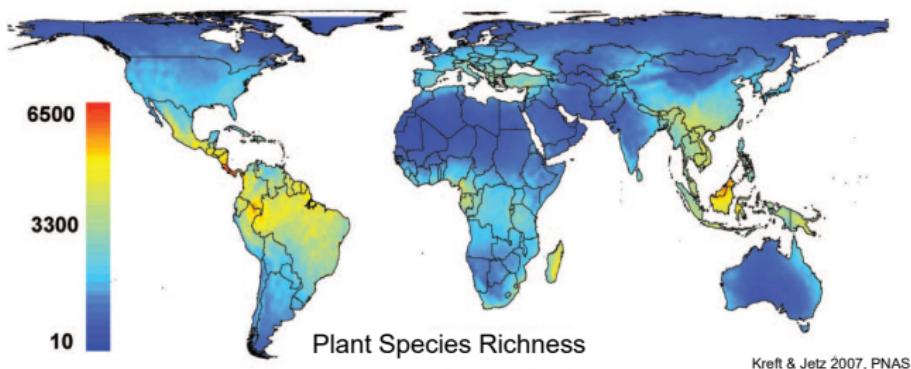


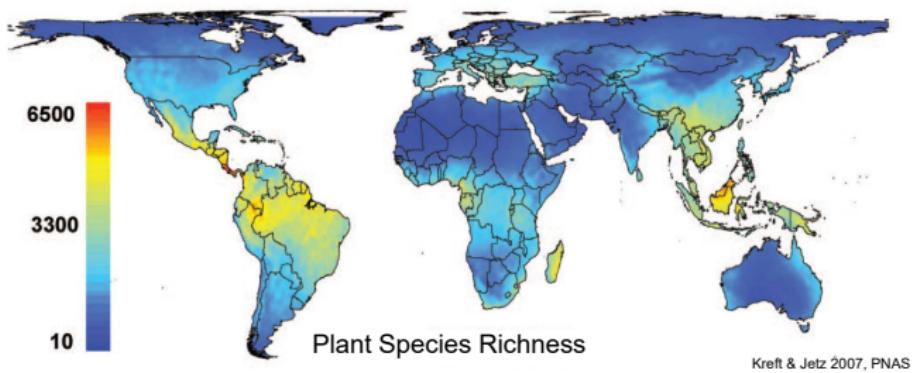
Testing the latitude-niche breadth hypothesis



Alyssa R. Cirtwill
Daniel B. Stouffer & Tamara N. Romanuk

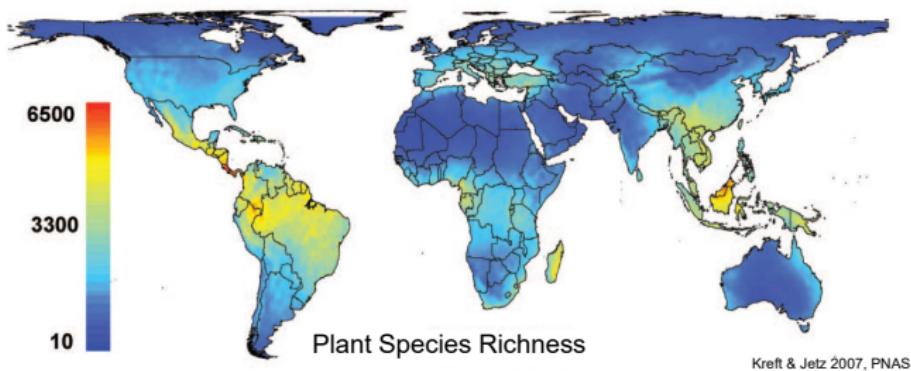
23 October 2015 | ABC 2015

Testing the latitude-niche breadth hypothesis



Many groups are more diverse in the tropics

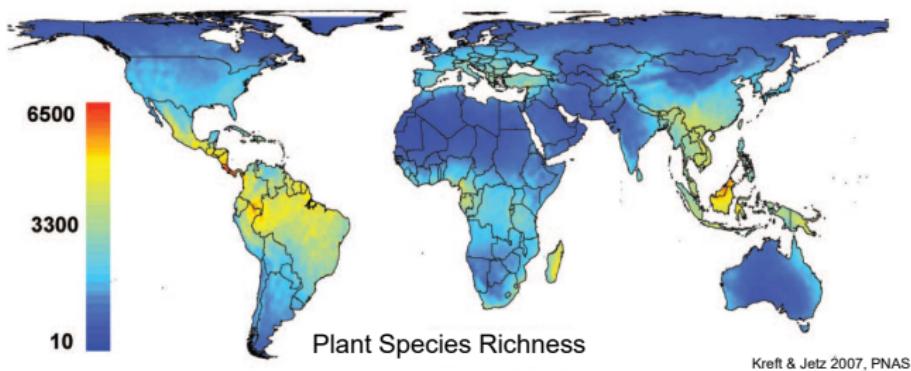
Testing the latitude-niche breadth hypothesis



Many groups are more diverse in the tropics

How?

Testing the latitude-niche breadth hypothesis



Many groups are more diverse in the tropics

Environmental stability? Productivity?

Testing the latitude-niche breadth hypothesis

Latitude-niche breadth version 1

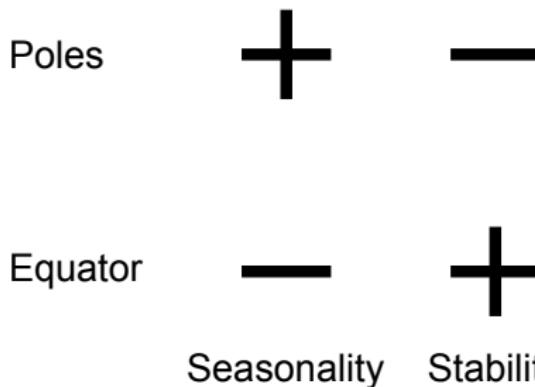


Seasonality

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

Testing the latitude-niche breadth hypothesis

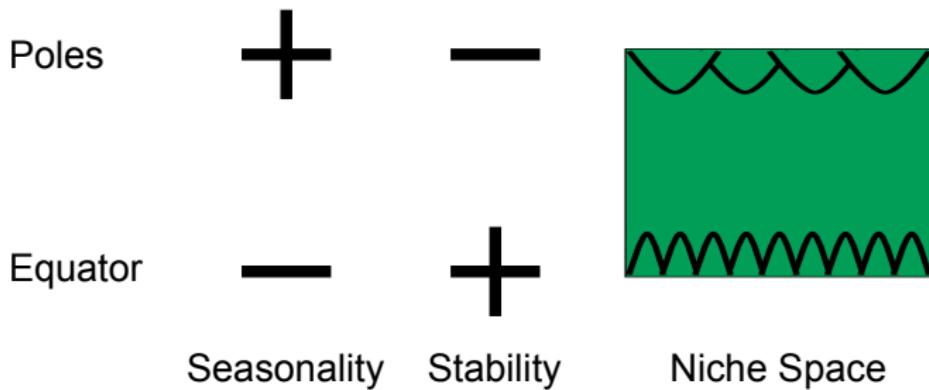
Latitude-niche breadth version 1



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 —

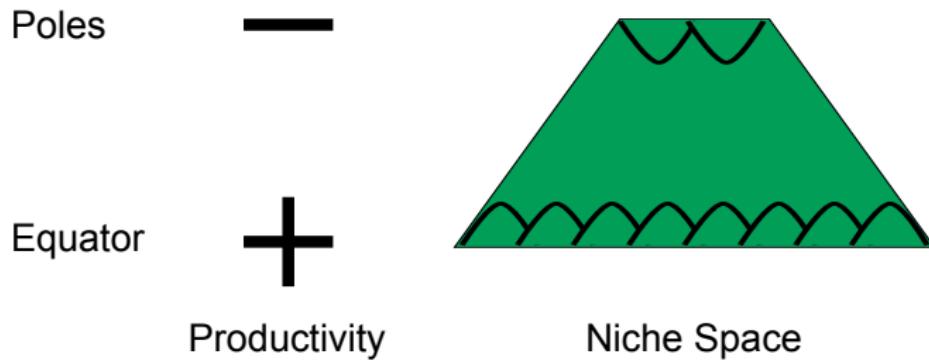
Equator +

Productivity

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

Testing the latitude-niche breadth hypothesis

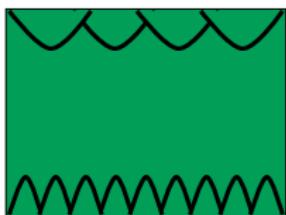
Latitude-niche breadth version 2



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

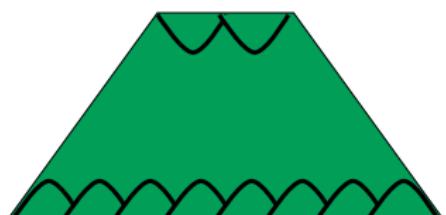
Testing the latitude-niche breadth hypothesis

Version 1



Greater specialisation
in the tropics

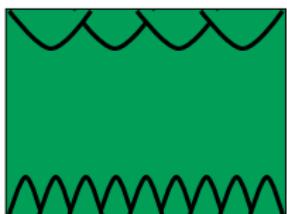
Version 2



Similar specialisation
at all latitudes

Testing the latitude-niche breadth hypothesis

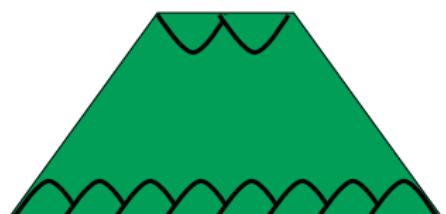
Version 1



Greater specialisation
in the tropics

Fewer prey per species
in the tropics

Version 2

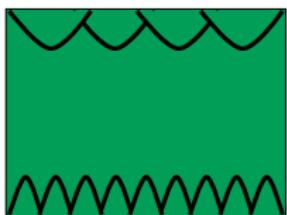


Similar specialisation
at all latitudes

Equal prey per species
at all latitudes

Testing the latitude-niche breadth hypothesis

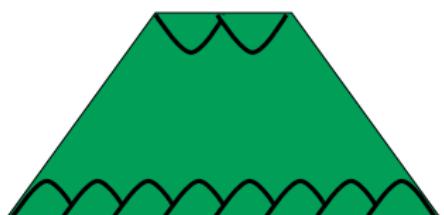
Version 1



Greater specialisation
in the tropics

Lower generality
in the tropics

Version 2



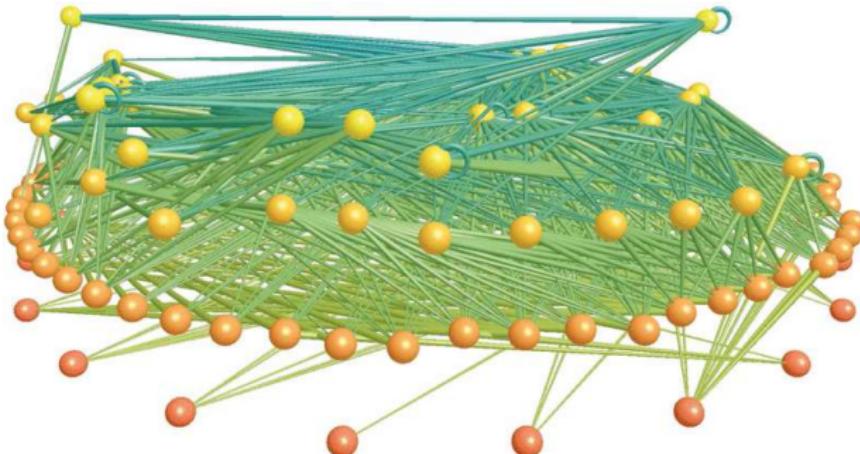
Similar specialisation
at all latitudes

Equal generality
at all latitudes

Generality : mean number of prey per species

Does niche breadth vary with latitude?

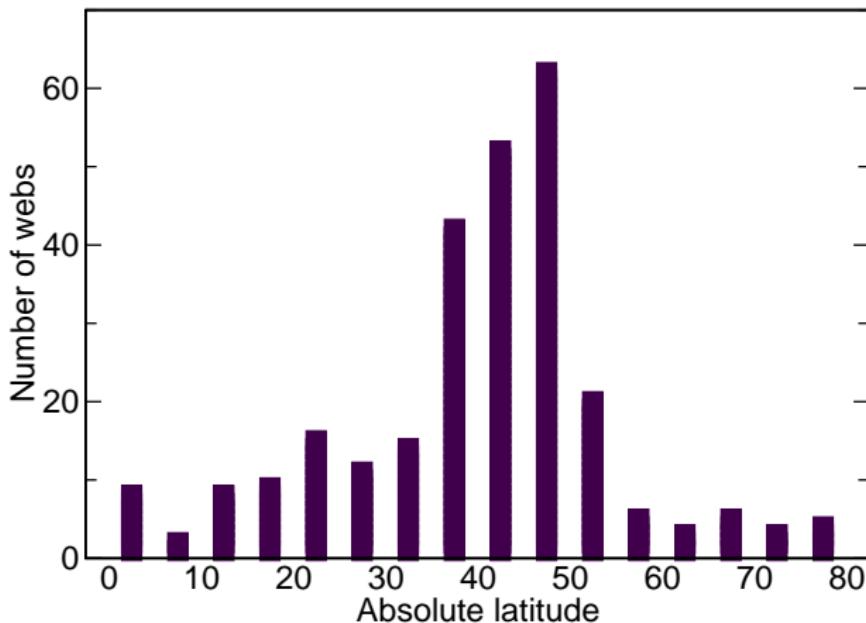
Dataset



195 food webs
5-188 species

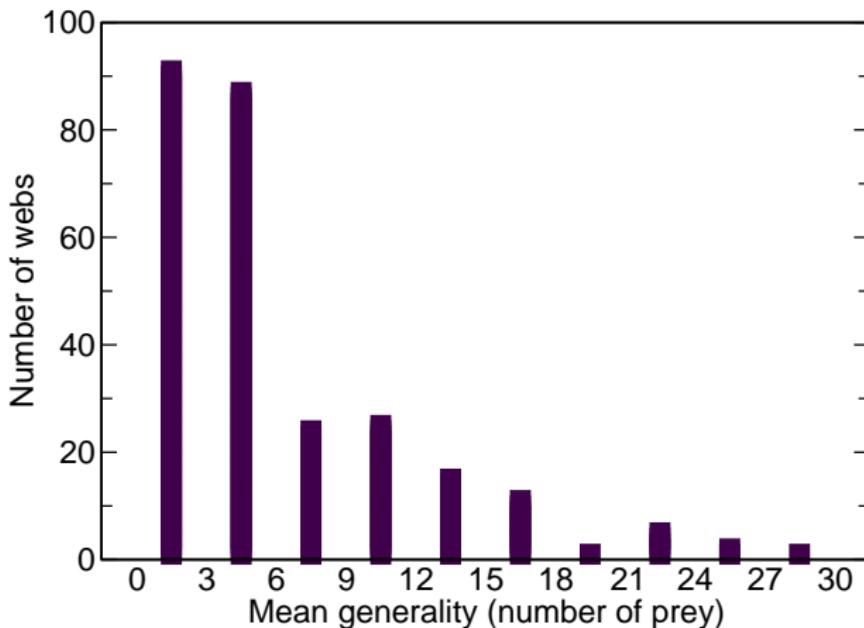
Does niche breadth vary with latitude?

Dataset

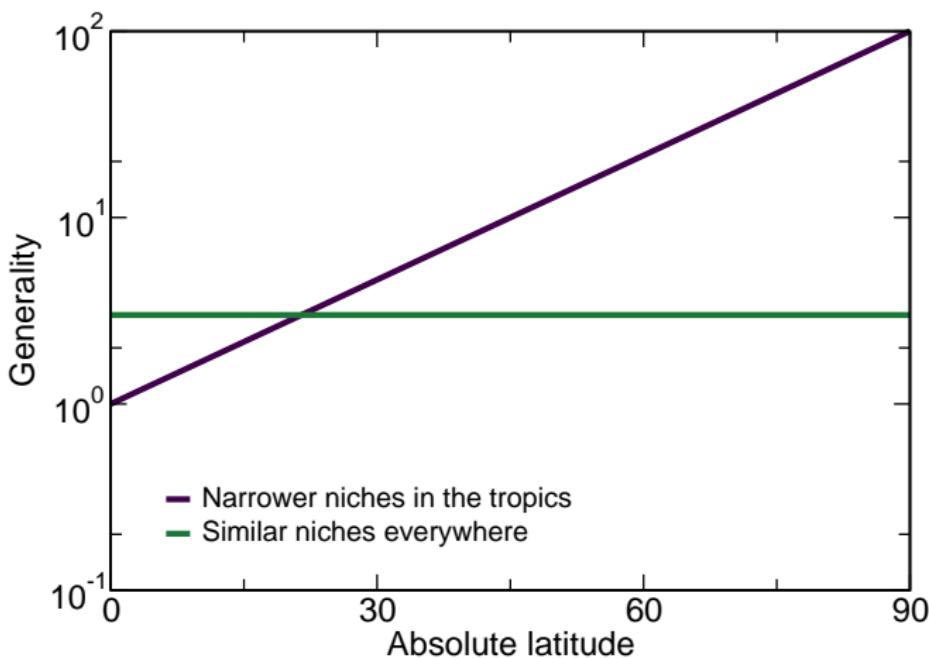


Does niche breadth vary with latitude?

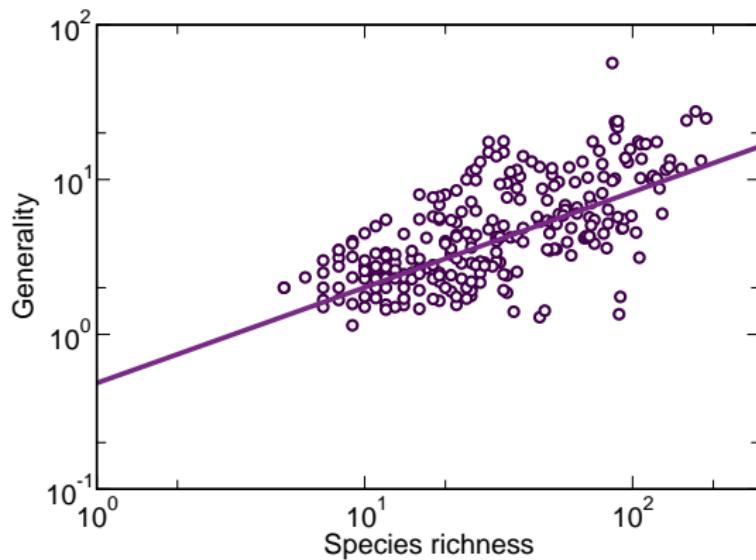
Dataset



Does niche breadth vary with latitude?

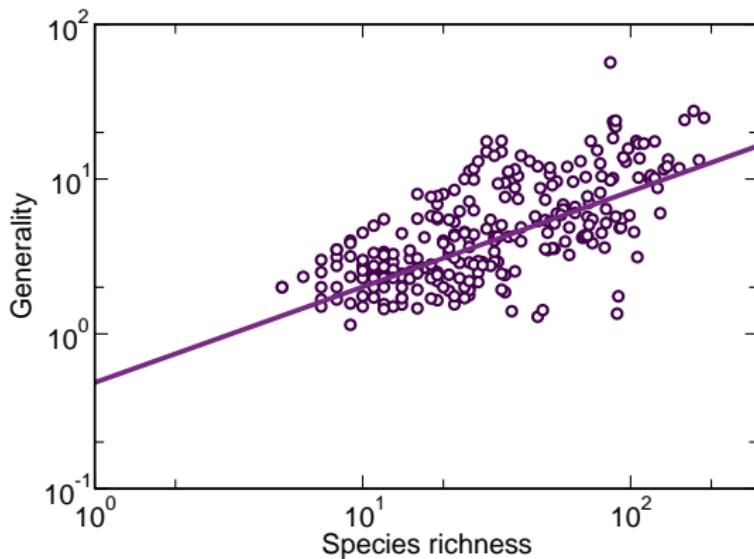


Niche breadth scales with species richness



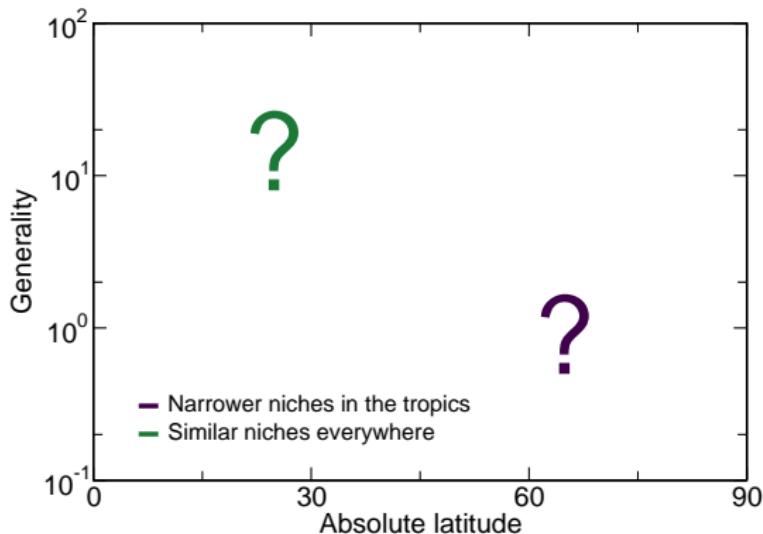
$$G \approx aS^b$$

Niche breadth scales with species richness



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

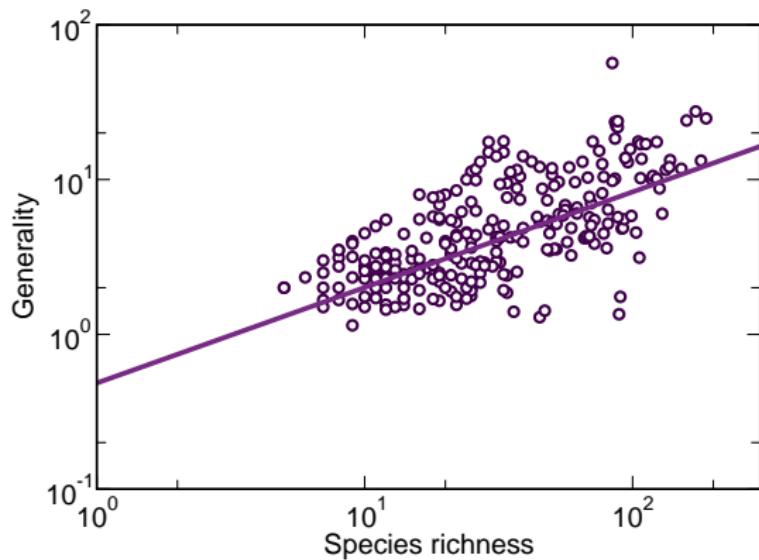
Niche breadth scales with species richness



$$G \approx aS^b$$

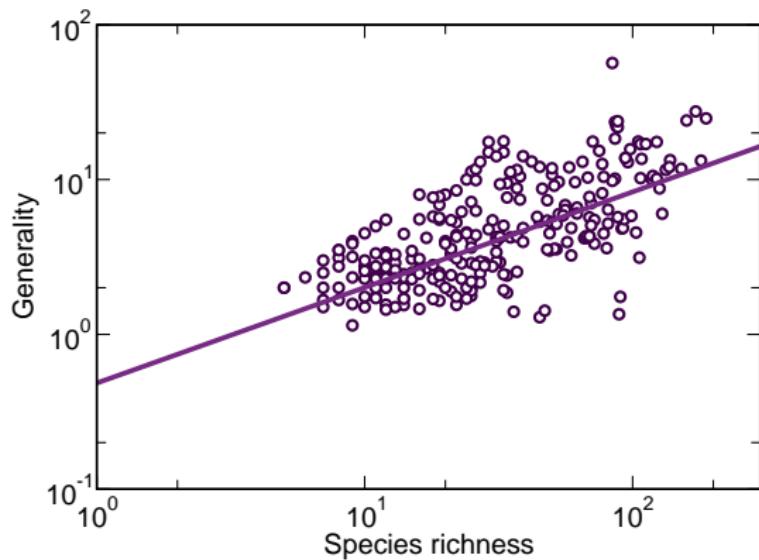
$$S \approx Latitude$$

Does latitude affect scaling of niche breadth?



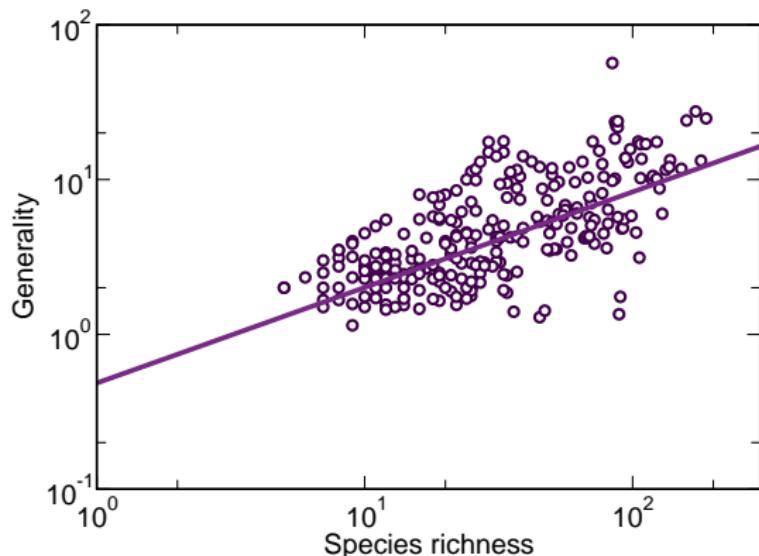
$$G \approx aS^b$$

Does latitude affect scaling of niche breadth?



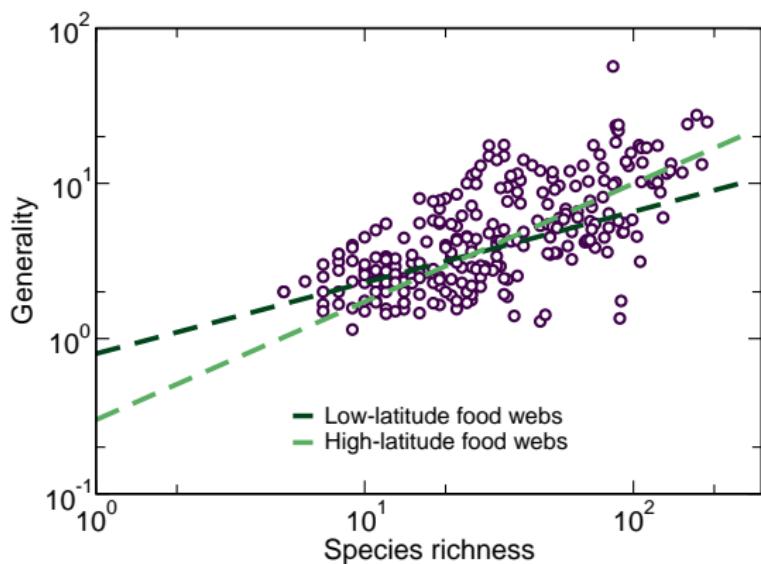
$$G \approx aS^b$$

Does latitude affect scaling of niche breadth?



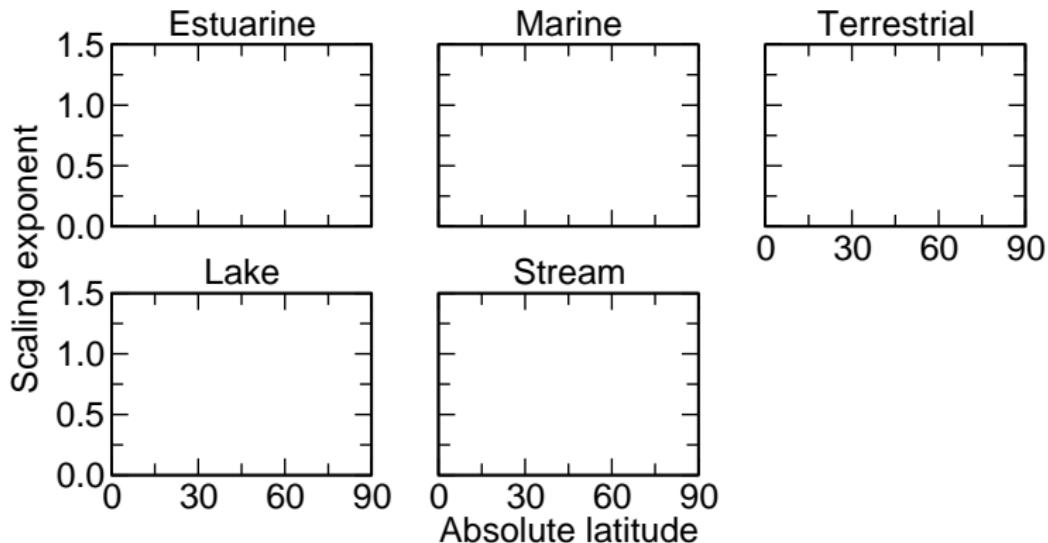
$$G \approx aS^{b_0 + b_1 Latitude}$$

Does latitude affect scaling of niche breadth?



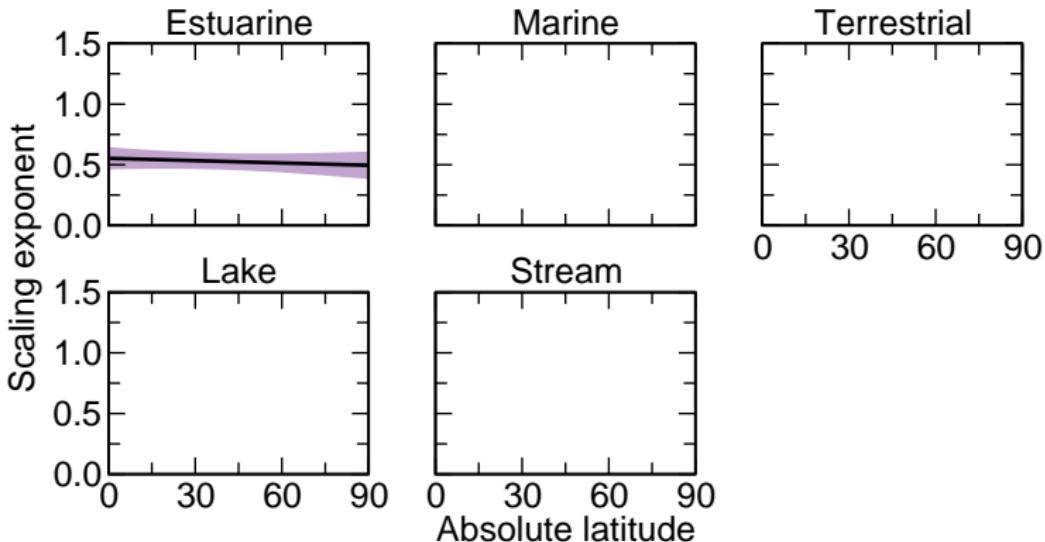
$$G \approx aS^{b_0 + b_1 Latitude}$$

Does latitude affect scaling of niche breadth?



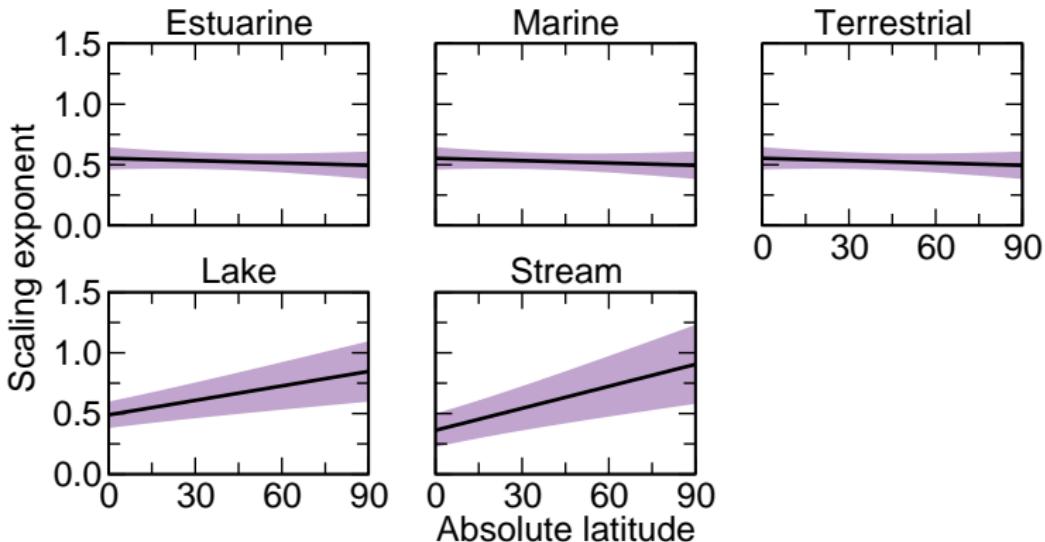
$$G \approx aS^{b_0 + b_1 Latitude}$$

Does latitude affect scaling?



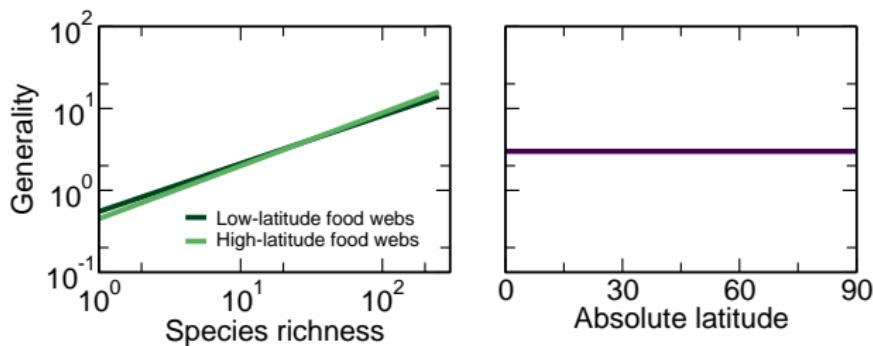
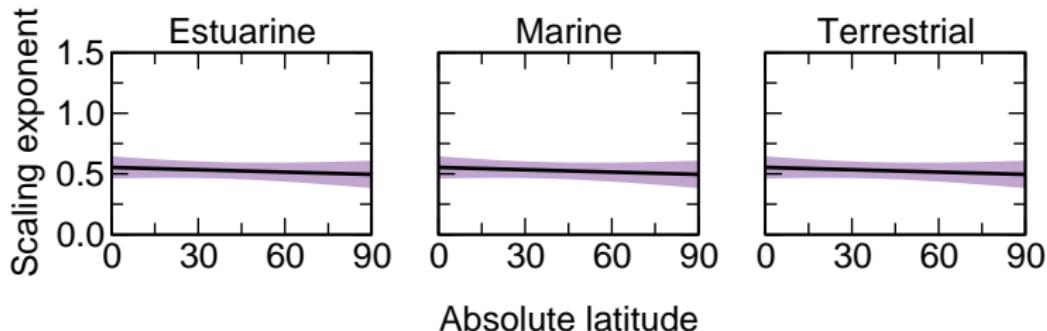
$$G \approx aS^{b_0 + b_1 Latitude}$$

Does latitude affect scaling?

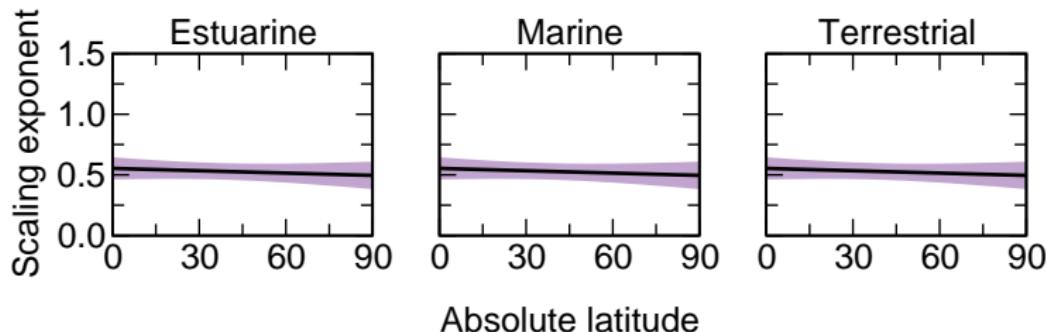


$$G \approx aS^{b_0 + b_1 Latitude}$$

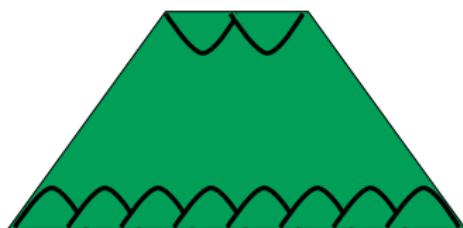
Estuarine, Marine, & Terrestrial Food Webs



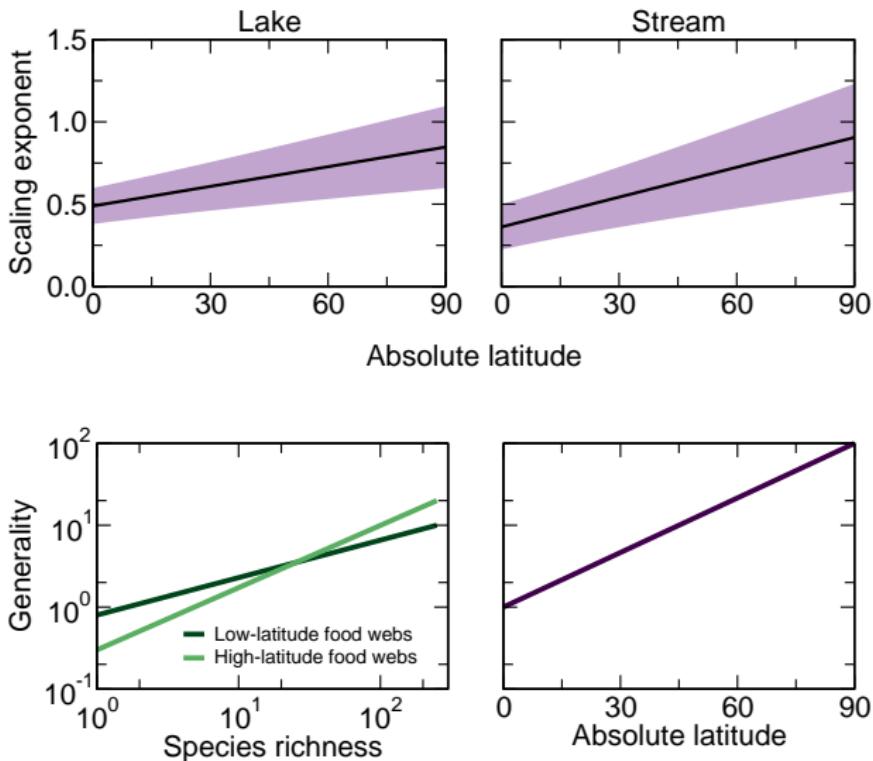
Estuarine, Marine, & Terrestrial Food Webs



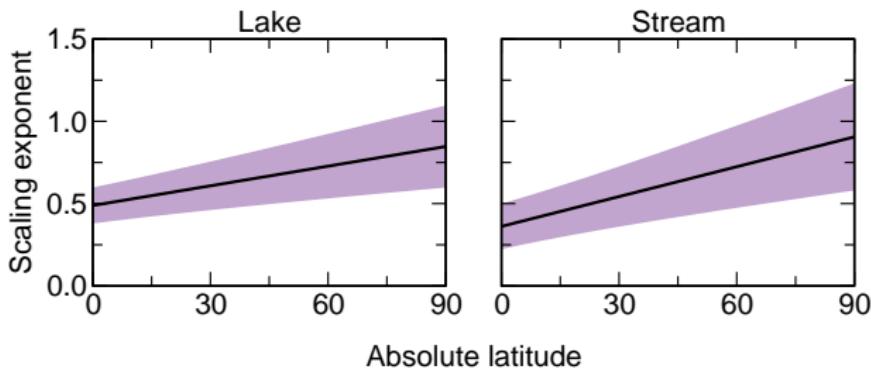
Version 2



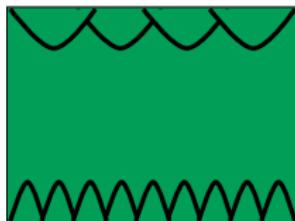
Lake & Stream Food Webs



Lake & Stream Food Webs



Version 1



How do lakes and streams differ from terrestrial food webs?

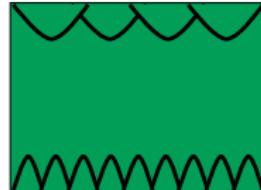


Gape-limitation!

Liem 1990, *Am. Zool*

Shurin et. al. 2007, *Ecol. Lett.*

Version 1



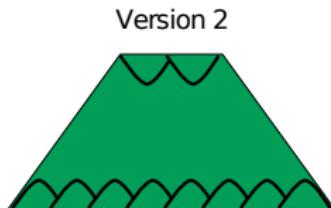
How do lakes and streams differ from estuarine & marine food webs?



Evidence for the latitude-niche breadth hypothesis

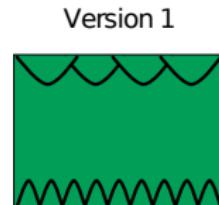
Estuarine, marine, & terrestrial webs

- Broader niche space in the tropics
- Similar specialisation everywhere



Lake & stream webs

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

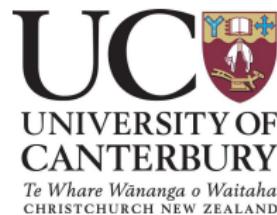


Acknowledgements

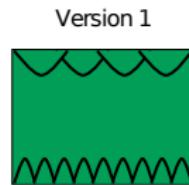
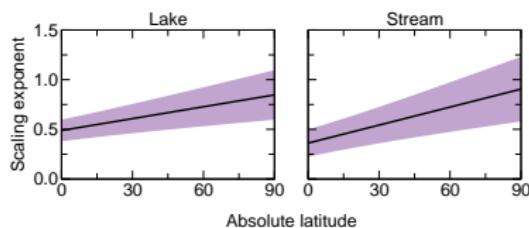
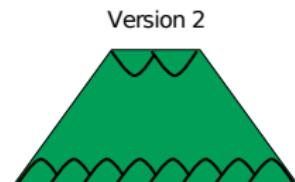
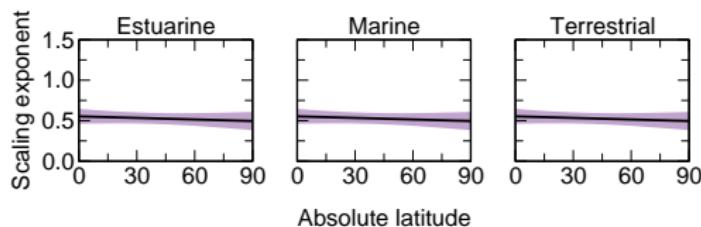
Daniel B. Stouffer
& his lab

Tamara N. Romanuk
& her lab

Angus McIntosh
Matthias Schleuning



Evidence for the latitude-niche breadth hypothesis



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