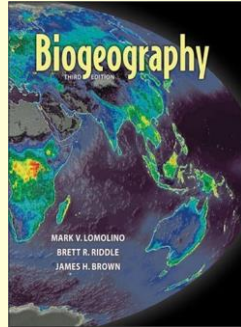


Geographic ecology



Alexander von Humboldt
1769 - 1859

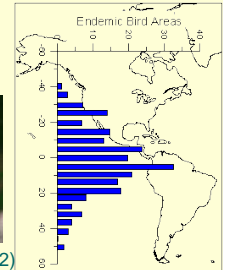


Lecture outline

- Geographic patterns in species richness
 - Influence of area and isolation
 - Island biogeography theory
 - Latitudinal patterns
 - Underlying mechanisms



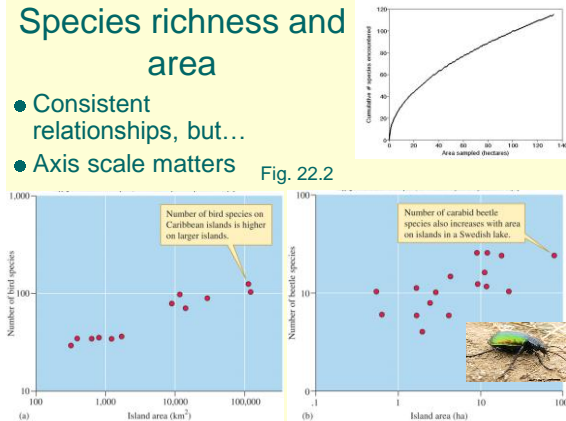
Bibby et al. (1992)



Species richness and area

- Consistent relationships, but...
- Axis scale matters

Fig. 22.2



Just oceanic islands?

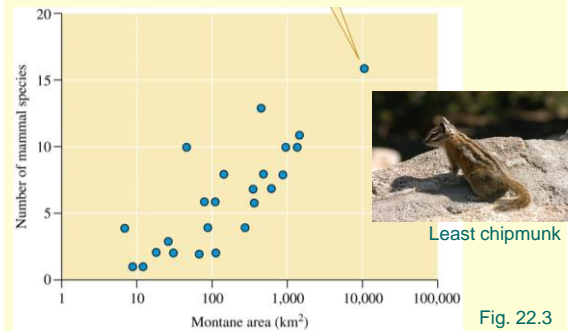


Fig. 22.3

Just terrestrial islands?

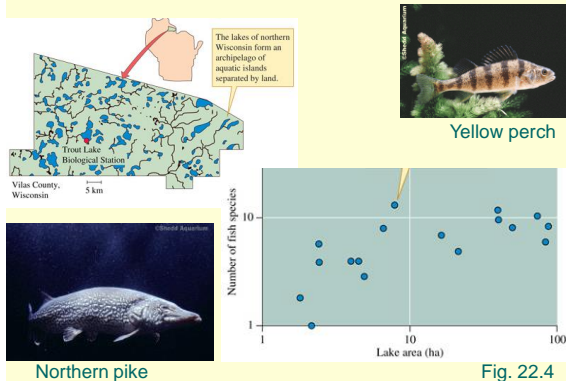
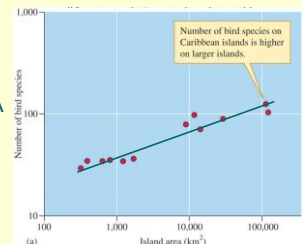


Fig. 22.4

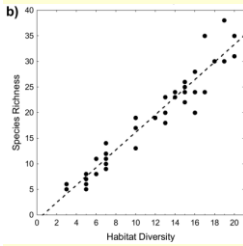
A little math

- Preston (1962):
 - $S = cA^z$
 - or
 - $\log S = \log c + z \log A$



Mathematical description originated with O. Arrhenius in 1921

What's so special about area?



● Area is a good surrogate for:

- ??
- ??
- ??



Terrestrial isopods on Greek islands (Hortal et al., 2009)

Is area the only thing?

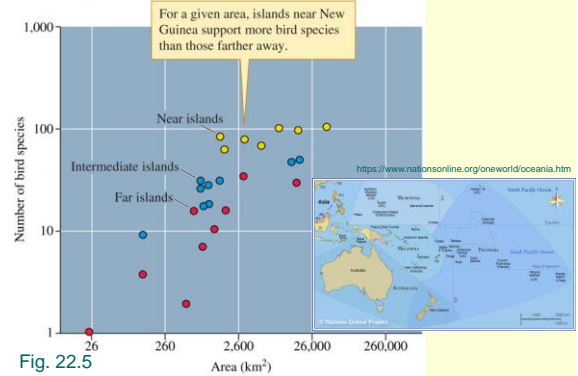
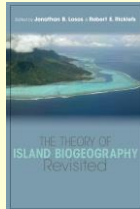
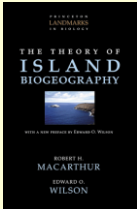


Fig. 22.5

Island biogeography theory (1)

- MacArthur and Wilson (1963)
- Richness on an island represents a dynamic equilibrium between the rates of two important ecological processes:

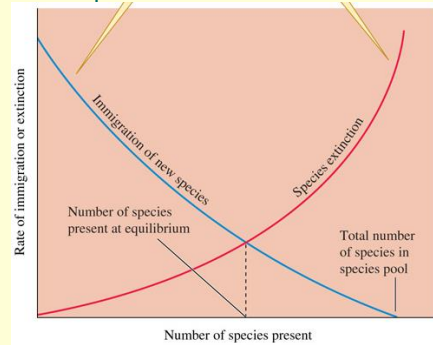
&



2009

Island biogeography theory (2)

- Explain these curves



"Species turnover"

Fig. 22.8

Island biogeography theory (3)

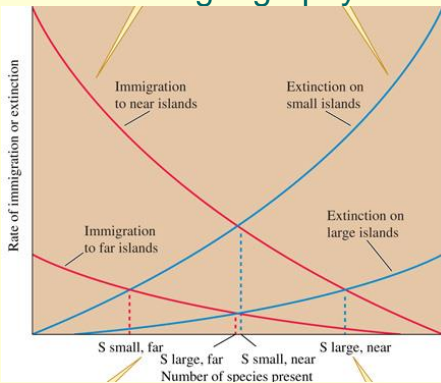


Fig. 22.9

Tests of island biogeography theory (1)

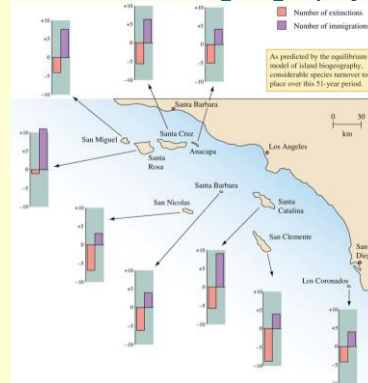


Fig. 22.10

Tests of island biogeography theory (2)

- Mangrove islands; Simberloff and Wilson (1969, 1970)

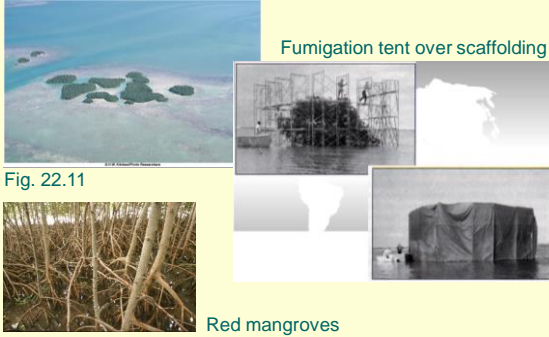


Fig. 22.11

Tests of island biogeography theory (3)

- Colonization dynamics

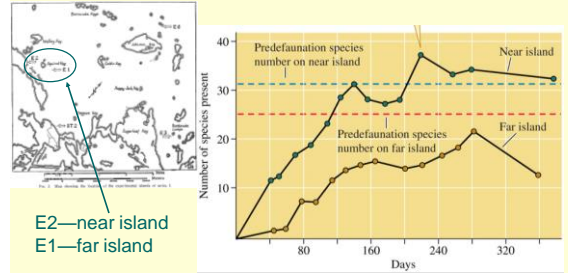


Fig. 22.12

Tests of island biogeography theory (4)

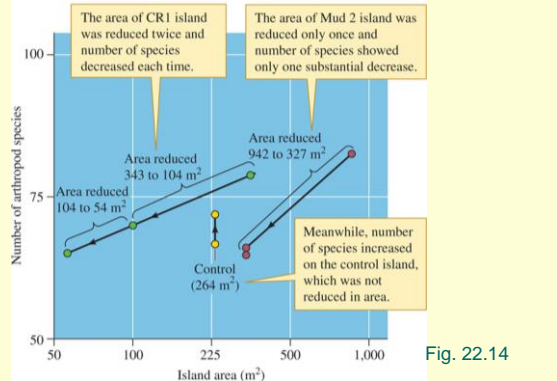


Fig. 22.14

Latitudinal trends in richness

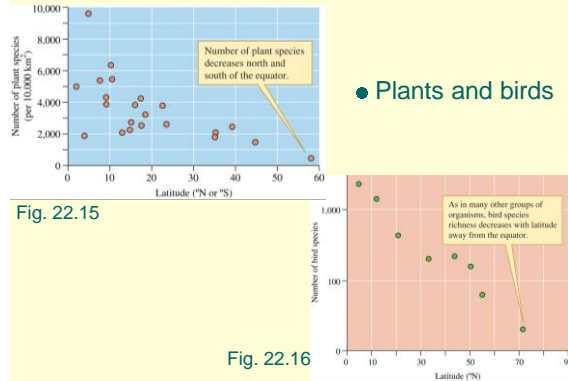


Fig. 22.15

Fig. 22.16

Why?

Historical Context
"Latitudinal Gradients in Species Diversity": Reflections on Pianka's 1966 Article and a Look Forward
2017
Douglas W. Schemske^{1,2*} and Gary G. Mittelbach³

- Pianka (1966)
 - Time
 - Spatial heterogeneity
 - Competition
 - Predation
 - Climatic stability
 - Productivity
- Ecology vs. Evolution

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Why? (2)

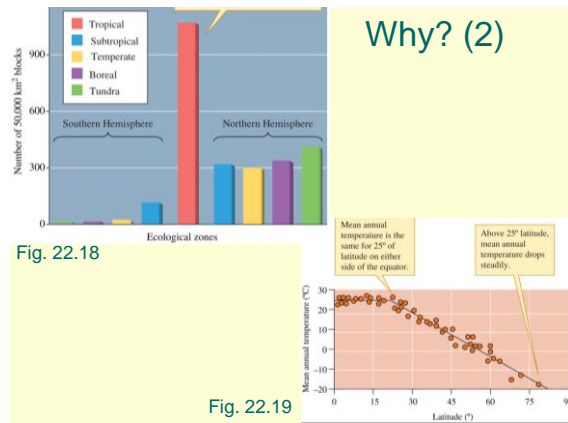


Fig. 22.18

Fig. 22.19

Why? (3)

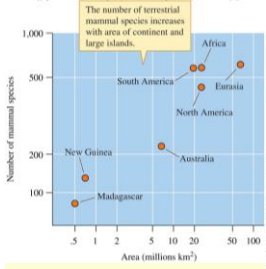


Fig. 22.20

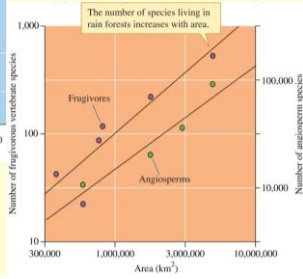


Fig. 22.21