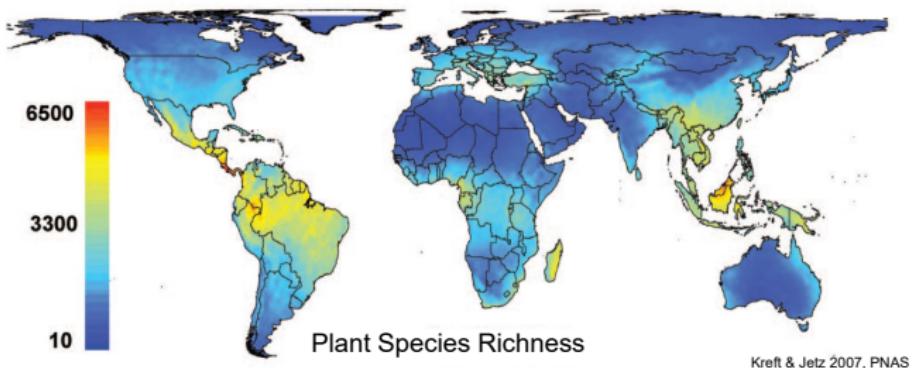
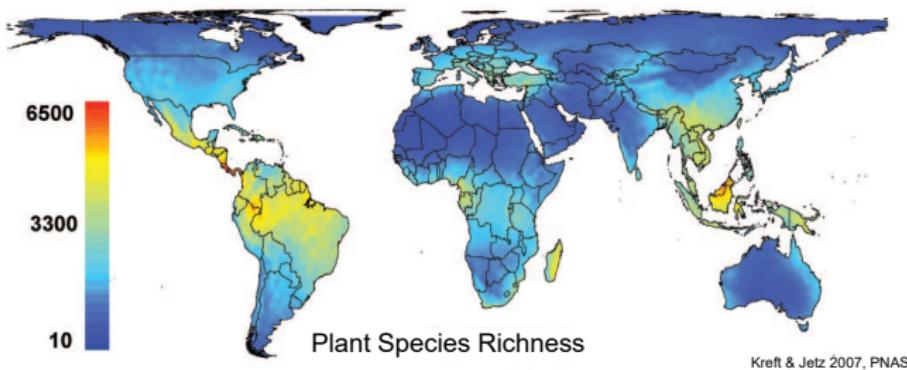


# Why are there more species in the tropics?



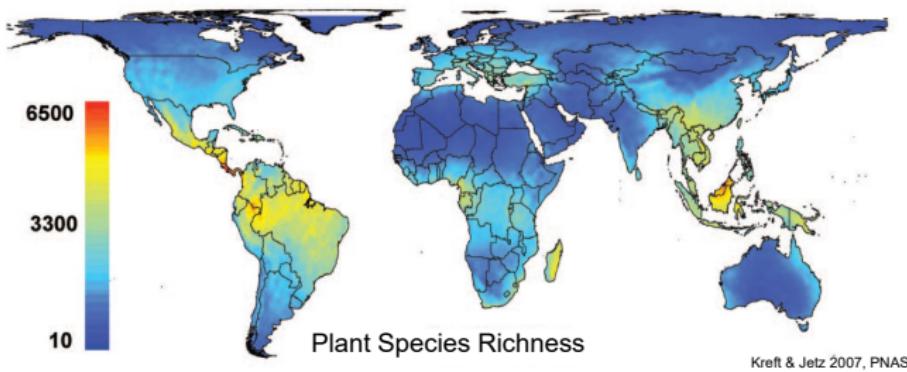
**Alyssa R. Cirtwill,**  
Daniel B. Stouffer & Tamara N. Romanuk

# Why are there more species in the tropics?



Envionmental stability? Productivity? Speciation rates?

# Why are there more species in the tropics?



## Latitude-Niche Breadth Hypothesis

Envionmental stability? Productivity? Speciation rates?

# Latitude-Niche Breadth Hypothesis

Poles

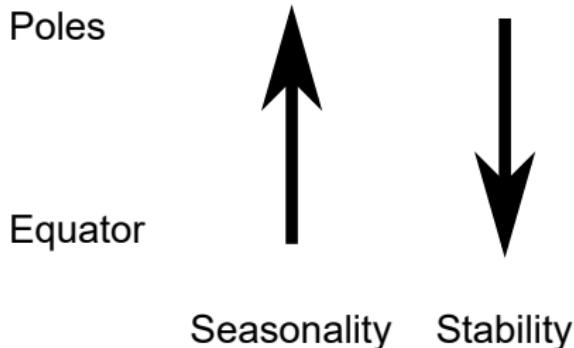


Equator

Seasonality

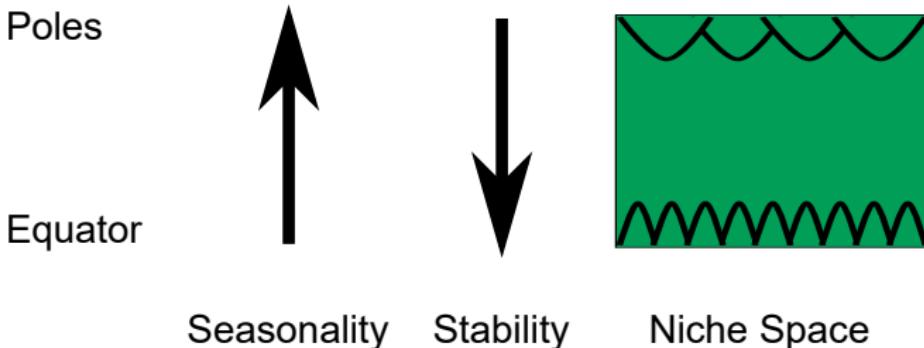
Vazquez, D.P. & Stevens, R.D. 2004. The latitudinal gradient in niche breadth: concepts and evidence. *Am. Nat.*

# Latitude-Niche Breadth Hypothesis



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

# Latitude-Niche Breadth Hypothesis



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

## Alternatively ...

Poles

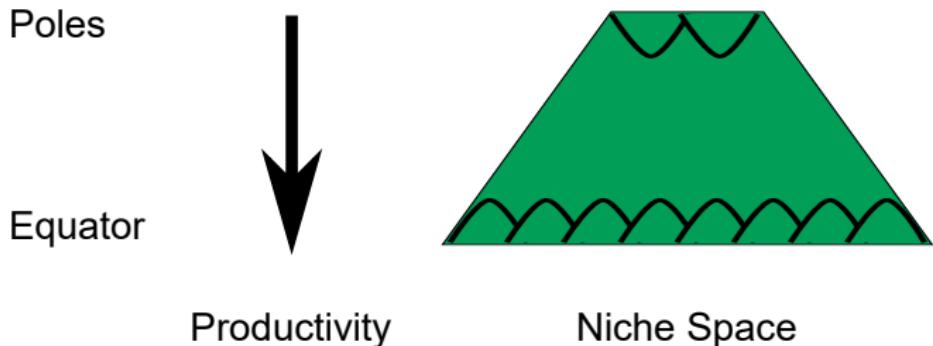


Equator

Productivity

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

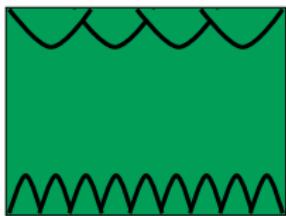
## Alternatively ...



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

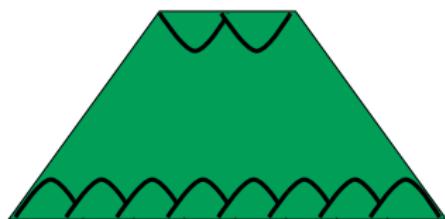
# Does niche breadth vary with latitude?

Version 1



Greater specialisation  
in the tropics

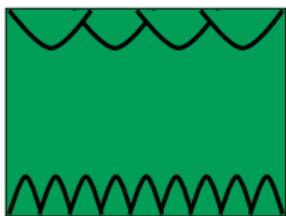
Version 2



Similar specialisation  
at all latitudes

# Does niche breadth vary with latitude?

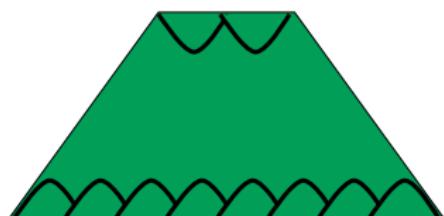
Version 1



Greater specialisation  
in the tropics

Fewer prey per species  
in the tropics

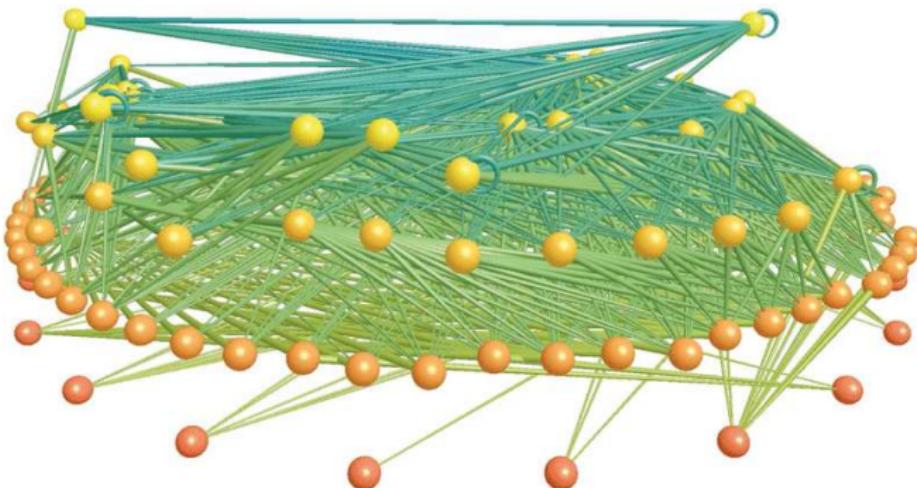
Version 2



Similar specialisation  
at all latitudes

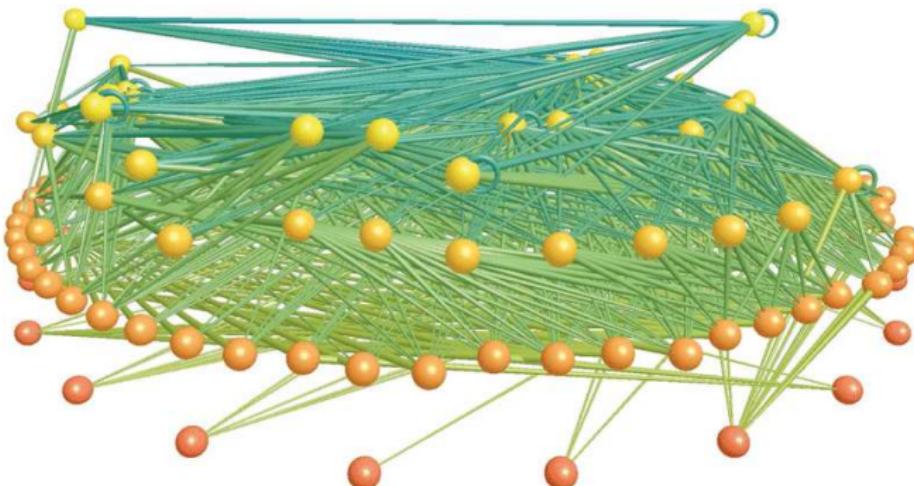
Equal prey per species  
at all latitudes

# Does niche breadth vary with latitude?



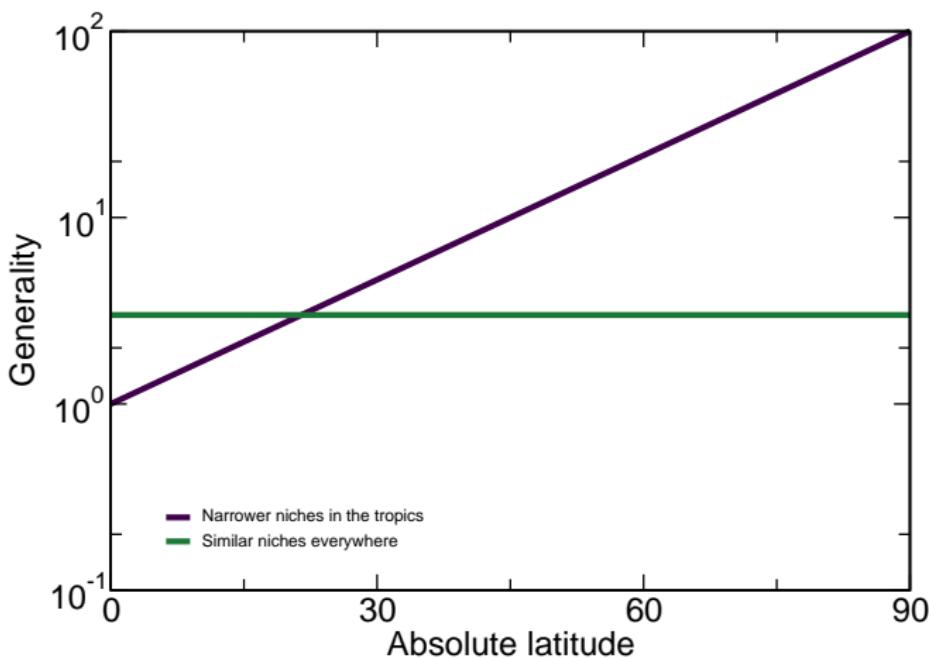
195 food webs  
0-78° (absolute latitude)

# Does niche breadth vary with latitude?

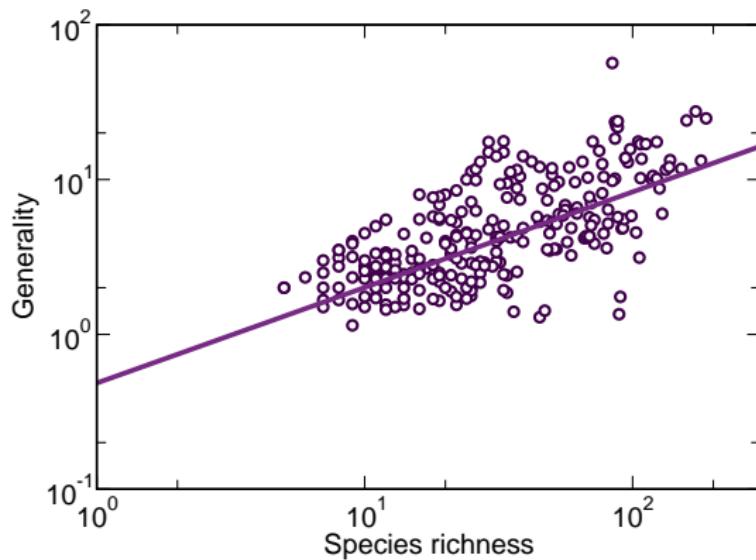


195 food webs  
0-78° (absolute latitude)  
Mean generality (**G**)

# Does niche breadth vary with latitude?

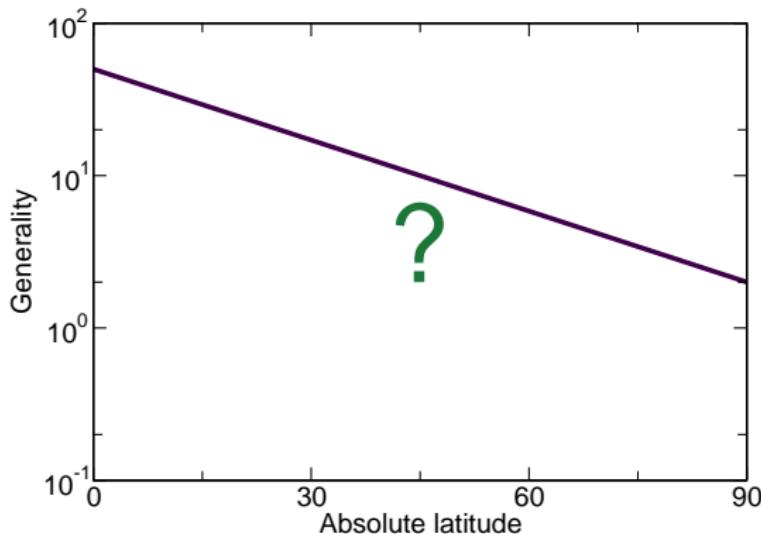


## Niche breadth varies with species richness

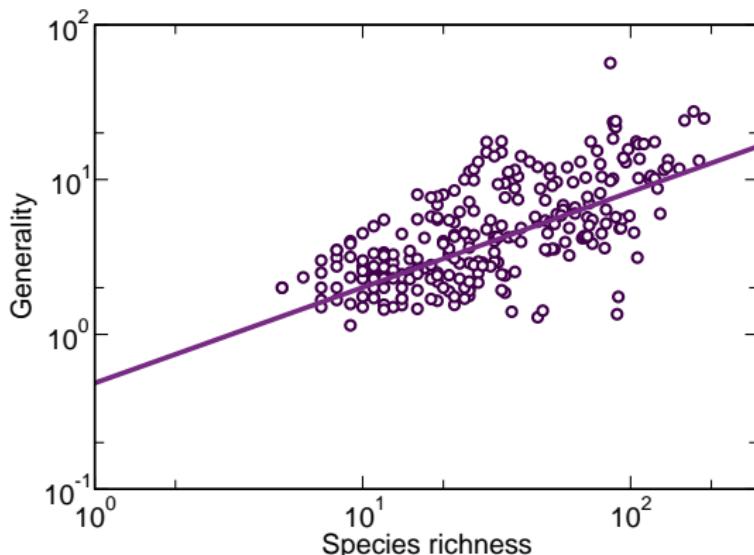


$$G \approx aS^b$$

# Does niche breadth vary with latitude?

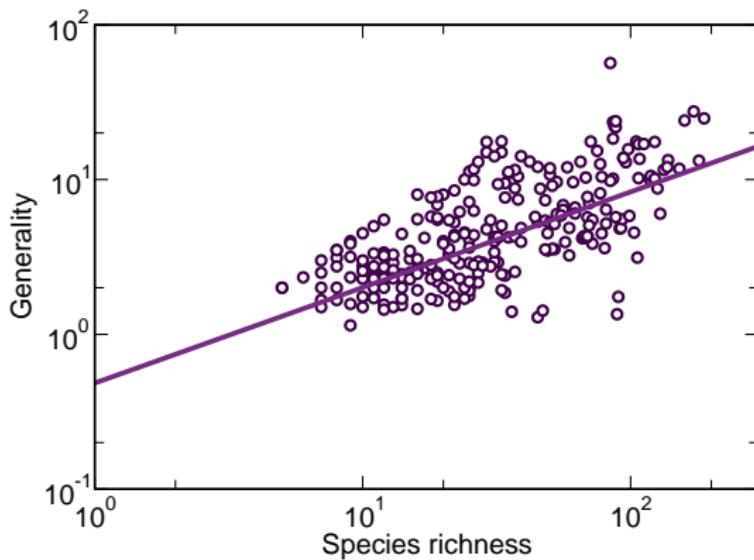


# Does latitude affect scaling?



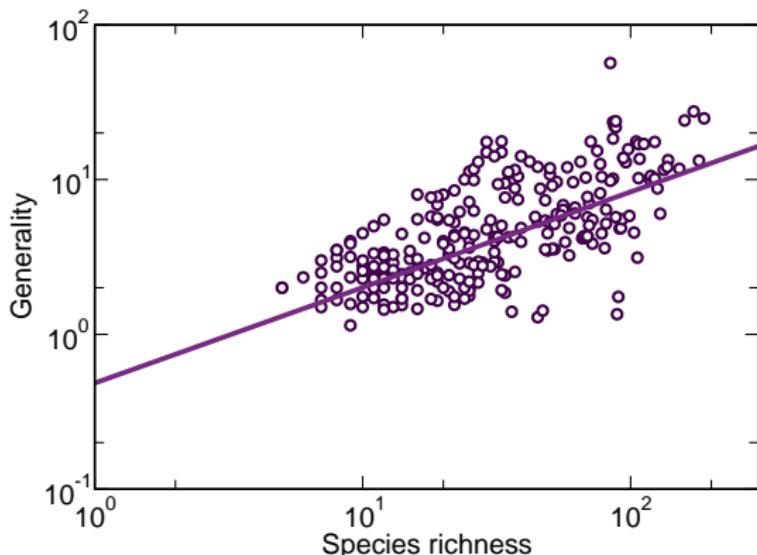
$$G \approx aS^b$$

# Does latitude affect scaling?



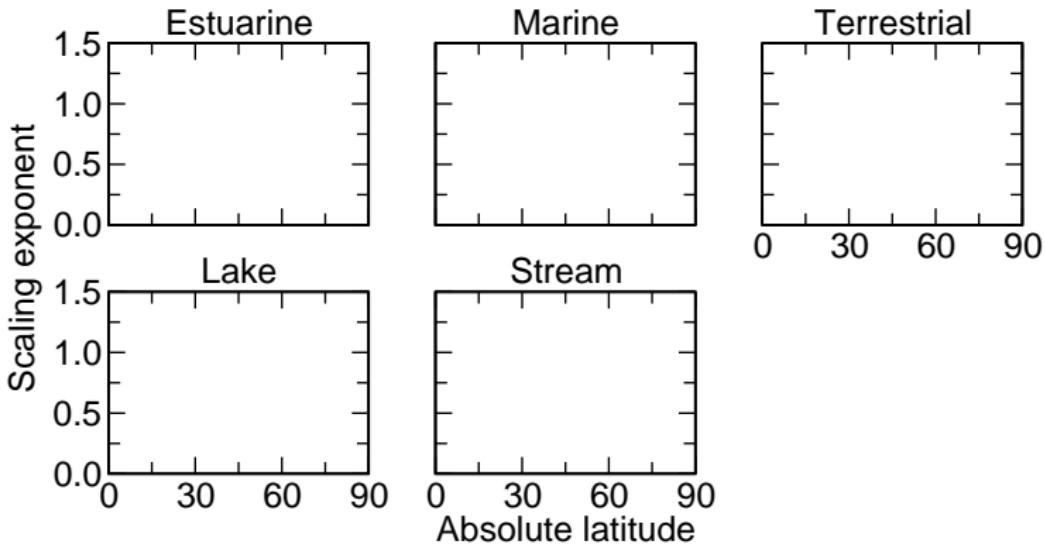
$$G \approx aS^{b_0 + b_1 \text{Latitude}}$$

## Does latitude affect scaling?



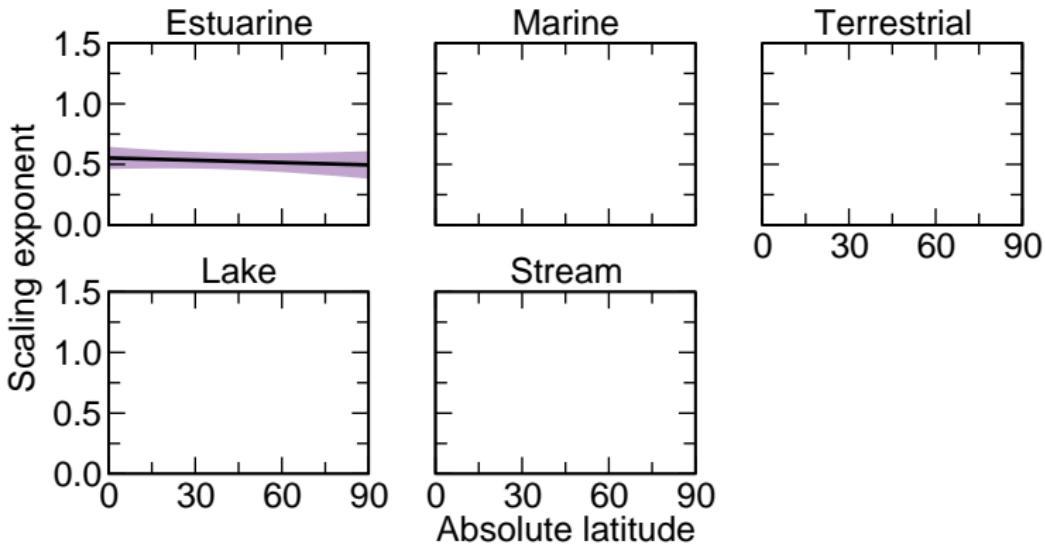
$$G \approx aS^{b_0 + b_1 \text{Latitude} + b_2 \text{Ecotype} + b_3 \text{Latitude:Ecotype}}$$

# Does latitude affect scaling?



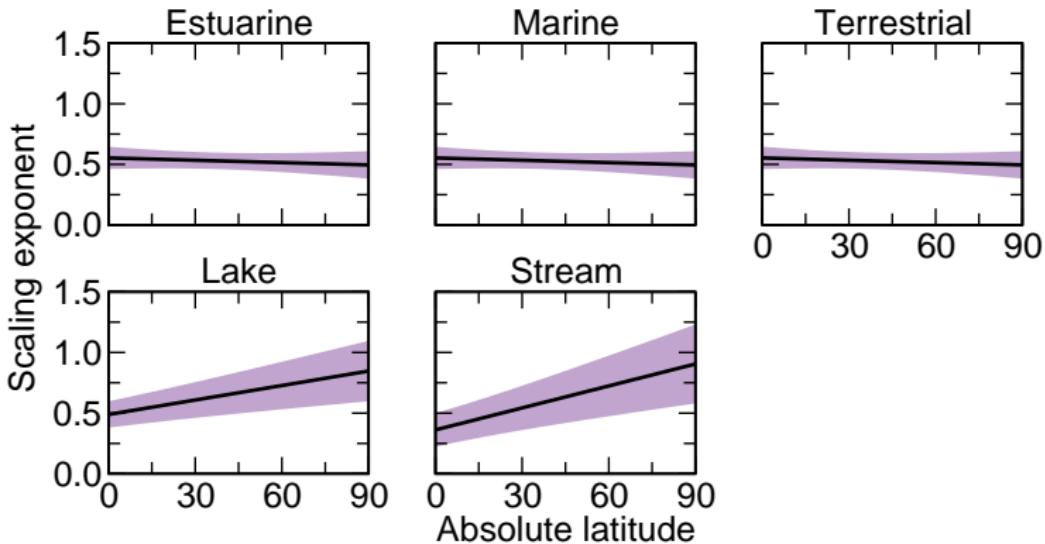
$$b_0 + b_1 \text{Latitude} + b_2 \text{Ecotype} + b_3 \text{Latitude : Ecotype}$$

# Does latitude affect scaling?



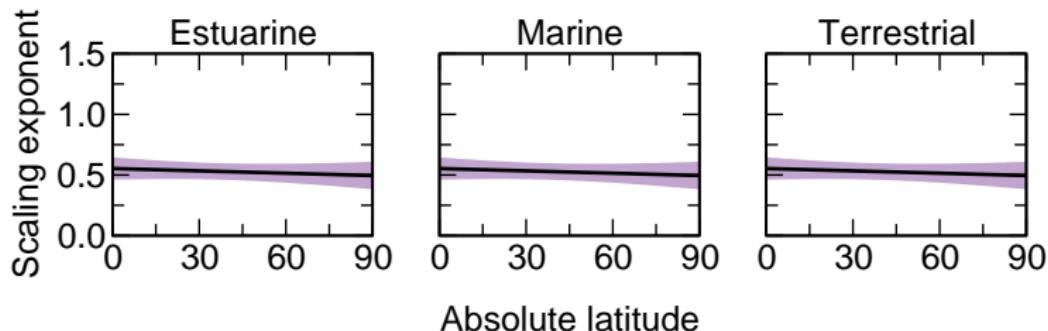
$$b_0 + b_1 \text{Latitude} + b_2 \text{Ecotype} + b_3 \text{Latitude : Ecotype}$$

# Does latitude affect scaling?

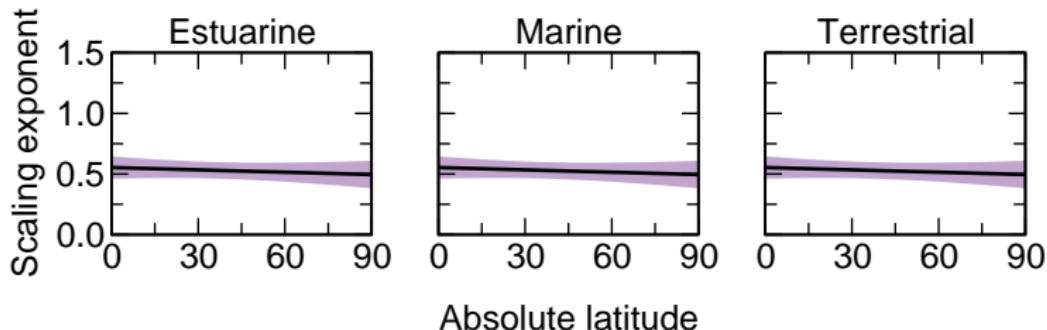


$$b_0 + b_1 \text{Latitude} + b_2 \text{Ecotype} + b_3 \text{Latitude : Ecotype}$$

# Estuarine, Marine, & Terrestrial Food Webs

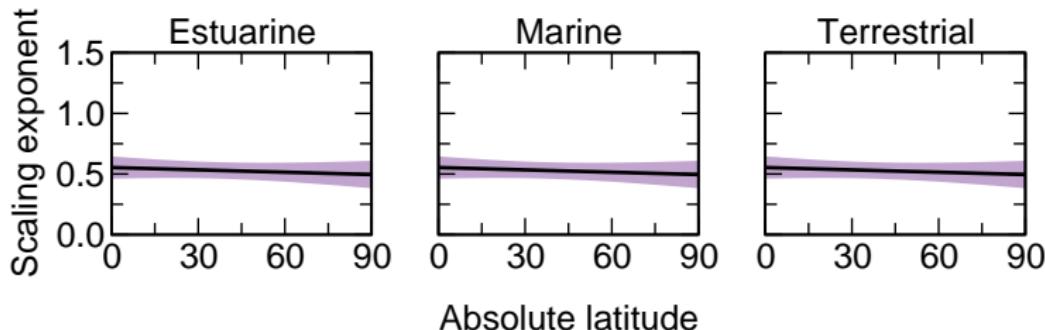


# Estuarine, Marine, & Terrestrial Food Webs



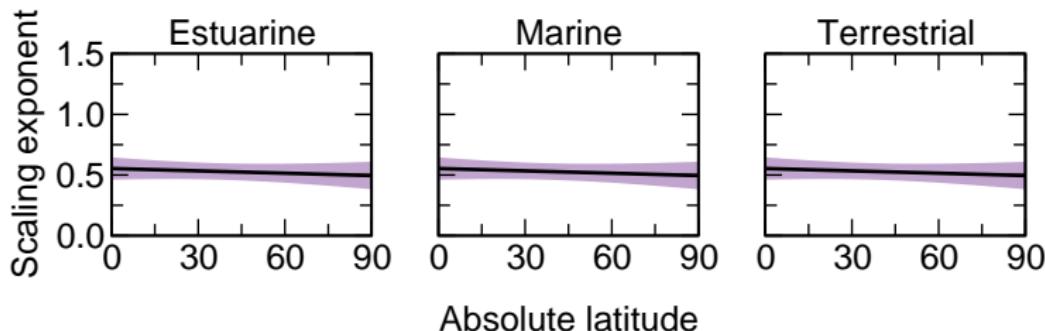
No effect of latitude on scaling

# Estuarine, Marine, & Terrestrial Food Webs



No effect of latitude on scaling  
Similar niche widths at all latitude

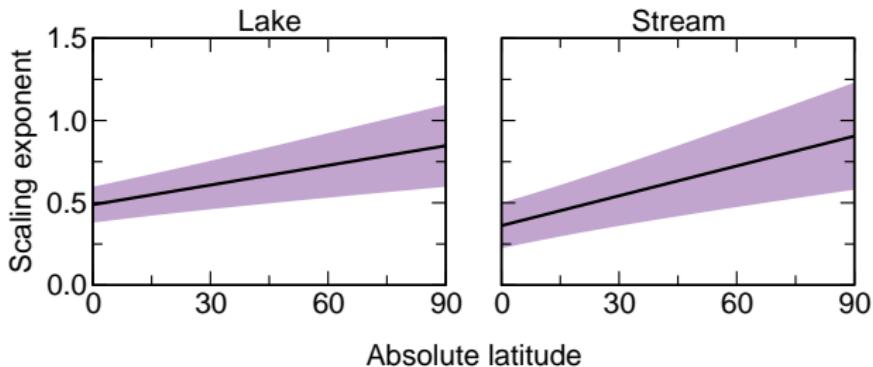
# Estuarine, Marine, & Terrestrial Food Webs



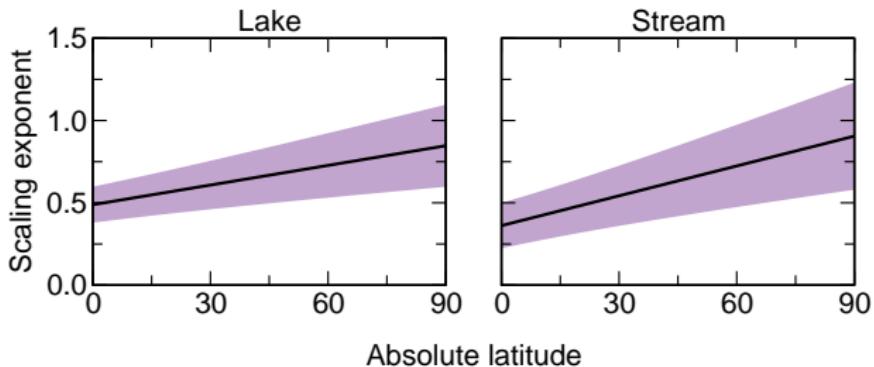
No effect of latitude on scaling  
Similar niche widths at all latitude

Supports Davies *et. al.*, 2007:  
Broader niche space in the tropics

# Lake & Stream Food Webs

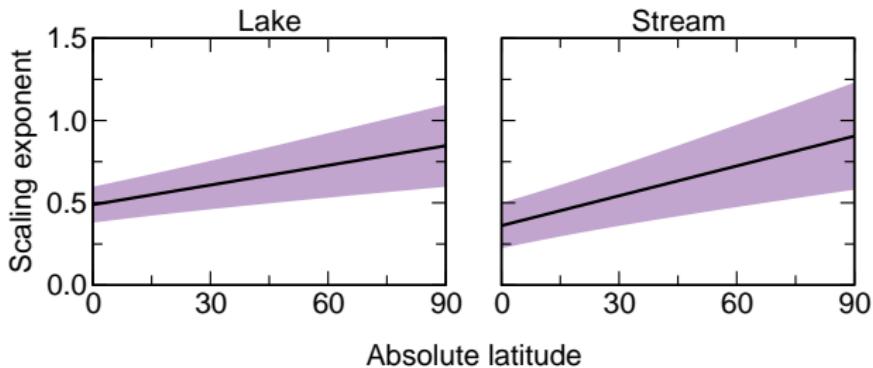


# Lake & Stream Food Webs



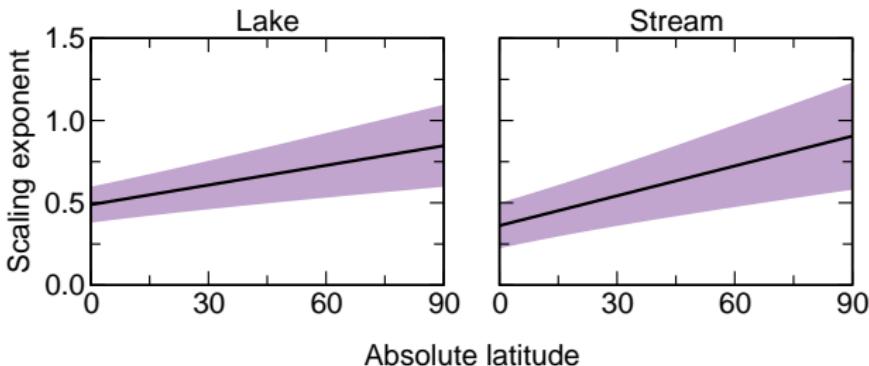
Scaling increases with latitude

# Lake & Stream Food Webs



Scaling increases with latitude  
Narrower niches in the tropics

# Lake & Stream Food Webs

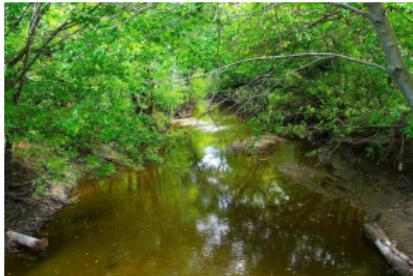


Scaling increases with latitude  
Narrower niches in the tropics

Supports Vazquez & Stevens 2004

# What's different in freshwaters?

They're highly seasonal



## What's different in freshwaters?

They're highly seasonal - except in NZ



# What's different in freshwaters?

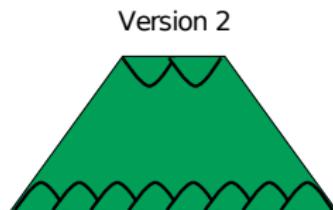
They're dominated by fish



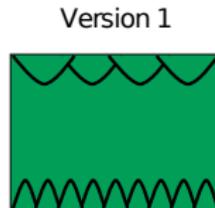
# So why are there more species in the tropics?

## Estuarine, marine, & terrestrial

- Broader niche space in the tropics
- Similar specialisation everywhere



Version 2



Version 1

## Lakes & Streams

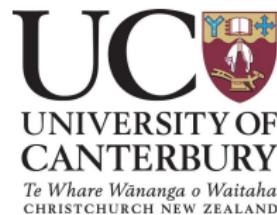
- Narrower niches in the tropics
- Generality due to seasonality?

# Acknowledgements

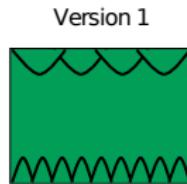
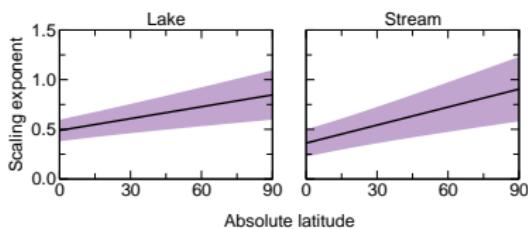
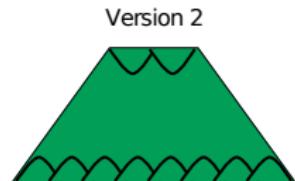
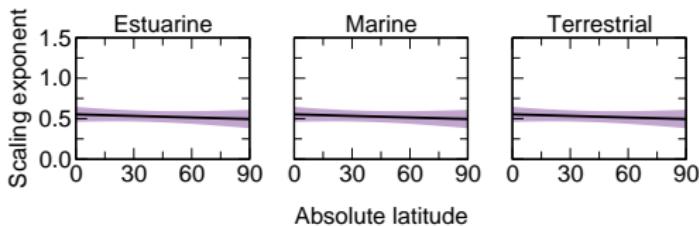
Daniel B. Stouffer  
& his lab

Tamara N. Romanuk  
& her lab

Angus McIntosh  
Matthias Schleuning



# Latitude affects scaling in freshwaters



$$G \approx aS^{b_0 + b_1 \text{Latitude} + b_2 \text{Ecotype} + b_3 \text{Latitude:Ecotype}}$$