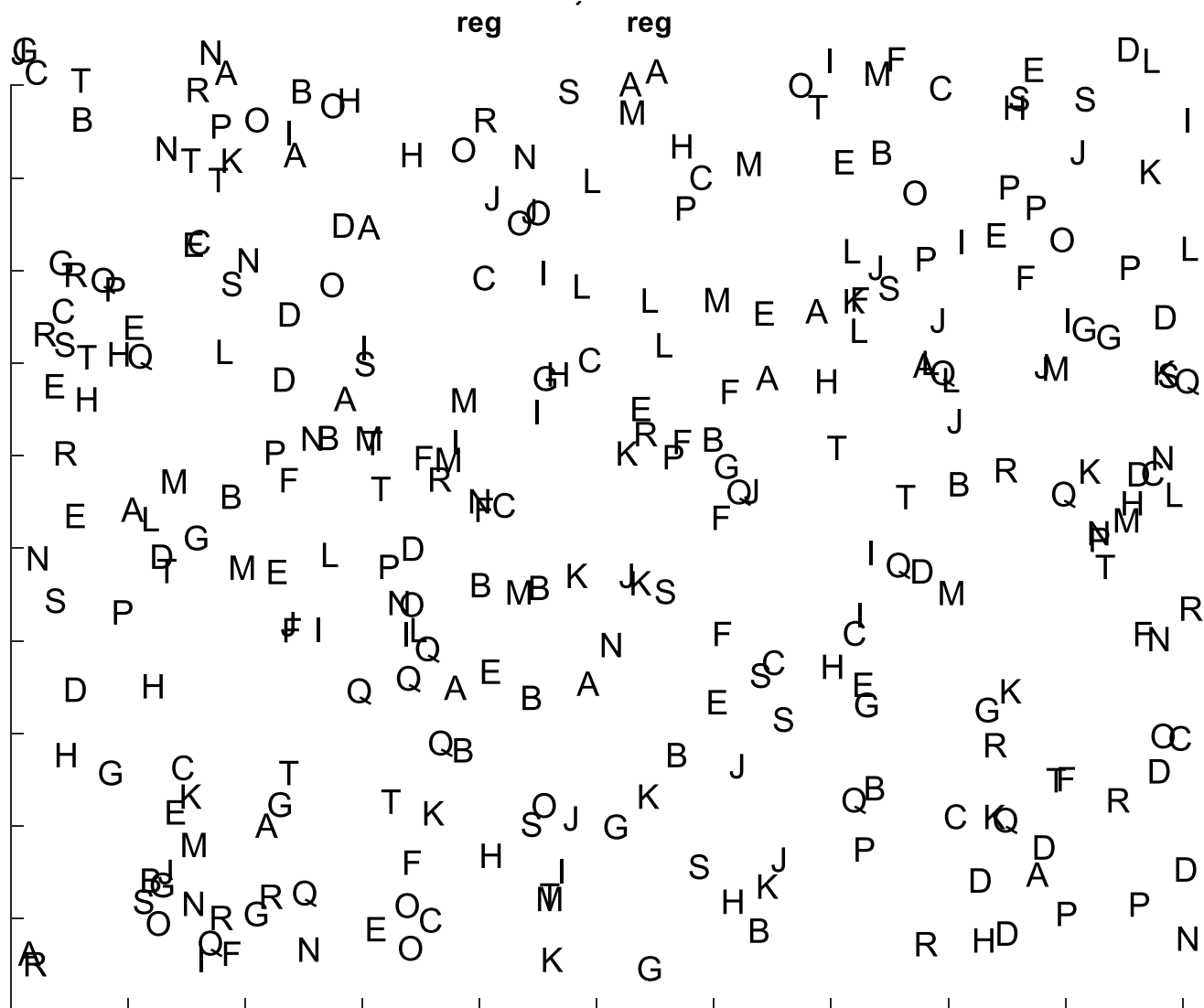


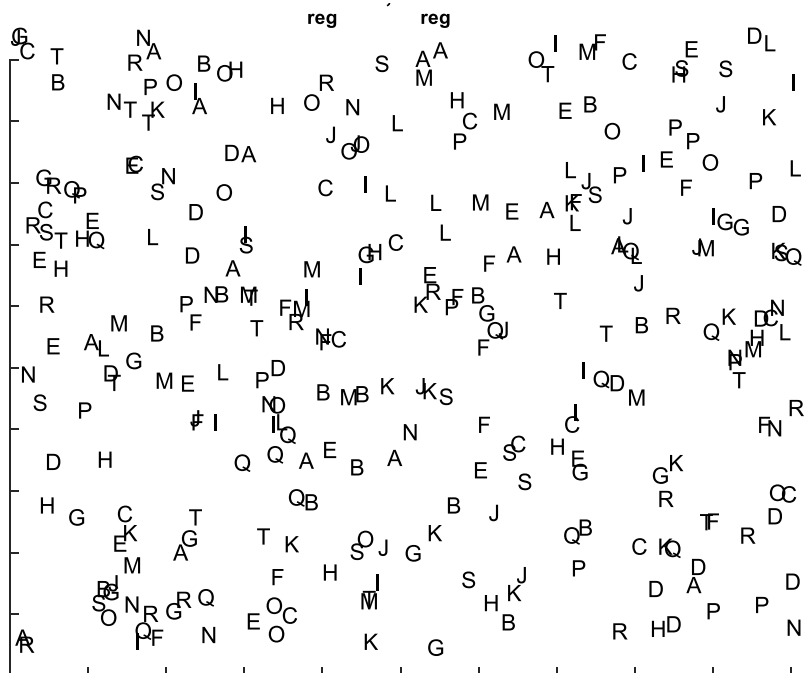
Components of Biodiversity and Scale Dependence

Brian McGill

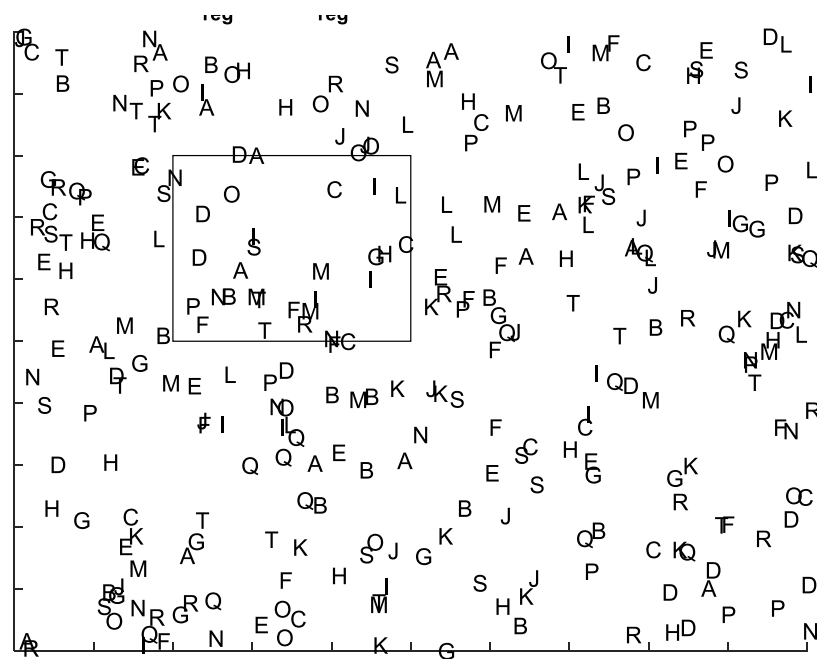
$S_{\text{reg}}=20, N_{\text{reg}}=300$



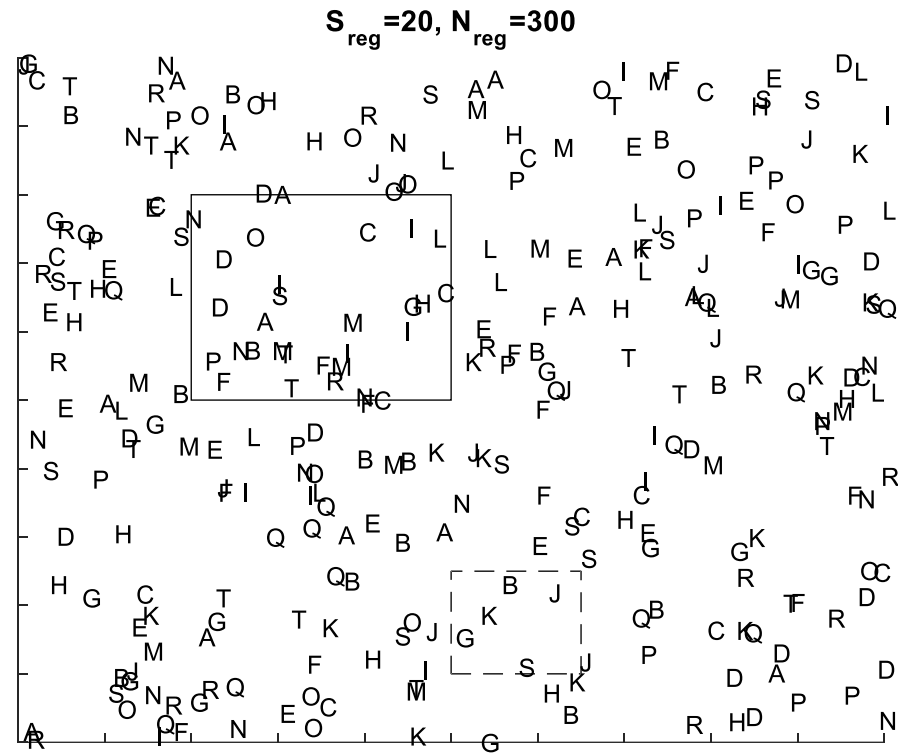
$S_{\text{reg}}=20, N_{\text{reg}}=300$



$S_{\text{local}}=16, N_{\text{local}}=27$

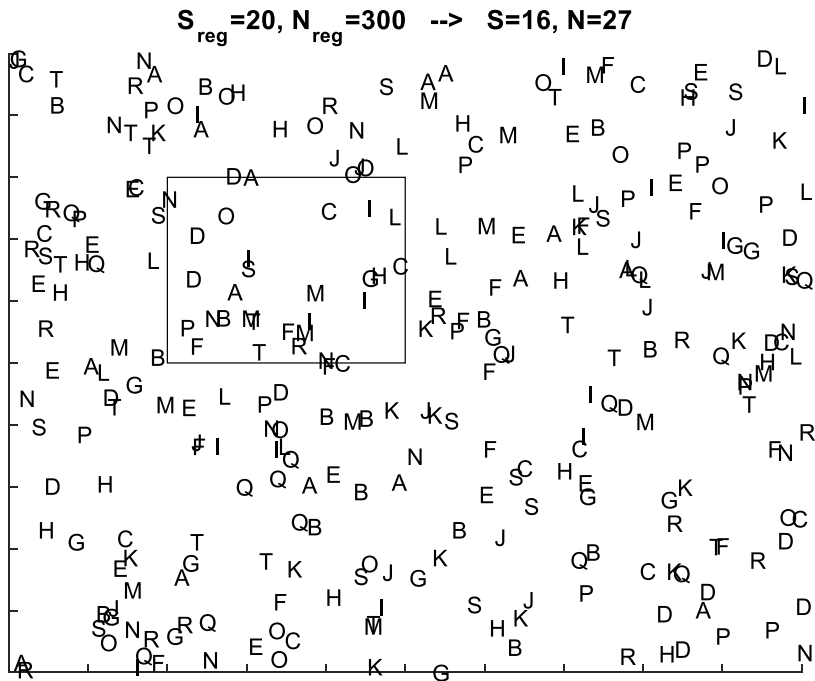


Scale dependent comparisons of S are problematic ...

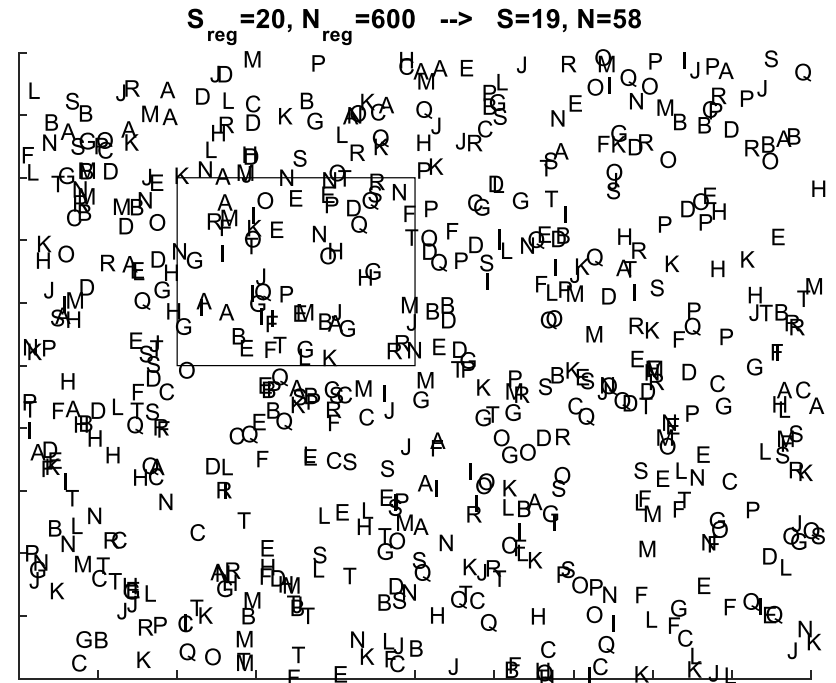


$$S_{\text{reg}}=20, N_{\text{reg}}=300 \rightarrow 600$$

$$S_{\text{local}}=16, N_{\text{local}}=27$$



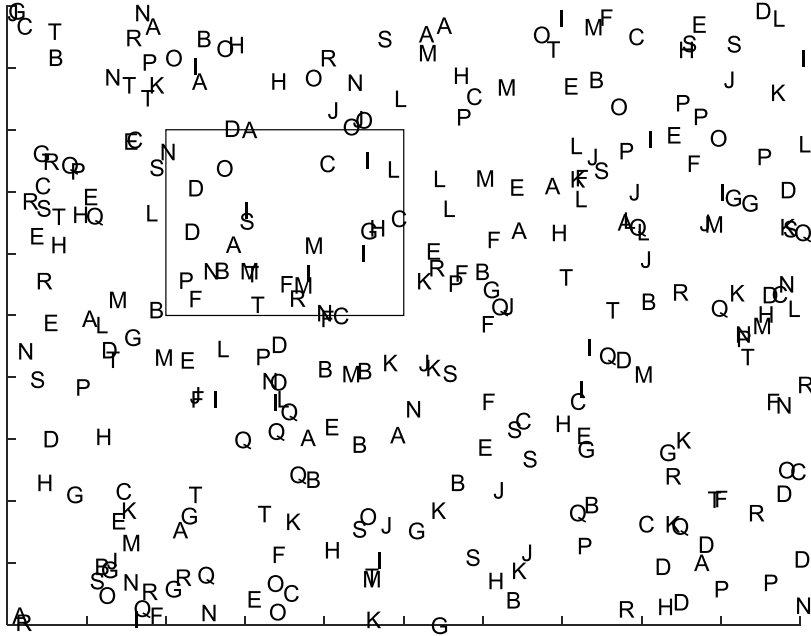
$$S_{\text{local}}=19, N_{\text{local}}=58$$



$S_{\text{reg}}=20 \rightarrow 40, N_{\text{reg}}=300$

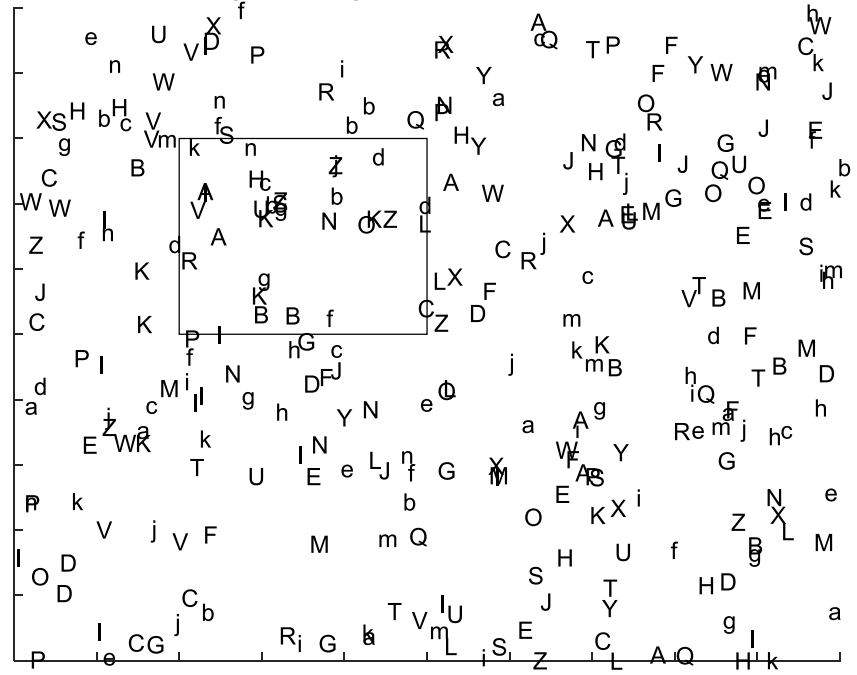
$S_{\text{local}}=16, N_{\text{local}}=27$

$S_{\text{reg}}=20, N_{\text{reg}}=300 \rightarrow S=16, N=27$



$S_{\text{local}}=23, N_{\text{local}}=32$

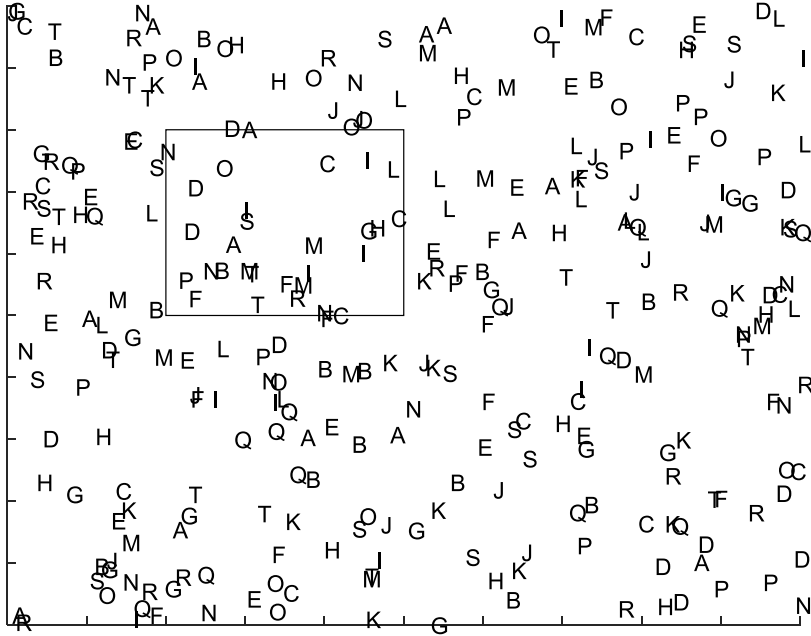
$S_{\text{reg}}=40, N_{\text{reg}}=300 \rightarrow S=23, N=32$



$S_{\text{reg}}=20, N_{\text{reg}}=300$ + less spatially aggregated

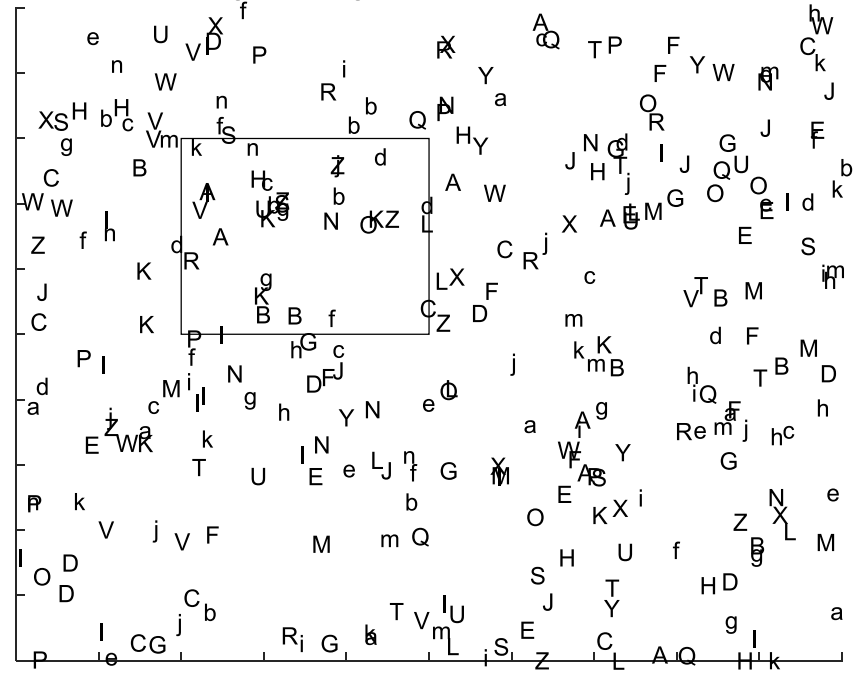
$S_{\text{local}}=16, N_{\text{local}}=27$

$S_{\text{reg}}=20, N_{\text{reg}}=300 \rightarrow S=16, N=27$



$S_{\text{local}}=23, N_{\text{local}}=32$

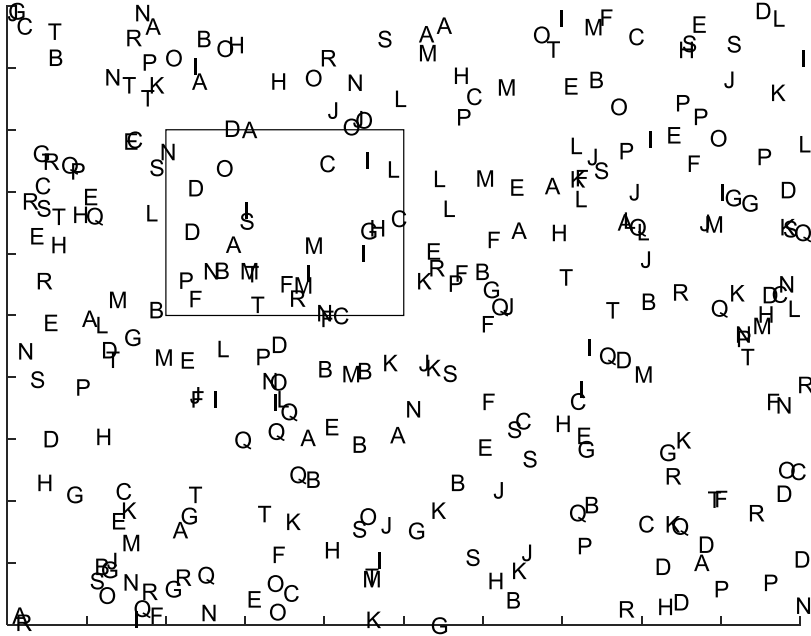
$S_{\text{reg}}=40, N_{\text{reg}}=300 \rightarrow S=23, N=32$



$S_{\text{reg}}=20, N_{\text{reg}}=300$ + SAD more uneven

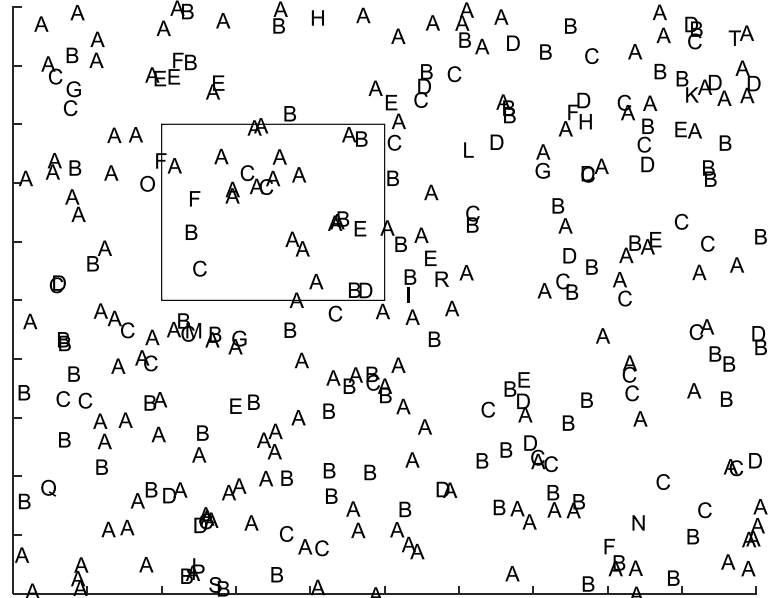
$S_{\text{local}}=16, N_{\text{local}}=27$

$S_{\text{reg}}=20, N_{\text{reg}}=300 \rightarrow S=16, N=27$



$S_{\text{local}}=6, N_{\text{local}}=28$

$S_{\text{reg}}=20, N_{\text{reg}}=300 \rightarrow S=6, N=28$



The components of observed local S

- **More regional species (S)**
- **Greater individual density (N)**
- **More spatially even/less aggregated**
- **More even regional SAD**



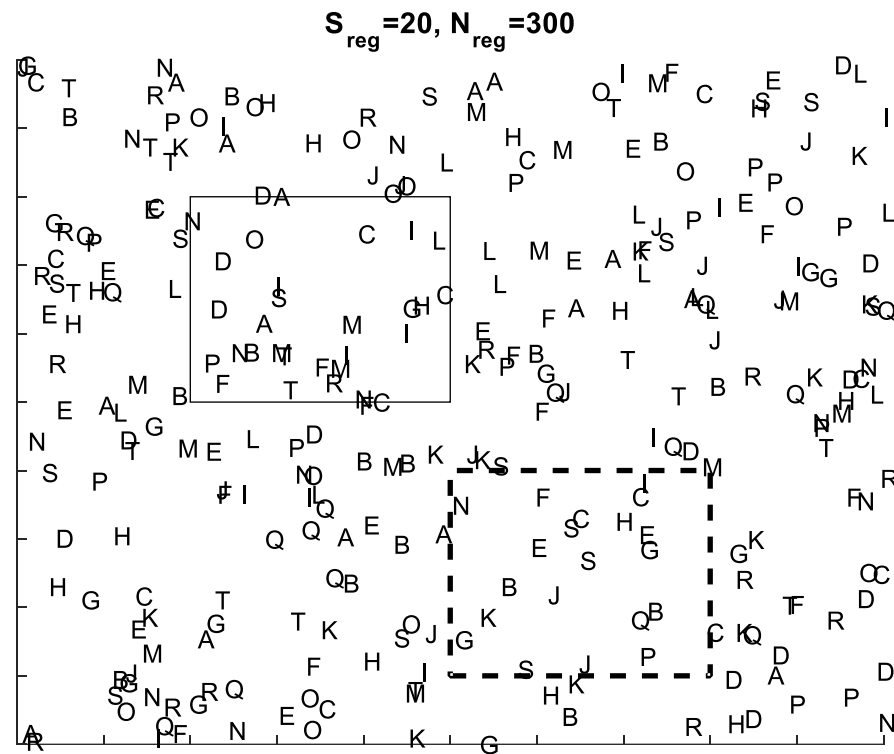
**Increases
Local S**

So when local S goes up in an observation of experiment what does it mean ...?

The components of observed local S

- **$S_{\text{local}} = f(S_{\text{regional}}, N_{\text{local}}, \text{aggregation}, \text{evenness})$**
 - **NB: different components can go in opposite directions & cancel each other out.**
 - **Aside from just being interesting to figure out which component, the components link to processes**
 - **N (density) could come from nitrogen addition or disturbance**
 - **Aggregation could come from change in dispersal**

Same issues – opposite sign - for β diversity



Summary

- When talking about α or β diversity (using local plots), it is much more informative to look at the four components driving change:
 - Regional S
 - Local density (N)
 - Spatial aggregation
 - Regional SAD evenness