Today

- Art of modeling: ants model
  - mapping to research questions
  - scope of inference

Exponential model

$$y = ae^{bx}$$

a is y intercept

expecting b negative for downward trend

$$\log(y) = \log(a) + bx$$

log(a) is y intercept

y is richness

x is latitude

Exponential model

$$\log(y_i) \sim \text{Normal}(\mu_i, \sigma)$$

$$\mu_i = \begin{cases} \log(a_b) + b_b x_i & : \text{bog} \\ \log(a_f) + b_f x_i & : \text{forest} \end{cases}$$

y is richness
x is latitude

Map science questions to model

- What model quantities answer questions?
- Could be:
  - parameters
  - derived quantities
    - a function of the parameters
    - predictions of the model
- Plus associated uncertainty

Map science questions to model

How does species richness vary with latitude?

Is this relationship different between habitats?

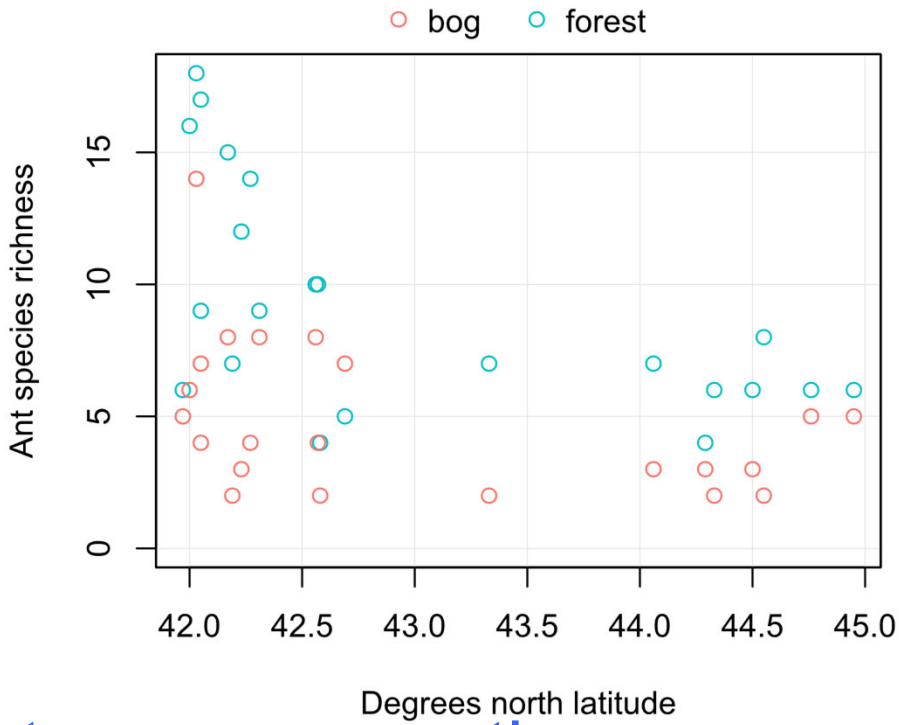
How different is species richness between habitats?

$$y_i \sim \text{Normal}(\mu_i, \sigma)$$

$$\mu_i = \begin{cases} \beta_{0,b} + \beta_{1,b} x_i & : \text{bog} \\ \beta_{0,f} + \beta_{1,f} x_i & : \text{forest} \end{cases}$$

$$\log(y_i) \sim \text{Normal}(\mu_i, \sigma)$$

$$\mu_i = \begin{cases} \log(a_b) + b_b x_i & : \text{bog} \\ \log(a_f) + b_f x_i & : \text{forest} \end{cases}$$



Identify model quantities that answer questions

Sketch how you would visualize answer with uncertainty

Scope of inference

- Ants questions: descriptive inference
- What statistical population will this description generalize to?
- Generalization is determined by study design and assumptions we're willing to accept (wrt data → population)

"We sampled 22 high-grade, undisturbed bogs and their surrounding forests in Vermont, Massachusetts, and Connecticut"

Make a statement about scope. Justify your statement