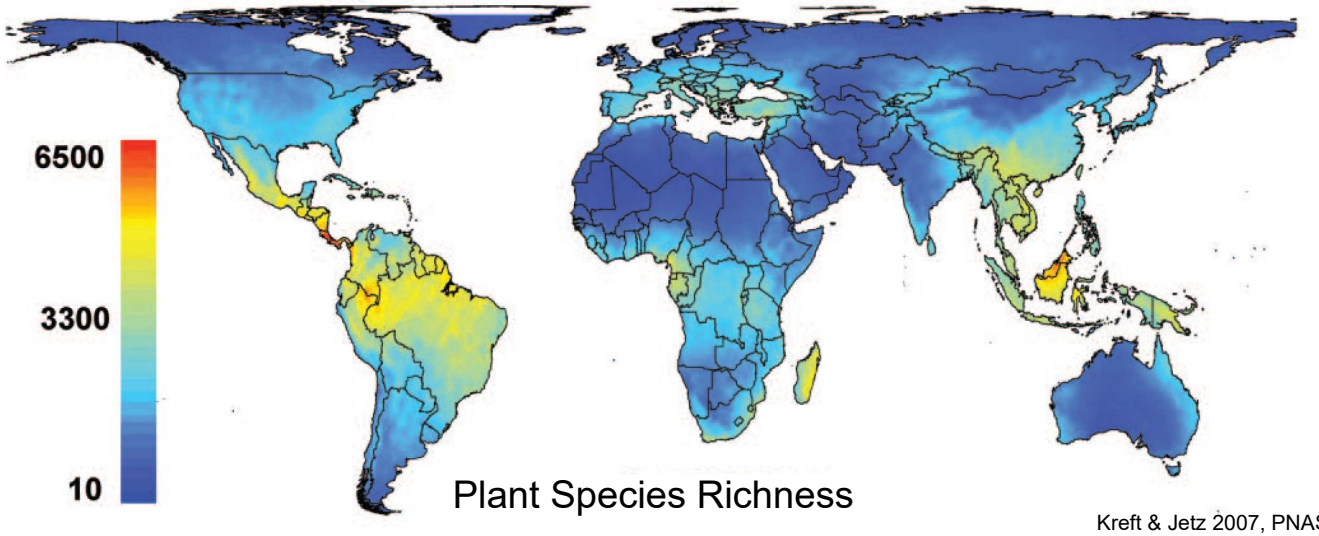
Testing the latitude-niche breadth hypothesis



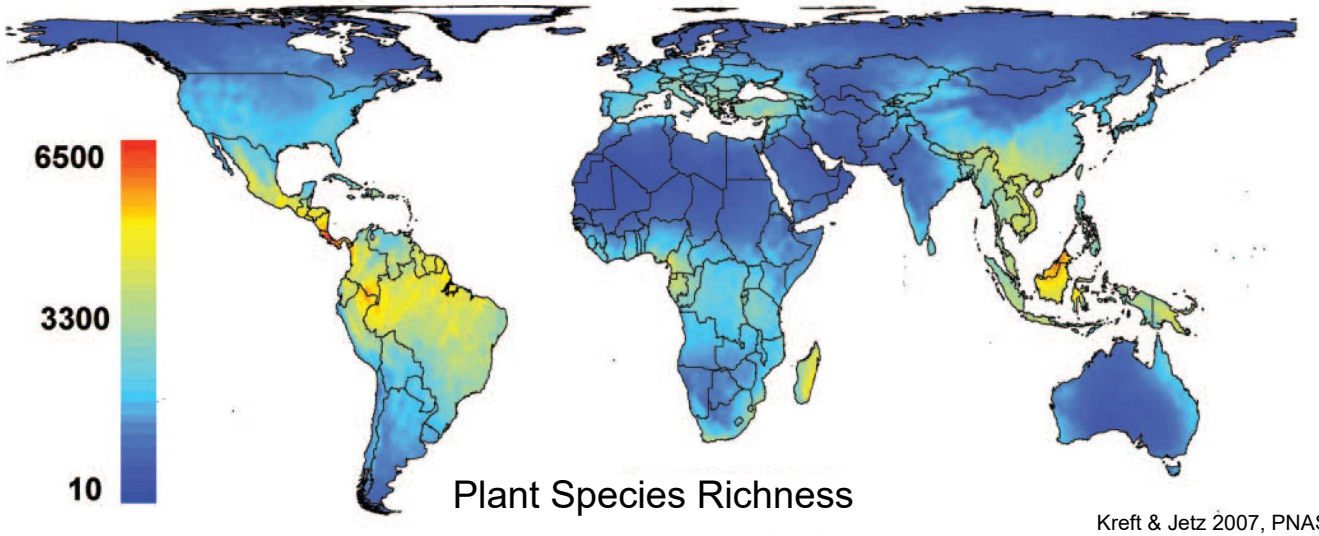
Kreft & Jetz 2007, PNAS

Alyssa R. Cirtwill

Daniel B. Stouffer & Tamara N. Romanuk

23 October 2015 | ABC 2015

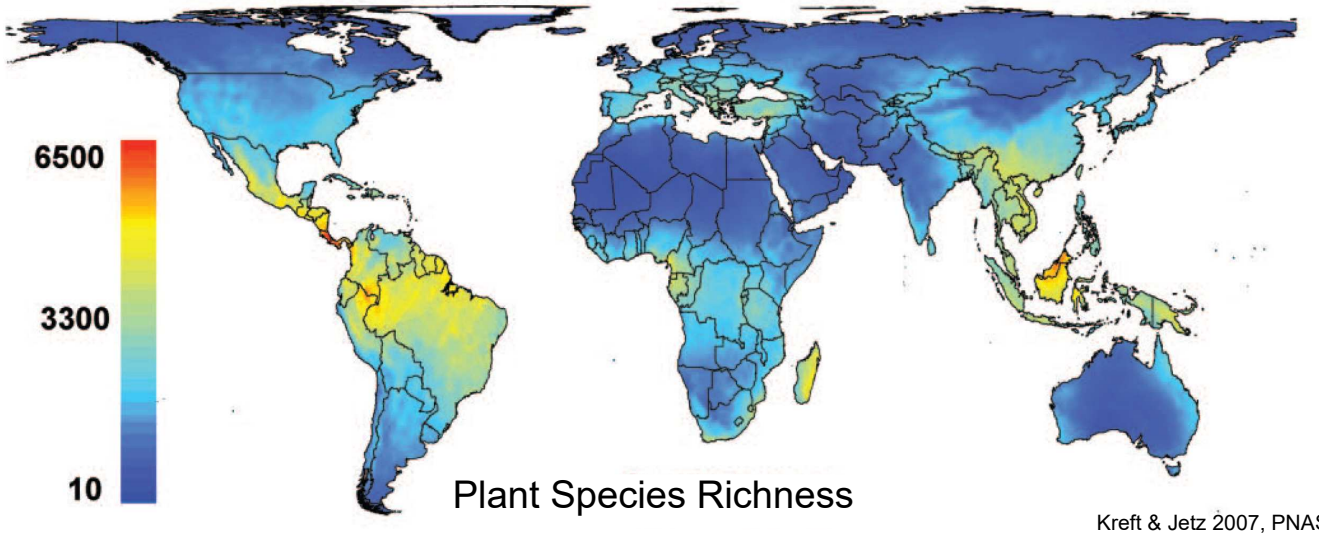
Testing the latitude-niche breadth hypothesis



Kreft & Jetz 2007, PNAS

Many groups are more diverse in the tropics

Testing the latitude-niche breadth hypothesis

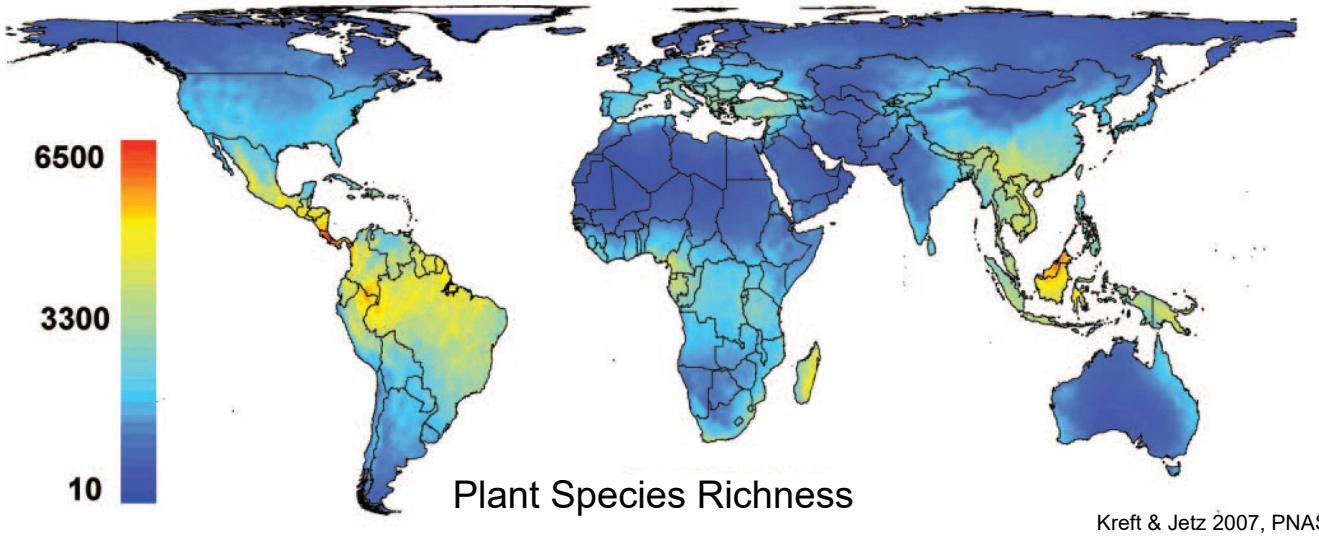


Kreft & Jetz 2007, PNAS

Many groups are more diverse in the tropics

How?

Testing the latitude-niche breadth hypothesis



Kreft & Jetz 2007, PNAS

Many groups are more diverse in the tropics

Environmental stability? Productivity?

Testing the latitude-niche breadth hypothesis

Latitude-niche breadth version 1

Poles +

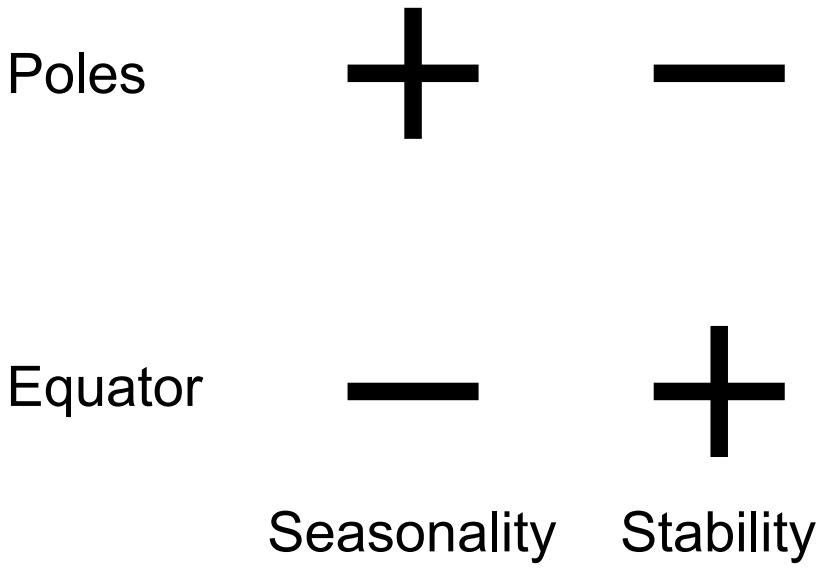
Equator —

Seasonality

Vazquez, D.P. & Stevens, R.D. 2004. The latitudinal gradient in niche breadth: concepts and evidence. *Am. Nat.*

Testing the latitude-niche breadth hypothesis

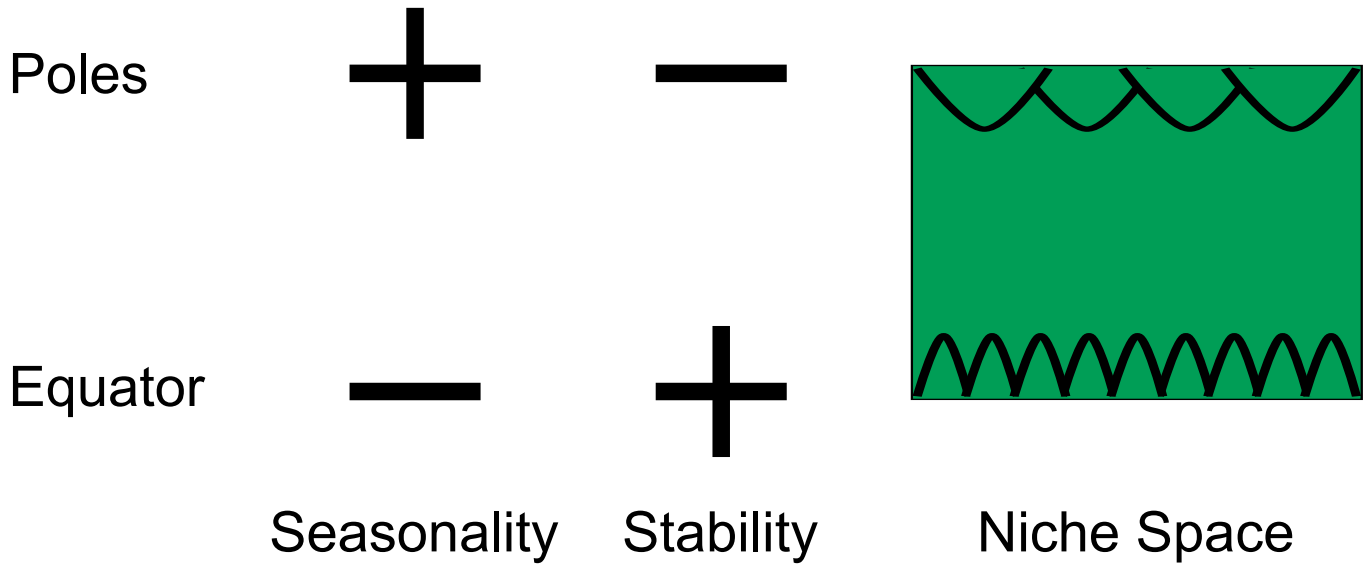
Latitude-niche breadth version 1



Vazquez, D.P. & Stevens, R.D. 2004. The latitudinal gradient in niche breadth: concepts and evidence. *Am. Nat.*

Testing the latitude-niche breadth hypothesis

Latitude-niche breadth version 1



Vazquez, D.P. & Stevens, R.D. 2004. The latitudinal gradient in niche breadth: concepts and evidence. *Am. Nat.*

Testing the latitude-niche breadth hypothesis

Latitude-niche breadth version 2

Poles —

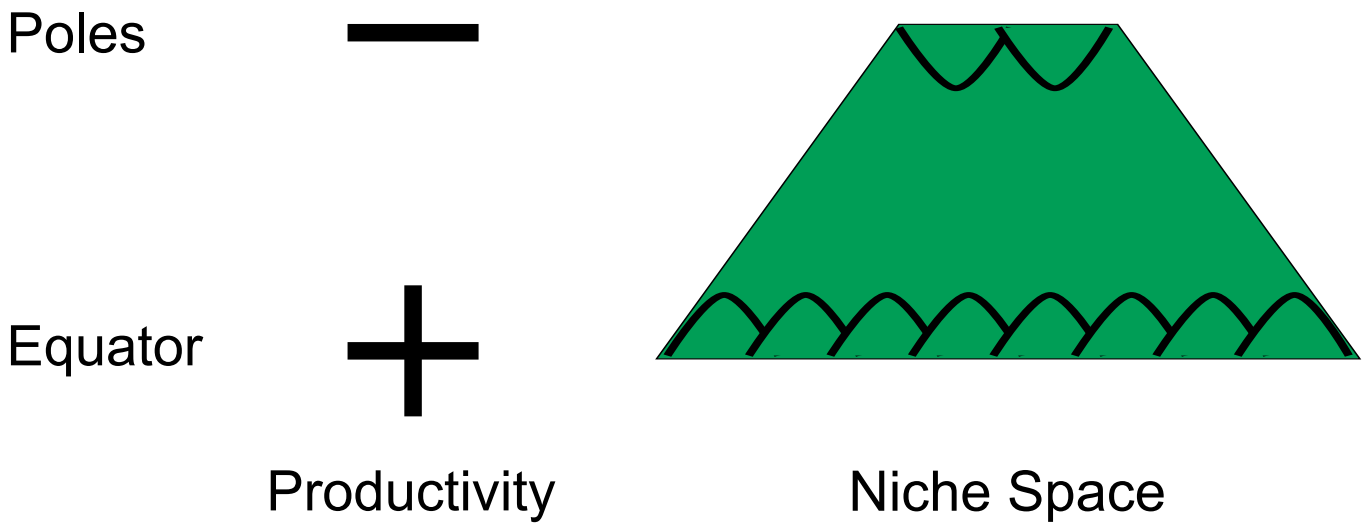
Equator +

Productivity

Davies *et. al.* 2007. Productivity alters the scale dependence of the diversity-invasibility relationship. *Ecology.*

Testing the latitude-niche breadth hypothesis

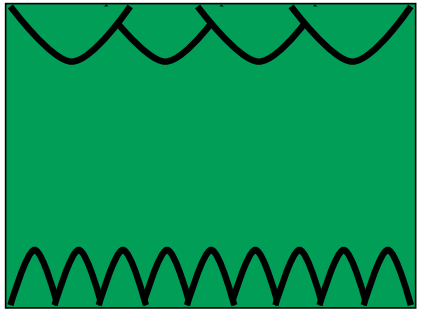
Latitude-niche breadth version 2



Davies *et. al.* 2007. Productivity alters the scale dependence of the diversity-invasibility relationship. *Ecology.*

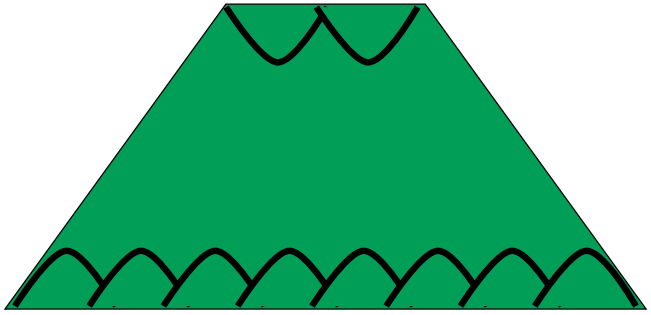
Testing the latitude-niche breadth hypothesis

Version 1



Greater specialisation
in the tropics

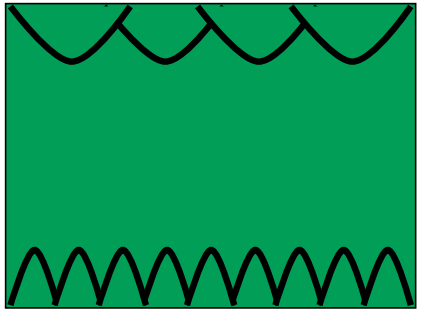
Version 2



Similar specialisation
at all latitudes

Testing the latitude-niche breadth hypothesis

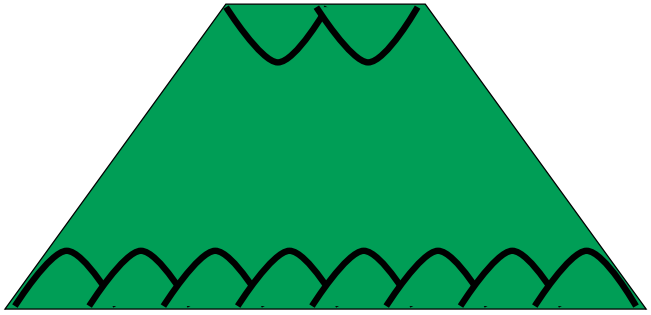
Version 1



Greater specialisation
in the tropics

Fewer prey per species
in the tropics

Version 2

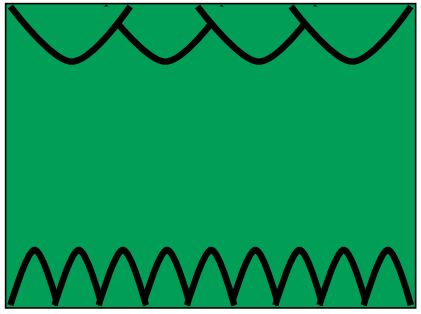


Similar specialisation
at all latitudes

Equal prey per species
at all latitudes

Testing the latitude-niche breadth hypothesis

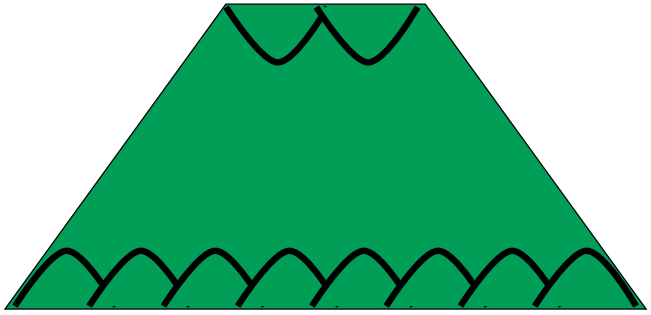
Version 1



Greater specialisation
in the tropics

Lower generality
in the tropics

Version 2



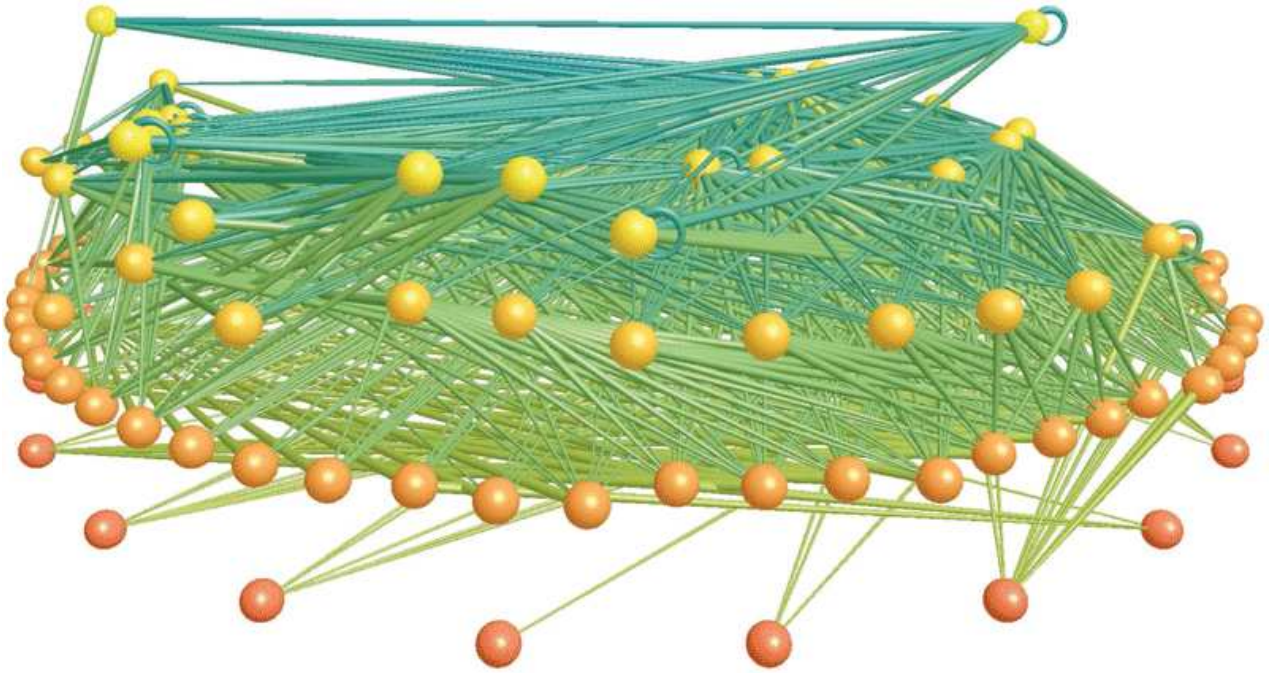
Similar specialisation
at all latitudes

Equal generality
at all latitudes

Generality : mean number of prey per species

Does niche breadth vary with latitude?

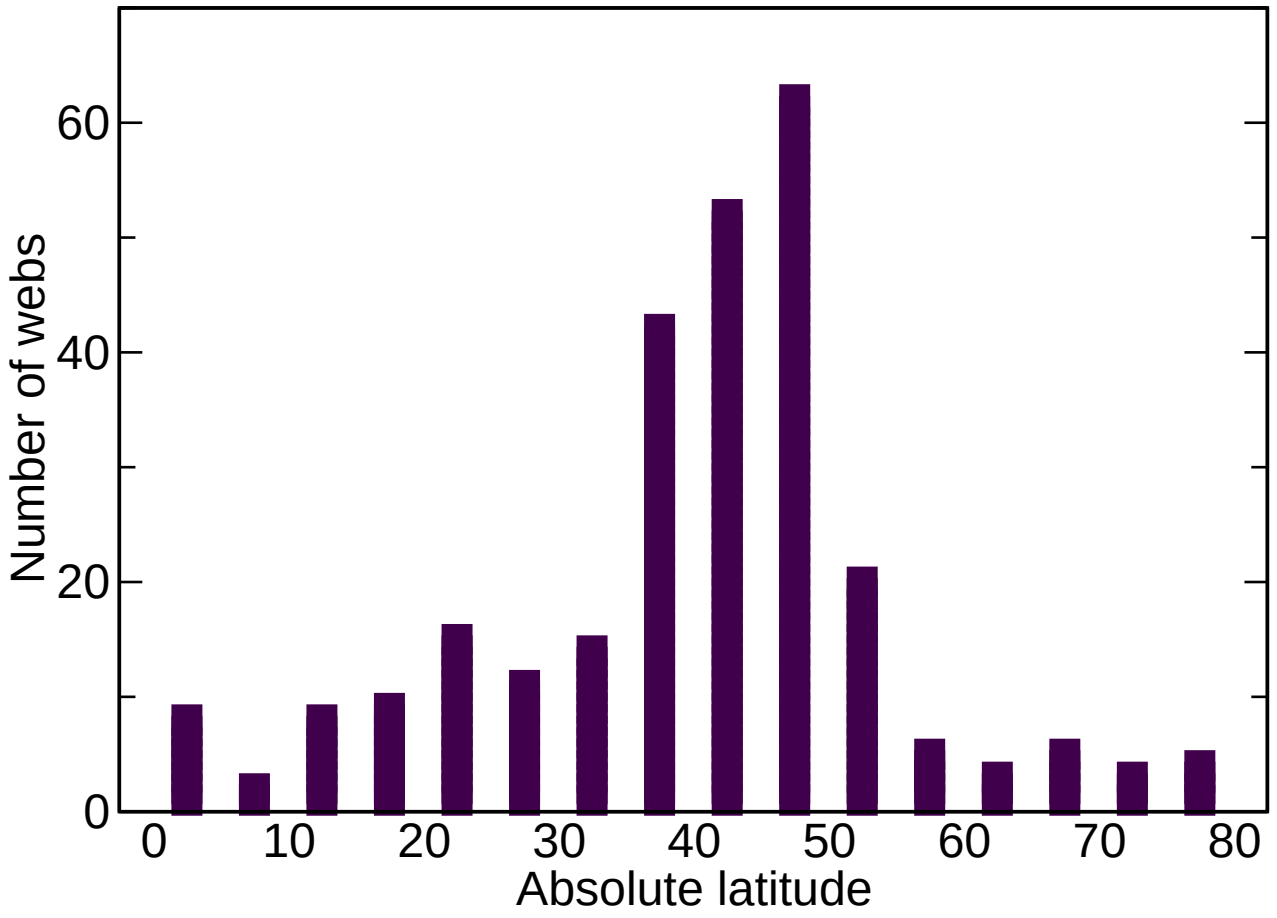
Dataset



195 food webs
5-188 species

Does niche breadth vary with latitude?

Dataset



Does niche breadth vary with latitude?

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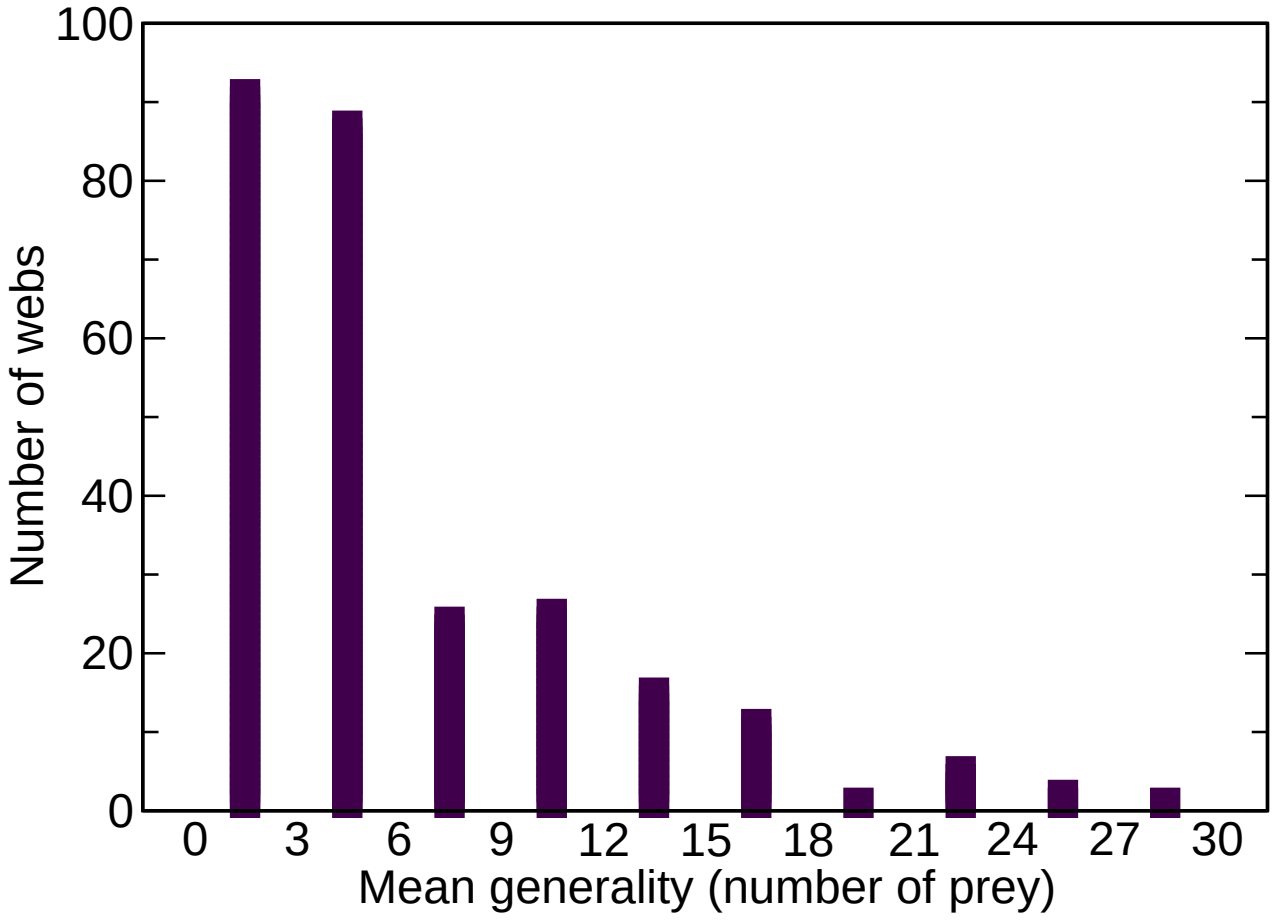
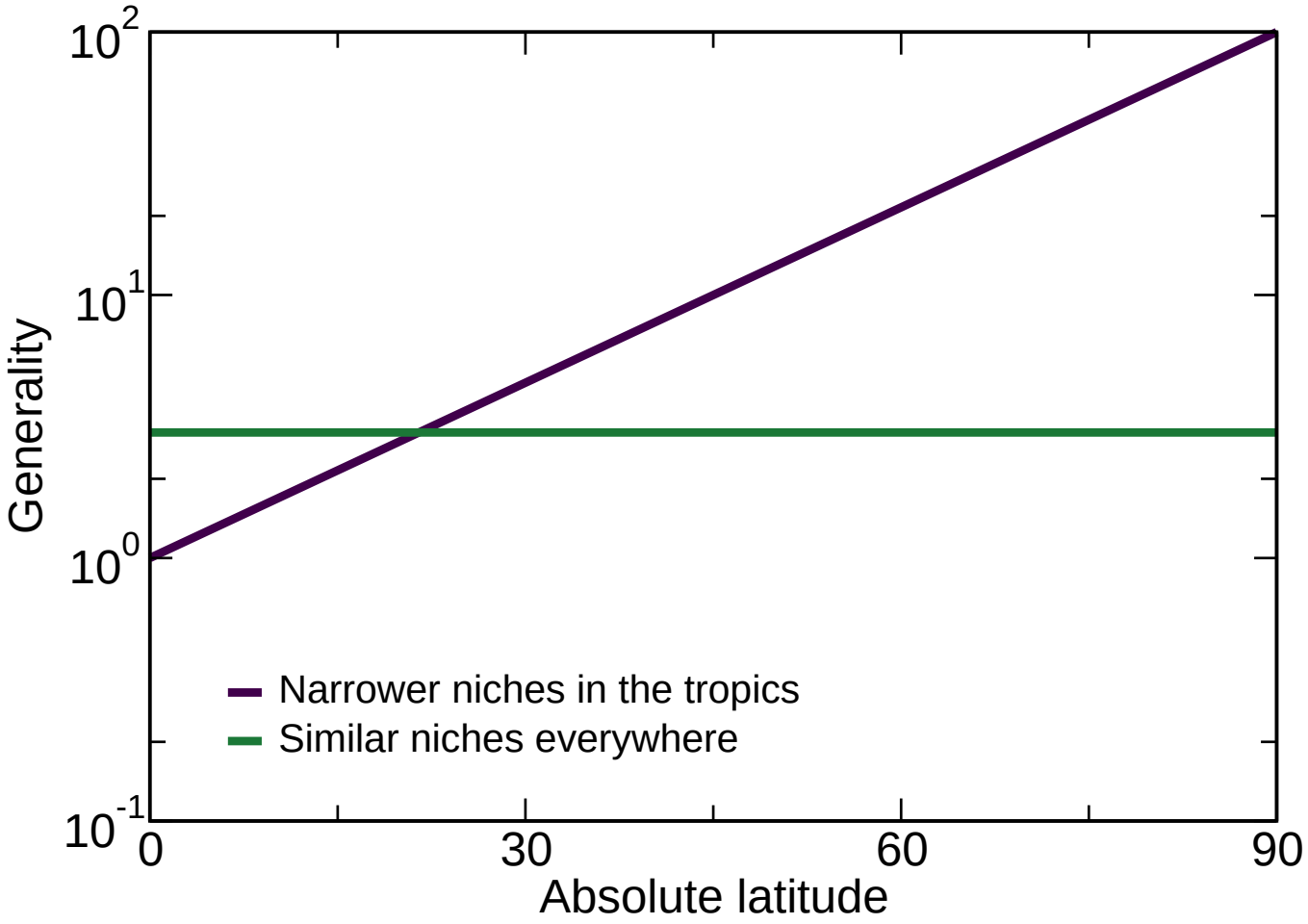
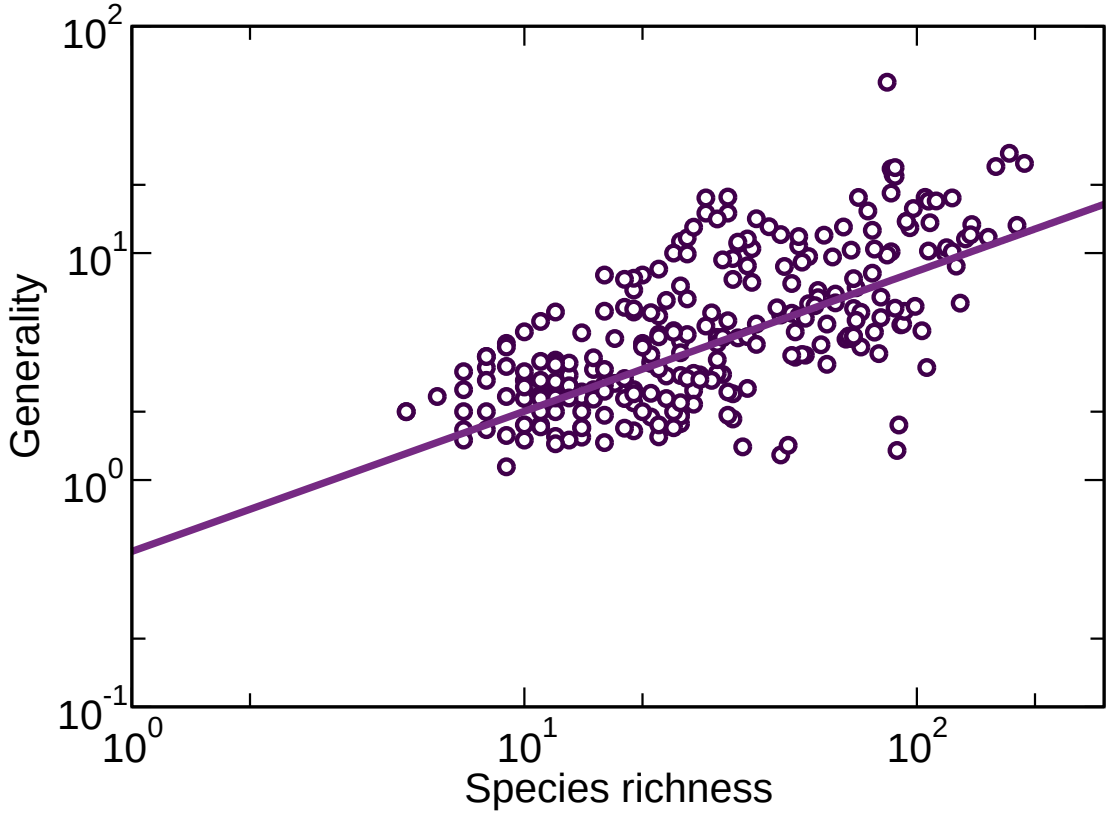


Does niche breadth vary with latitude?

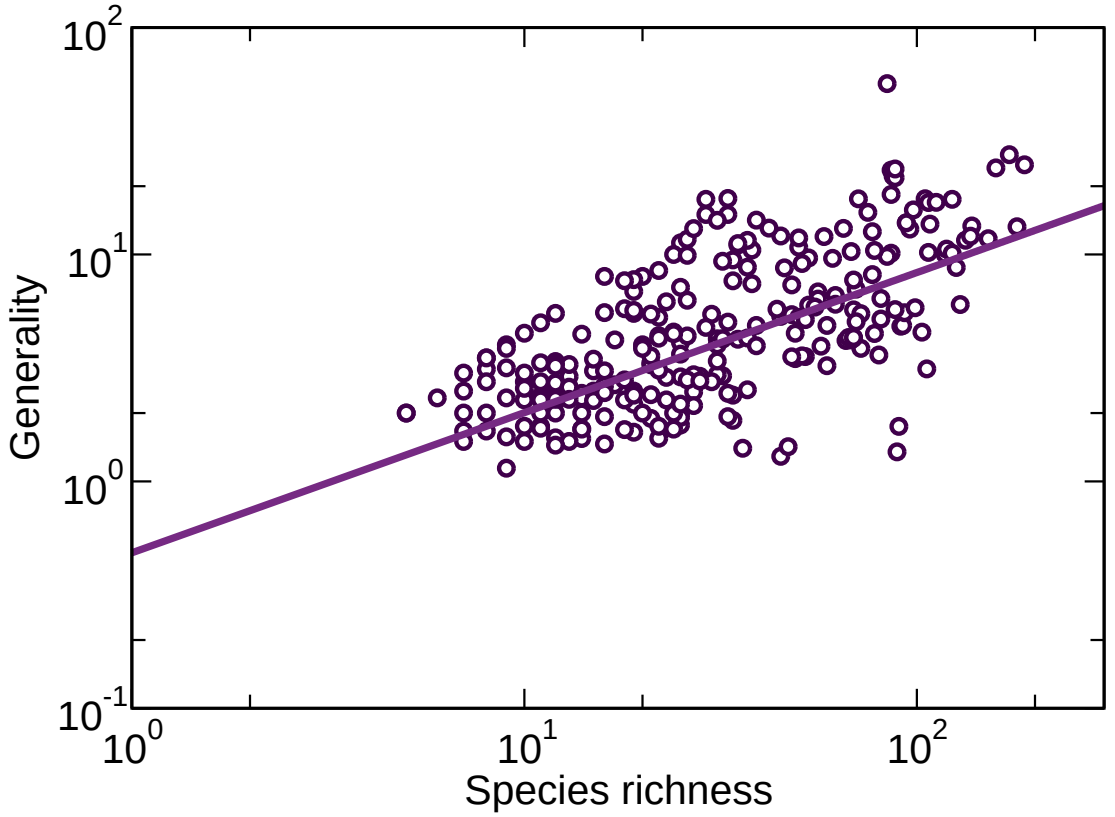


Niche breadth scales with species richness



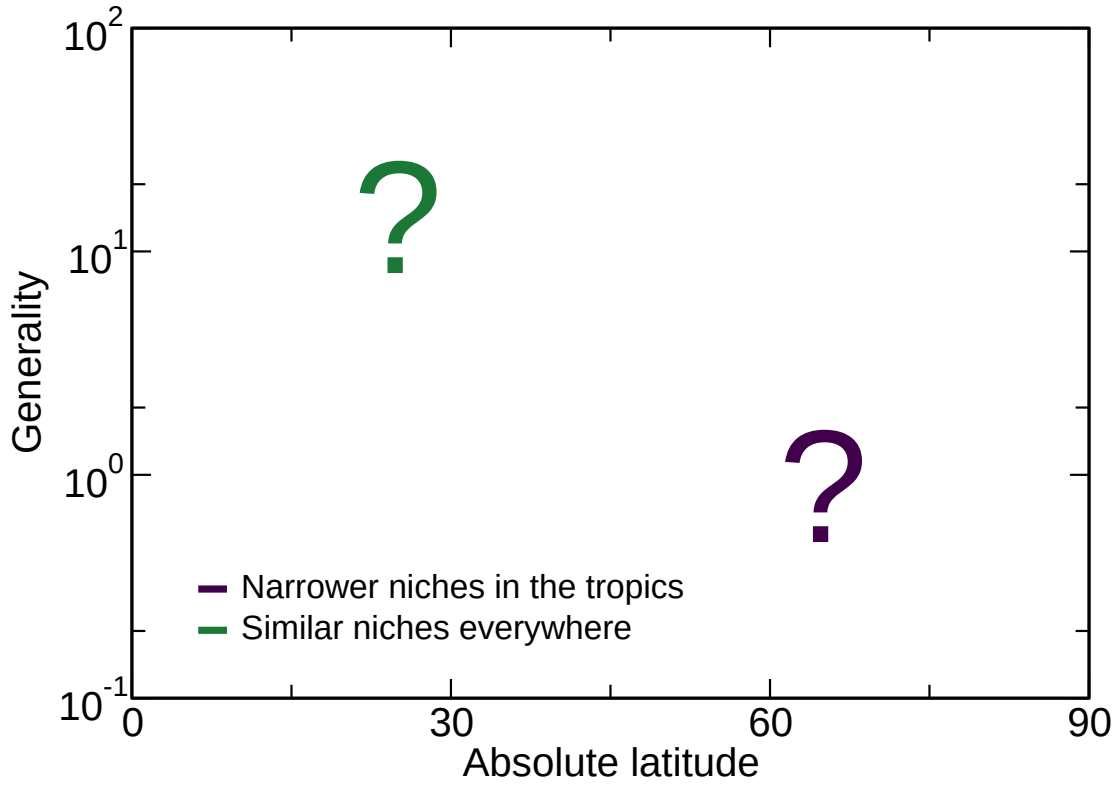
$$G \approx aS^{b}$$

Niche breadth scales with species richness



$$\log(G) \approx b \log(a) \log(S)$$

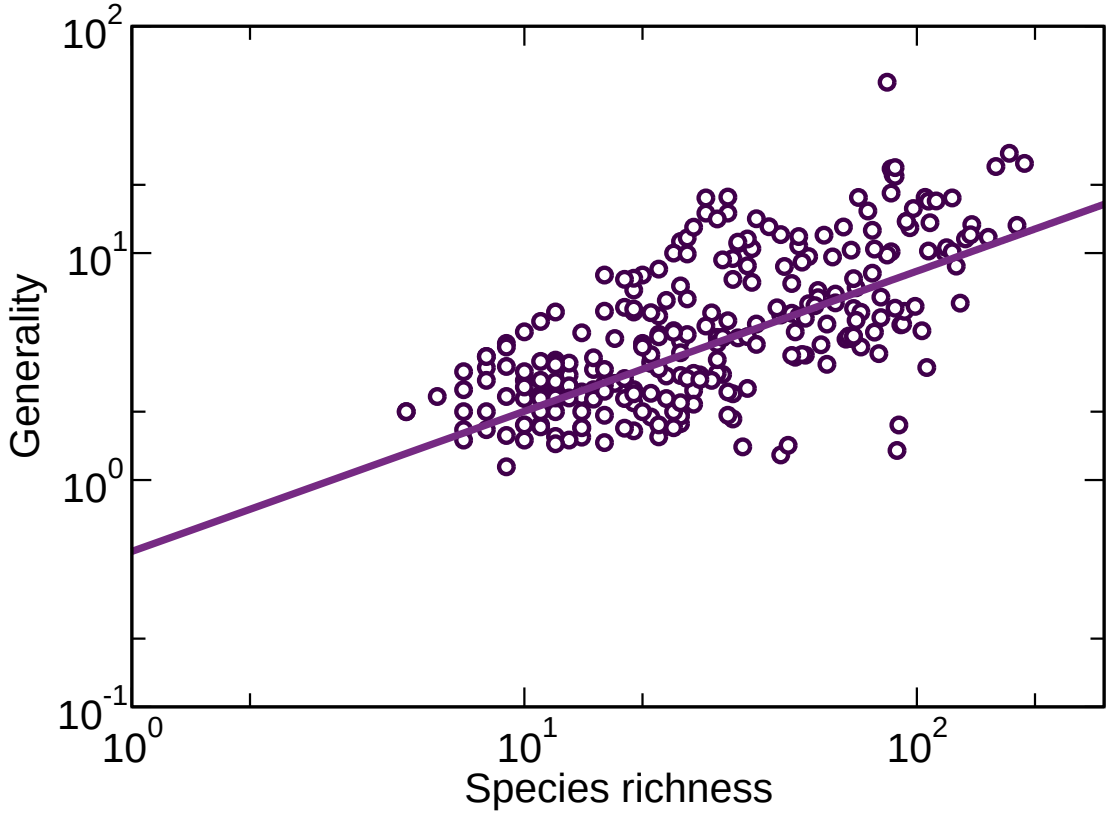
Niche breadth scales with species richness



$G \approx aS^b$

$S \approx Latitude$

Does latitude affect scaling of niche breadth?



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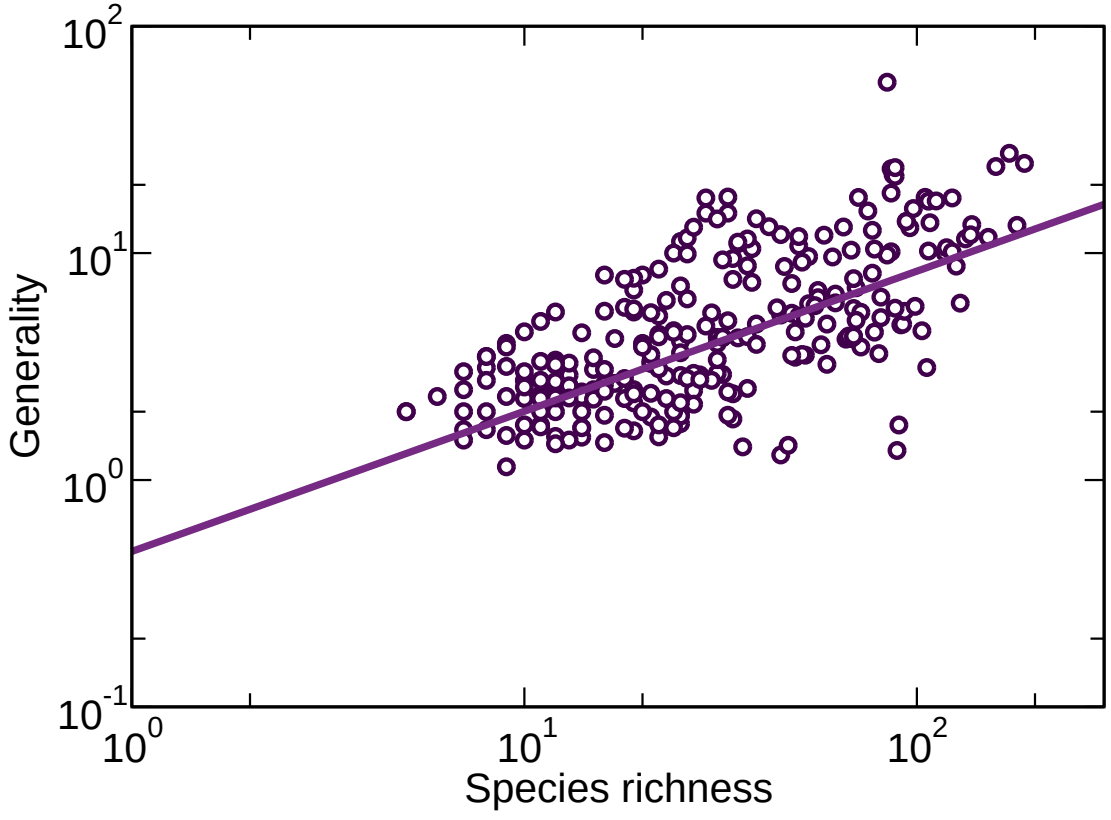

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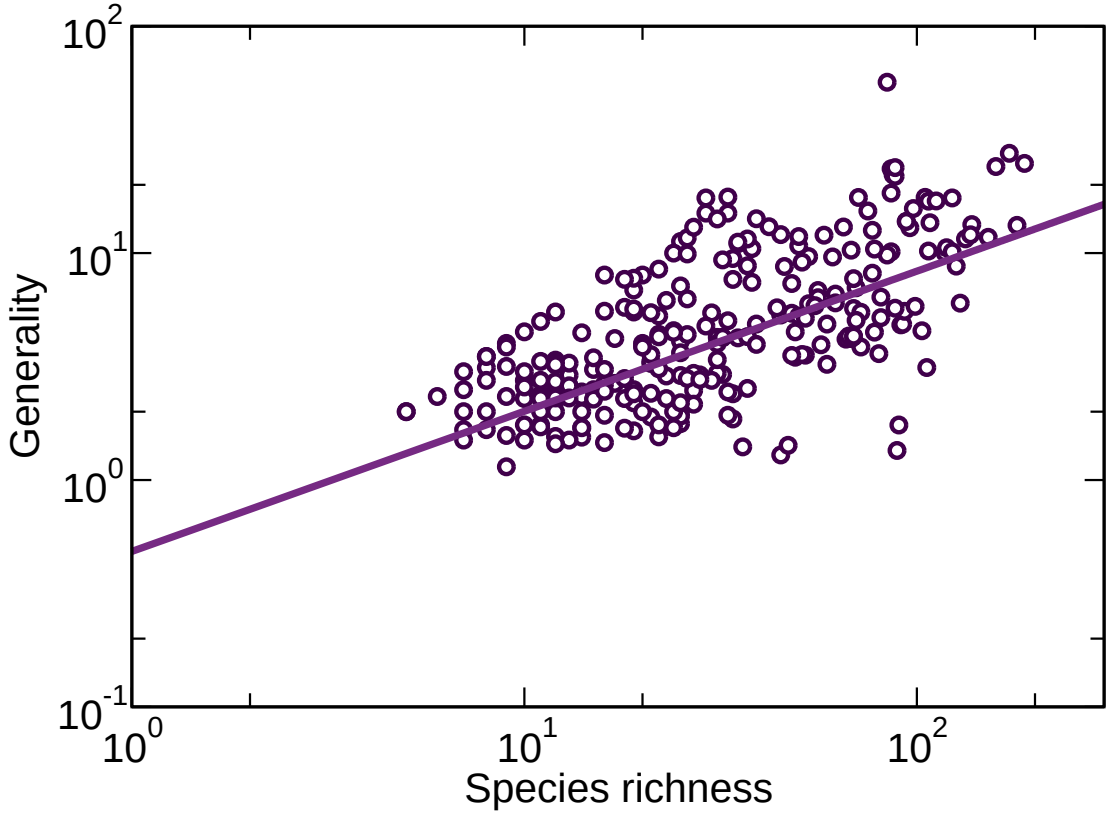
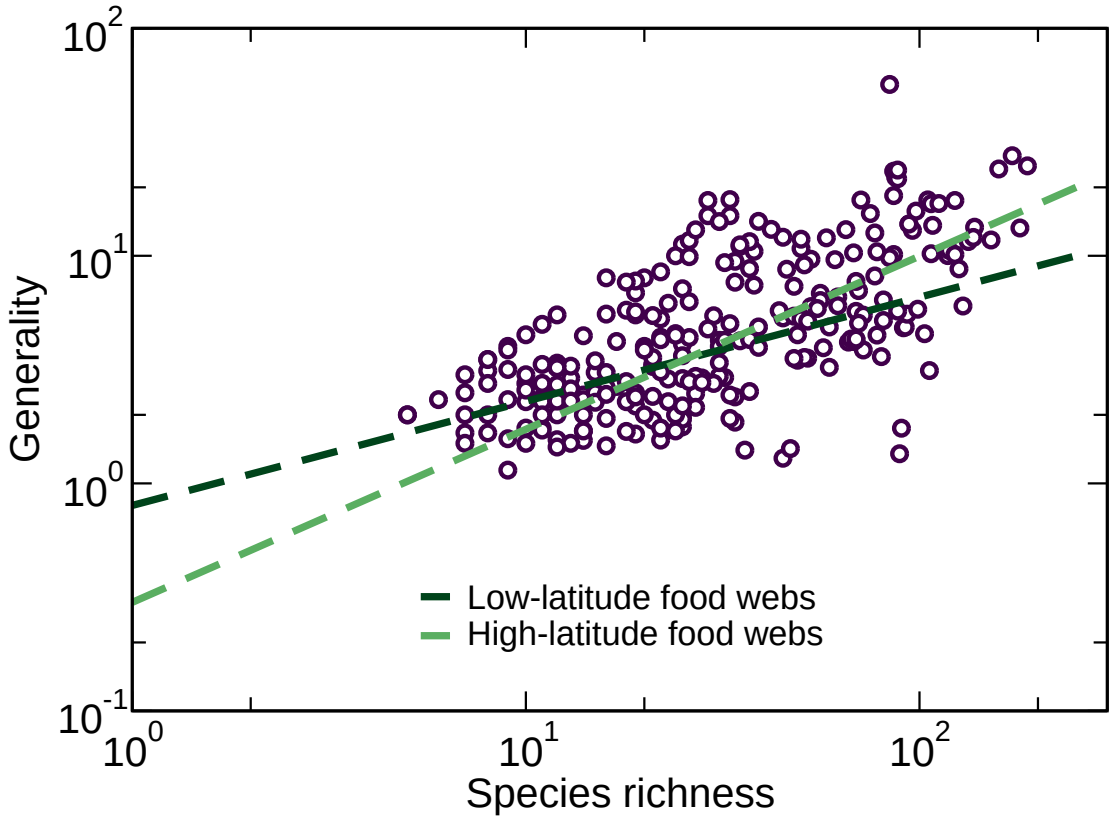


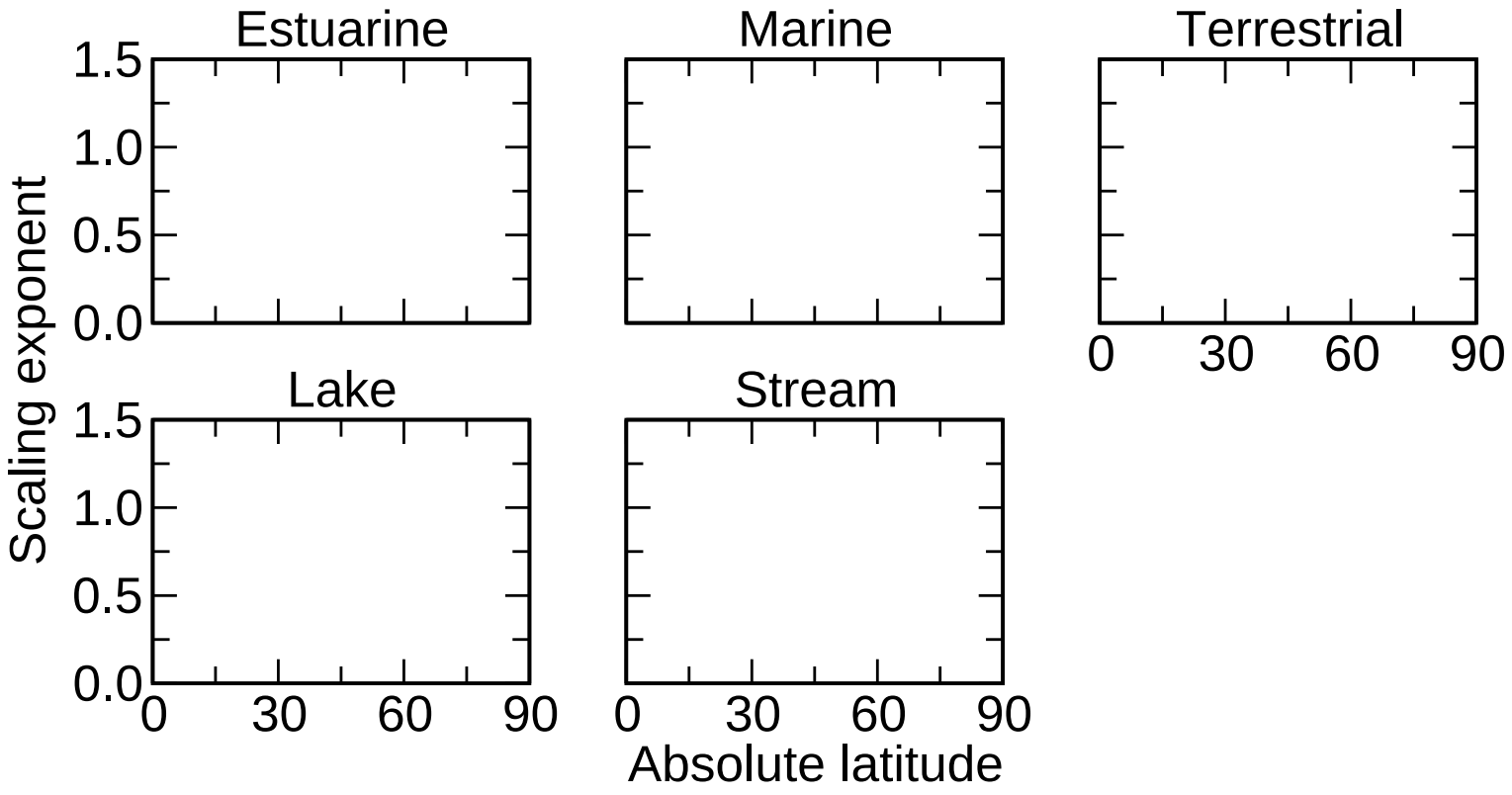
$$G \approx aS^{b_0 + b_1 Latitude}$$

Does latitude affect scaling of niche breadth?



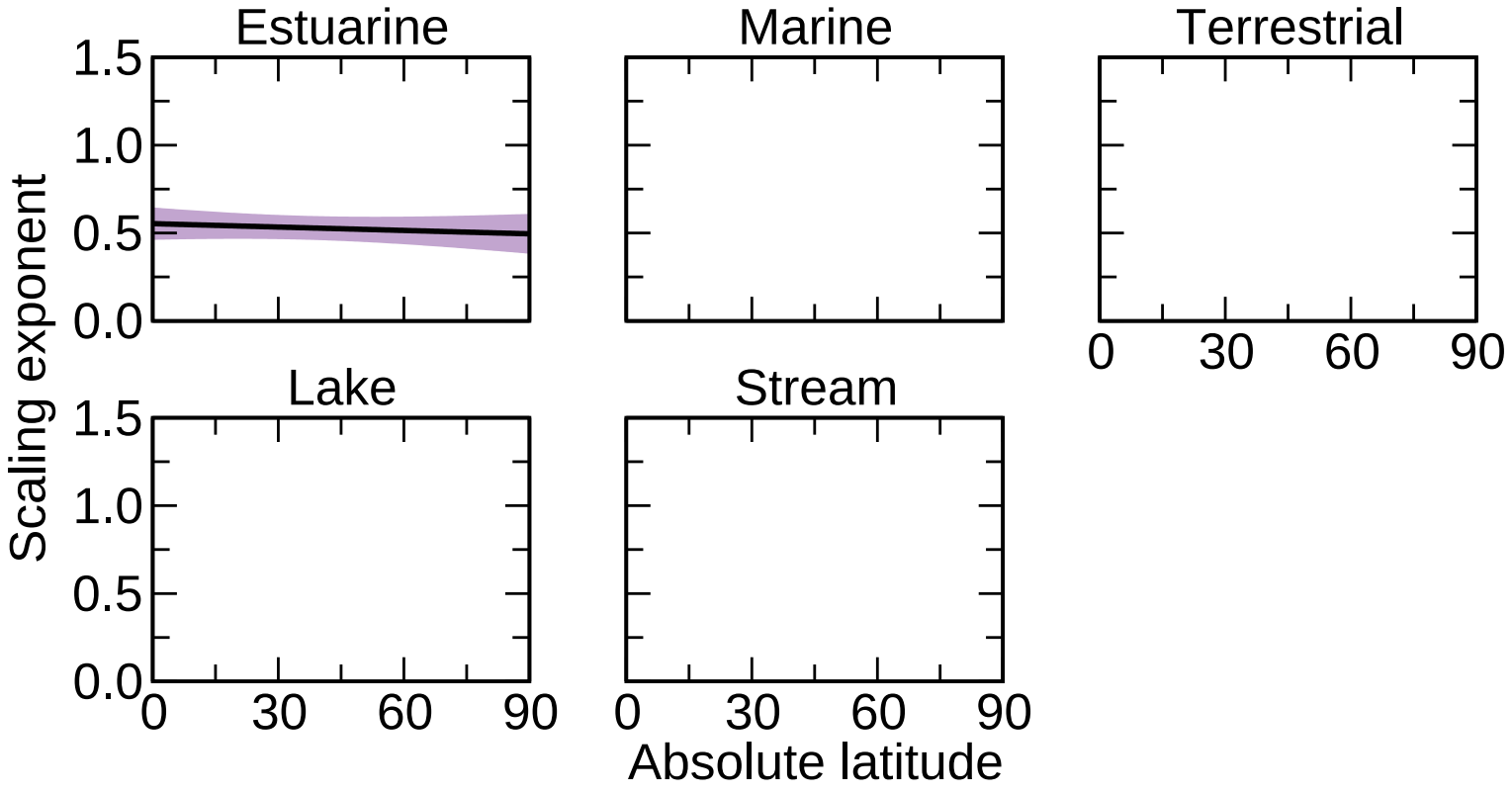
$$G \approx aS^{b_0 + b_1 Latitude}$$

Does latitude affect scaling of niche breadth?



$$G \approx aS^{b_0 + b_1 Latitude}$$

Does latitude affect scaling?



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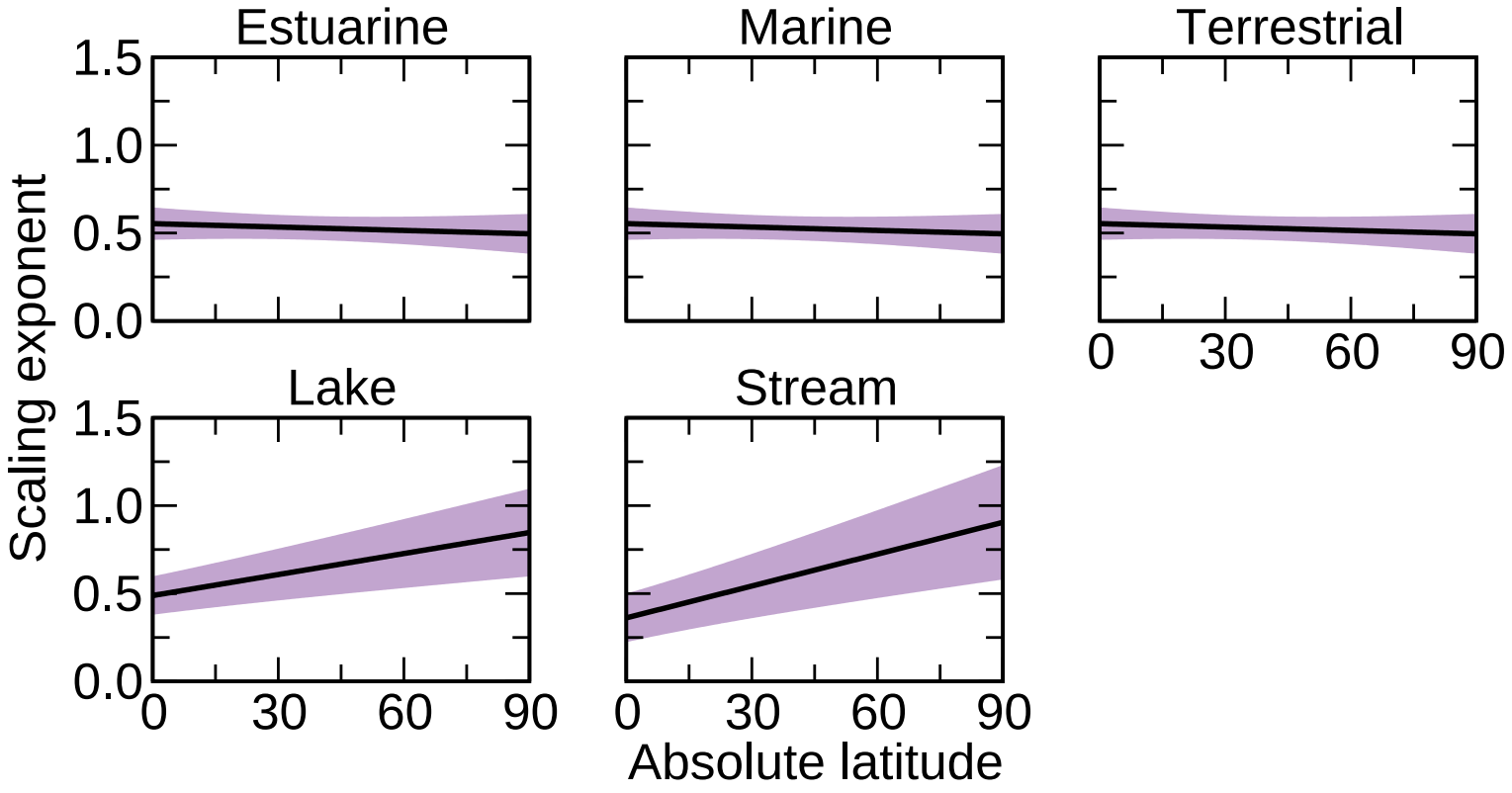
Does latitude affect scaling?



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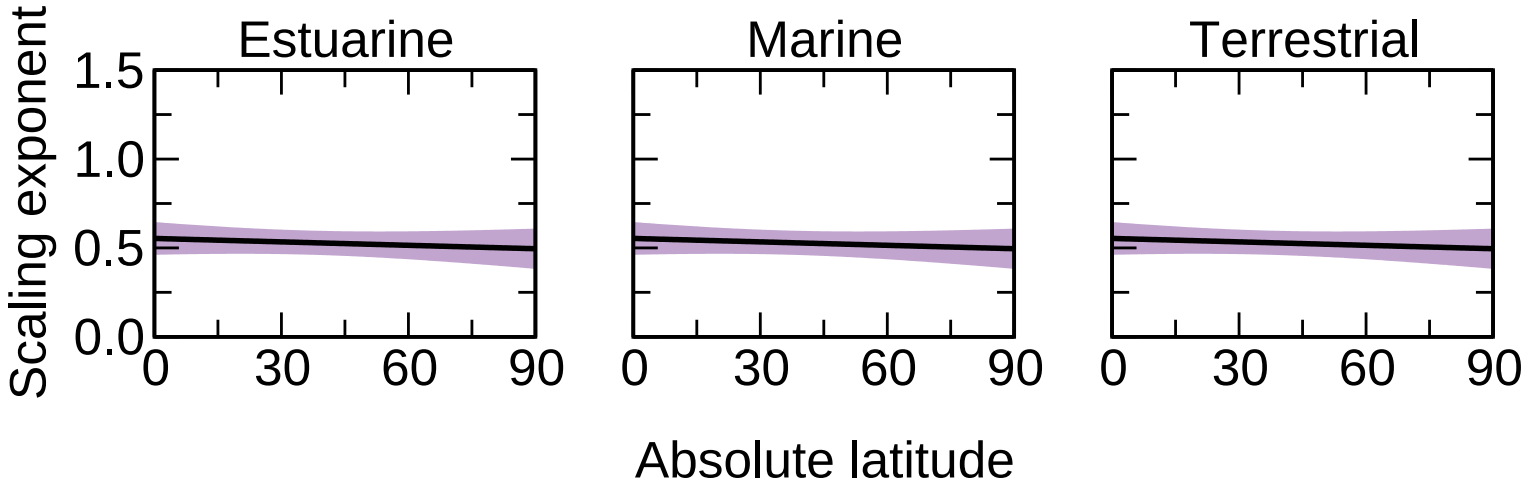
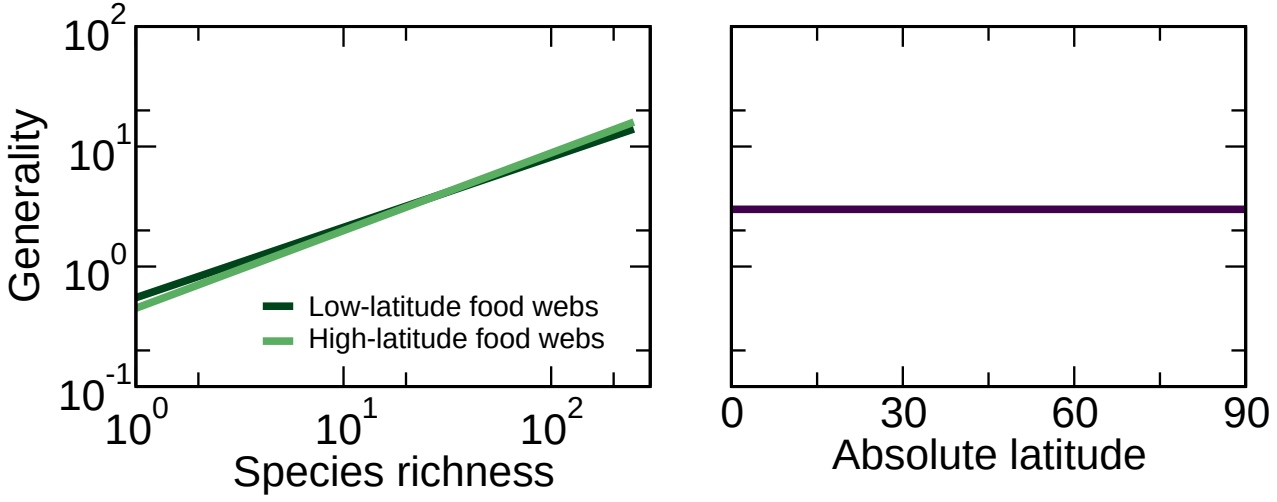
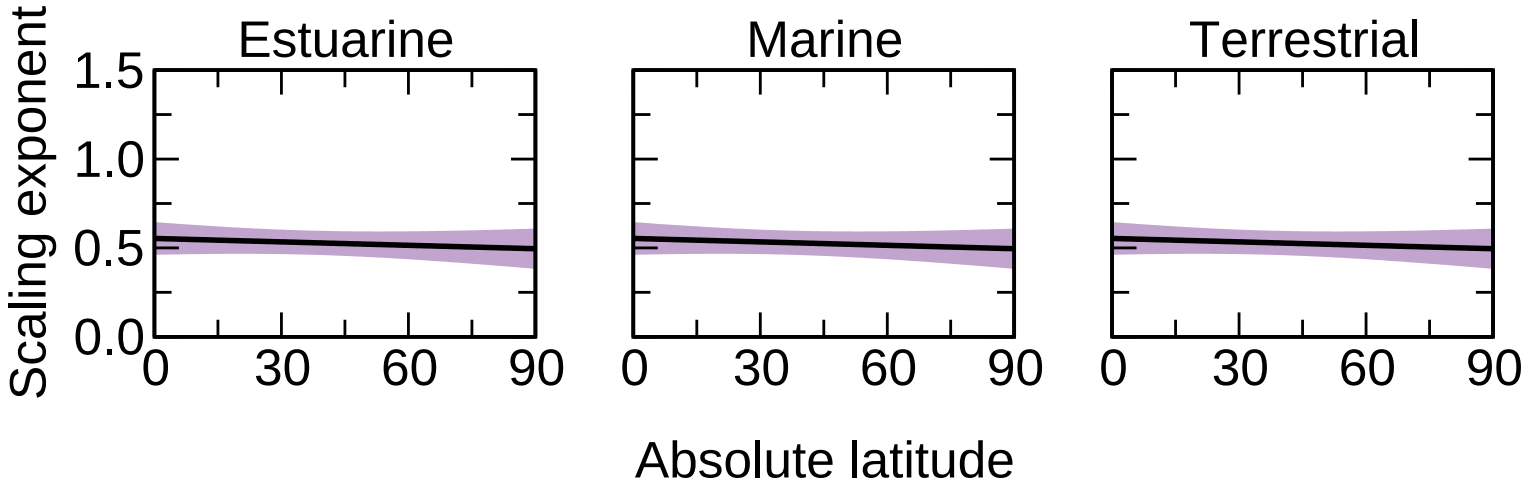
Estuarine, Marine, & Terrestrial Food Webs

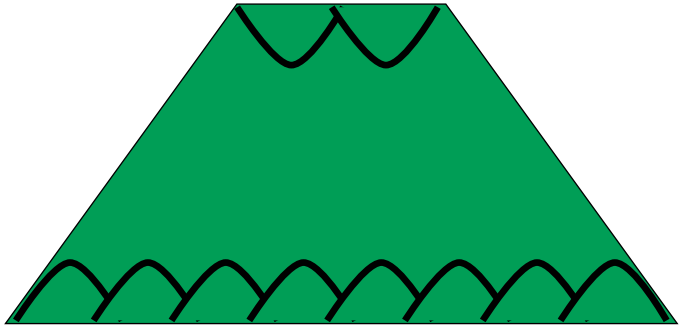




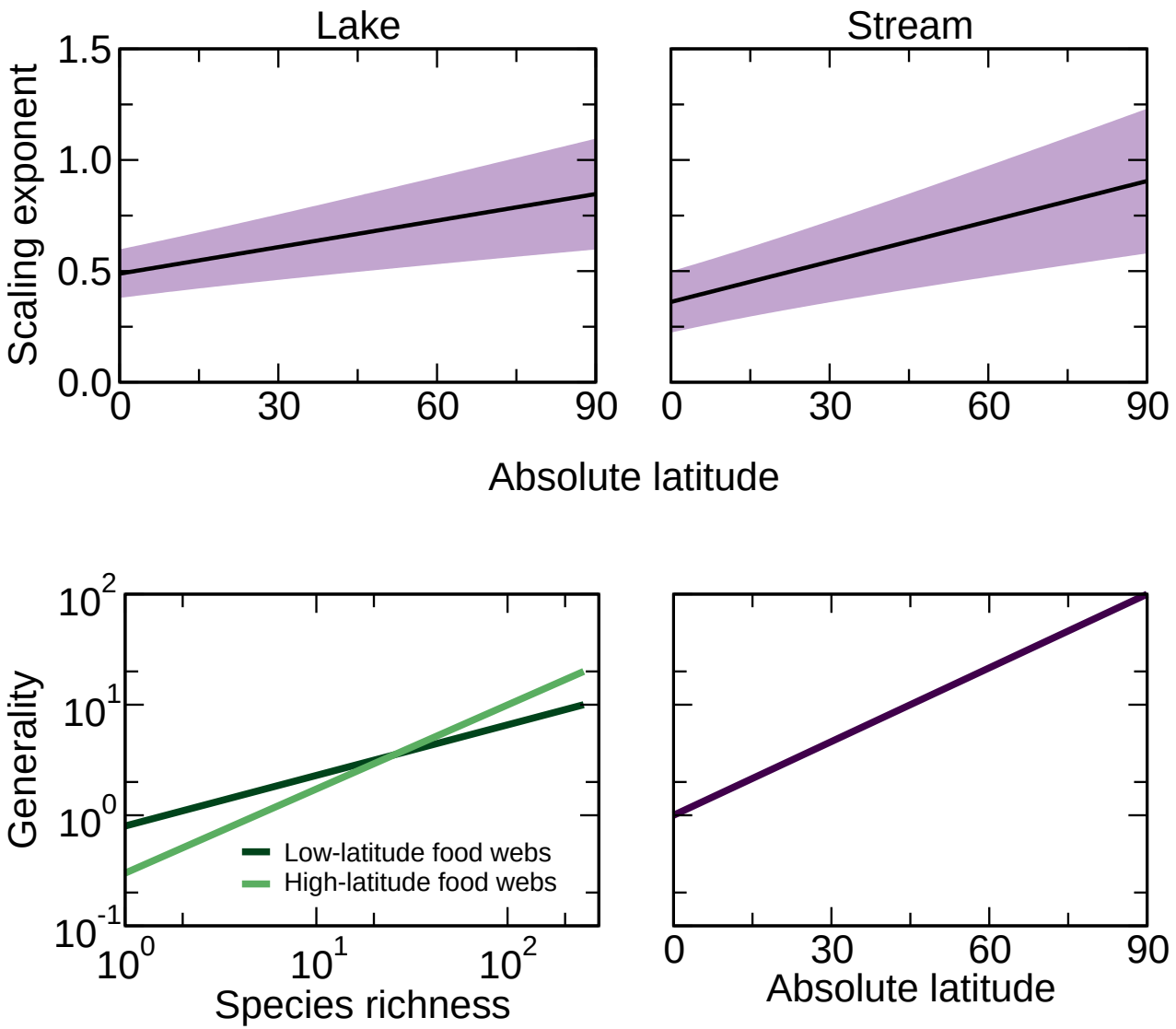
Estuarine, Marine, & Terrestrial Food Webs



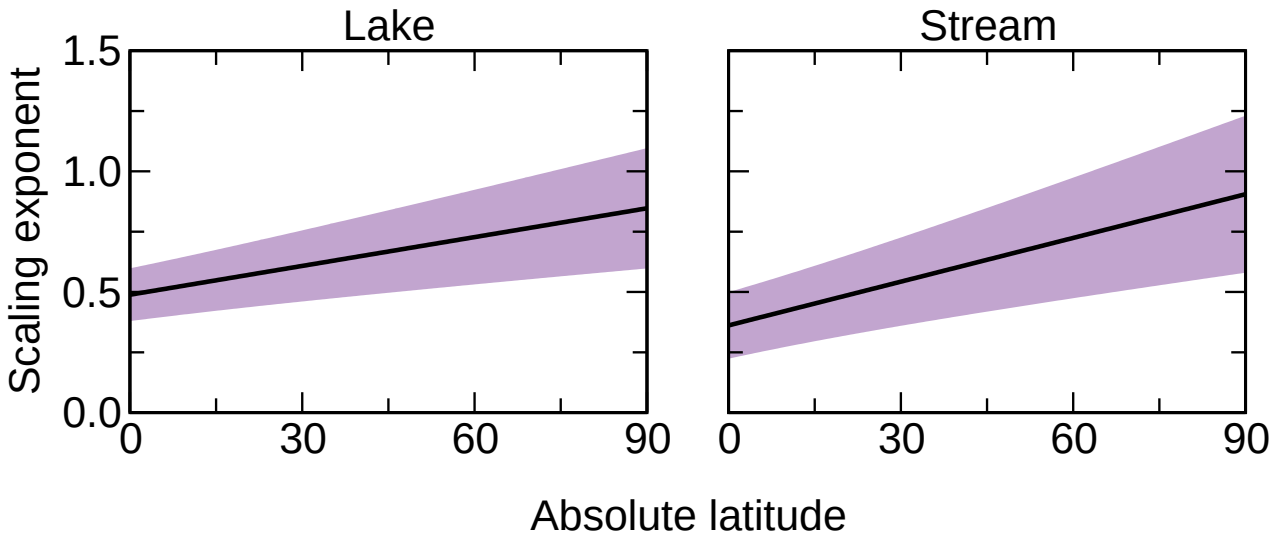
Version 2



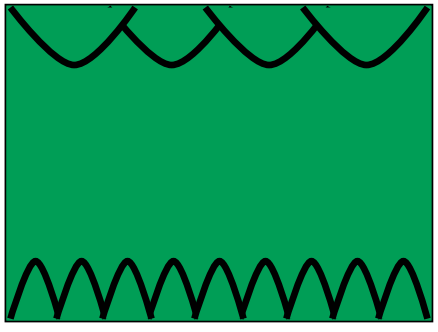
Lake & Stream Food Webs



Lake & Stream Food Webs

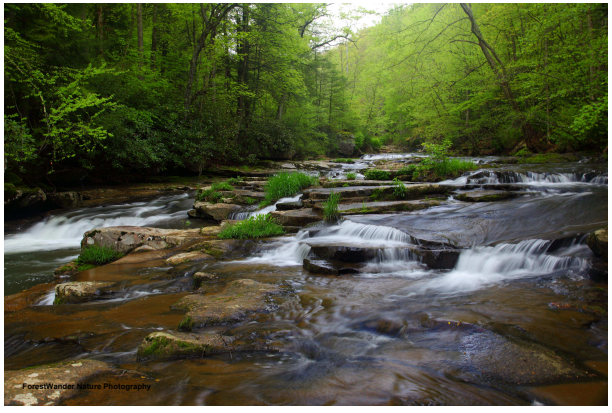


Version 1



How do lakes and streams differ

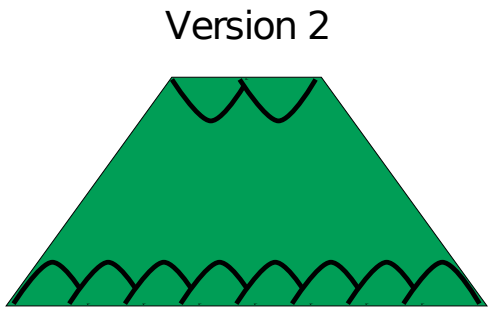
from estuarine & marine food webs?



Evidence for the latitude-niche breadth hypothesis

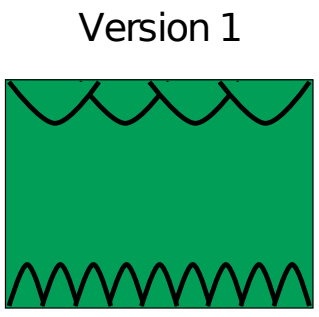
Estuarine, marine, & terrestrial webs

- Broader niche space in the tropics
- Similar specialisation everywhere



Lake & stream webs

- Narrower niches in the tropics
- Specialisation due to stability?



Acknowledgements

Daniel B. Stouffer
& his lab

Tamara N. Romanuk
& her lab

Angus McIntosh
Matthias Schleuning

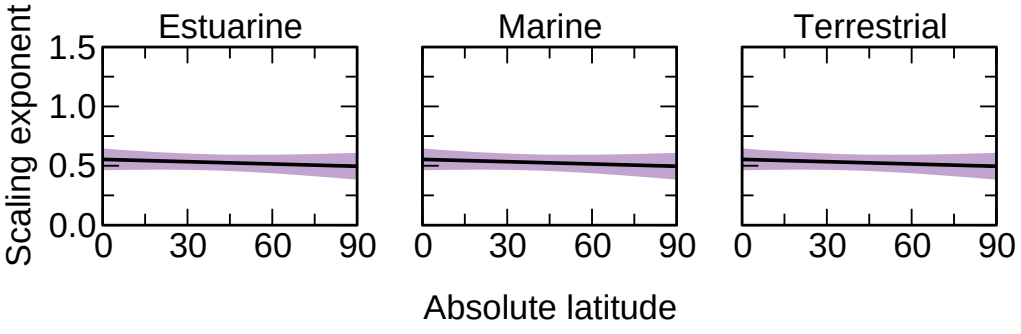
MARSDEN FUND
TE PŪTEA RANGAHAU
A MARSDEN

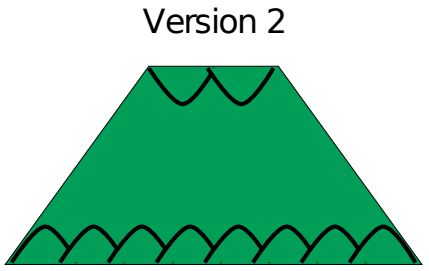
NSERC
CRSNG

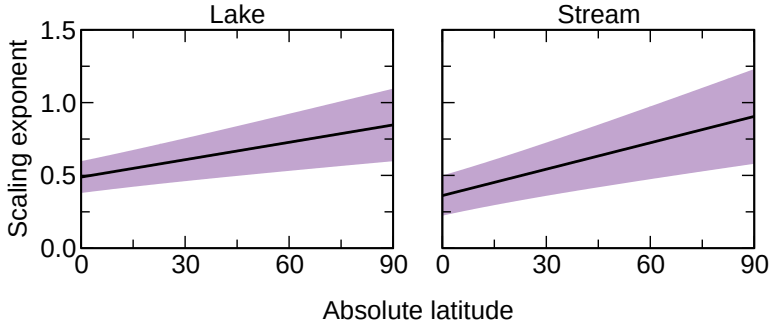
DALHOUSIE
UNIVERSITY

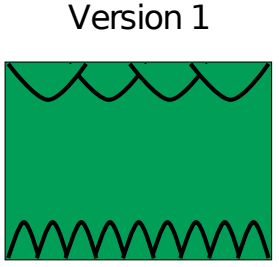
UC
UNIVERSITY OF
CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

Evidence for the latitude-niche breadth hypothesis









$$G \approx aS^{b_0 + b_1 Latitude}$$