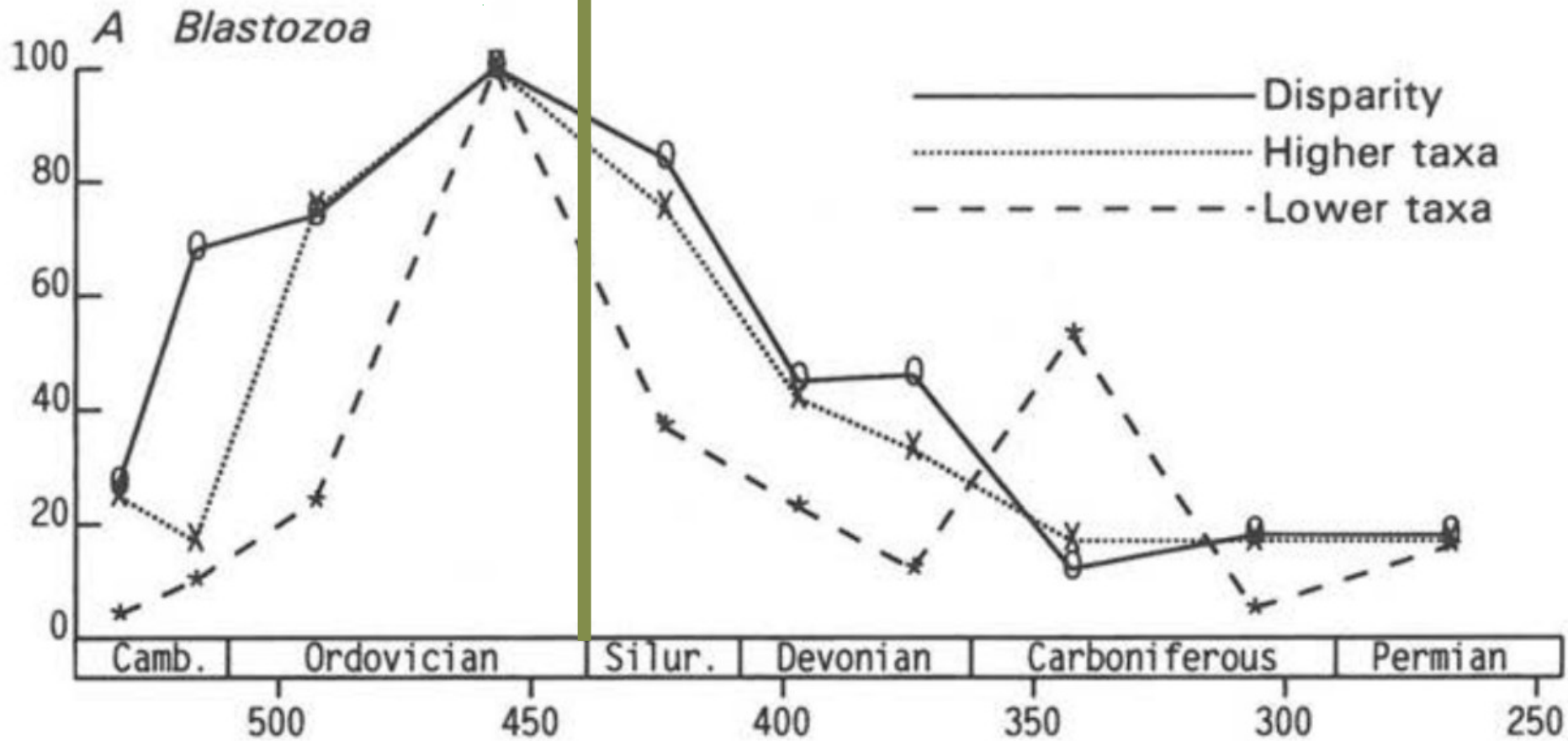
cool.

What are we measuring
with disparity?

Disparity through time

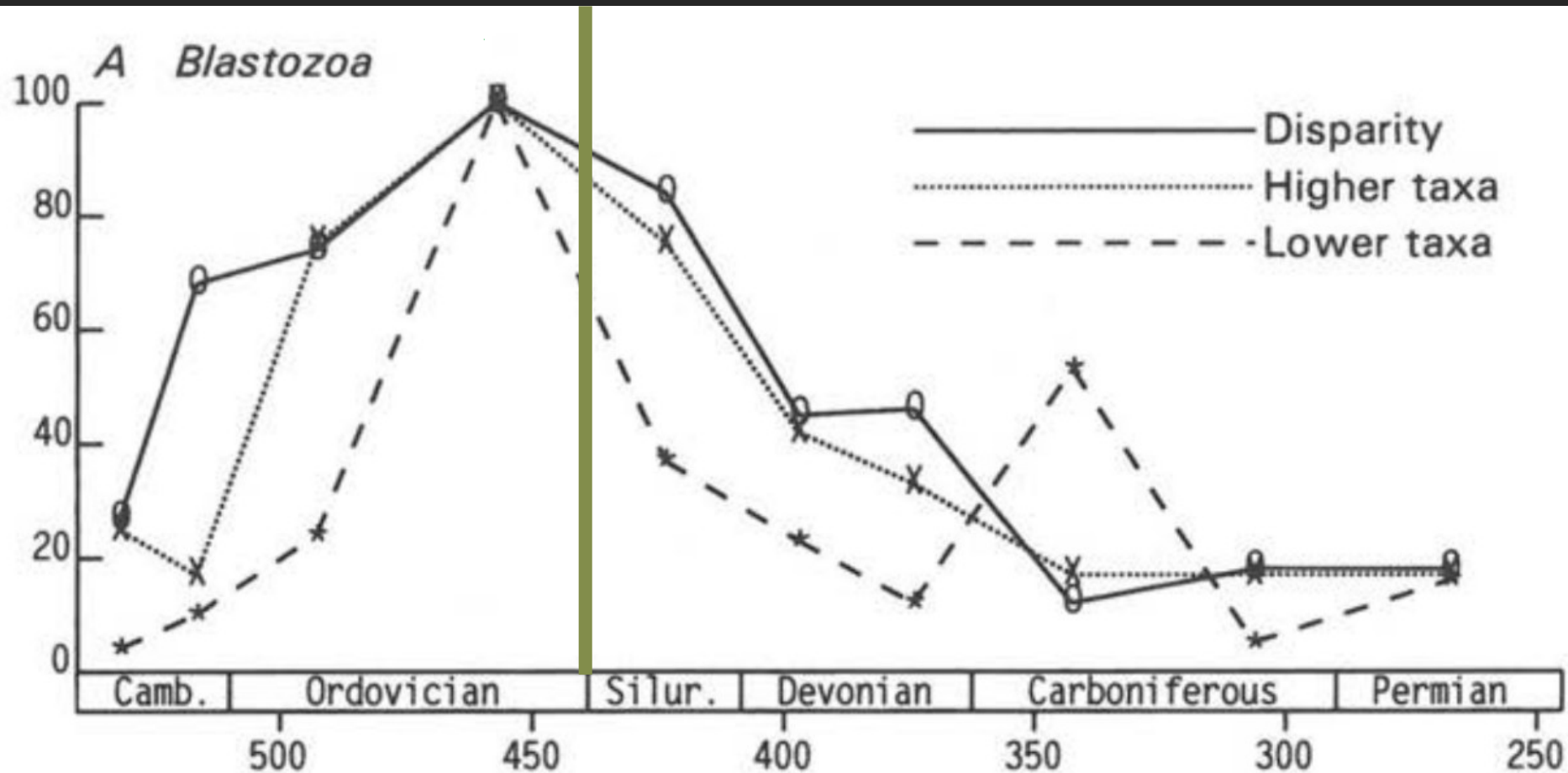


Disparity through time



Footnote 1996

Disparity through time across a mass extinction event



Foote 1996

Effect of mass extinction

through time

on disparity

Mechanism =
Effect of mass extinction

through time

on disparity

Mechanism =
Effect of mass extinction
Process =
through time
on disparity

Mechanism =
Effect of mass extinction

Process =
through time

Pattern =
on disparity

Mechanism =
Effect of mass extinction

Process =
through time

Pattern = **what?**
on disparity

Mechanism =
Effect of mass extinction

Process = **how?**
through time

Pattern = **what?**
on disparity

Mechanism = **why?**

Effect of mass extinction

Process = **how?**

through time

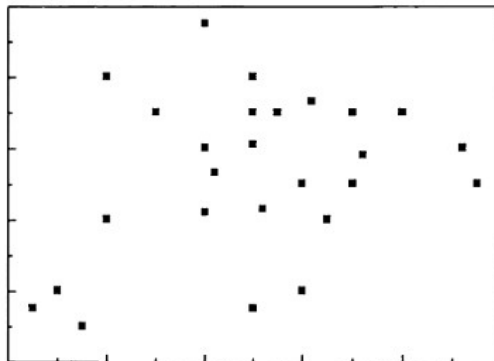
Pattern = **what?**

on disparity

What are we measuring
with disparity?

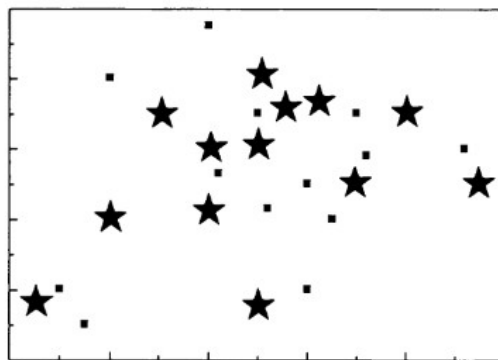
A **pattern** generated by a
mechanistic process

Initial Distribution

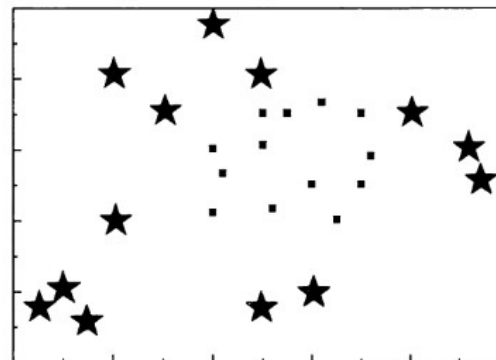


A

Random Extinction

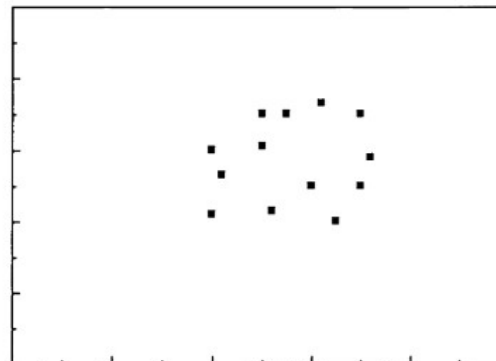
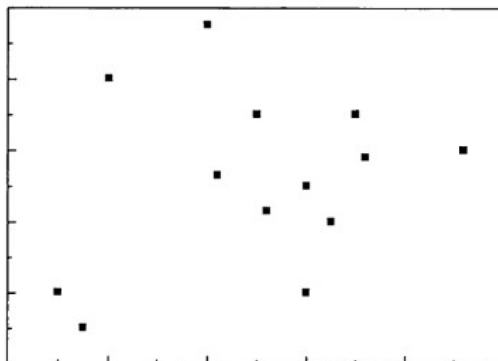


Selective Extinction



B

Resulting Distribution



C

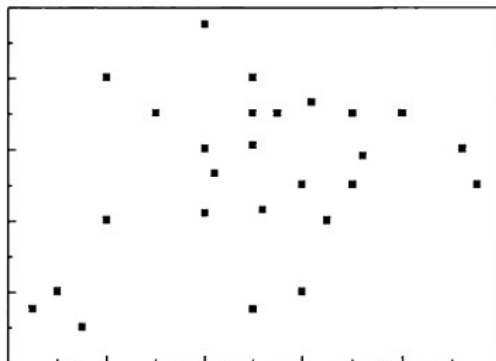
Surviving ■

Extinct ★

Process

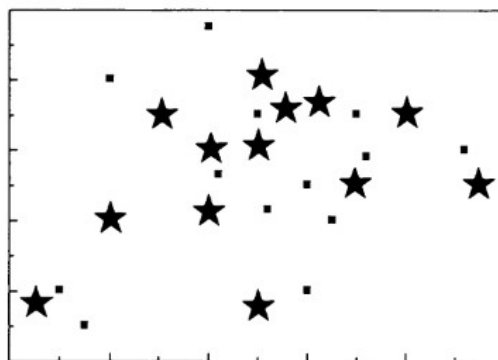
A

Initial Distribution

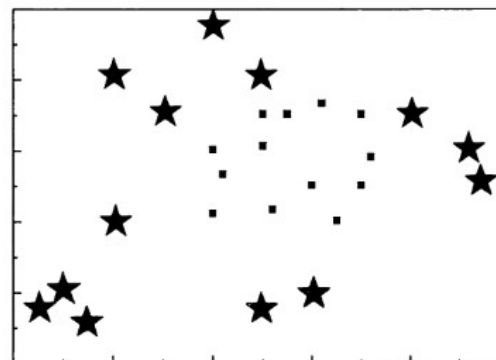


B

Random Extinction

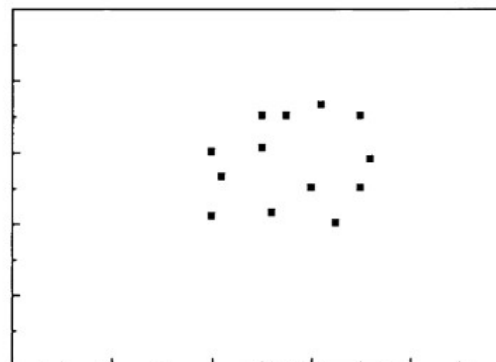
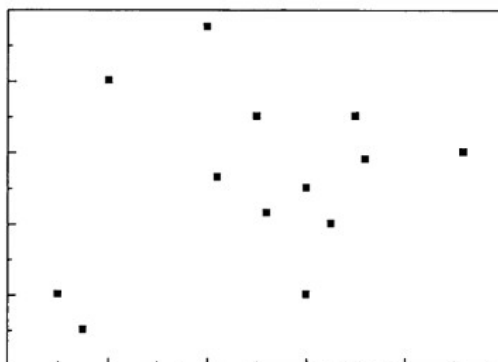


Selective Extinction



C

Resulting Distribution



Surviving ■
Extinct ★

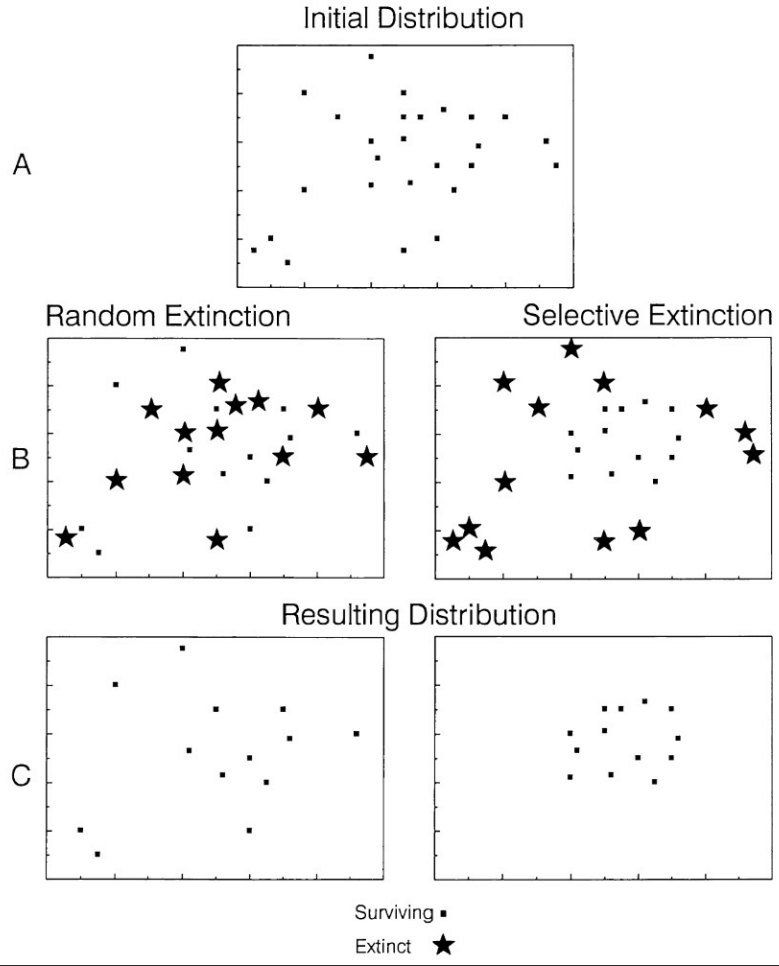
Foote
1991

Process

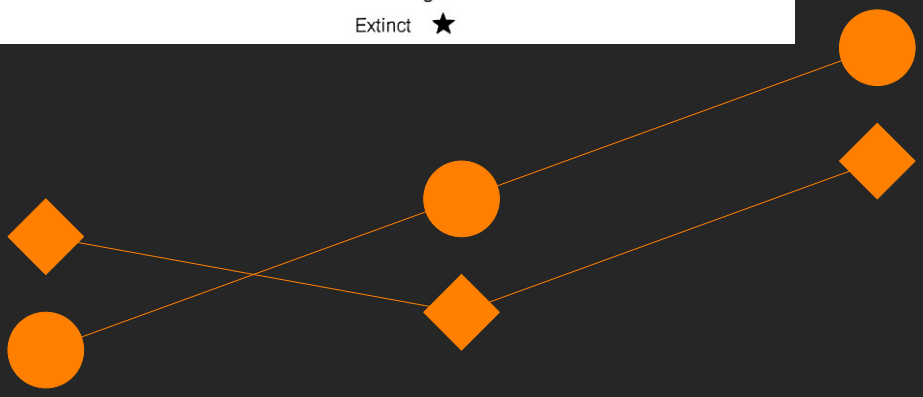


Foote
1991

Process



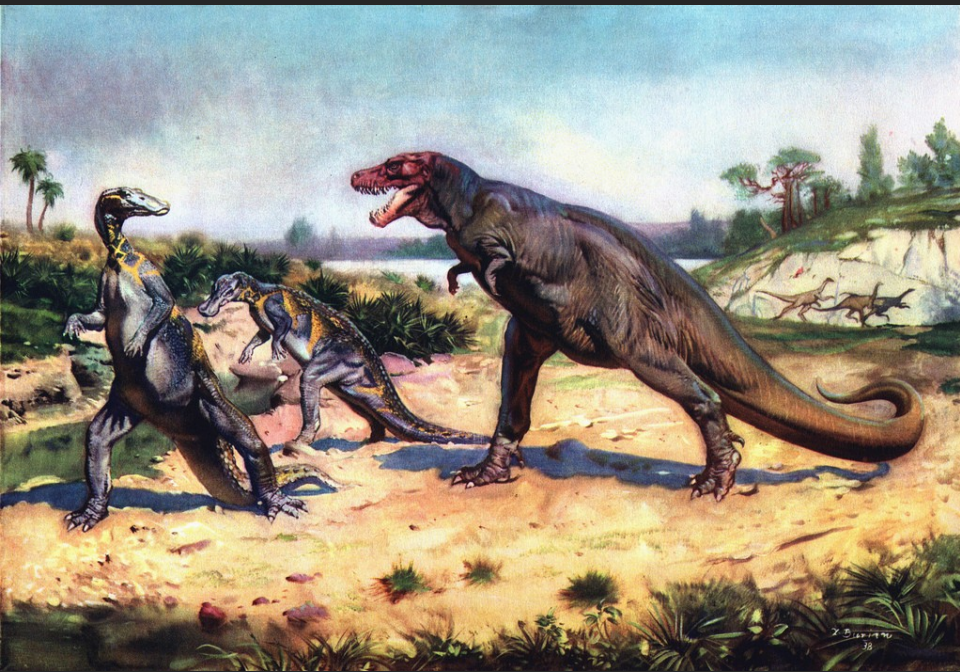
Mechanism



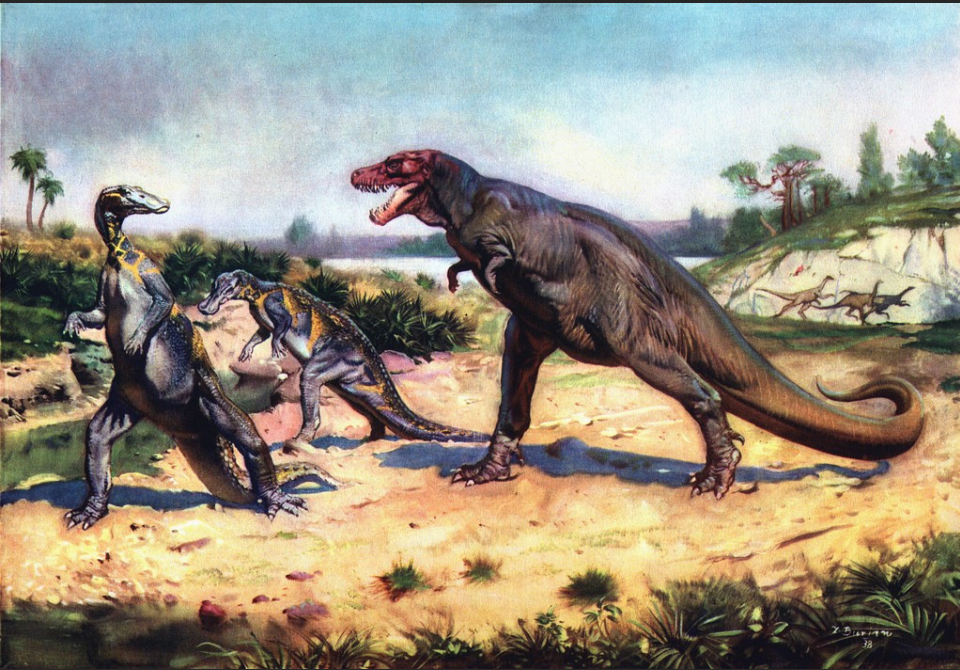
Pattern

Foote
1991

OK, so how do I choose
my metric?



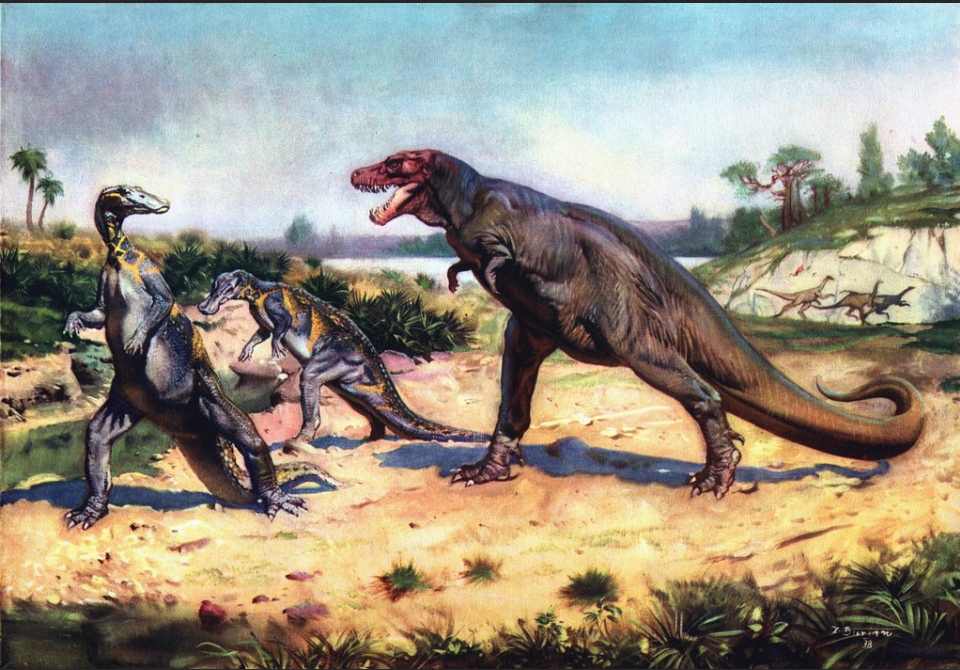
How is competition changing diversity through time?



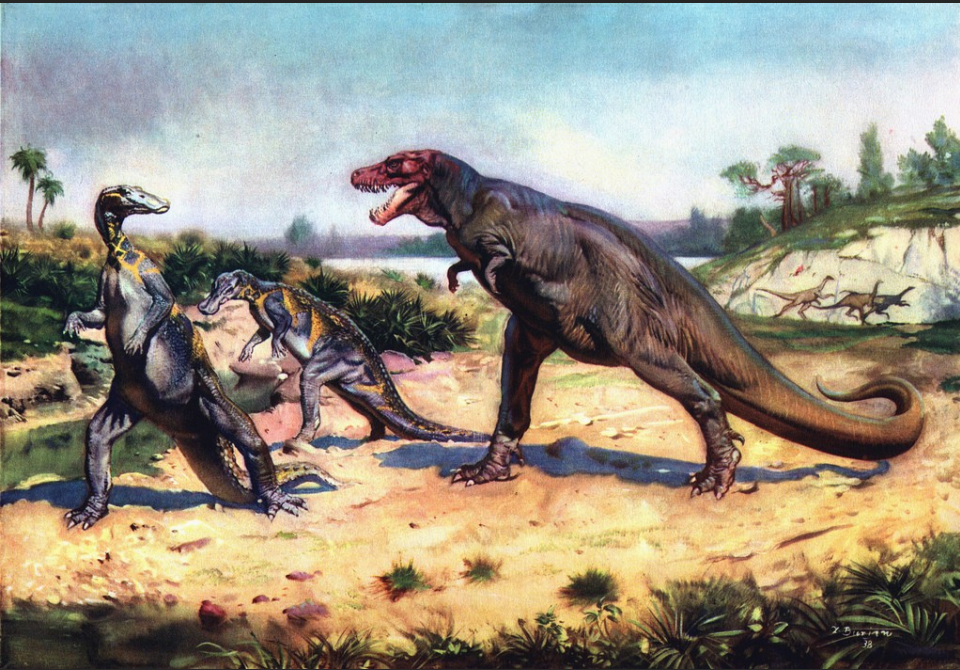
How is competition changing diversity through time?



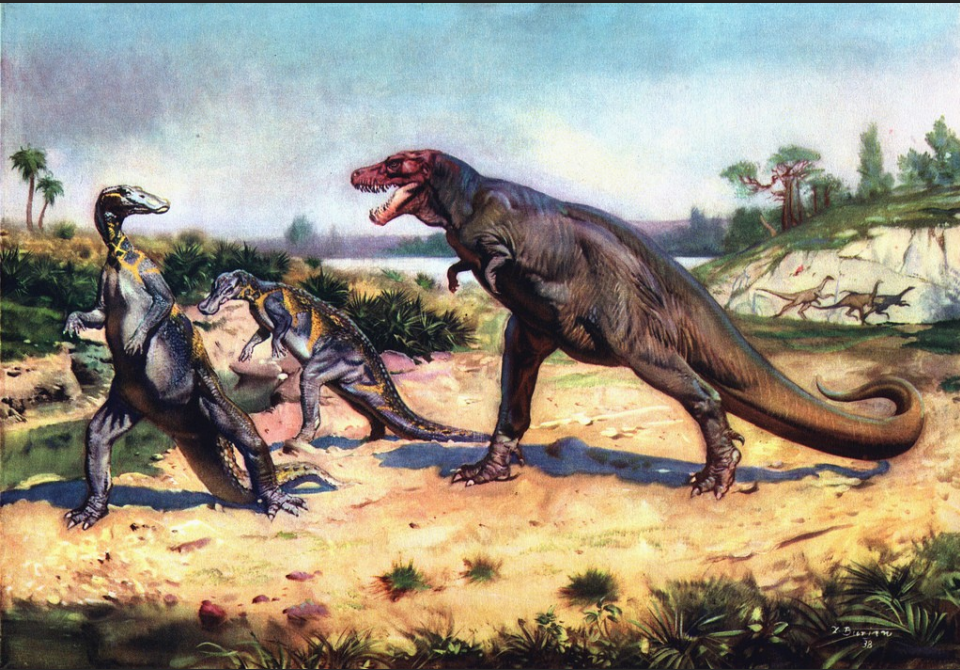
How is competition changing diversity through time?



How is competition changing diversity through time?

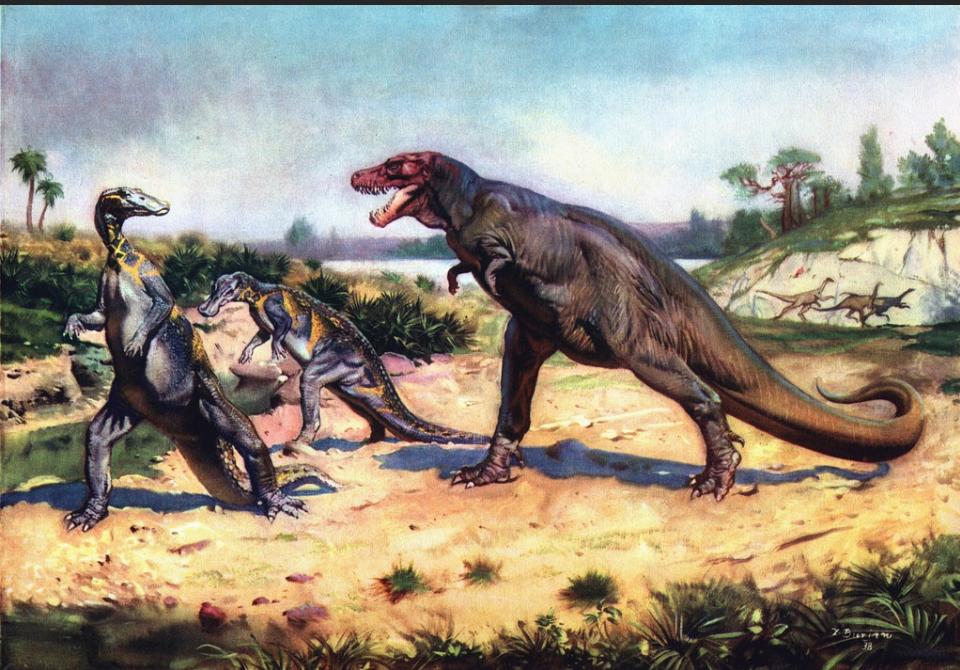


Competition through time: What is changing?



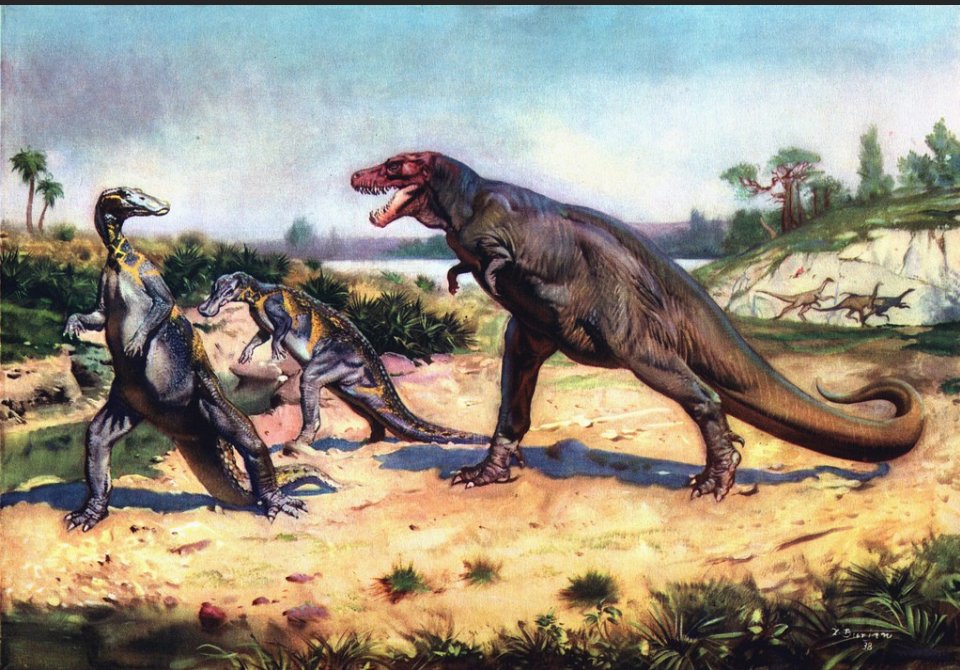
What **pattern** captures changes in diversity?

Competition through time: What is changing?



Pattern 1: # of vertebrates?

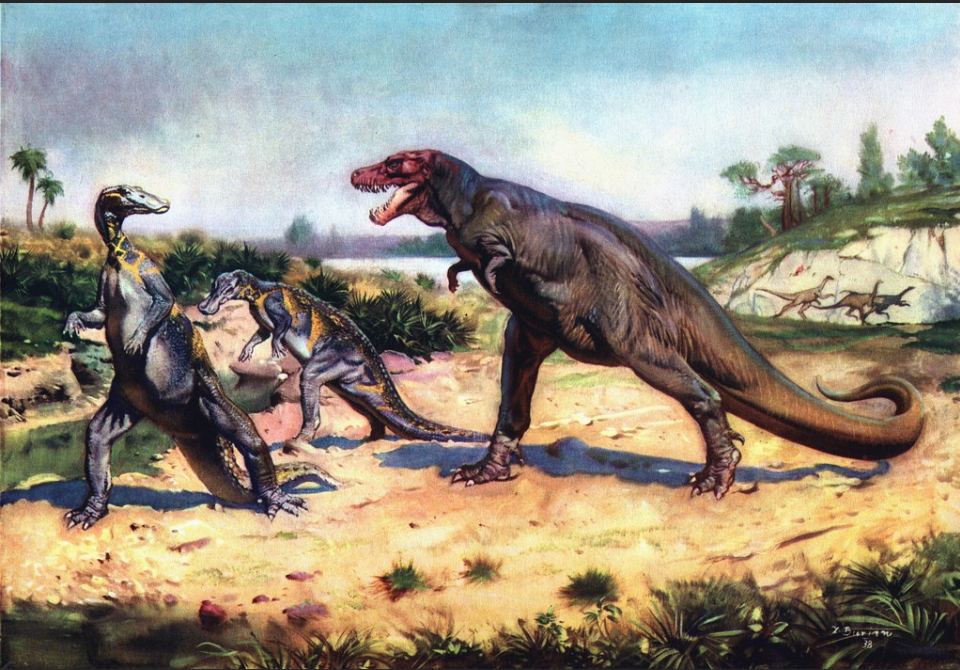
Competition through time: What is changing?



Pattern 1: # of vertebrates?

Pattern 2: # of dinos/mammals?

Competition through time: What is changing?



Pattern 1: # of vertebrates?

3 sp

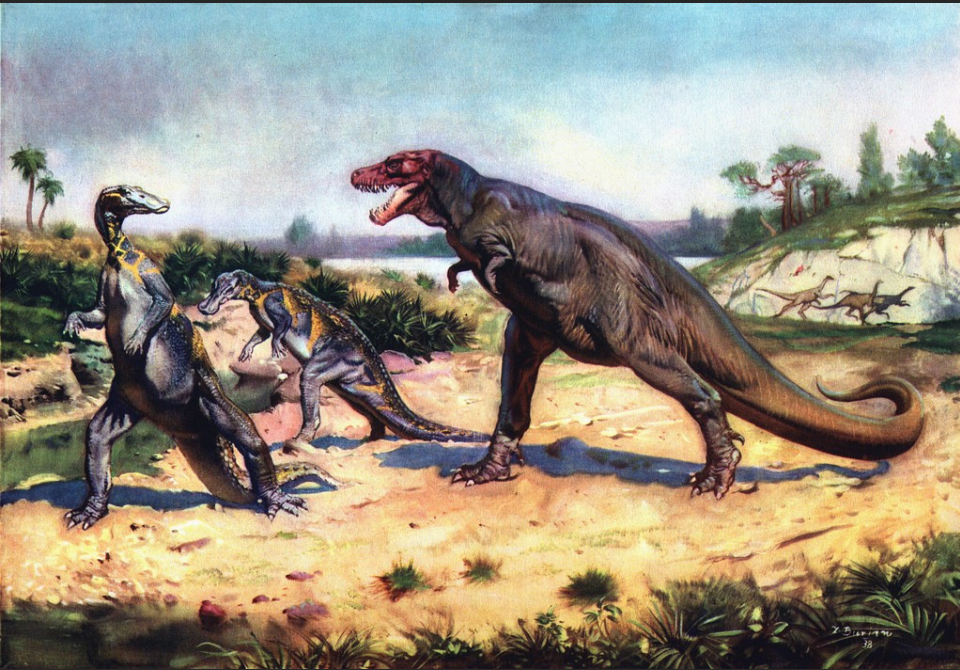
4sp

Pattern 2: # of dinos/mammals?

3 dinos/0 mammals

1 dinos/3 mammals

Competition through time: What is changing?



~~Pattern 1: # of vertebrates?~~

~~3 sp~~

4 sp

Pattern 2: # of dinos/mammals?

3 dinos/0 mammals

1 dinos/3 mammals

Competition through time: What is changing?



~~Pattern 1: # of vertebrates?~~

~~3 sp~~

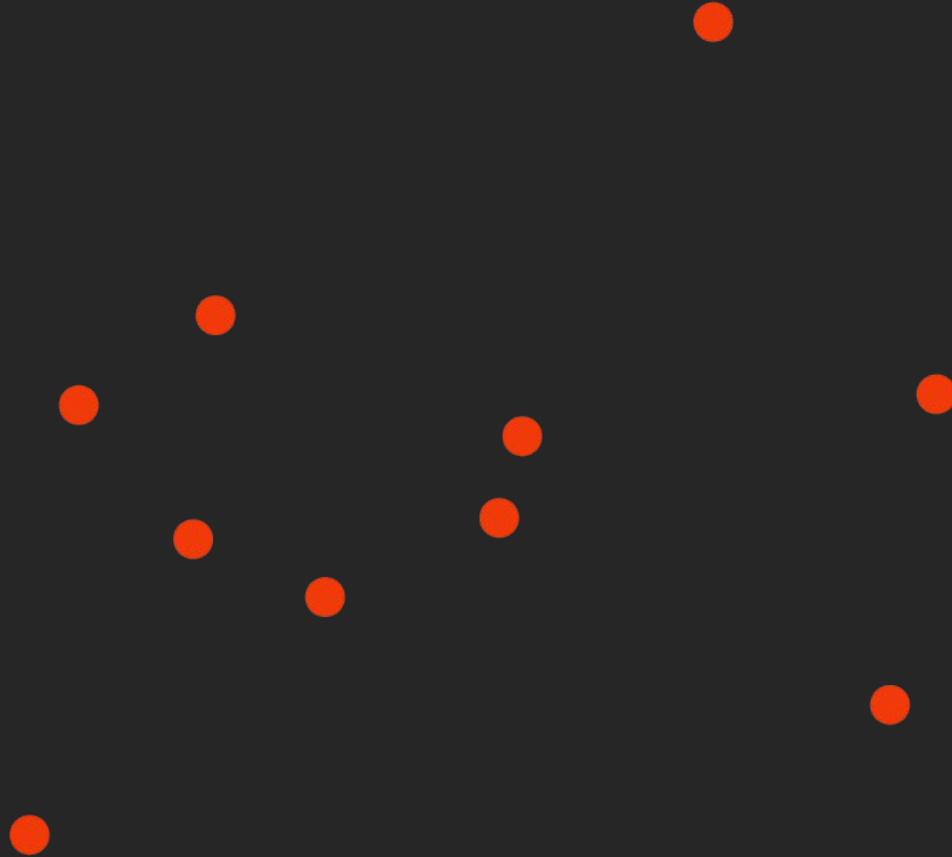
4 sp

Pattern 2: # of dinos/mammals?

3 dinos/0 mammals

1 dinos/3 mammals

Effect of mass extinction through time on disparity?

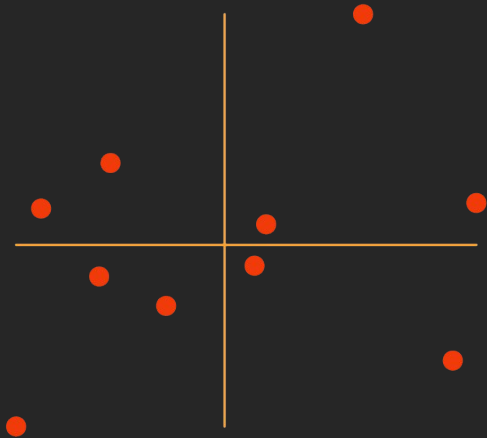


Effect of mass extinction through time on disparity?



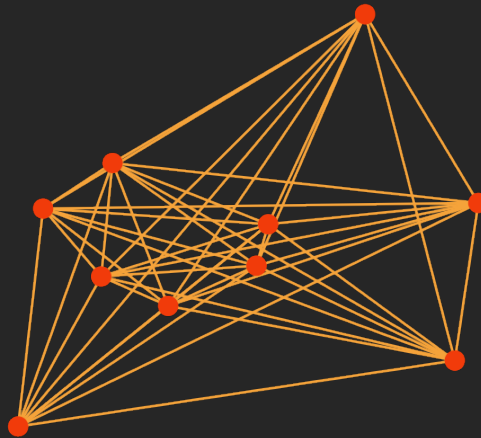
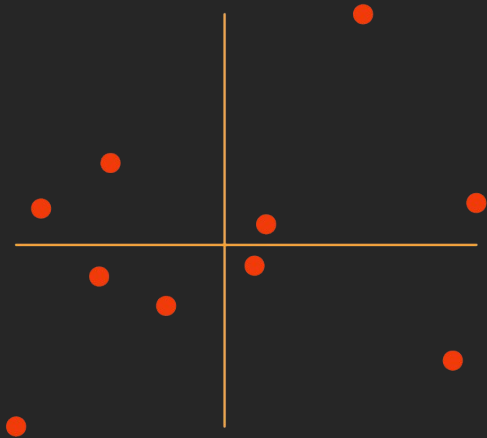
Disparity =

size

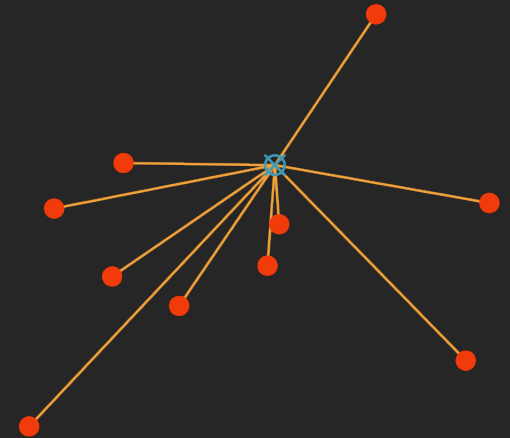
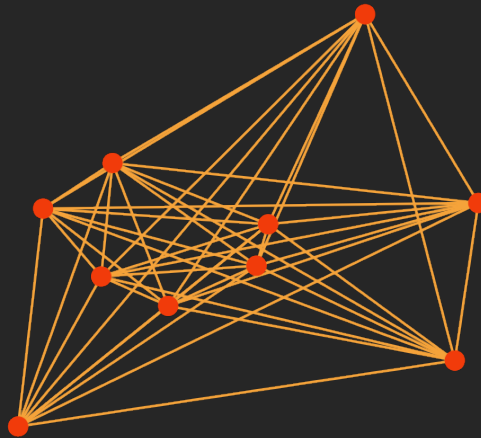
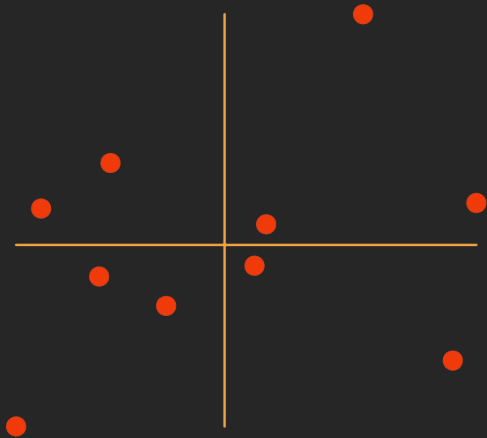


size

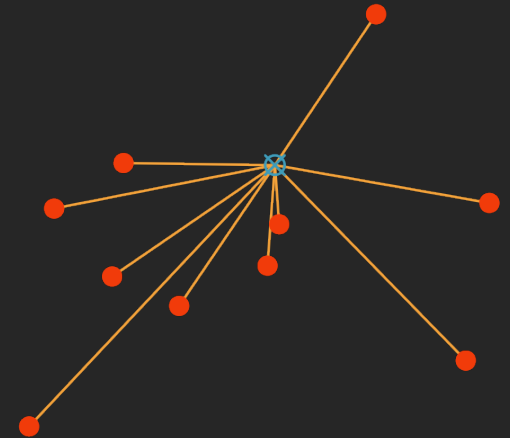
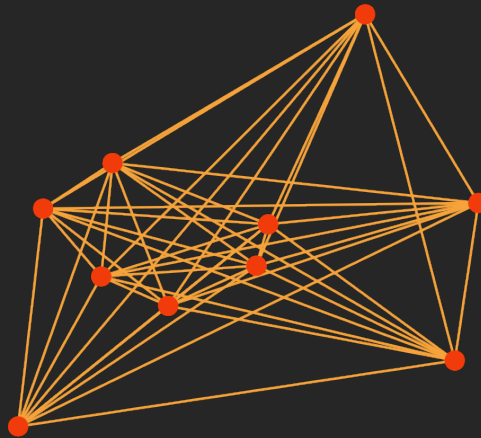
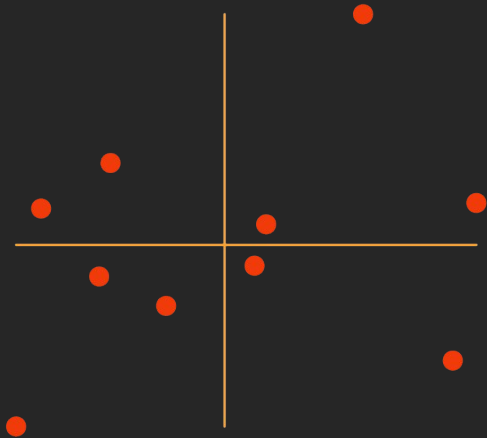
Disparity =
density



Disparity =
size density position

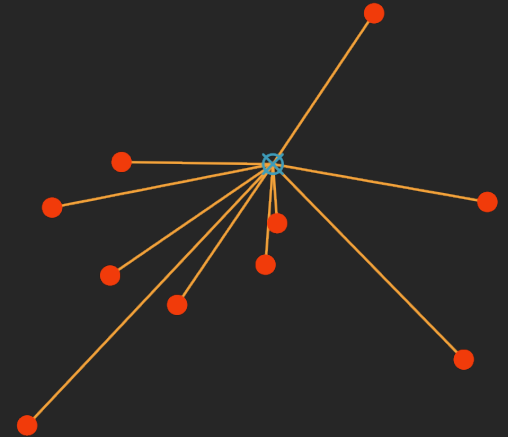
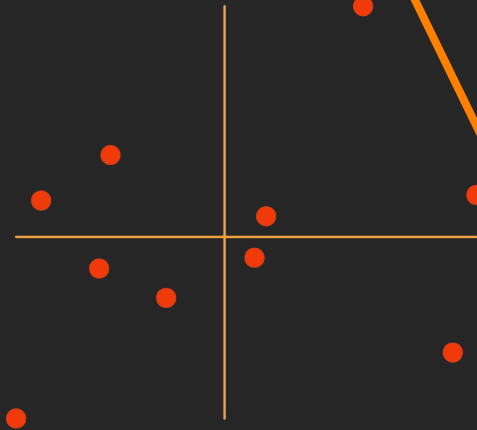


Disparity =
size & density & position



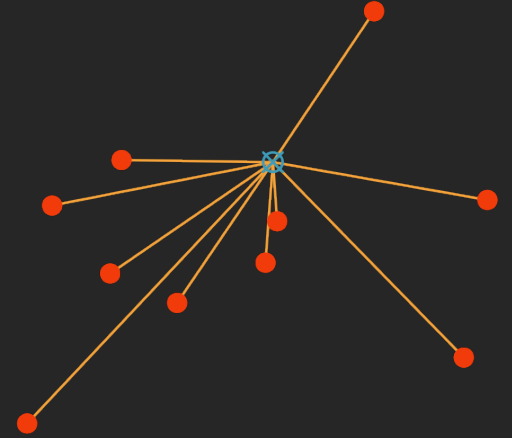
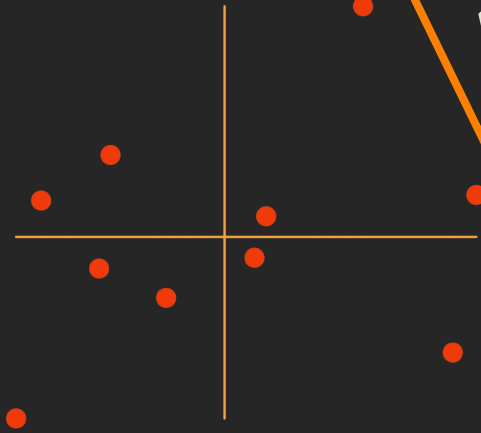
Disparity
size & density
position

Multiple aspects +
many more things
to measure!



Disparity
size & density position

Multiple aspects +
many more things
to measure!



& shape & orientation & ...

Disparity
size & den
ition

Multiple aspects +
many more things
to measure!



& shape & orientation & ...

Disparity
size & density
position

Multiple aspects +
many more things
to measure!



The what, how and why of trait-based analyses in ecology

T Guillerme, P Cardoso, M Jørgensen, S Mammola, T Matthews

On *bioRxiv* (2nd round of review in *Ecography*)

OK, **but seriously**, how do
I choose my metric?



Welcome to wikiHow, the most trusted how-to site on the internet.

What will you learn on wikiHow today?

Q Make a top 10 diparity metrics list



Acknowledgments



Pedro Cardoso
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Natalie Cooper
Maria Jørgensen
Stefano Mammola
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Ariel Marcy
Mark Puttick
Vera Weisbecker



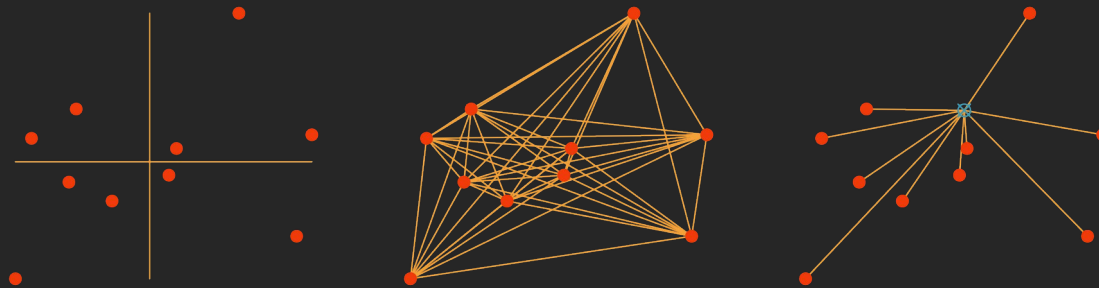
Thanks!



github.com/TGuillerme/dispRity

github.com/TGuillerme/moms

github.com/cardosopmb/BAT



Guillerme 2018 – *Methods in Ecology and Evolution*

Guillerme et al. 2020 – *Ecology and evolution*

Mammola et al. 2021 – *Functional ecology*

Guillerme et al. 2023 – *Science Advances*

Guillerme et al. 2025 – *nearly in Ecography*

