

The Unified Neutral Theory of
BIODIVERSITY AND BIOGEOGRAPHY

STEPHEN P. HUBBELL

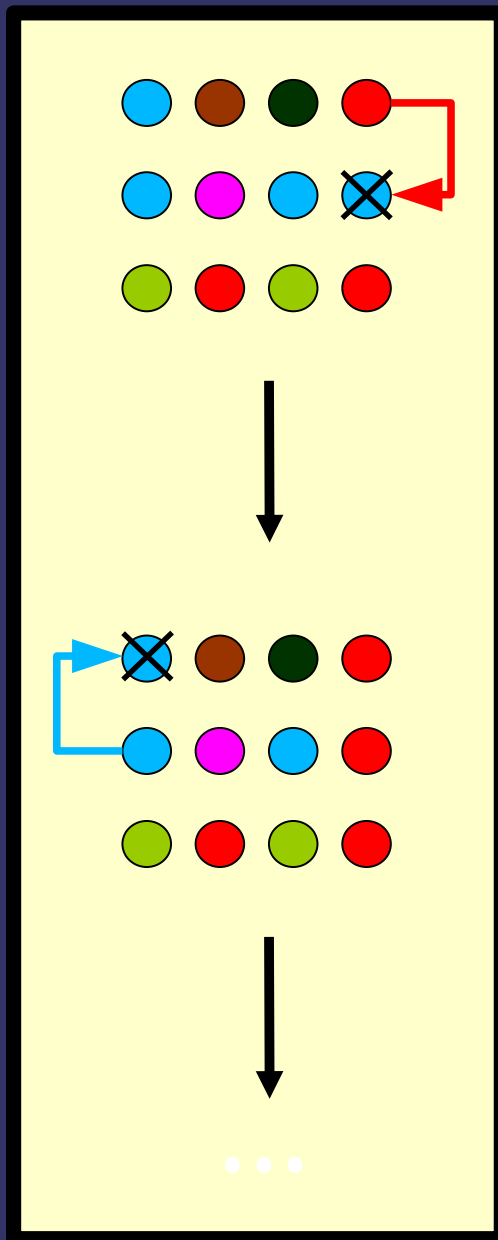


MONOGRAPHS IN POPULATION BIOLOGY • 32

**DINÂMICA
DE
COMUNIDADES:**

**Nicho
X
Neutralidade**

DINÂMICA ALEATÓRIA DE MORTES E NASCIMENTOS



Indivíduos pertencem a n classes diferentes.

Intervalos de tempo pequenos: N muda por perda ou acréscimo de um indivíduo.

Em média perdas igualam acréscimos ($E[r]=0$)

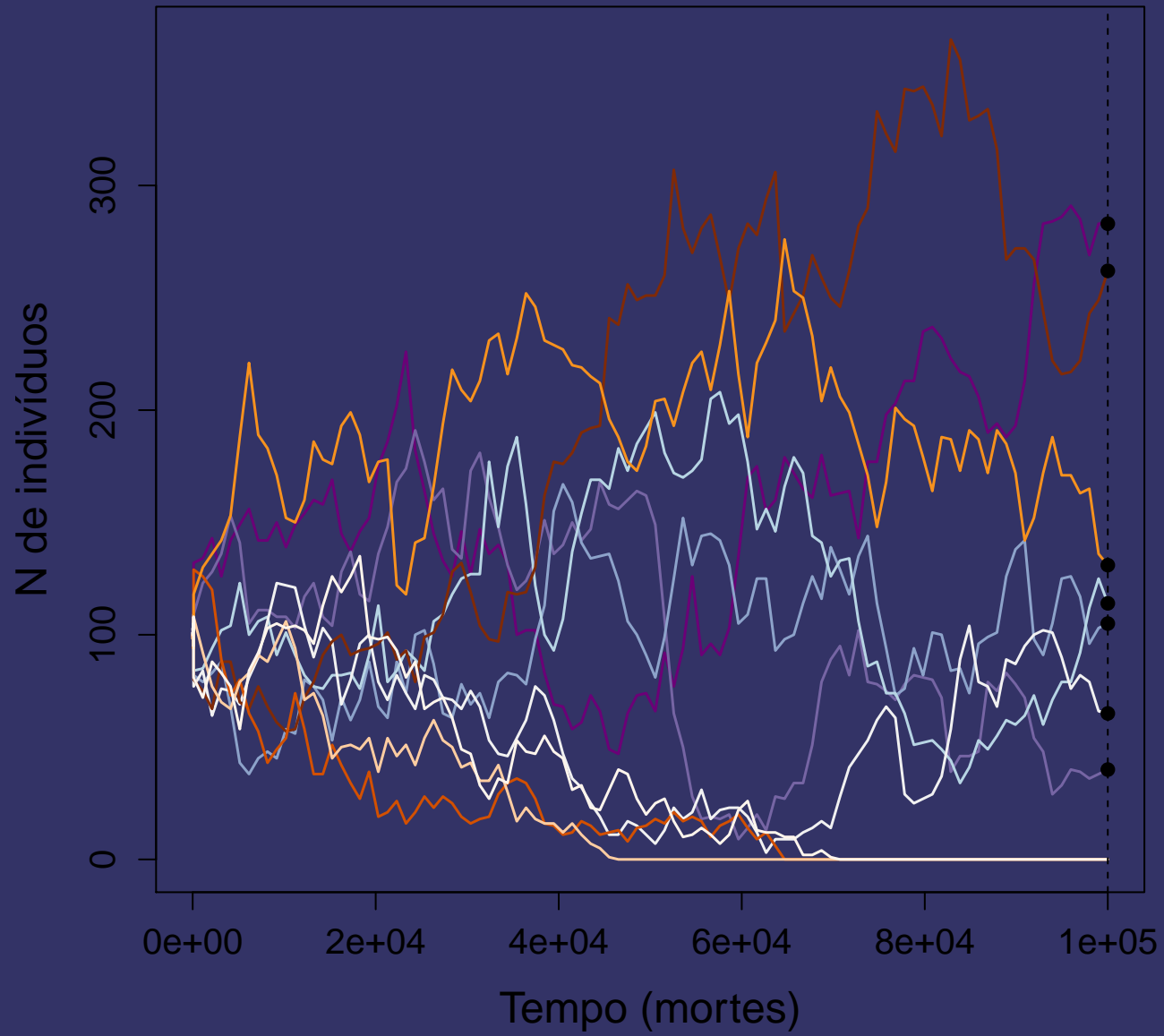
Há três transições possíveis, dado o intervalo pequeno de tempo:

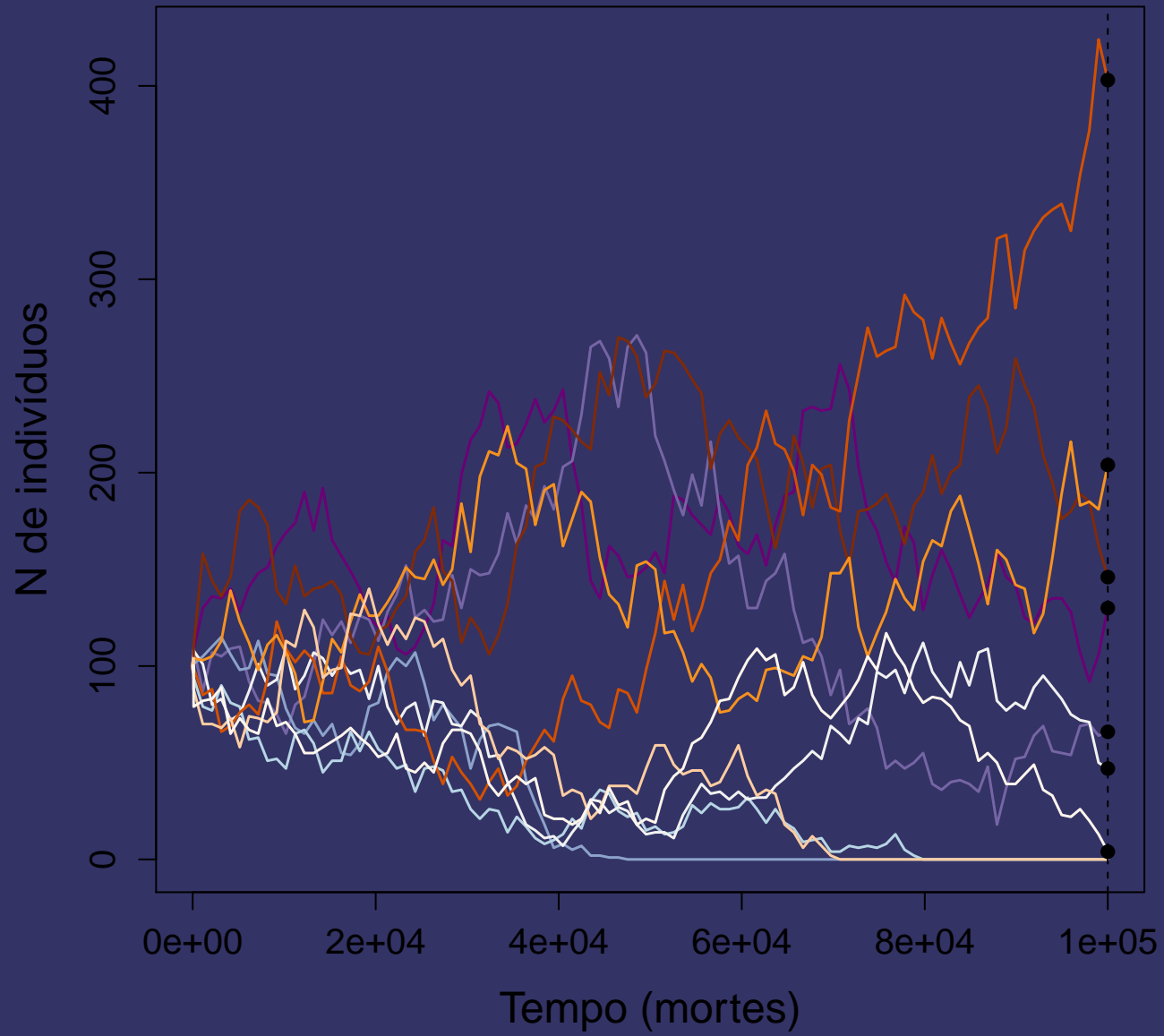
$$N_{t+dt} = N_t$$

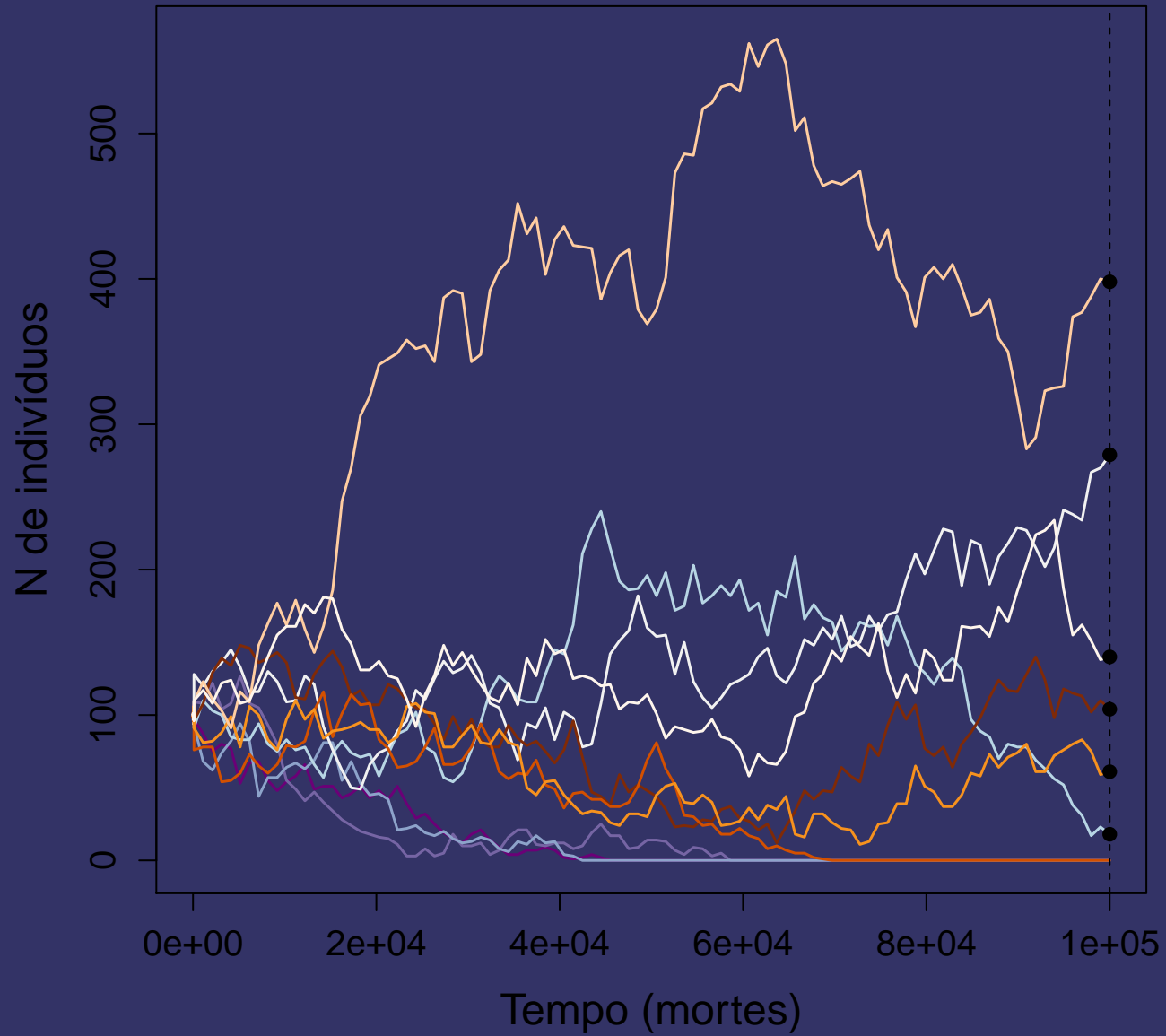
$$N_{t+dt} = N_t + 1$$

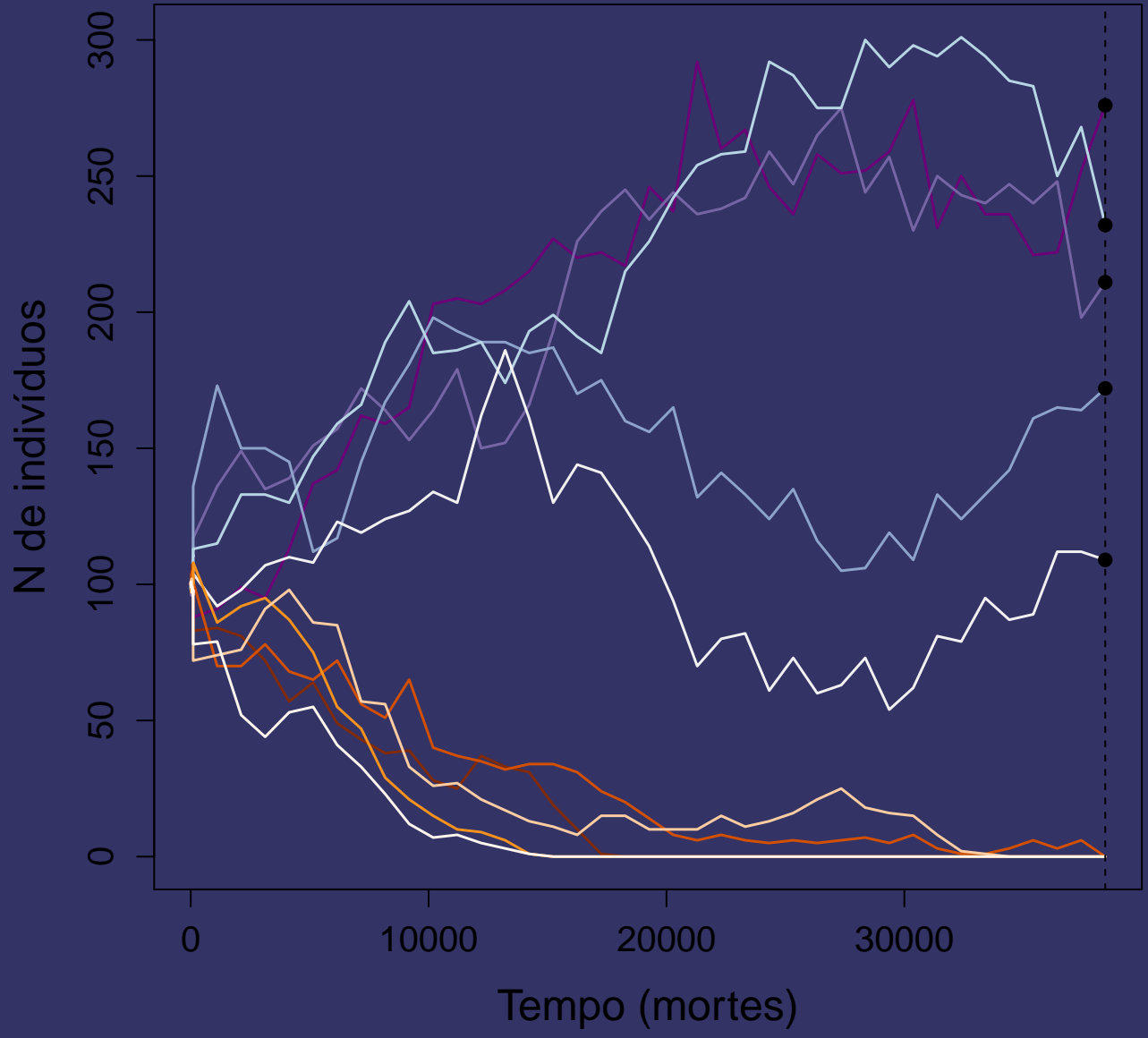
$$N_{t+dt} = N_t - 1$$

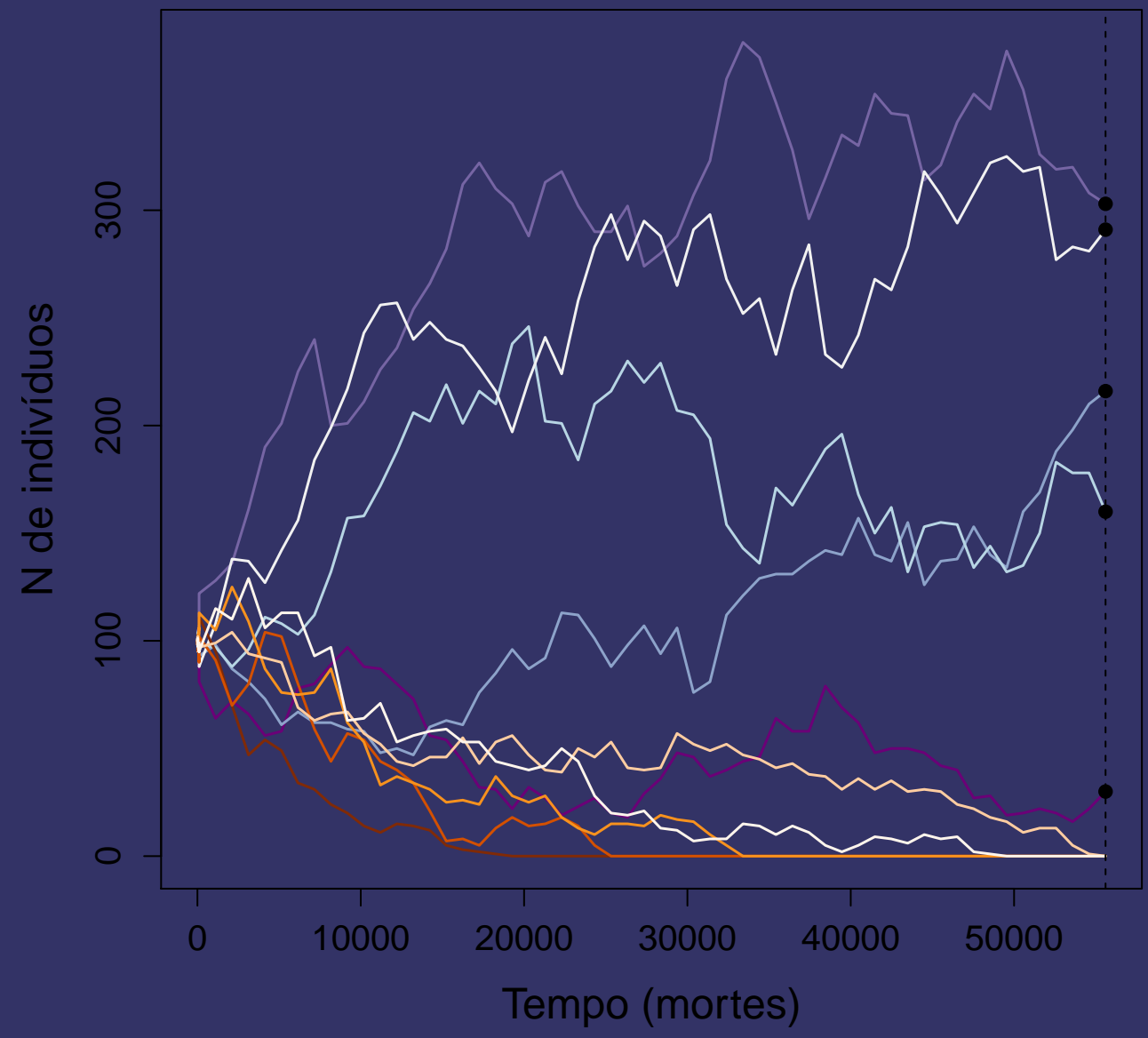
Neutralidade: as probabilidades são iguais para todos os indivíduos

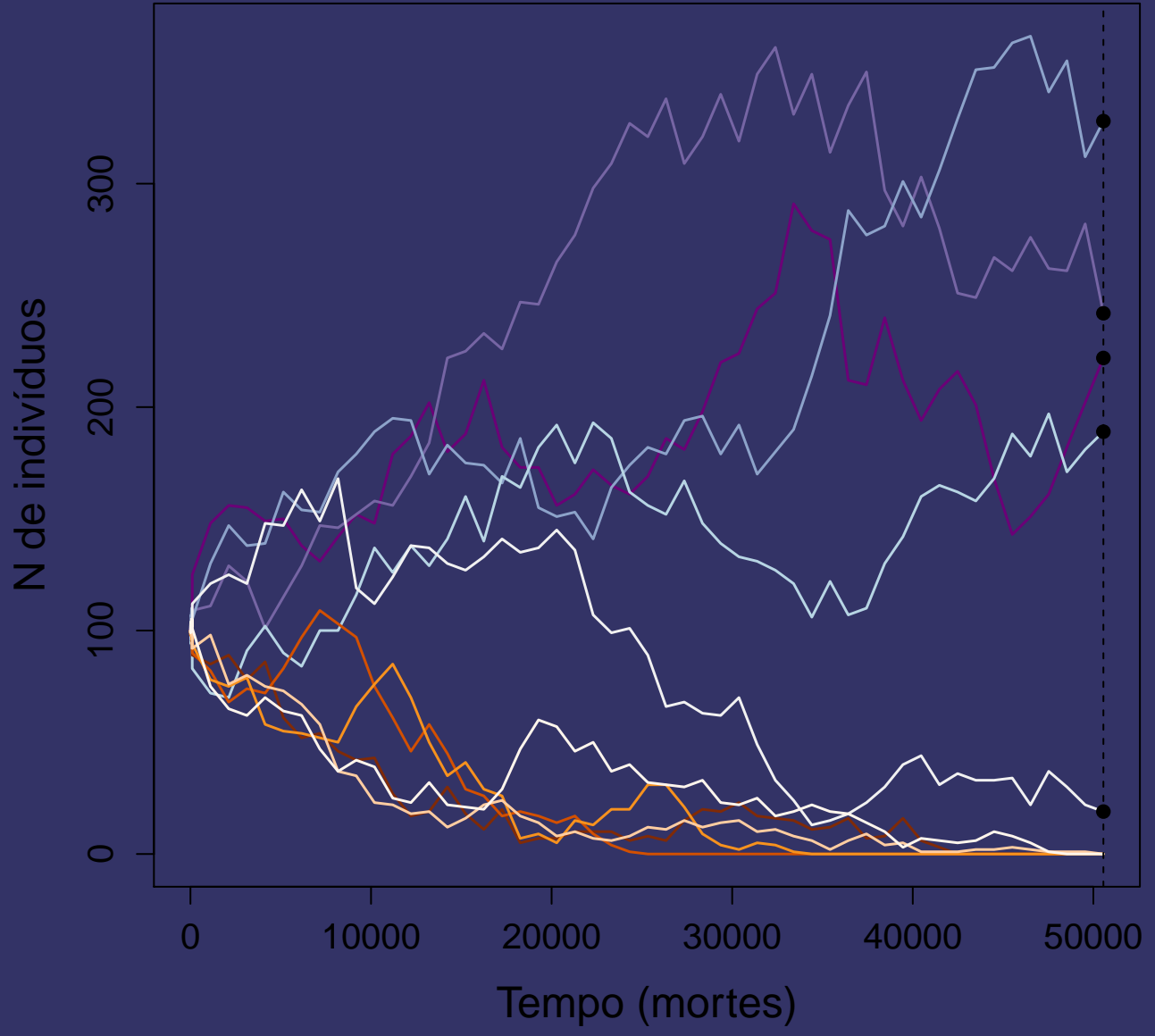


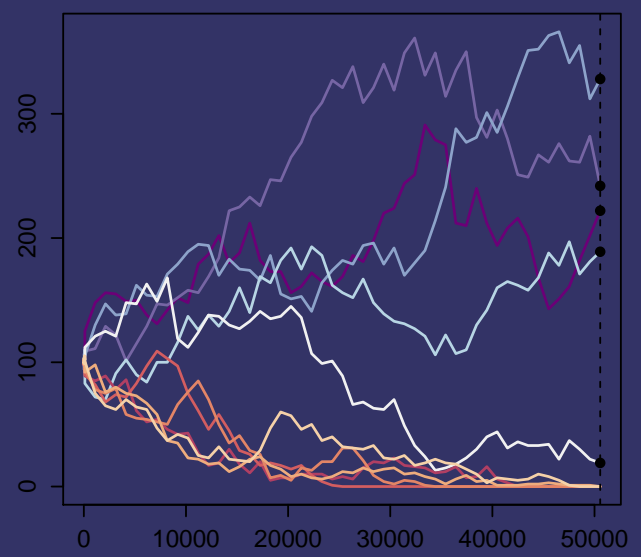
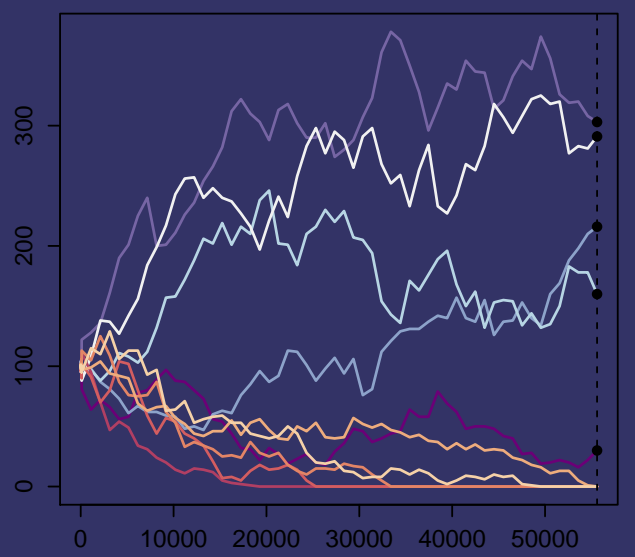
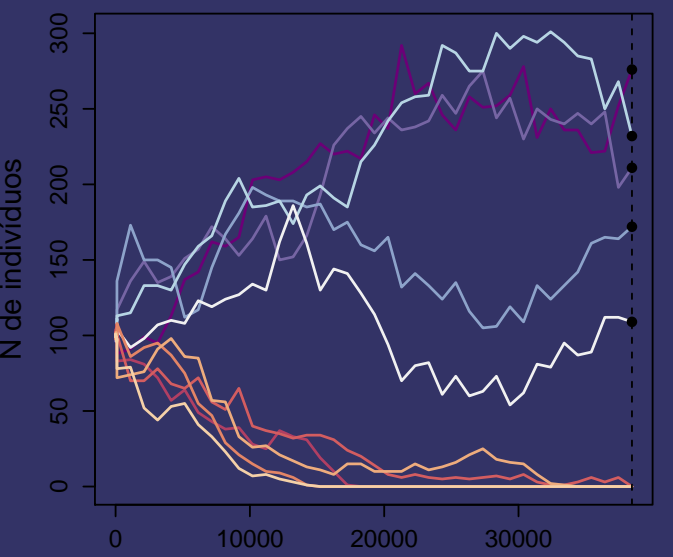
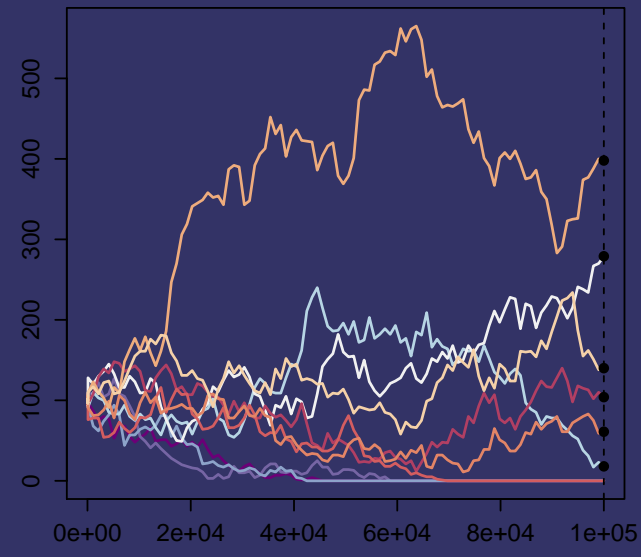
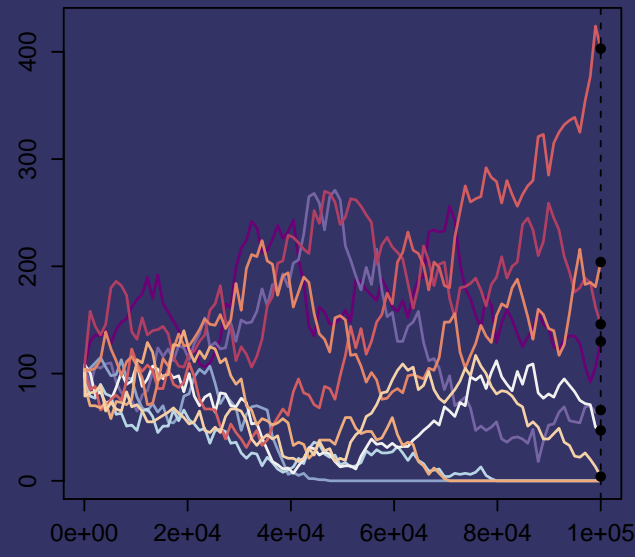
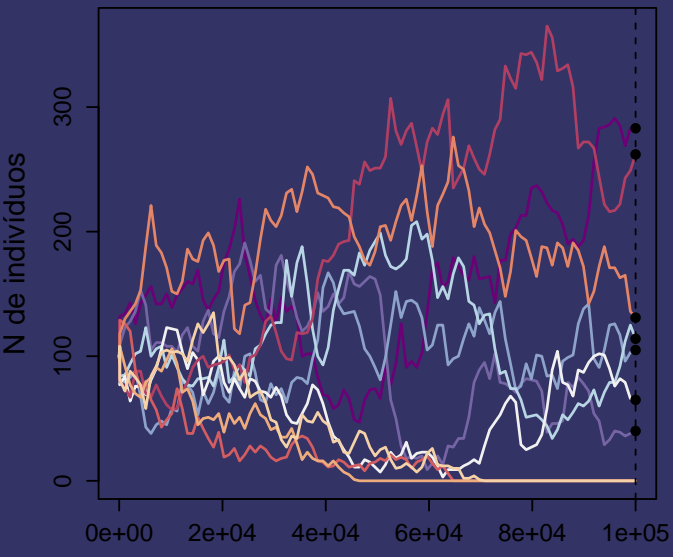






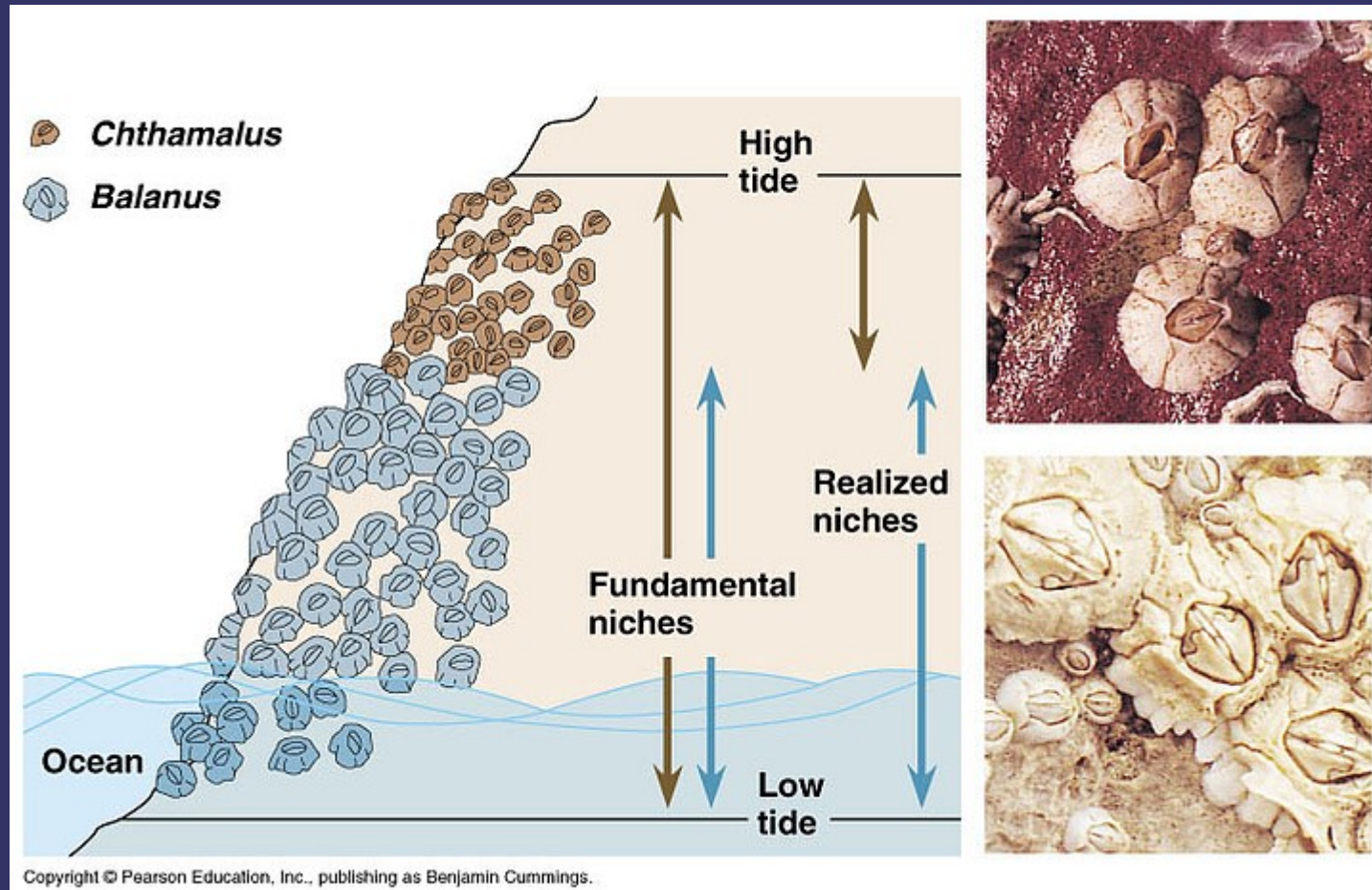




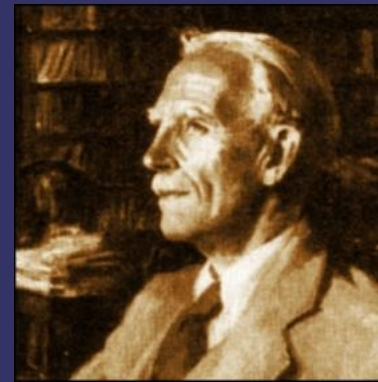
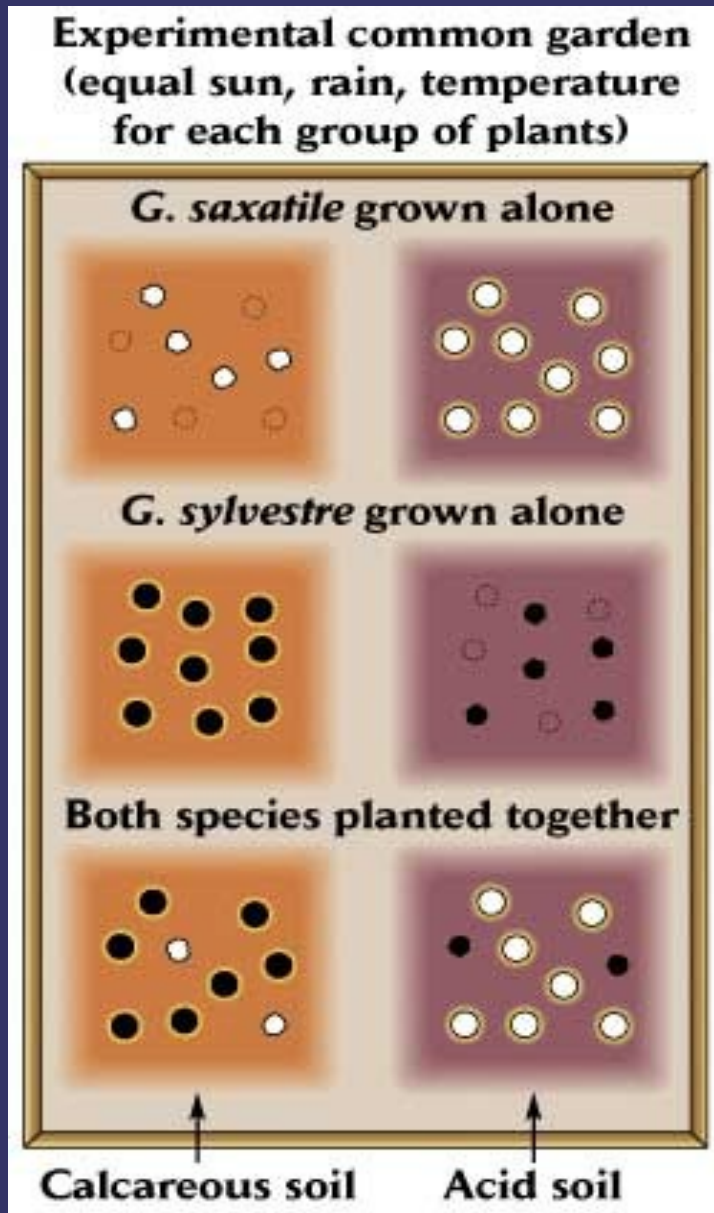


Tempo (mortes)

Exclusão competitiva e segregação de habitats



Segregação hábitats em plantas

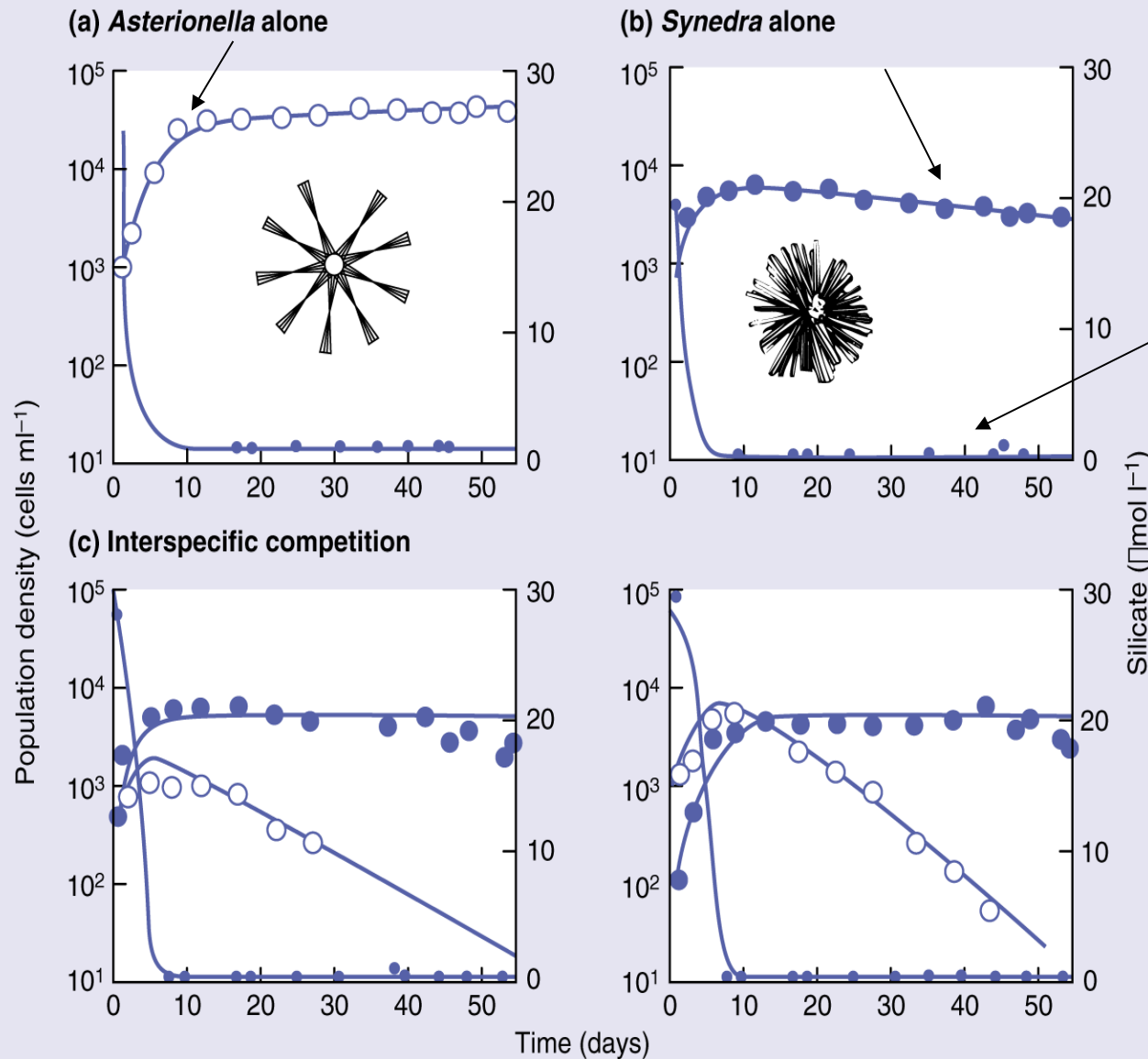


Sir Arthur Tanlsey



Galium saxatile

Plantas: competição mediada por recursos



Concentração de sílica no meio de cultura.

Synedra tem R* de SiO₂ menor do que *Asterionella*.

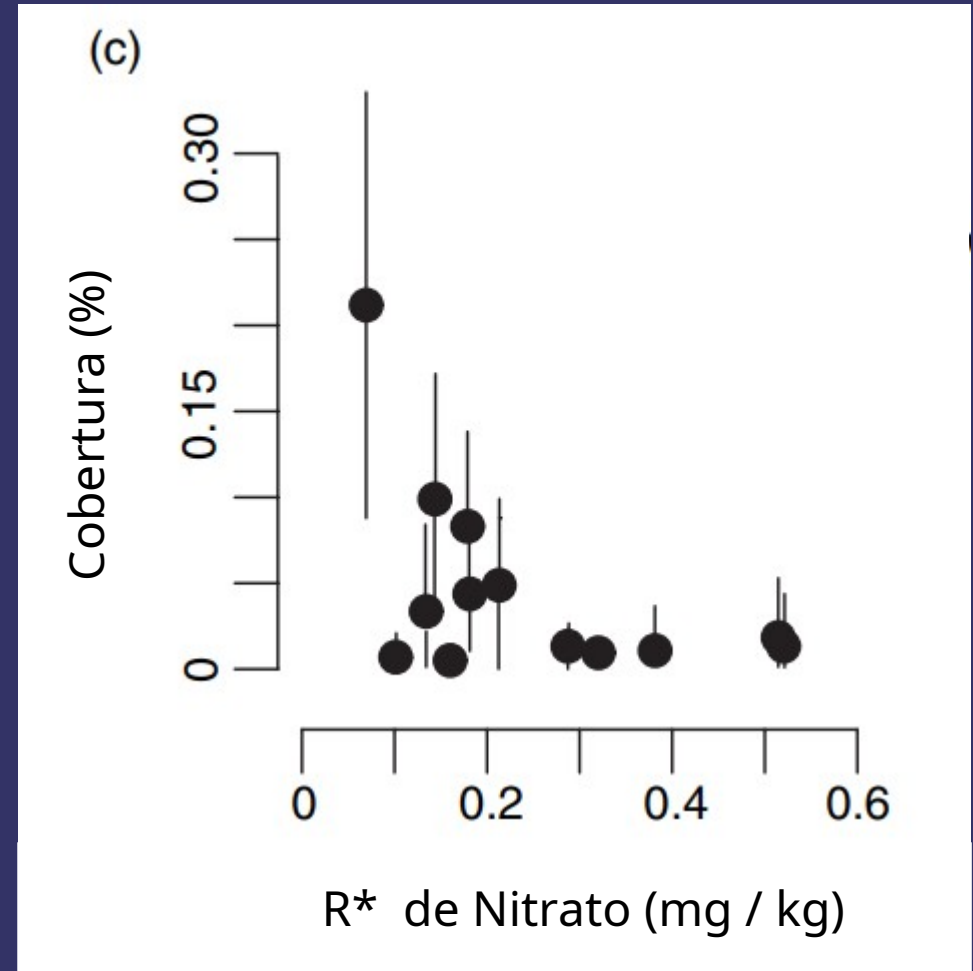
Tilman, 1982



David Tilman



Experimentos de Longa duração
(LTER) de Cedar Creek,
<http://www.cedarcreek.umn.edu>



Harpole & Tilman, Ecol Lett 2005

O mistério da riqueza tropical

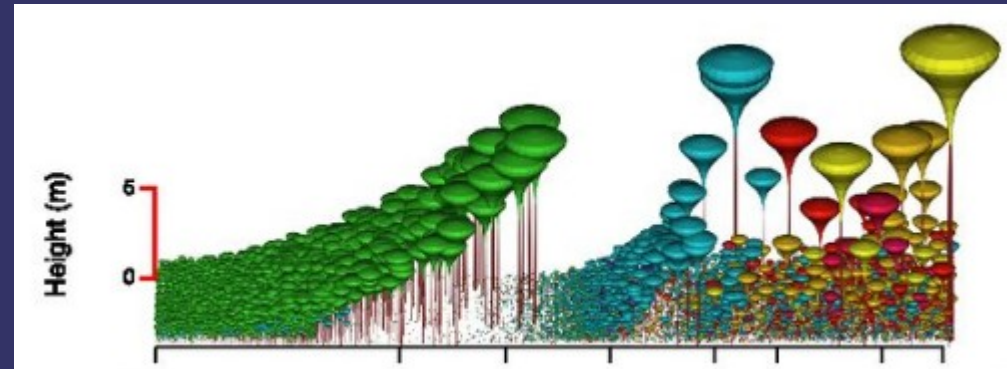
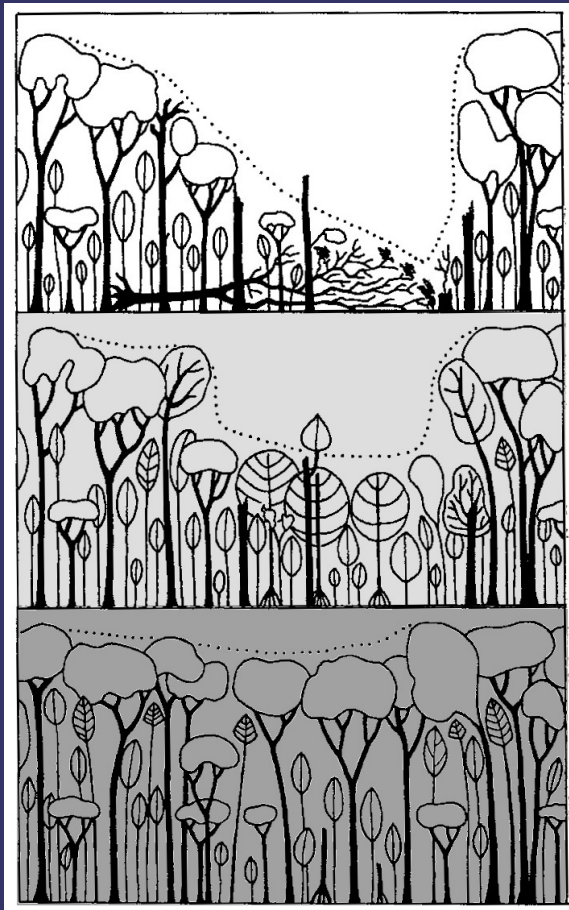


- 0,1 hectare de floresta tropical (BA): 144 espécies de árvores
- O dobro se considerarmos outras formas de vida.
- Reino Unido (243.610 km²): 32 espécies árvores nativas

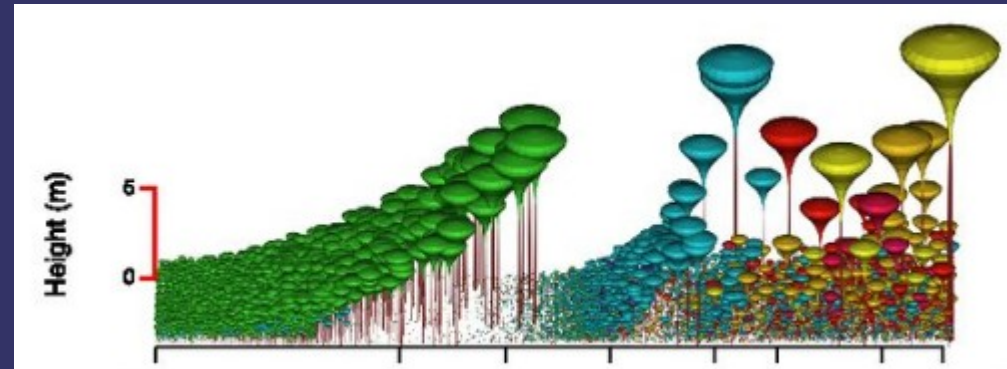
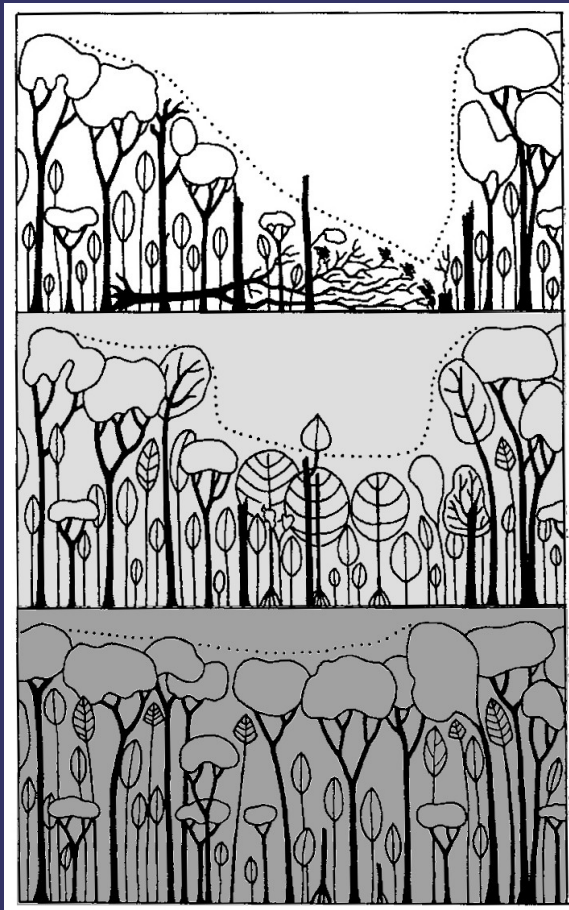
Hipótese de Janzen-Connell



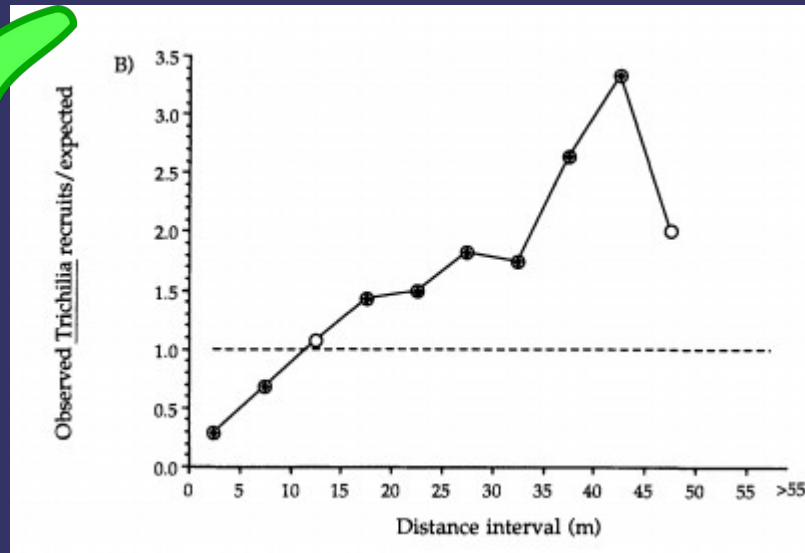
Nichos sucessionais



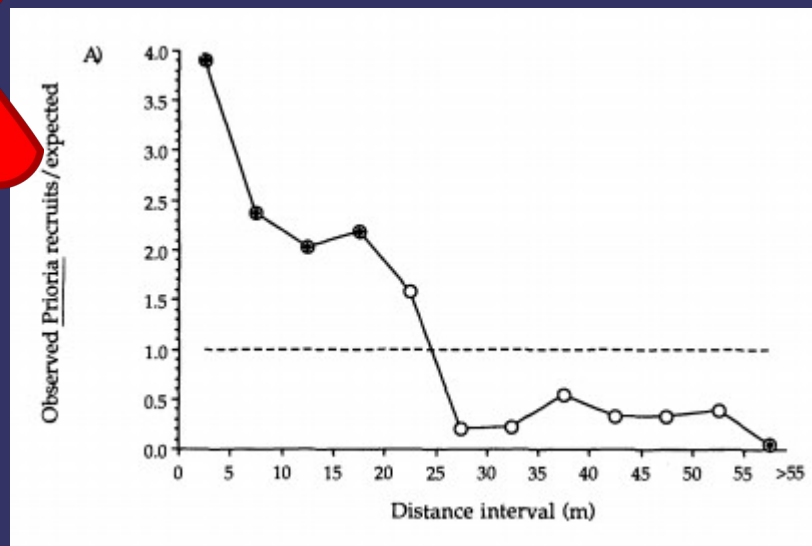
Nichos sucessionais



Das 80 espécies com mais de 50 recrutas em BCI (1982-1985) ...

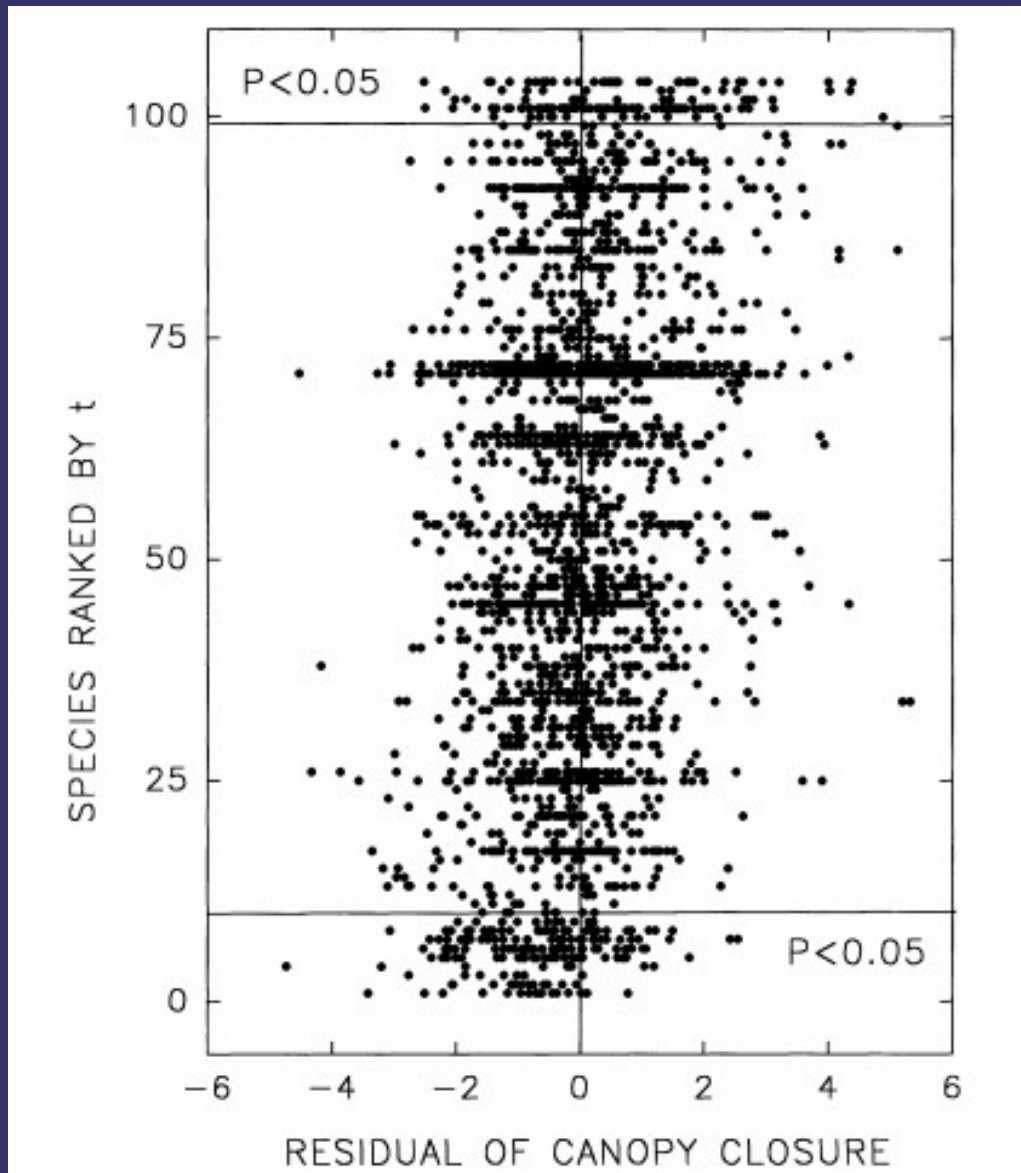


15 (19%) tiveram mais recrutas que o esperado **longe** das árvores-mãe



27 (34%) tiveram mais recrutas que o esperado **perto** das árvores-mãe

Das 104 espécies mais abundantes da parcela de La Selva ...



14 (13%) tiveram associação positiva ou negativa com áreas de dossel mais denso

MUDANDO O FOCO: COLONIZAÇÃO E EXTINÇÃO

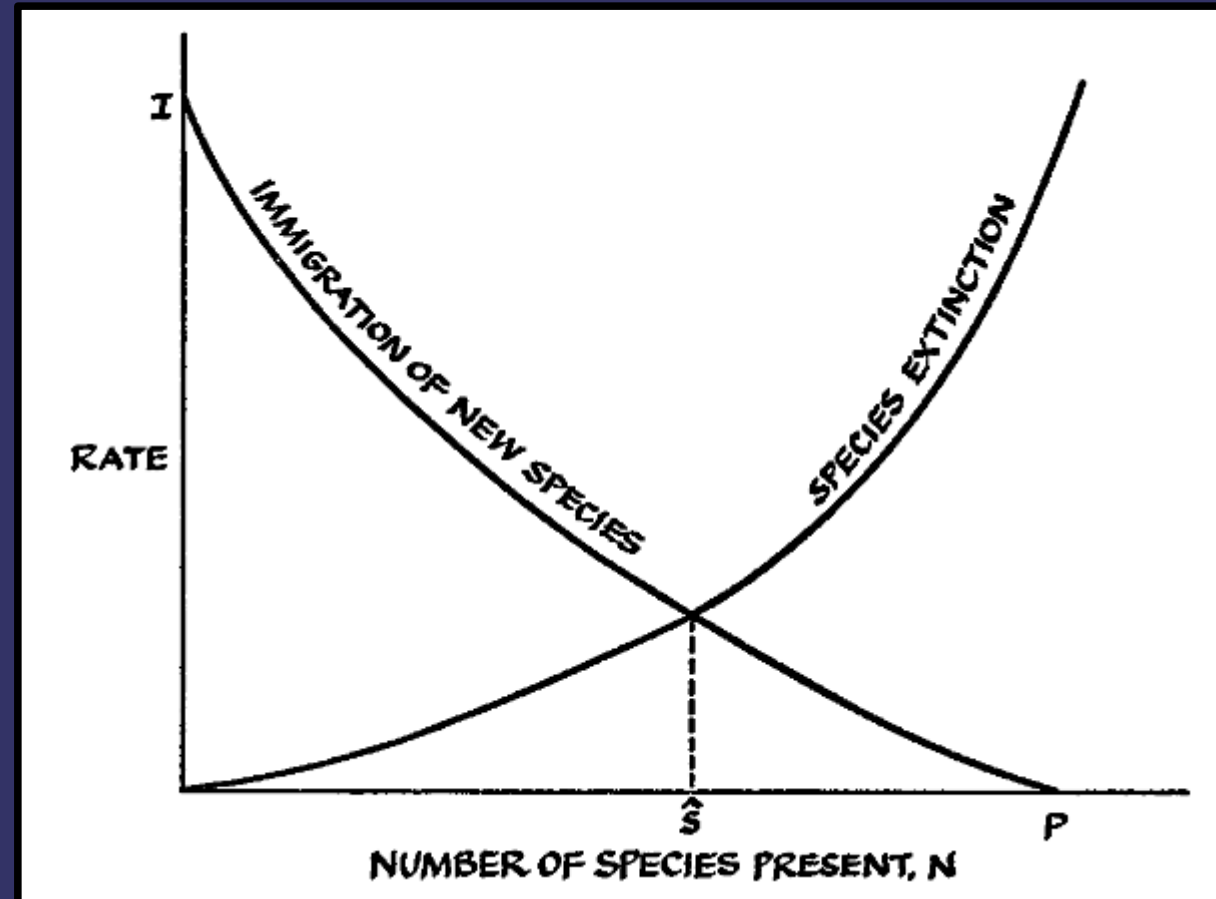
THE THEORY OF Island Biogeography

ROBERT H. MACARTHUR AND

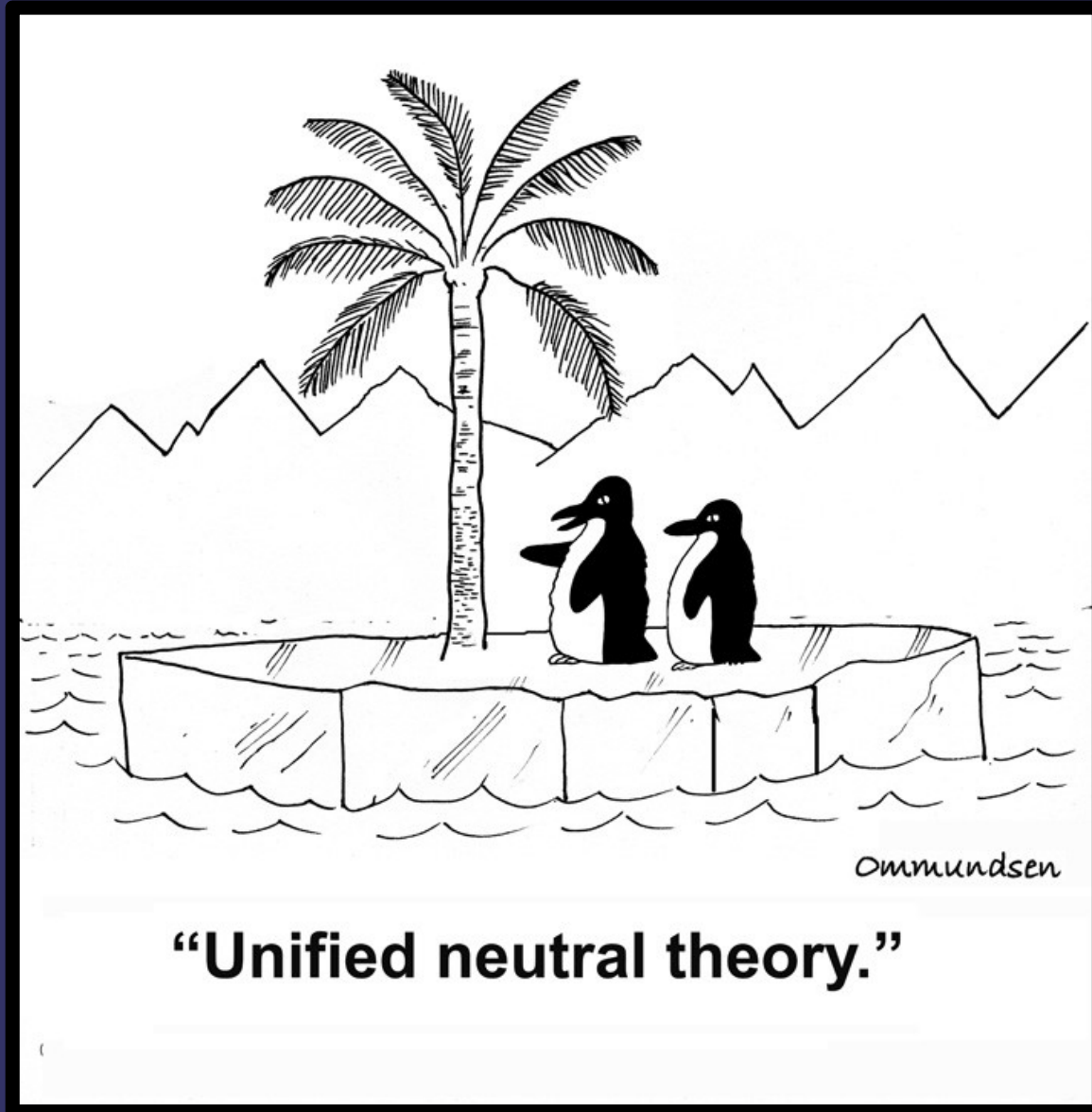
EDWARD O. WILSON

PRINCETON, NEW JERSEY
PRINCETON UNIVERSITY PRESS

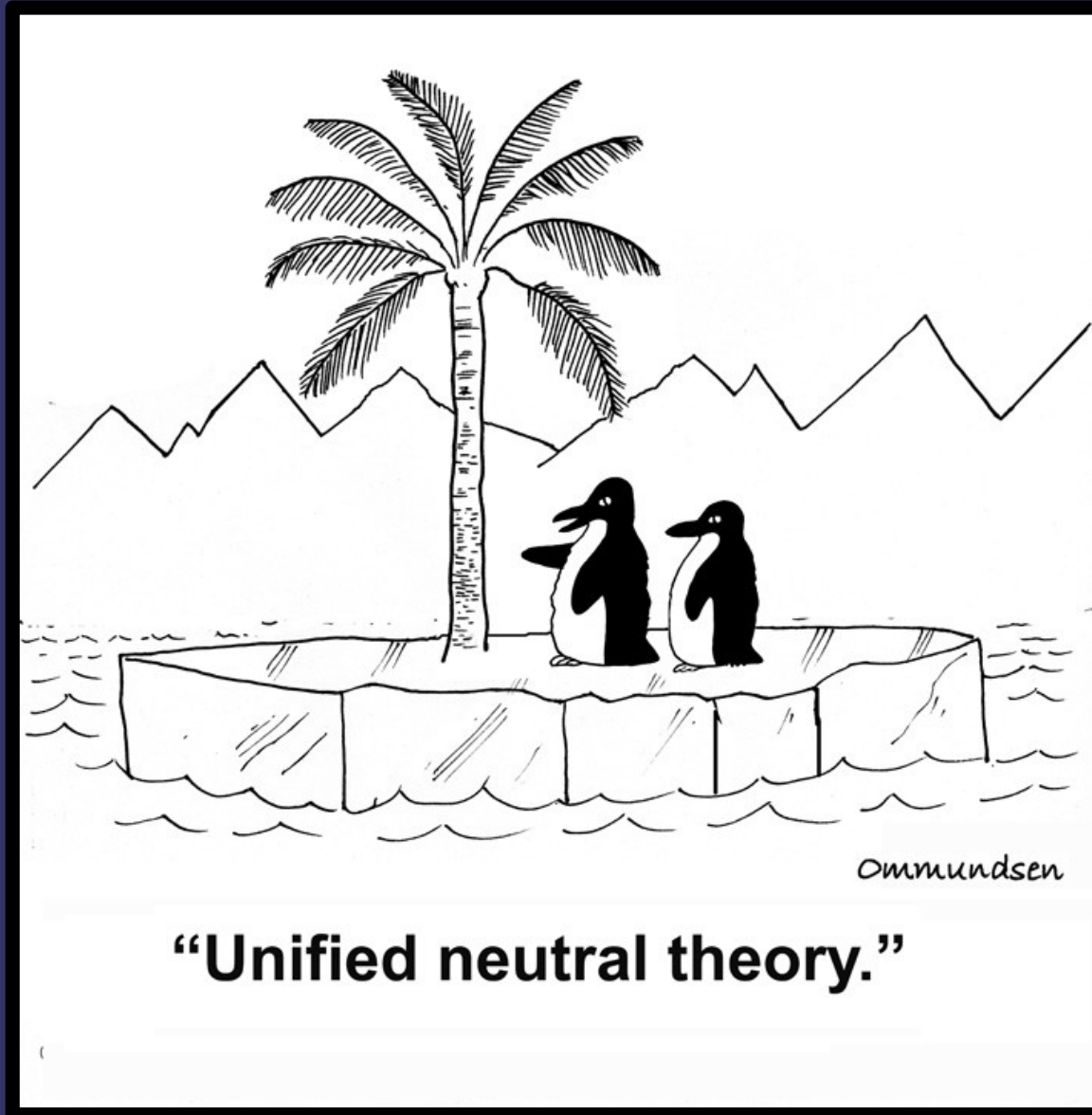
1967



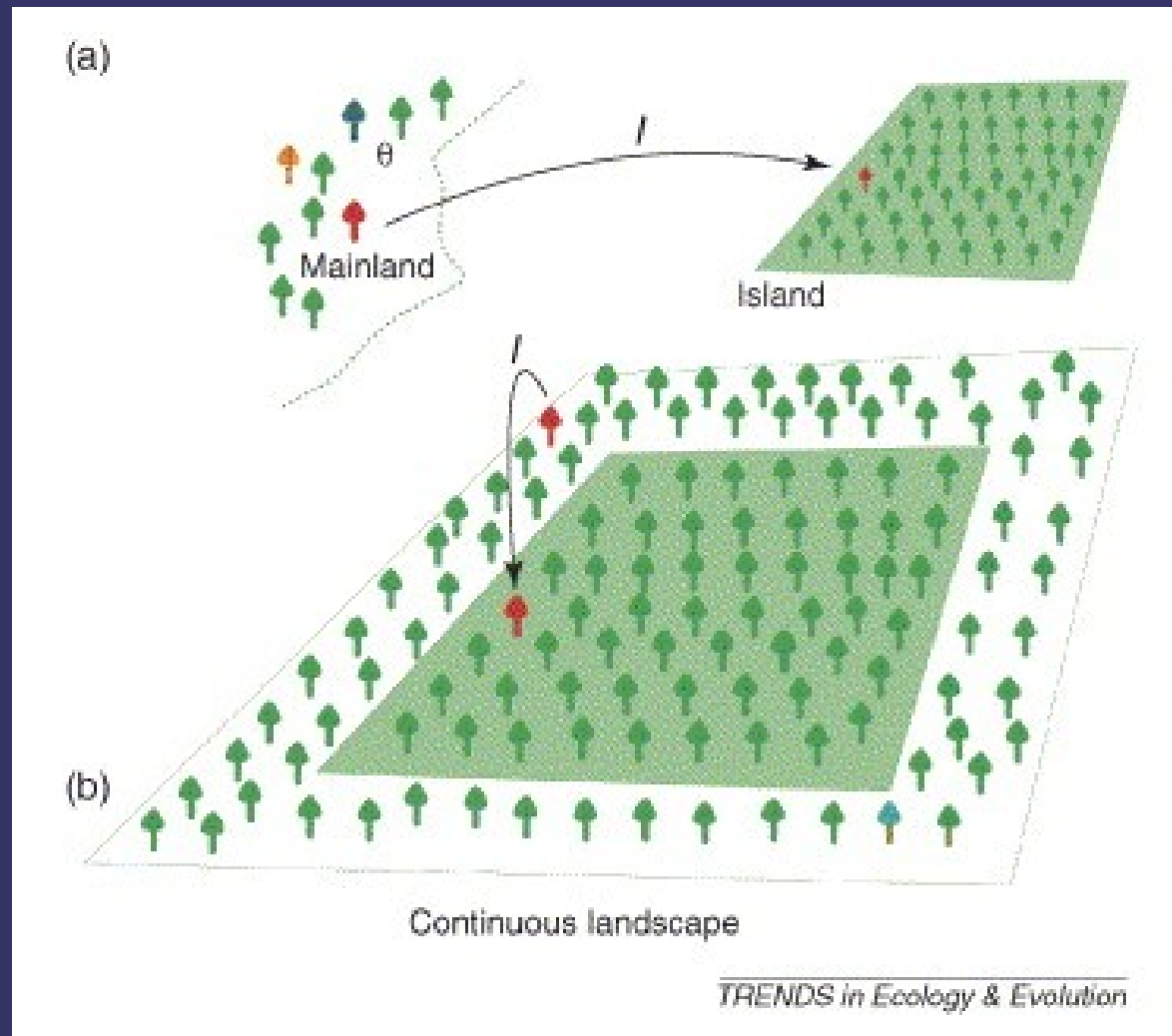
ELABORANDO A OUTRA RESPOSTA



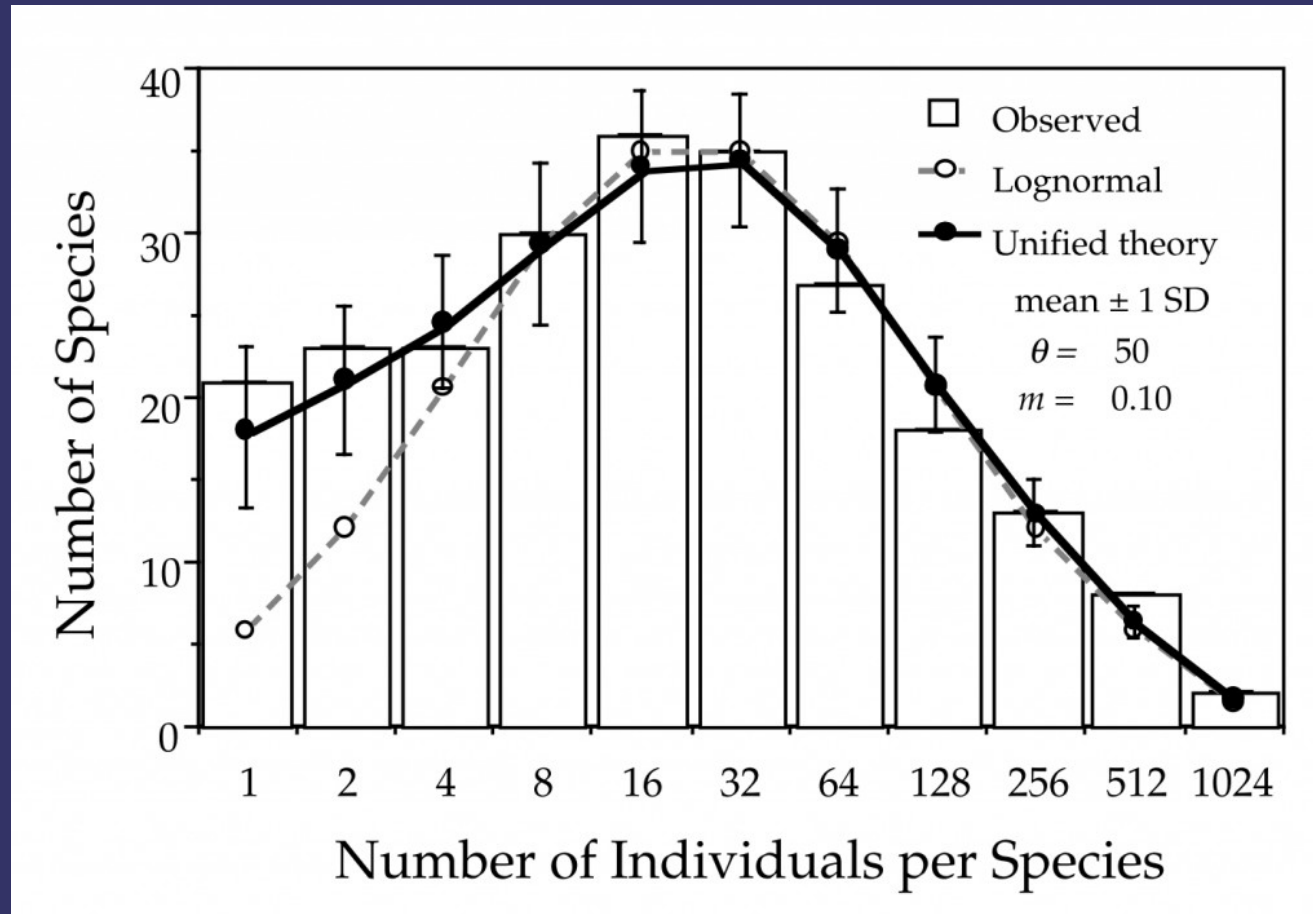
ELABORANDO A OUTRA RESPOSTA



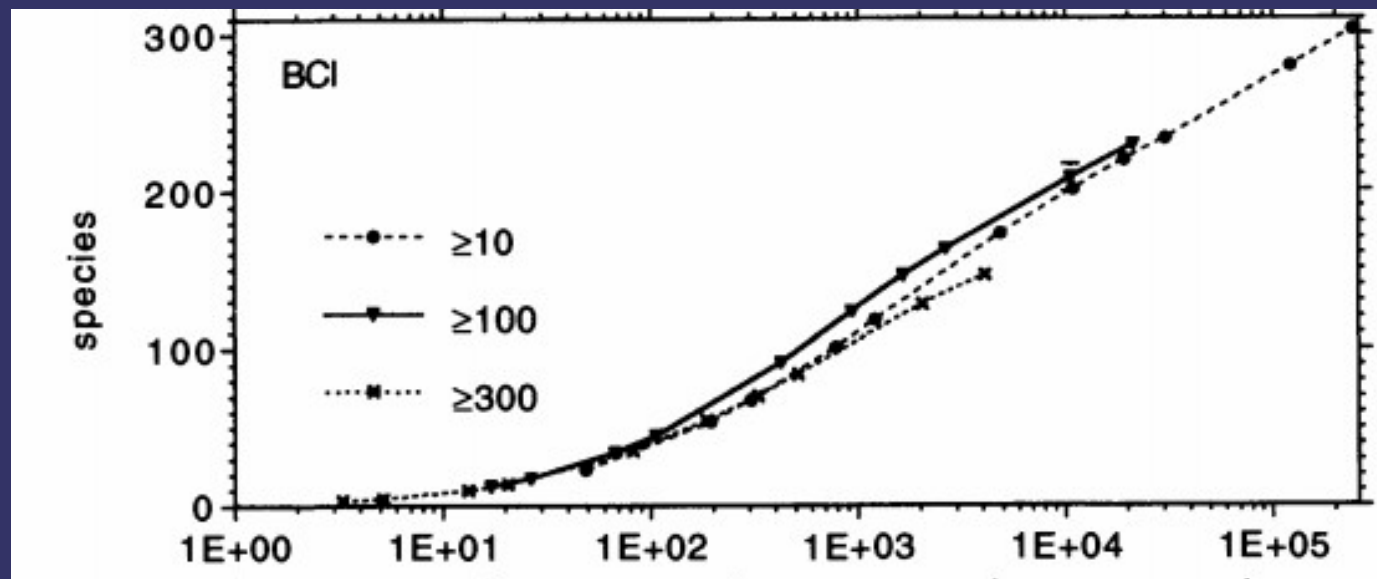
ESCALA LOCAL E REGIONAL



Distribuição de abundância de espécies



Curva de acúmulo de espécies



Condit et al. Journal of Ecology 1996

Taxa de entrada de novas espécies

Interval	Number of individuals			Number of species			Rate ($\cdot 10^{-4}$)	
	Initial	Dead	Recruited	Initial	Input	Extinct	Input (λ)	Extinction (ϵ)
1982–1985	235256	26330	33073	296	2	1	0.57	0.35
1985–1990	241999	37404	39377	297	4	7	0.94	1.72
1990–1995	243972	36750	21747	294	4	5	1.70	1.30
1995–2000	228969	36703	21458	293	4	6	1.71	1.55
2000–2005	213724	31422	26035	291	5	5	1.77	1.49
2005–2010	208337	30405	29243	291	3	6	0.95	1.83

The initial number (individuals or species) is the number at the start of the census interval; the other columns all refer to change across the intervals: deaths, recruits, input (number of novel species), and extinctions (locally extinct from the plot). The calculations of the rate constants are based on formulae given in Appendix S2. doi:10.1371/journal.pone.0049826.t001

- Taxa prevista pela teoria para manter 291 espécies na parcela: 1×10^{-4}
- Taxas observadas: 0,6 a $1,8 \times 10^{-4}$

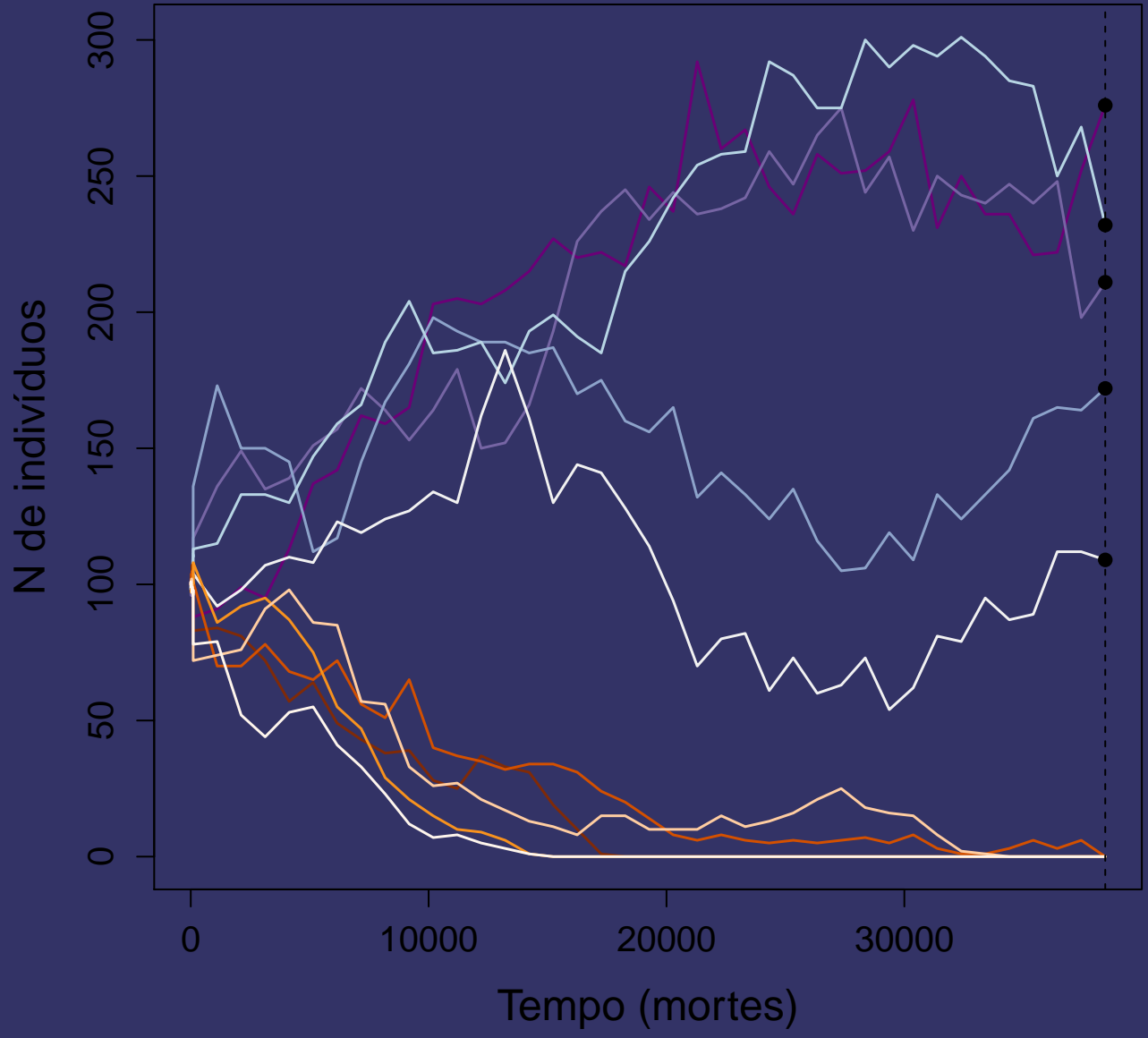
Afinal, o que é a UNTB ?

Teoria que propõe ligações explícitas entre escalas por meio das dinâmicas de processos evolutivos e ecológicos.

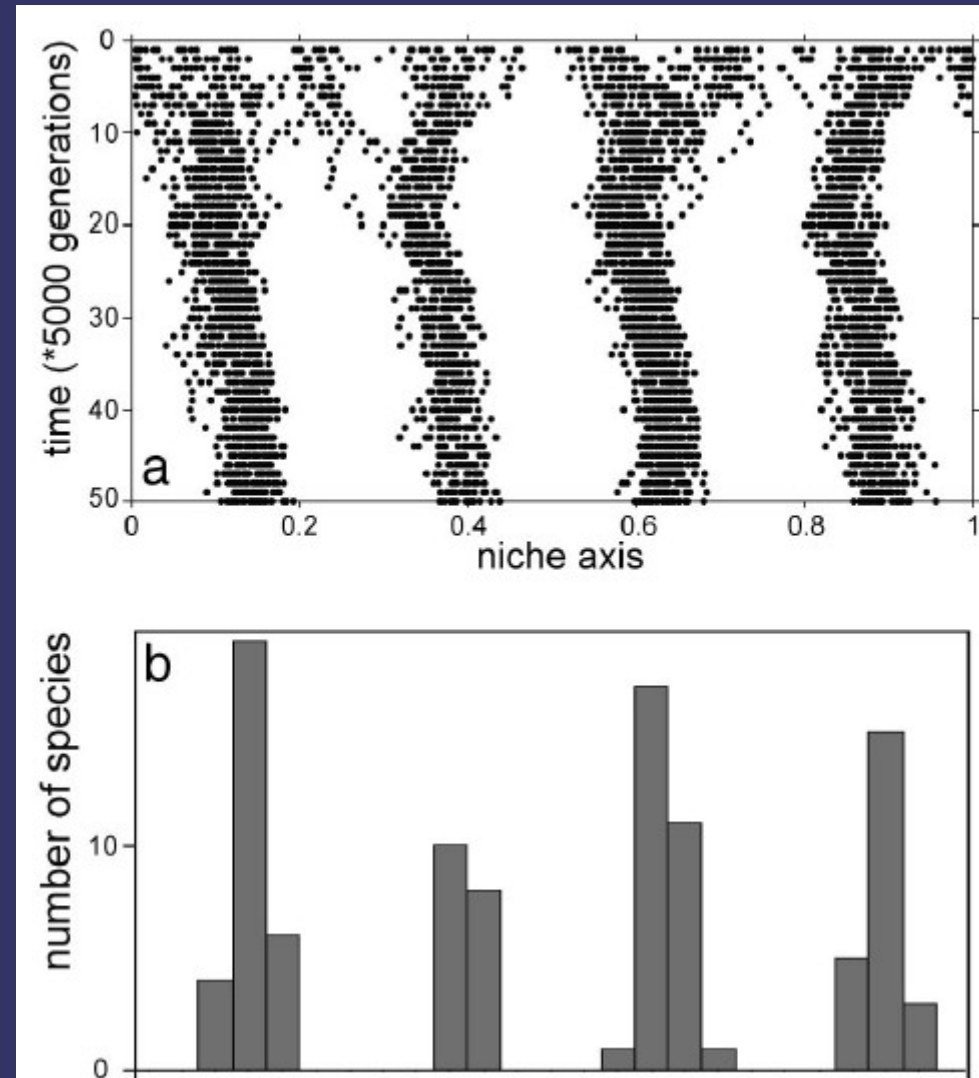
- Uma simplificação extrema que chega a aproximações razoáveis para algumas quantidades de interesse.
- Um modelo mínimo de referência (lei de força zero, como inércia)
- Uma descrição de propriedades macroscópicas que não são afetadas pelos detalhes do sistema (análogo à física estatística).

My precioussss



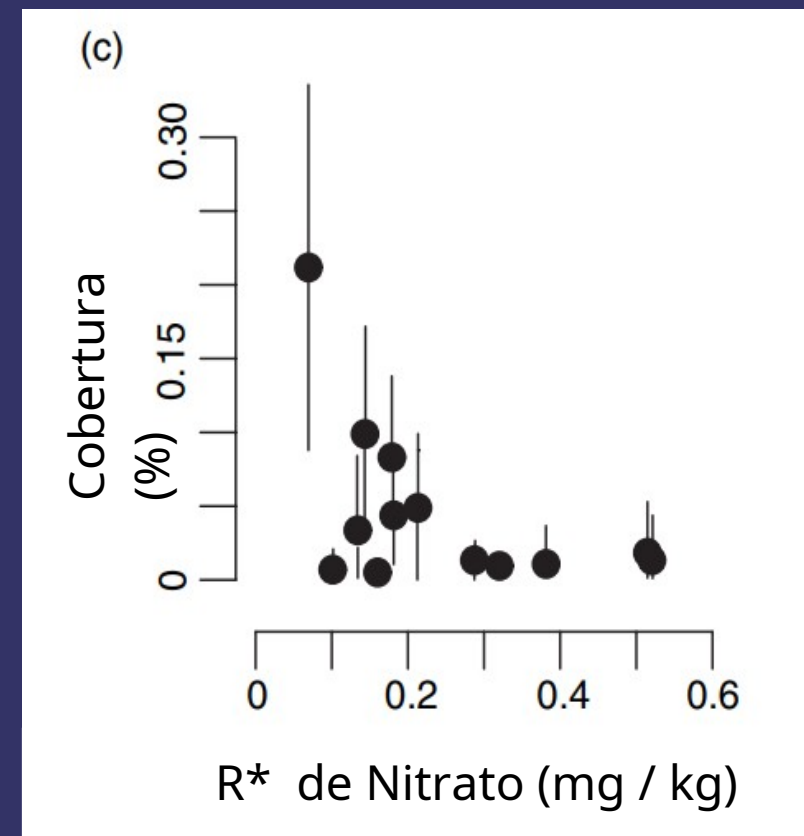
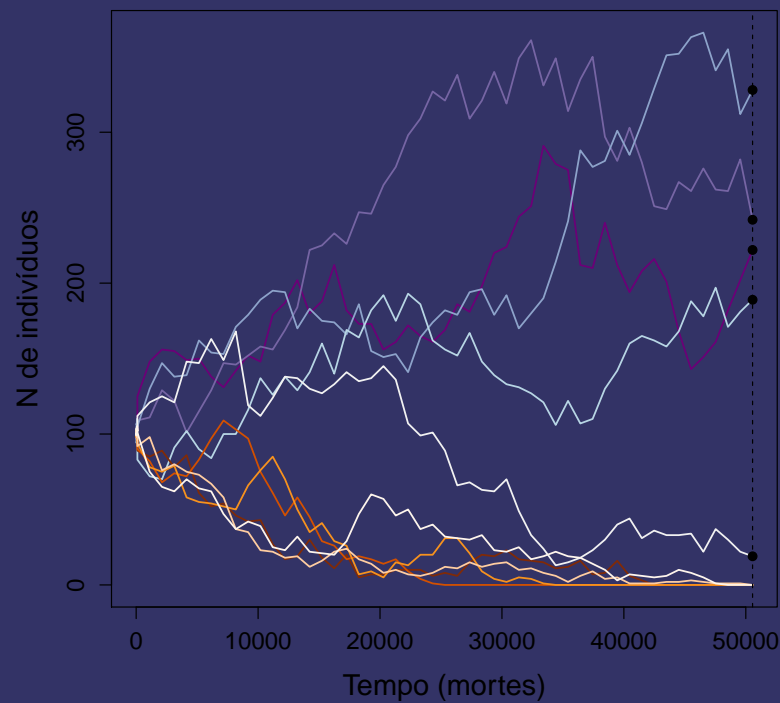


GRUPOS EMERGENTES



Scheffer & Van Ness 2006 PNAS

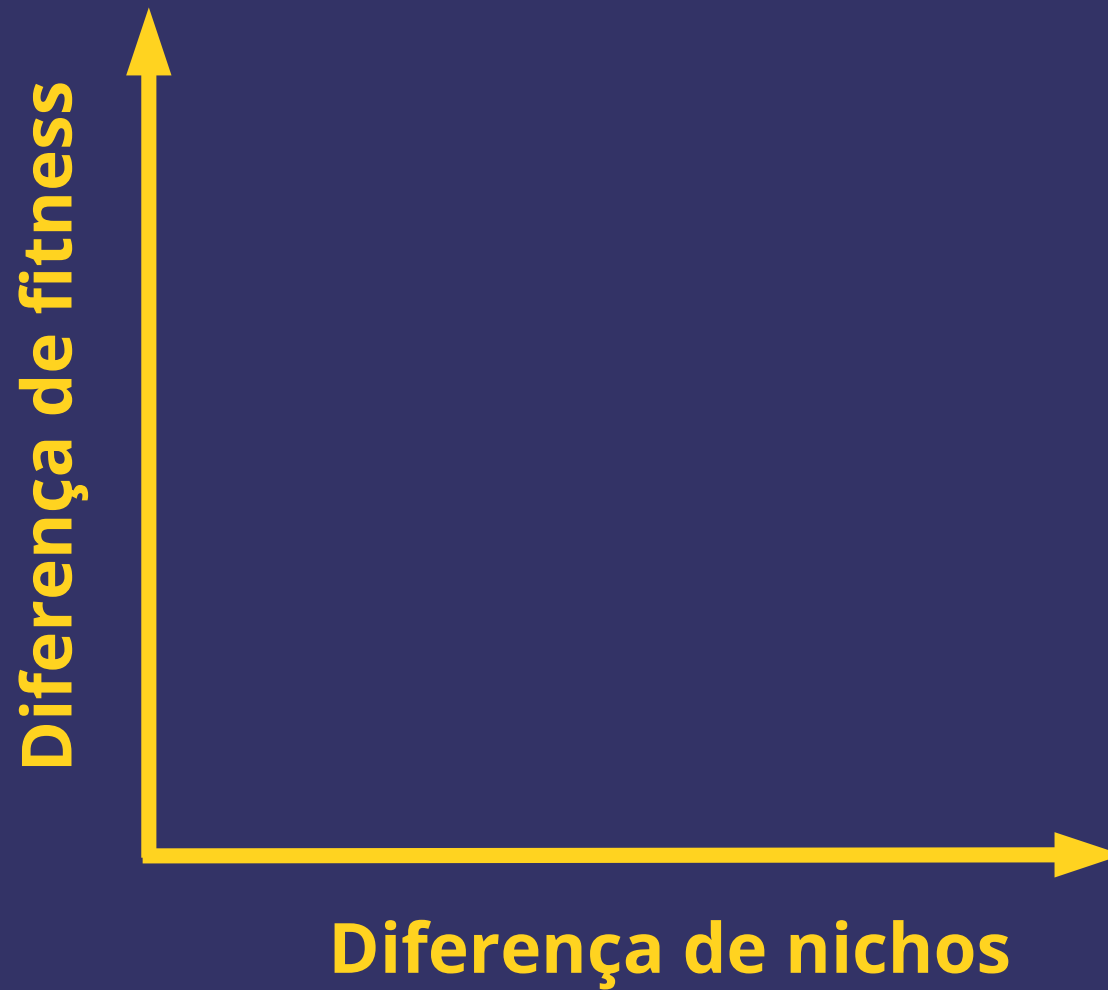
Nem toda diferença promove coexistência



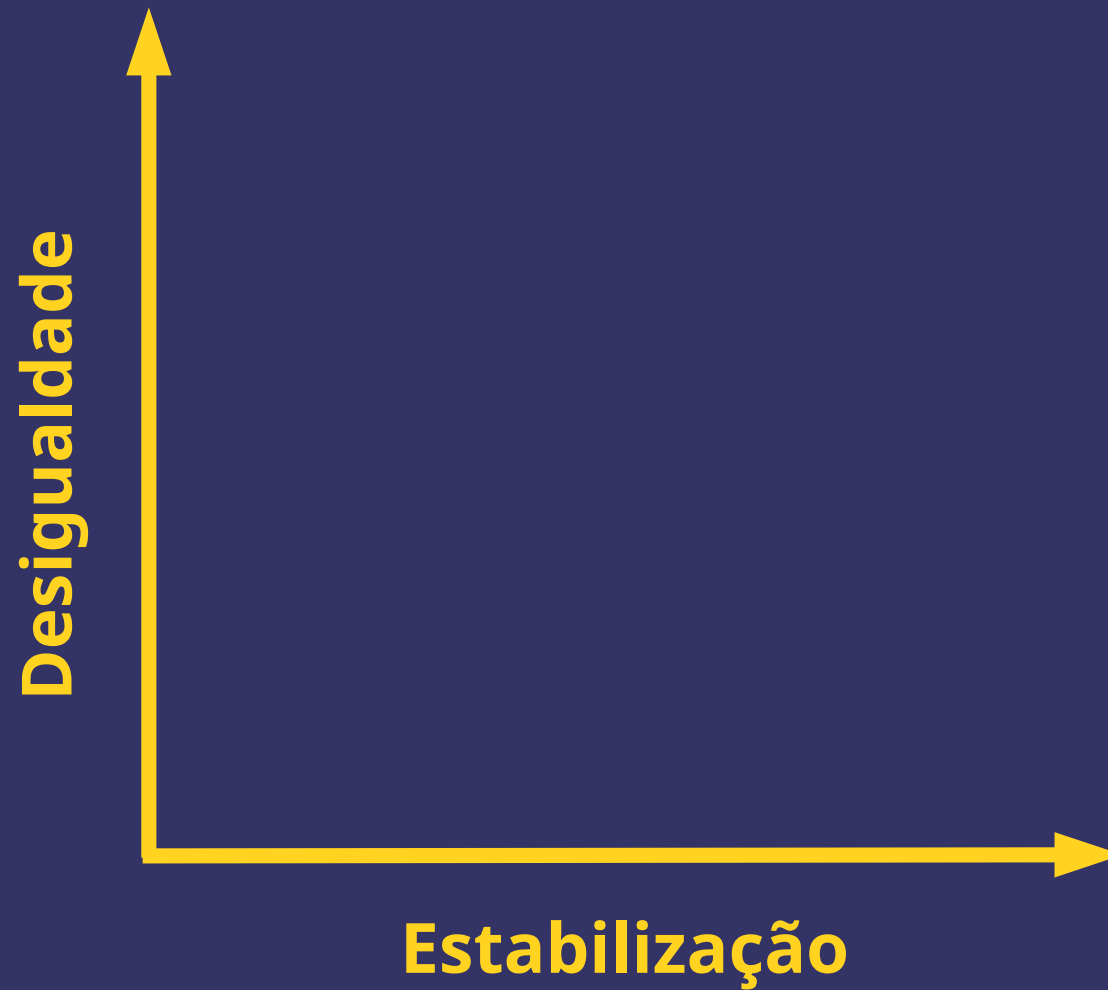
TEORIA MODERNA DA COEXISTÊNCIA

- Nem todas as diferenças entre as espécies promovem coexistência.
- **Estabilização:** espécies diferentes em características que amenizam sua competição
- **Equalização:** espécies parecidas nas características que dão vantagem competitiva de uma sobre a outra.

Teoria moderna da coexistência



Fatores equalizadores x estabilizadores



UNTB é um caso particular de coexistência?

