

Quiz

The theory of island biogeography seeks to explain

- a) Species composition of islands
- b) Equilibrium species richness of islands
- c) Accumulation of species on islands
- d) Relative abundance of species on islands

Bird species on Krakatoa



Variables

c = per species
colonization rate

h = per species extinction
rate

$C(s)$ = total colonization
rate

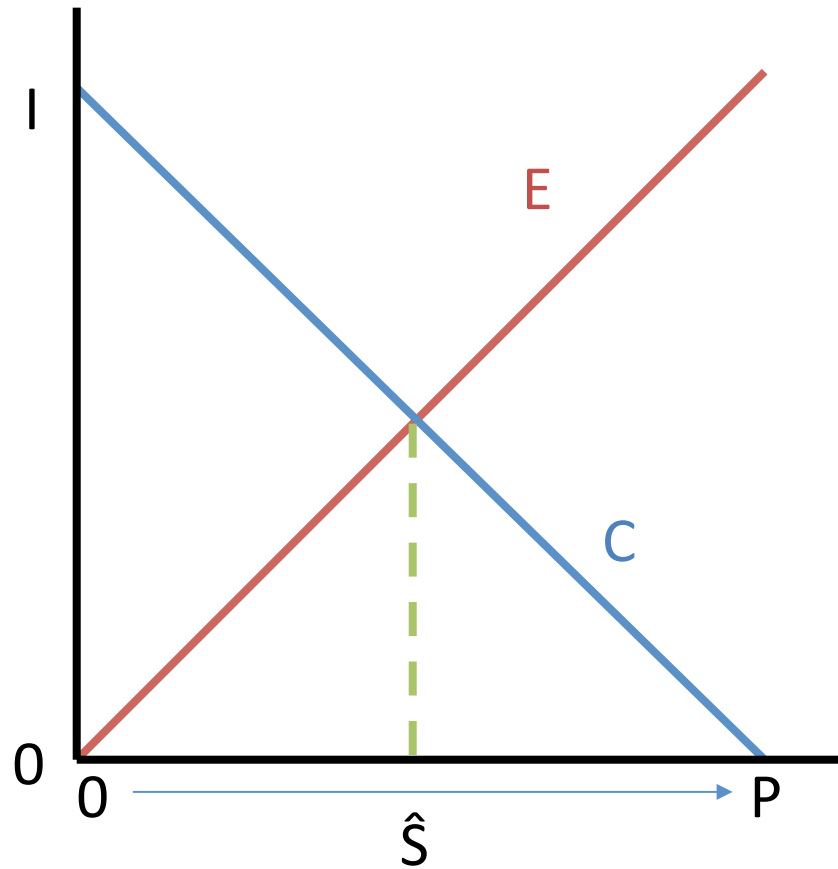
$E(s)$ = total extinction rate

p = number of mainland
species

s^* = equilibrium number
of species

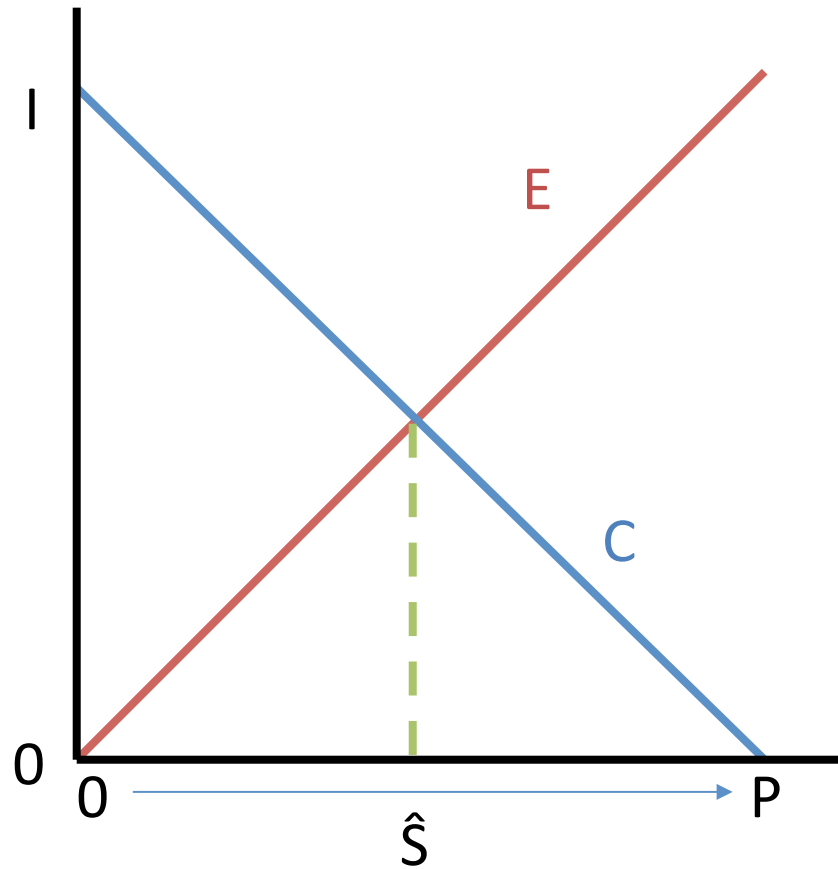
Simple model

$$C(s) = c(p-s)$$
$$E(s) = hs$$



Simple model

Problem:
Solve for equilibrium
number of species



More complex models

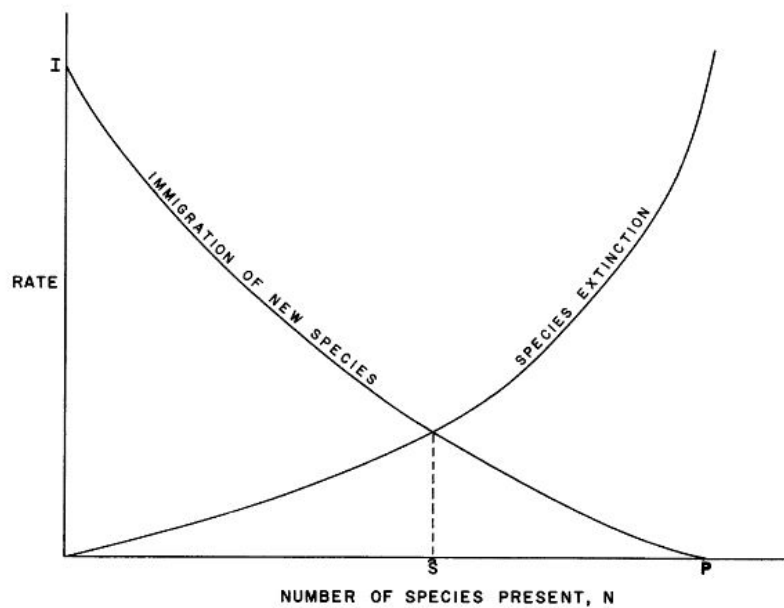


FIG. 4. Equilibrium model of a fauna of a single island. See explanation in the text.

What ecological reasons are behind:

Curved immigration line?

Curved extinction line?

More complex models

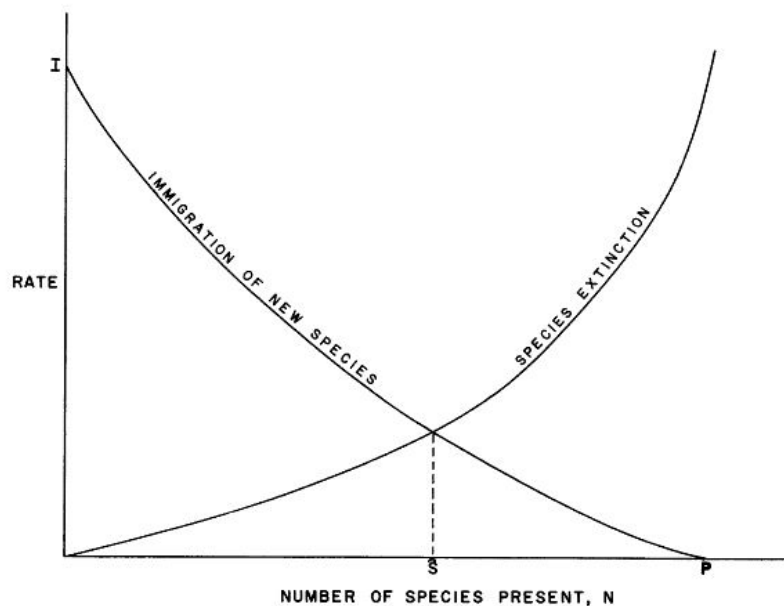


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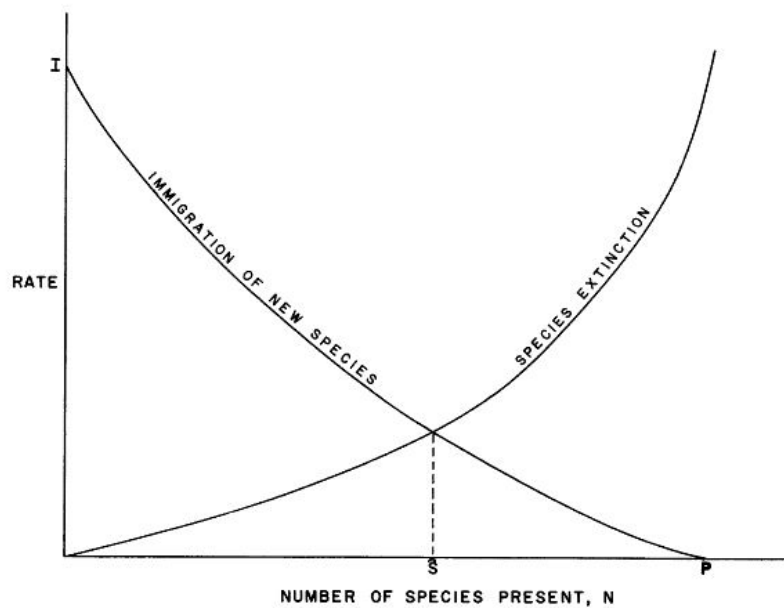
Curved immigration line?

Fast moving species get to island quickly – have to wait longer and longer as the species pool is left with slow moving species

Curved extinction line?

At high species richness, each species has low population size (has to share island) – extinction rate for each species goes up due to demographic effects and maybe genetic effects

More complex models



What do you predict would happen if:

Island is further from mainland?

Island is smaller?

More complex models

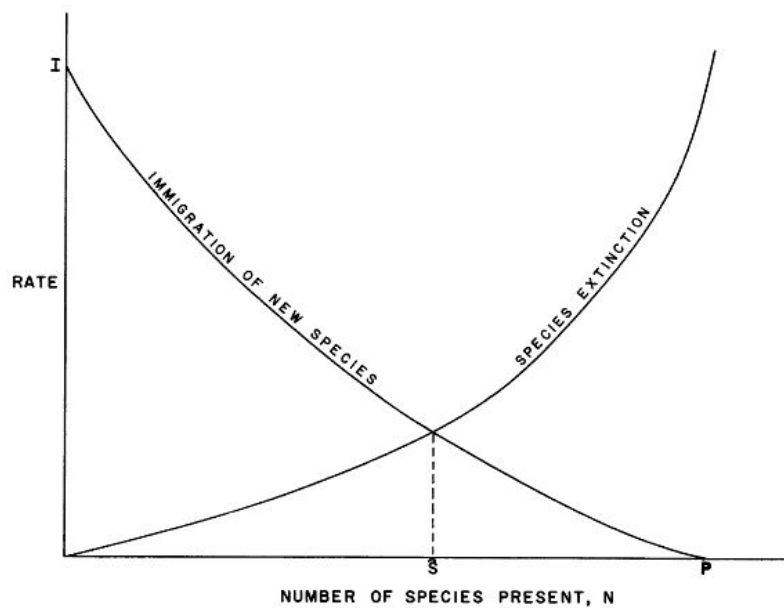


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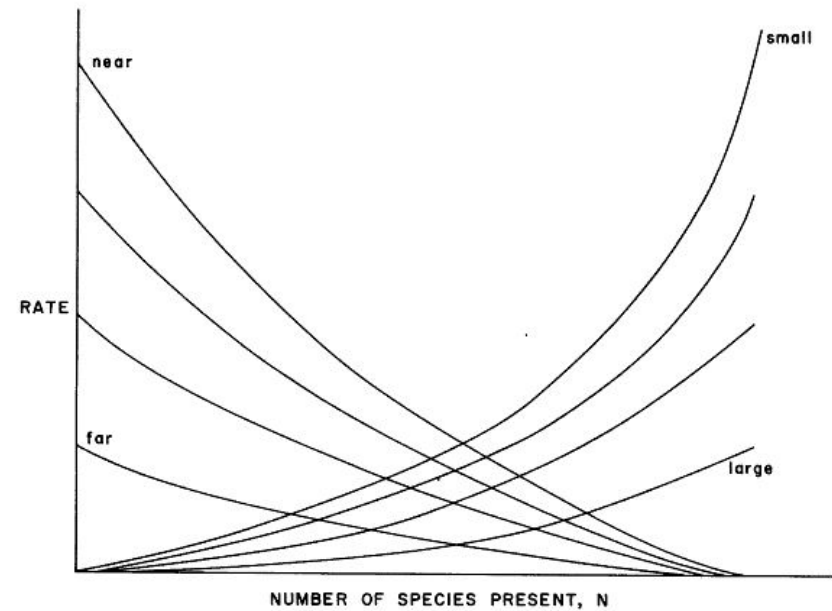


FIG. 5. Equilibrium model of faunas of several islands of varying distances from the source area and varying size. Note that the effect shown by the data of fig. 2, of faunas of far islands increasing with size more rapidly than those of near islands, is predicted by this model. Further explanation in text.

More complex models

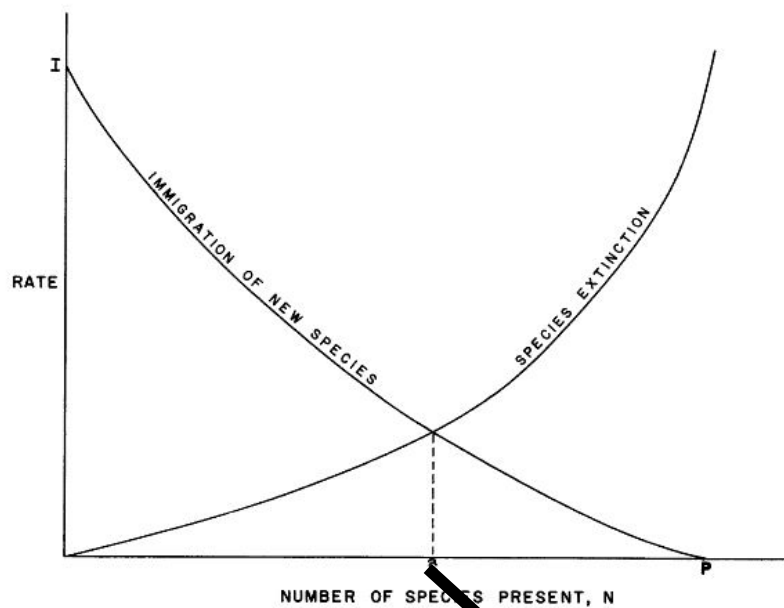


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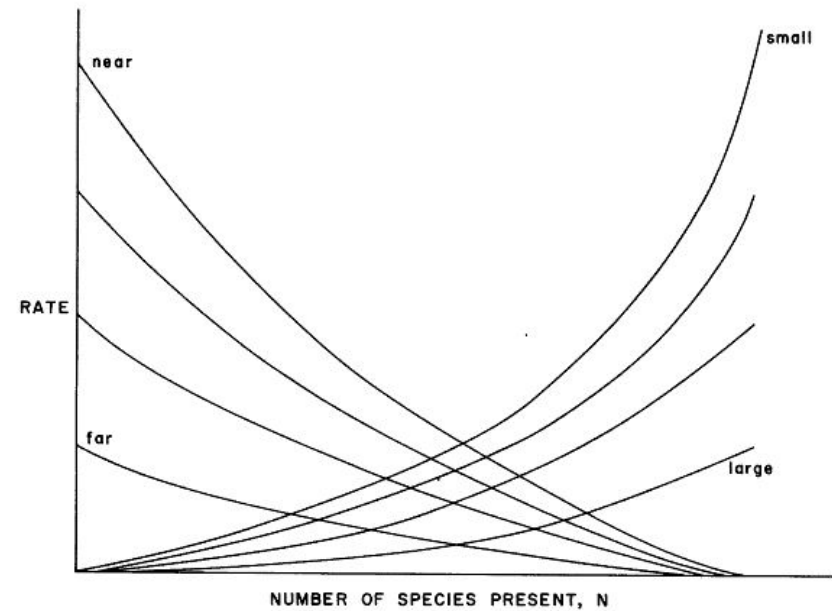


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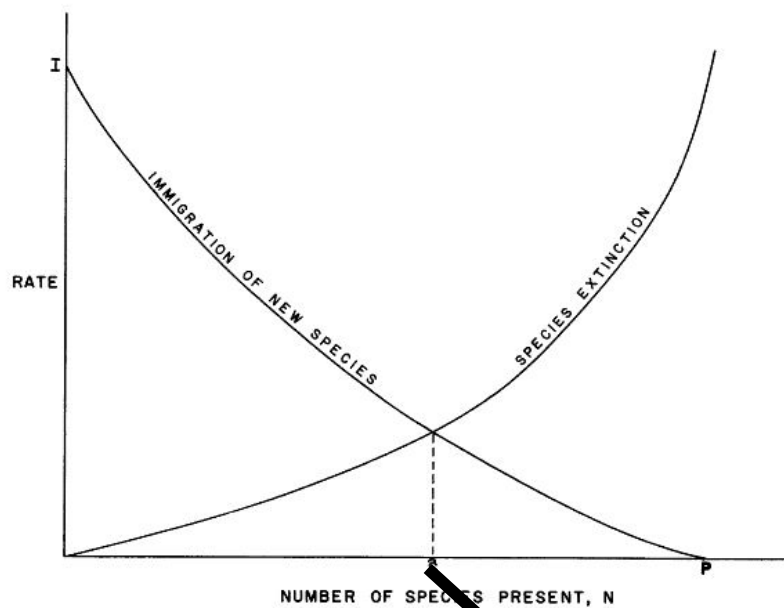


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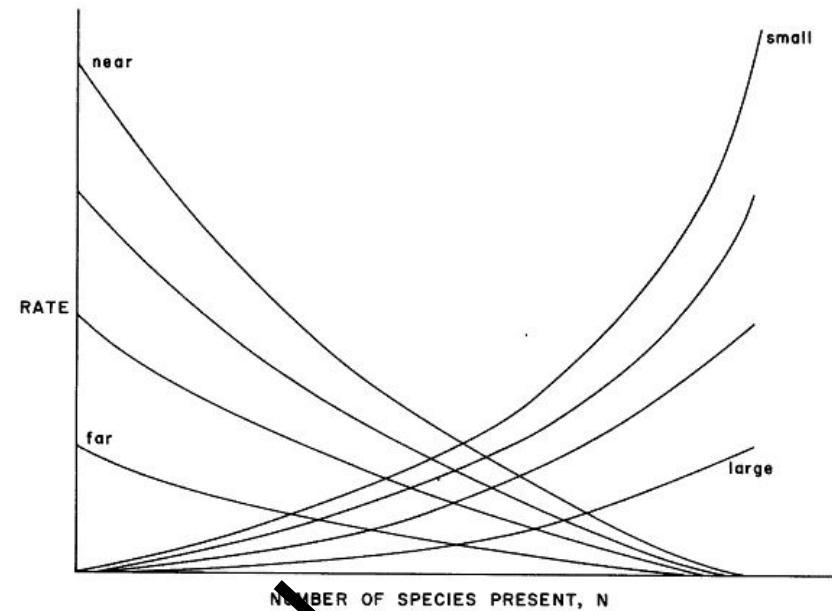


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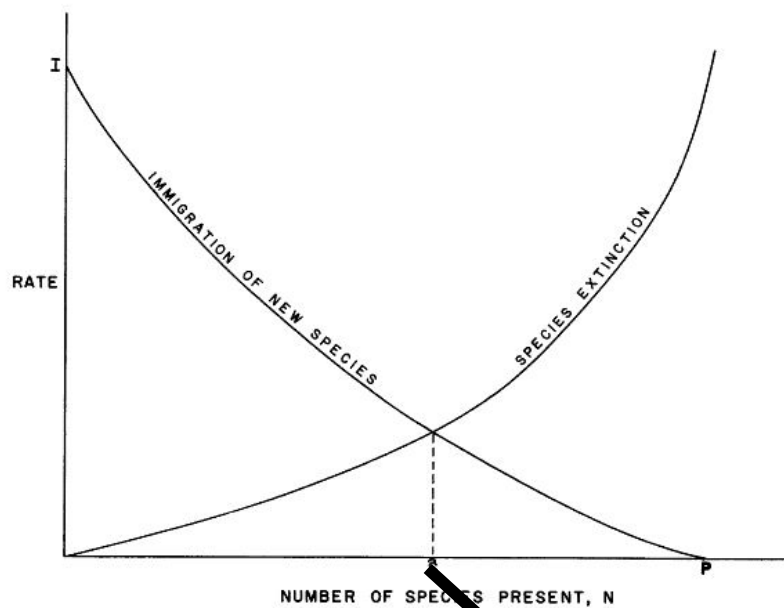


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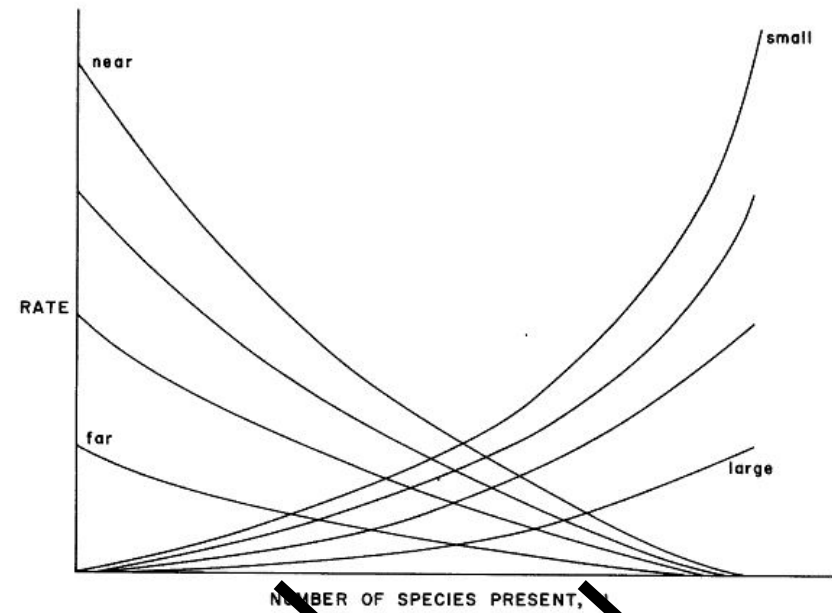


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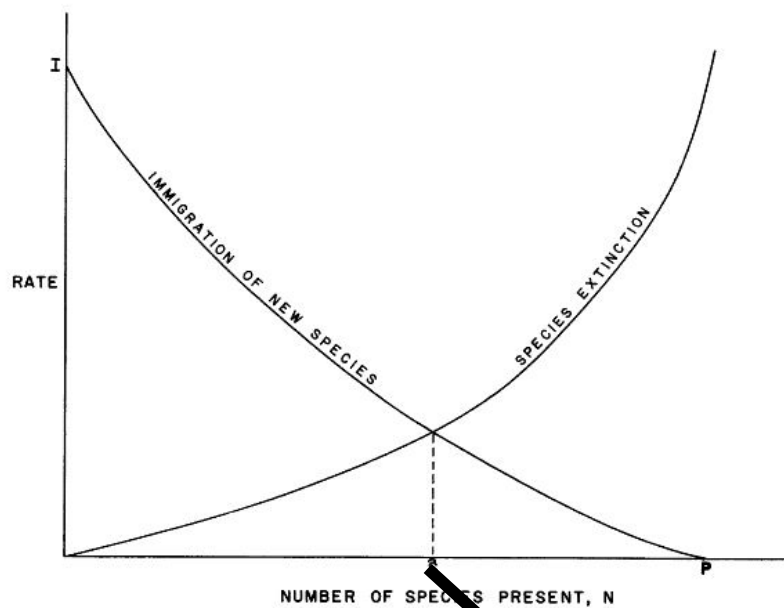


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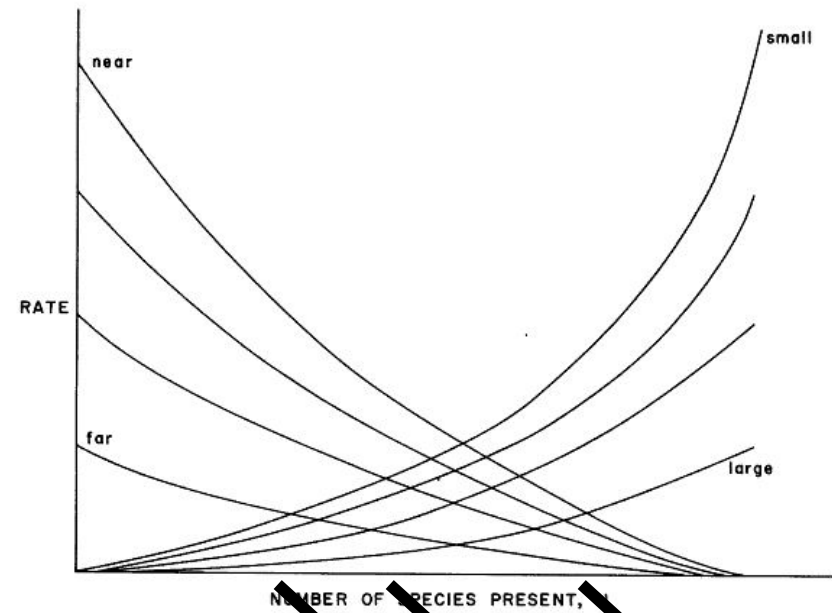


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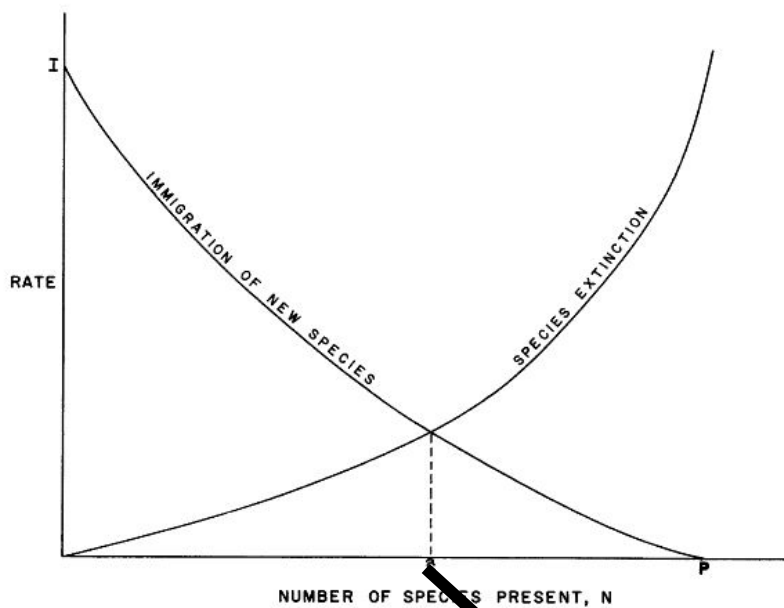


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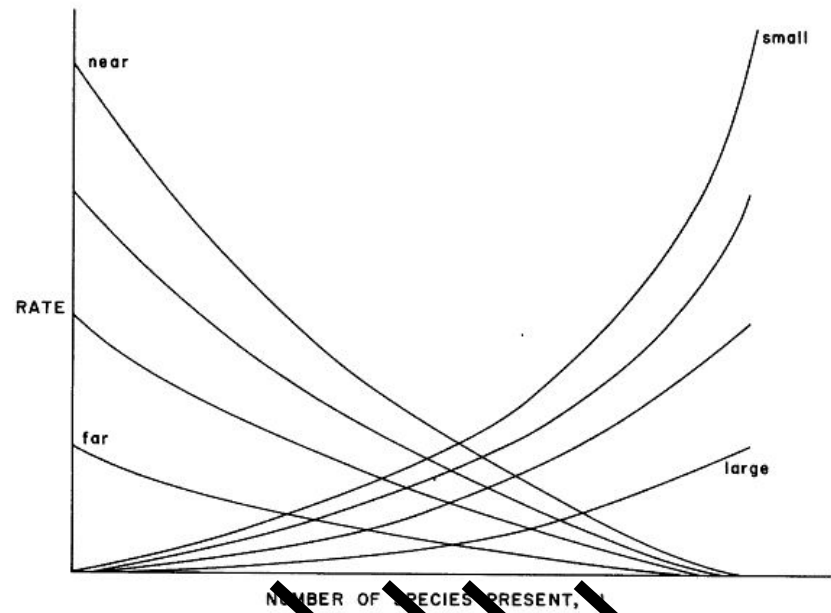


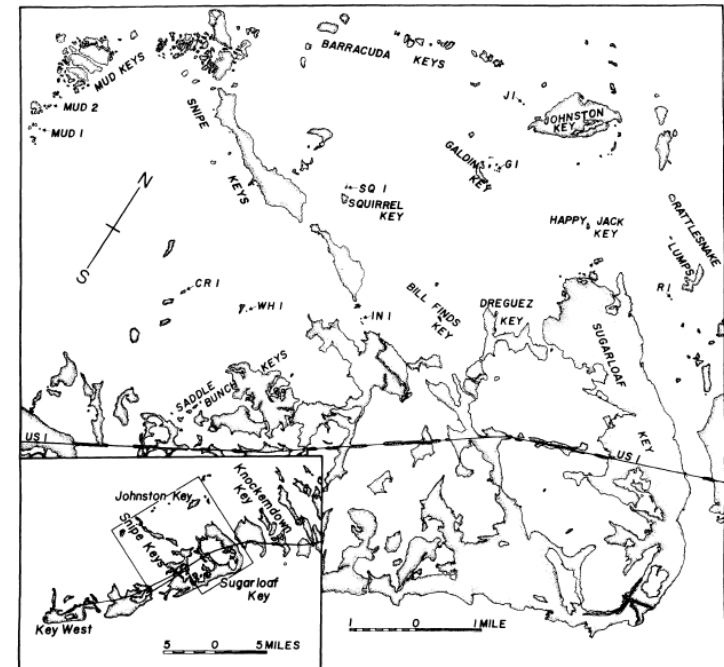
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- Applied insecticide (parathion and diazinon)



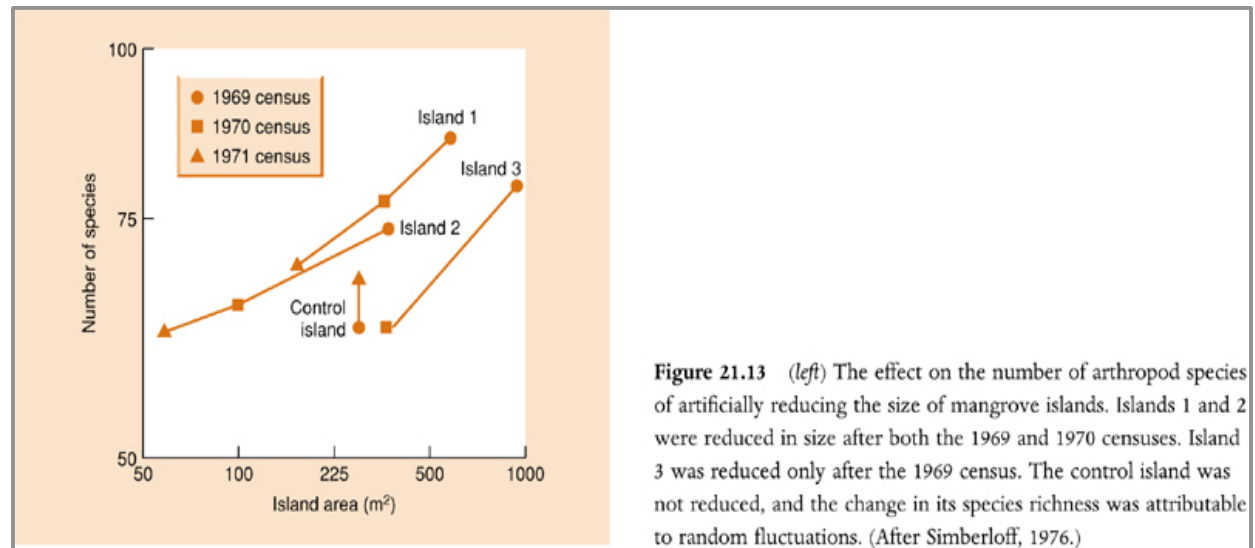
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- Applied insecticide
- Approximately same number of species
- Composition was different!



Simberloff and Wilson (1969) and Simberloff (1978)

- Applied insecticide
- Approximately same number of species
- Composition was different!
- Made islands smaller
- Extinction rates were close to hypothesized value



Similar Patterns in Virtual Islands

- Brazilian rainforest fragmentation
- Mountains in the American West (Great Basin)

