

# **EFEITO DO DISTÚRPIO NAS ESTRATÉGIAS DE VIDA**

**DINÂMICAS ECOLÓGICAS E EVOLUTIVAS**

**Luísa Novara Monclar Gonçalves**

**ORIENTADOR: Prof. Dr. Alexandre Adalardo de Oliveira**

**COORIENTADOR: Prof. Dr. Paulo Inácio Prado**



# seleção natural

# seleção natural

limitação de recursos

# seleção natural

limitação de recursos

batalha pela persistência

# seleção natural

limitação de recursos

batalha pela persistência

persistência dos  
mais aptos

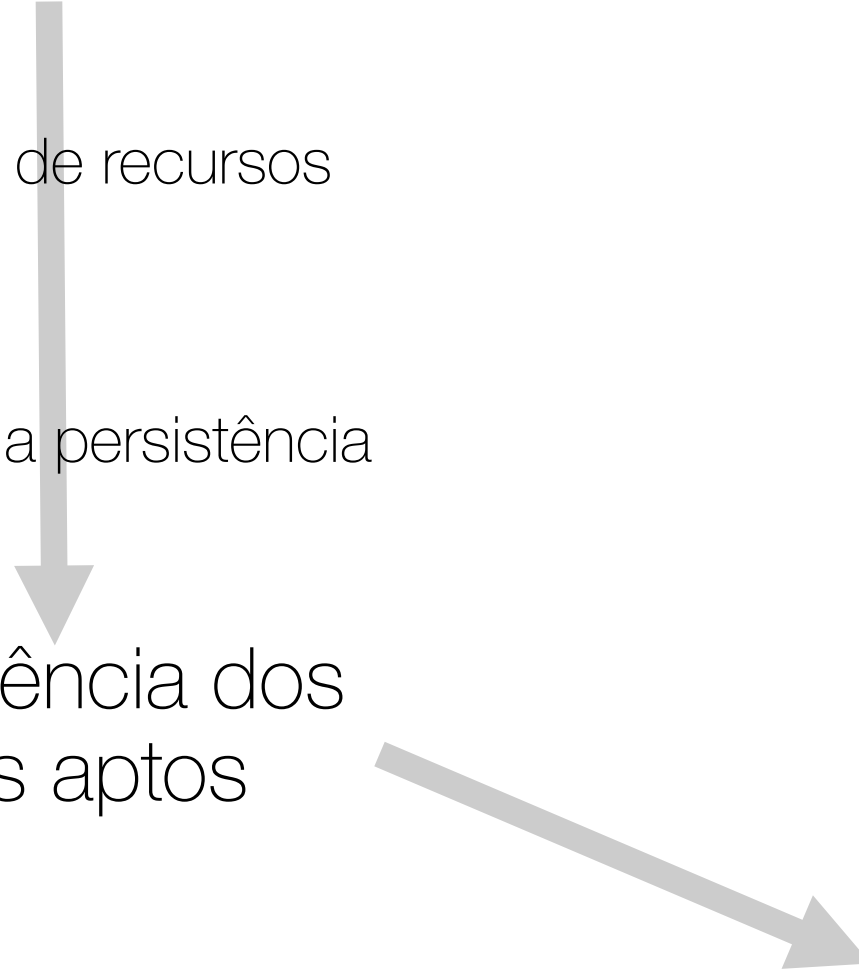
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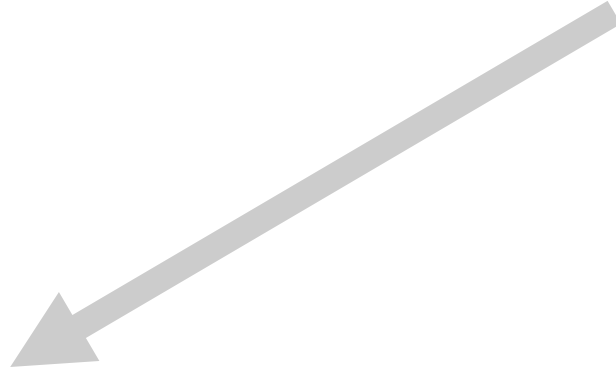
**adaptação**



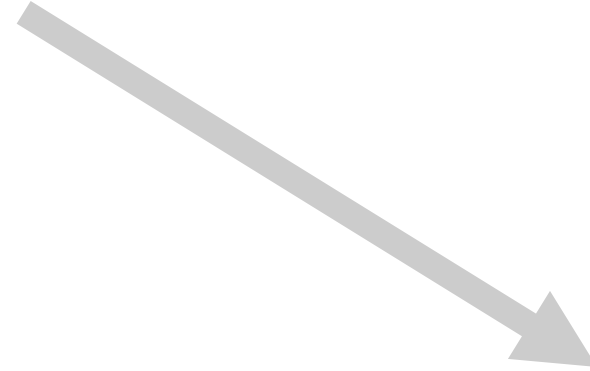
aptidão



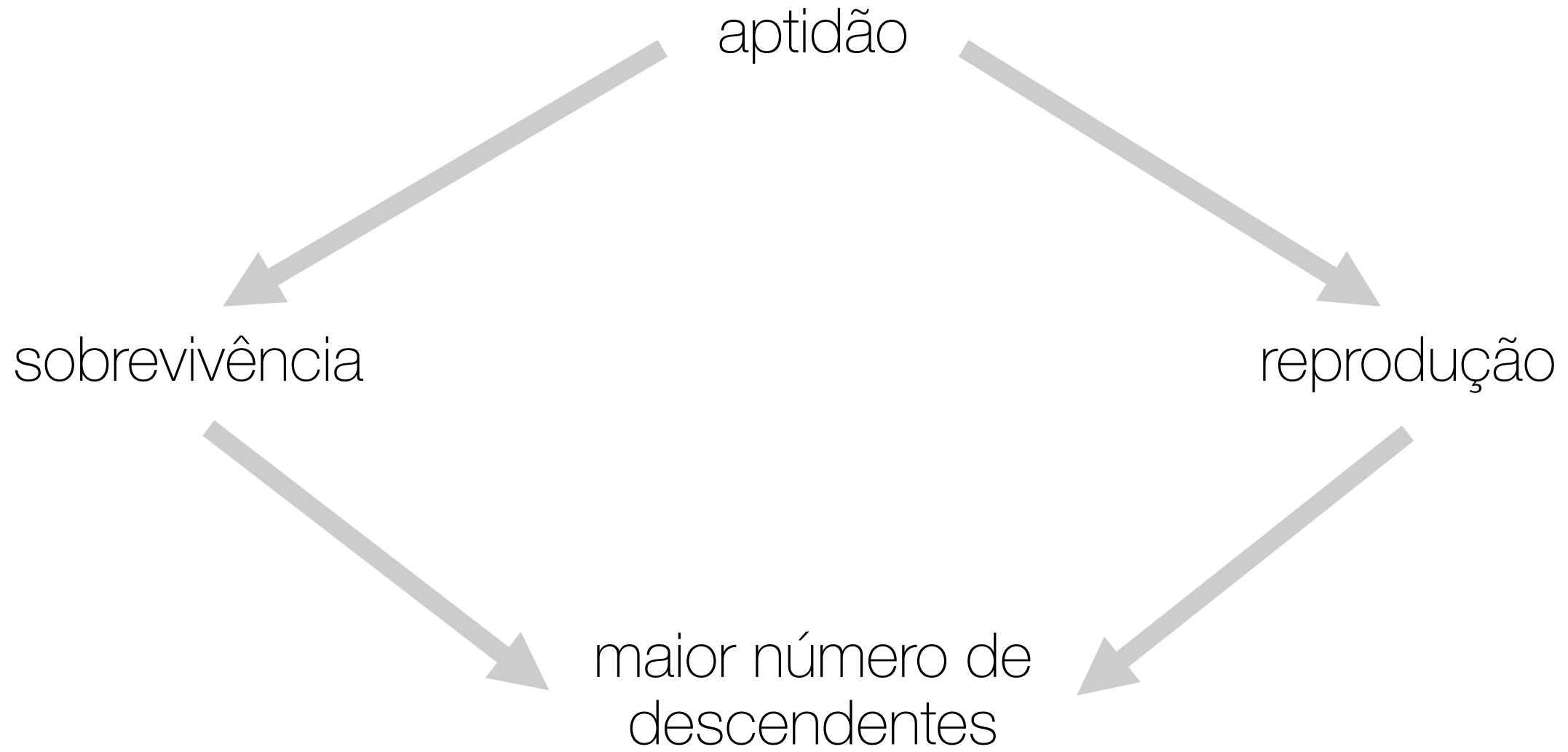
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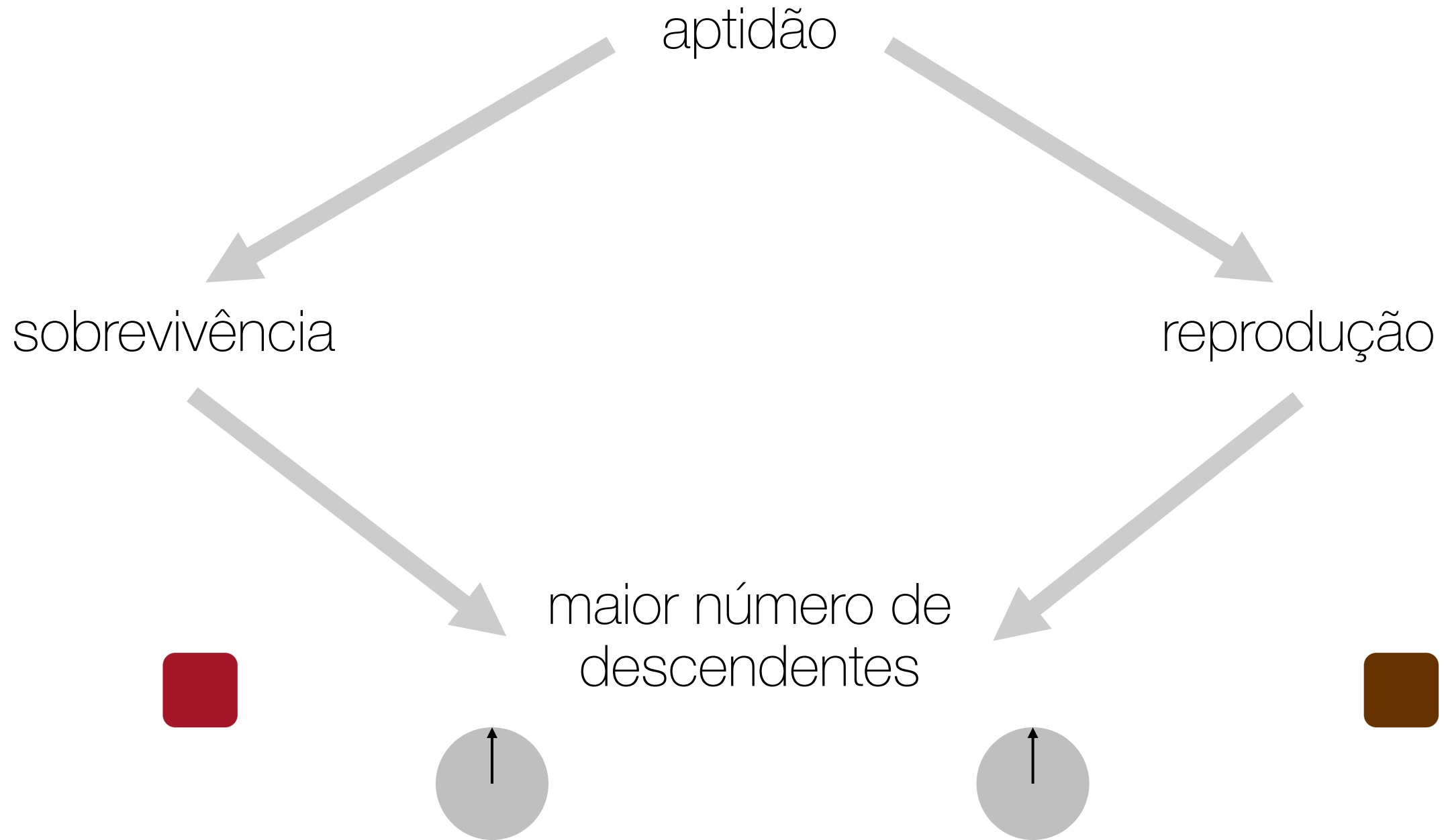


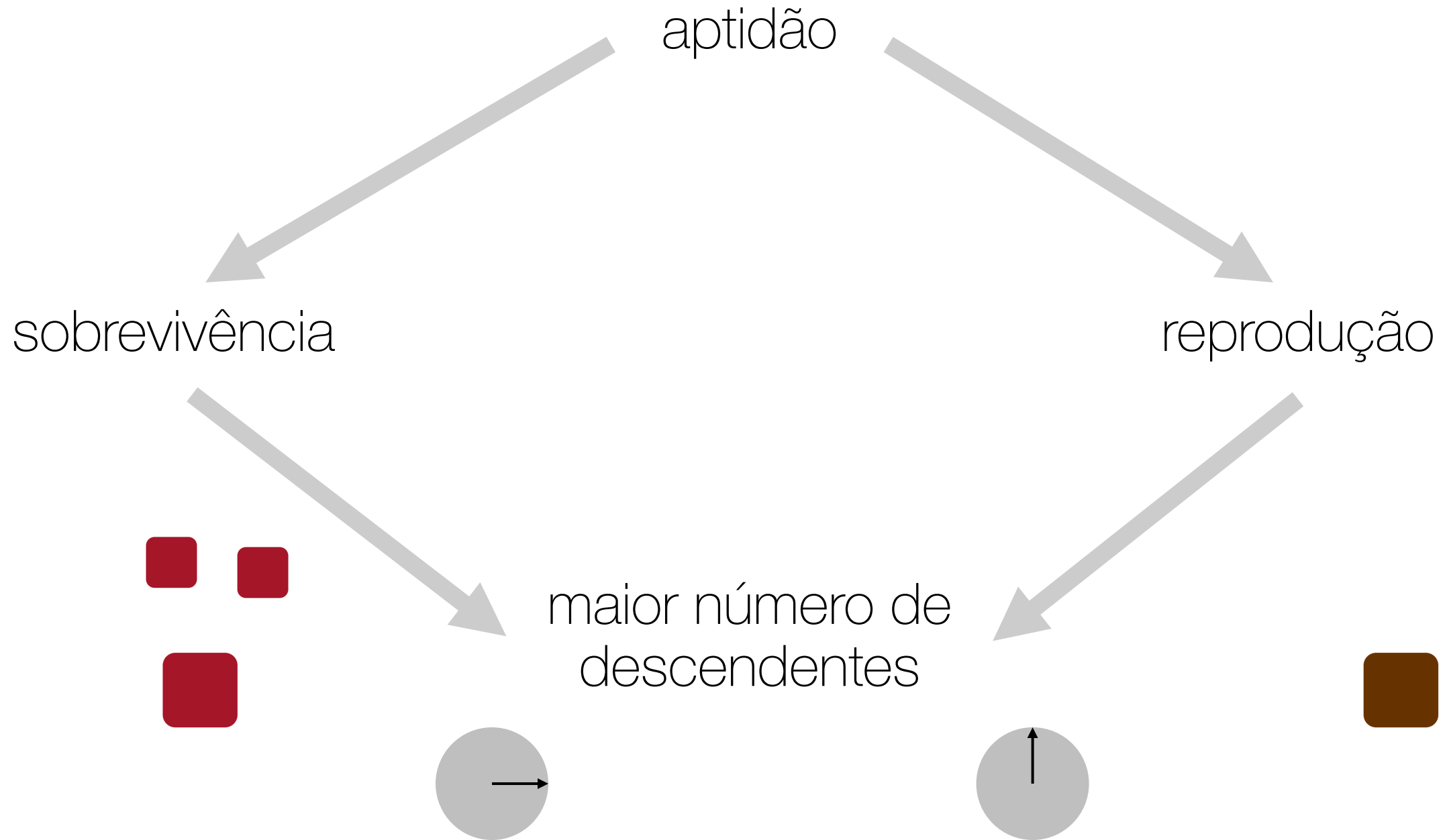
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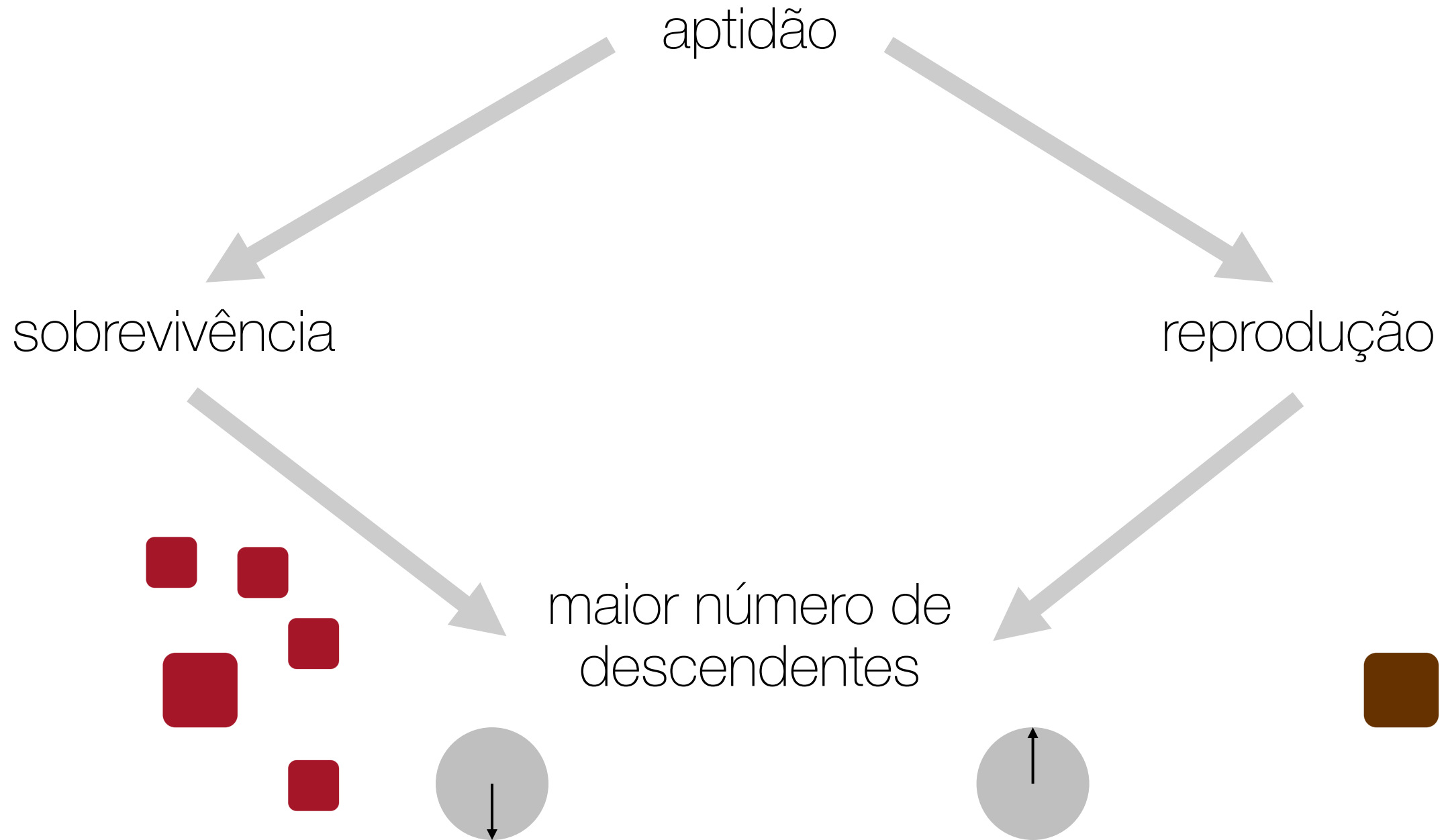


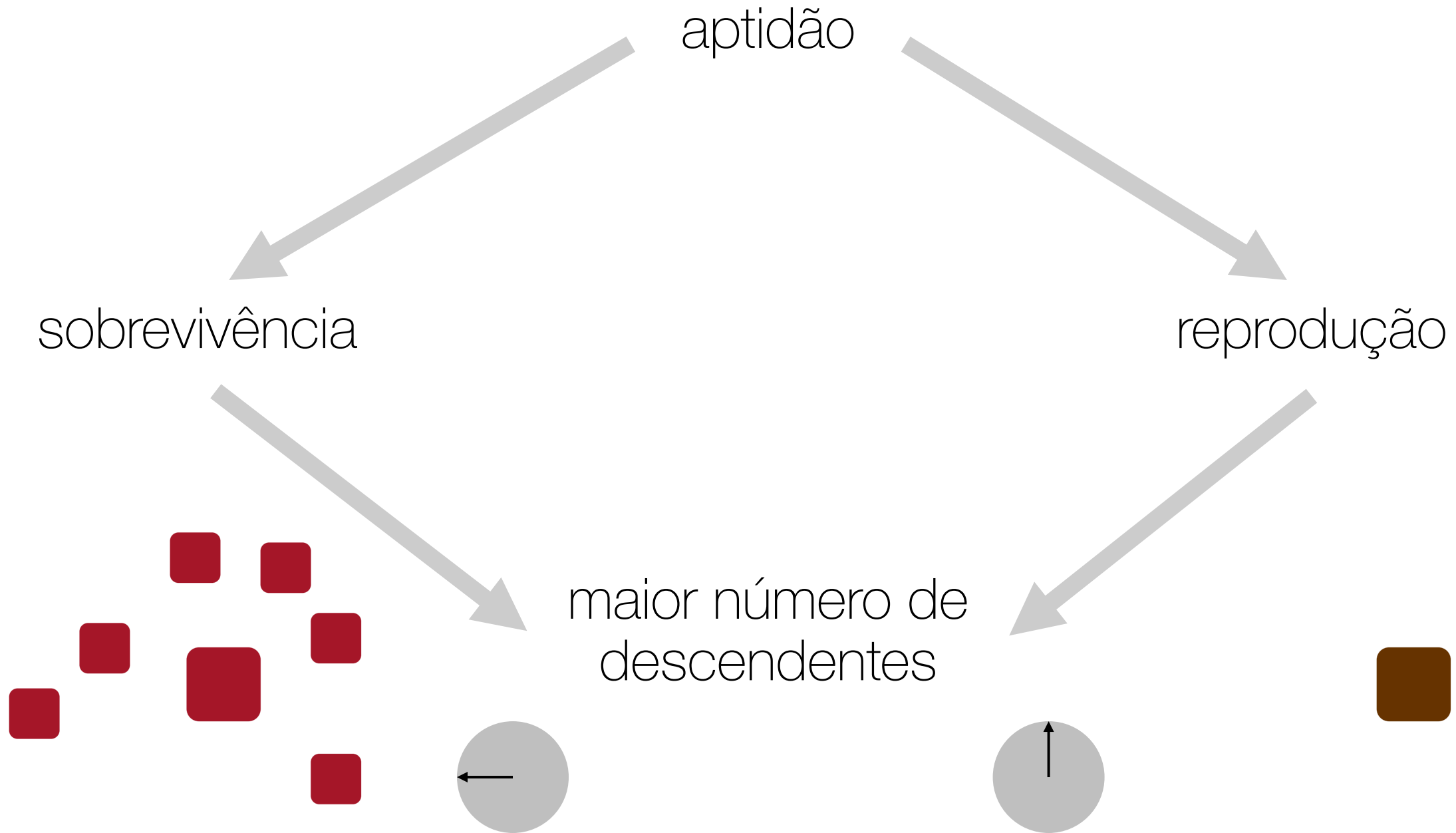
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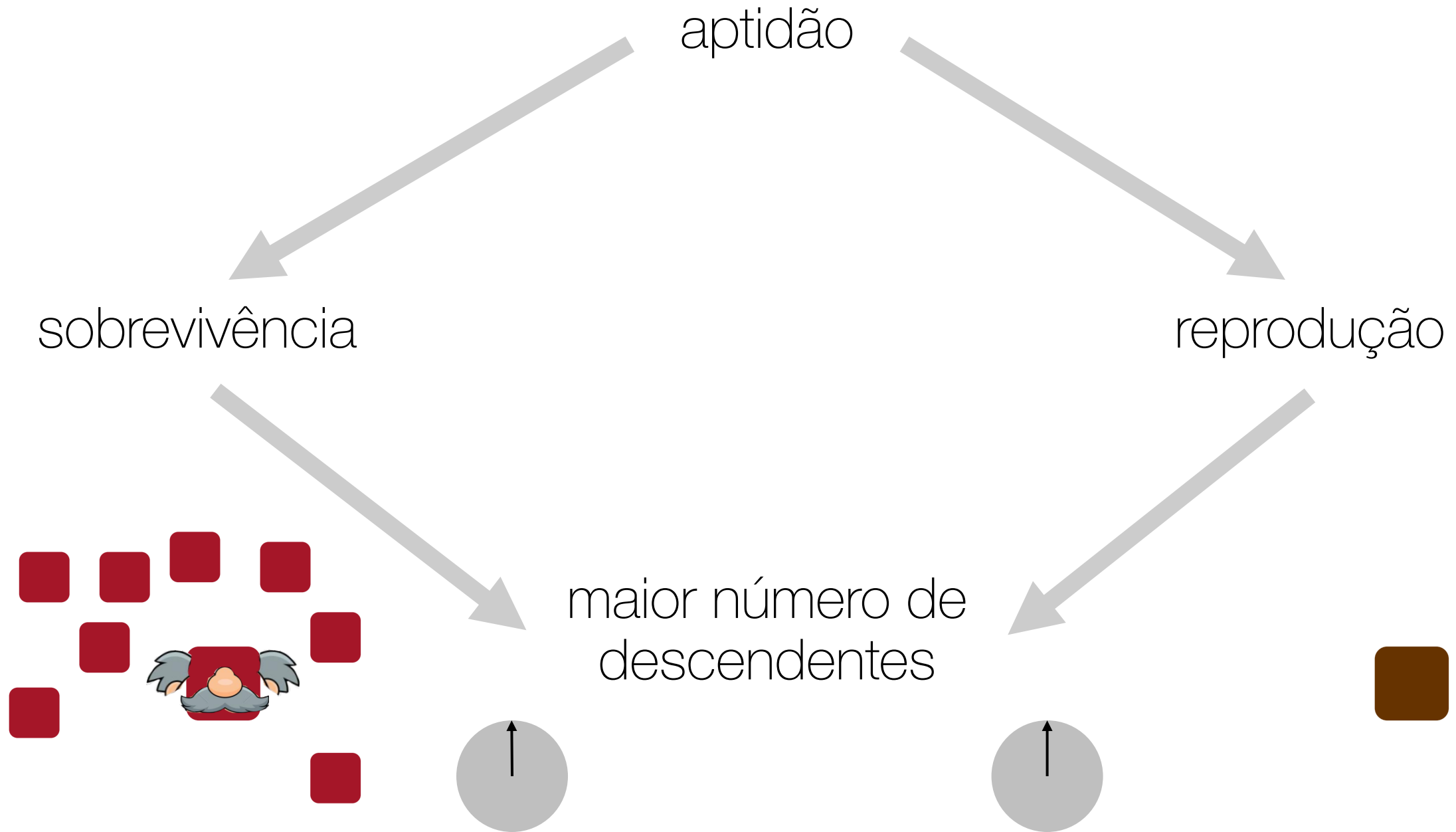


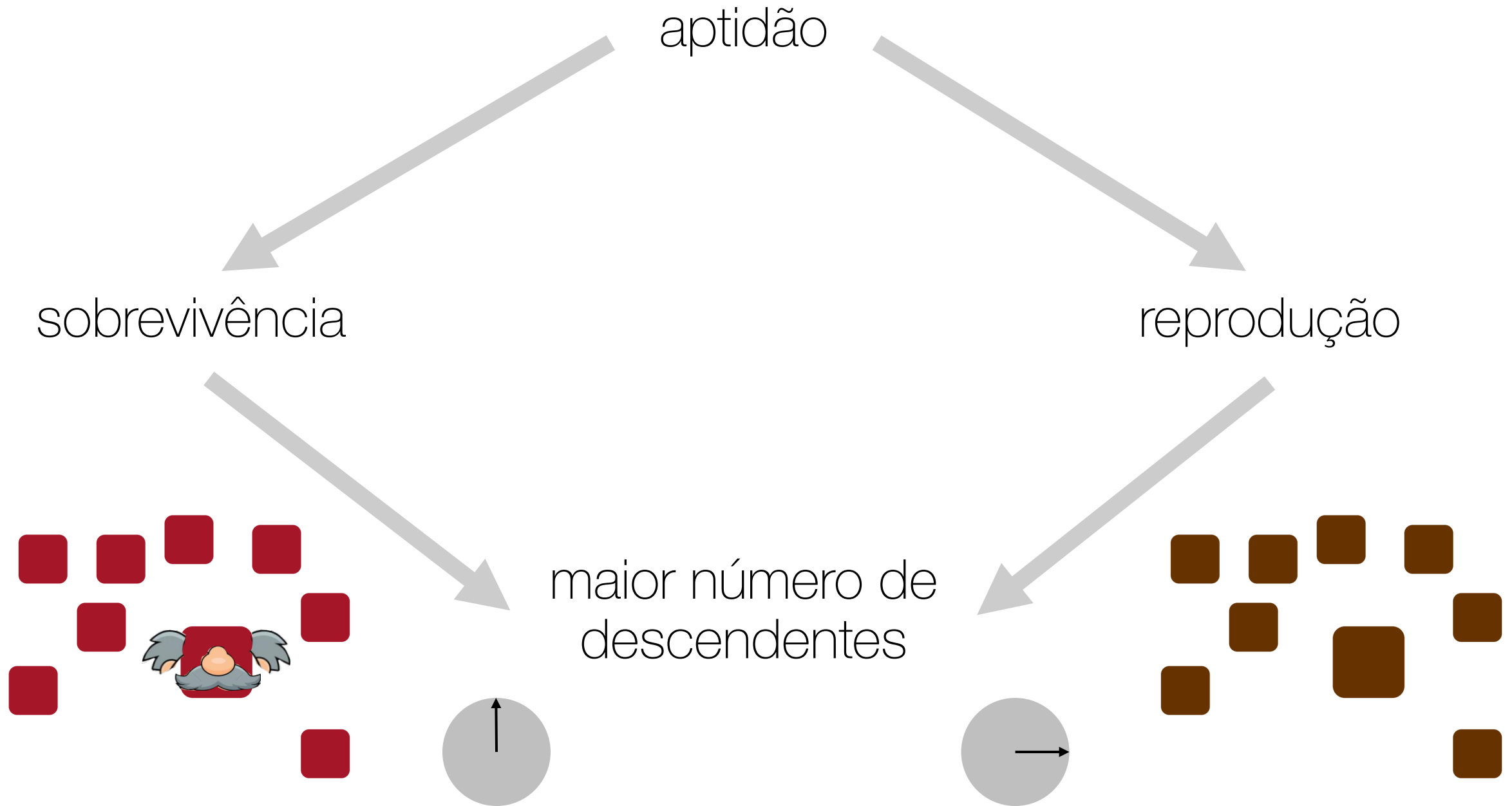




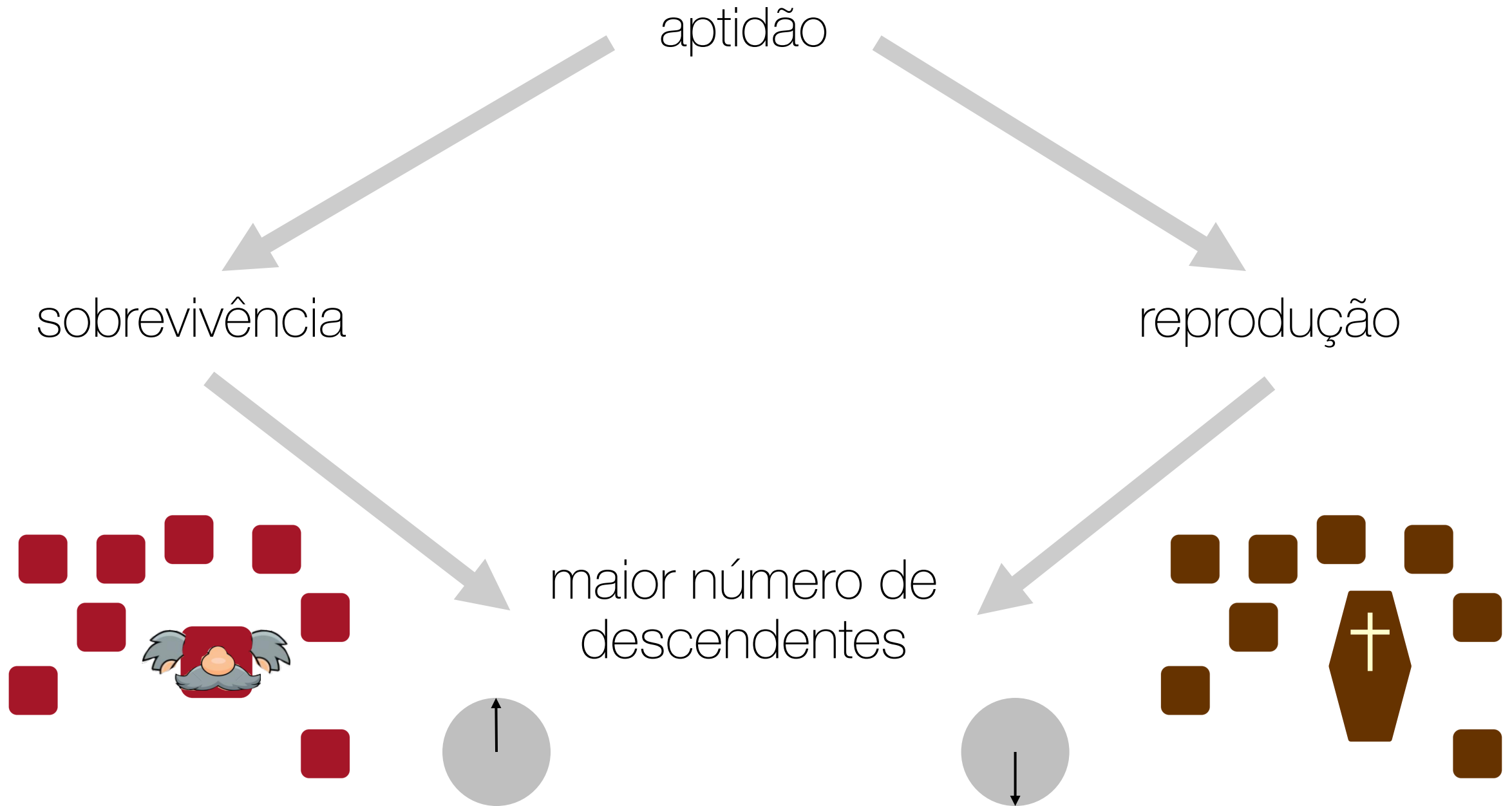


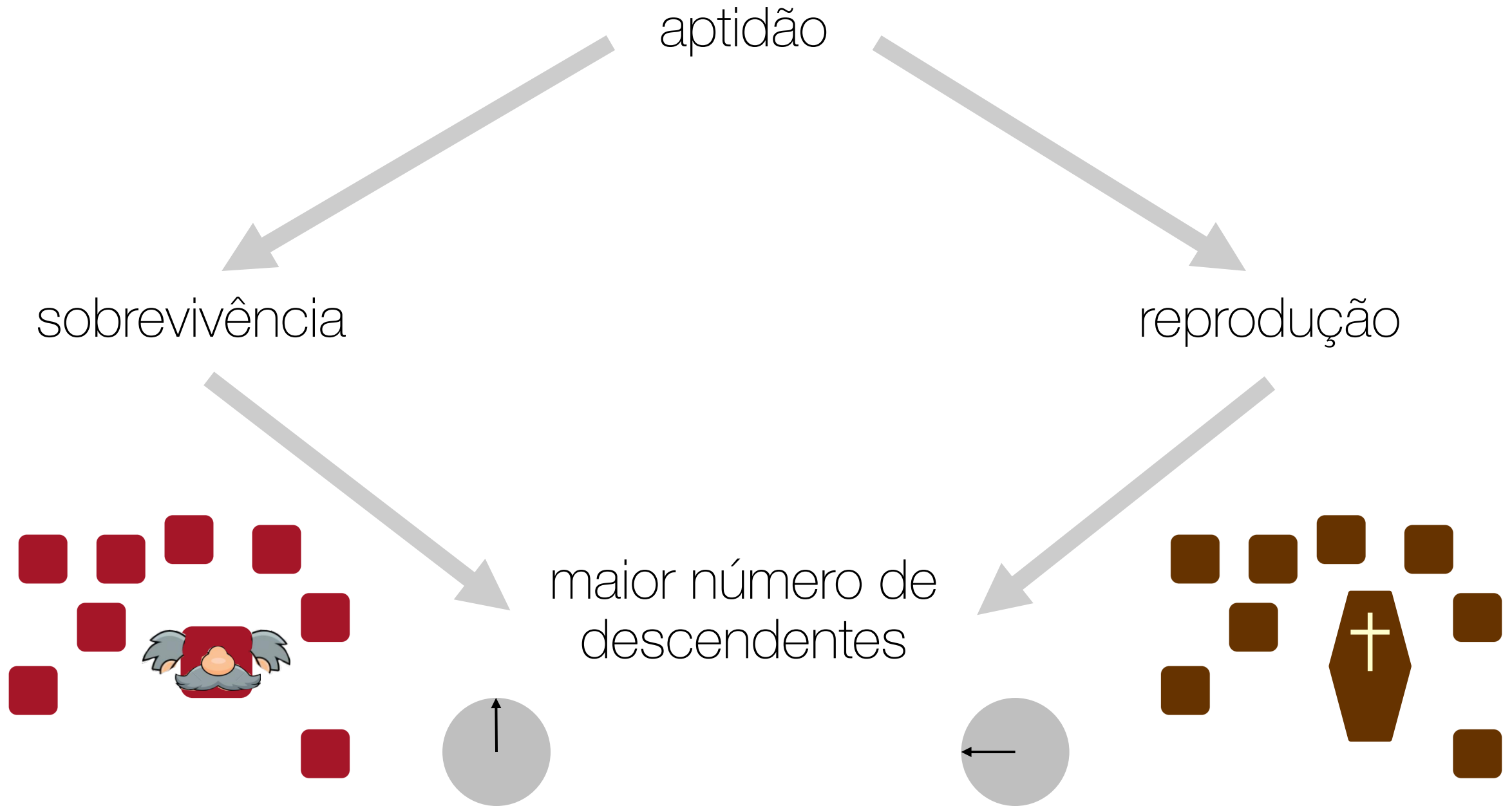


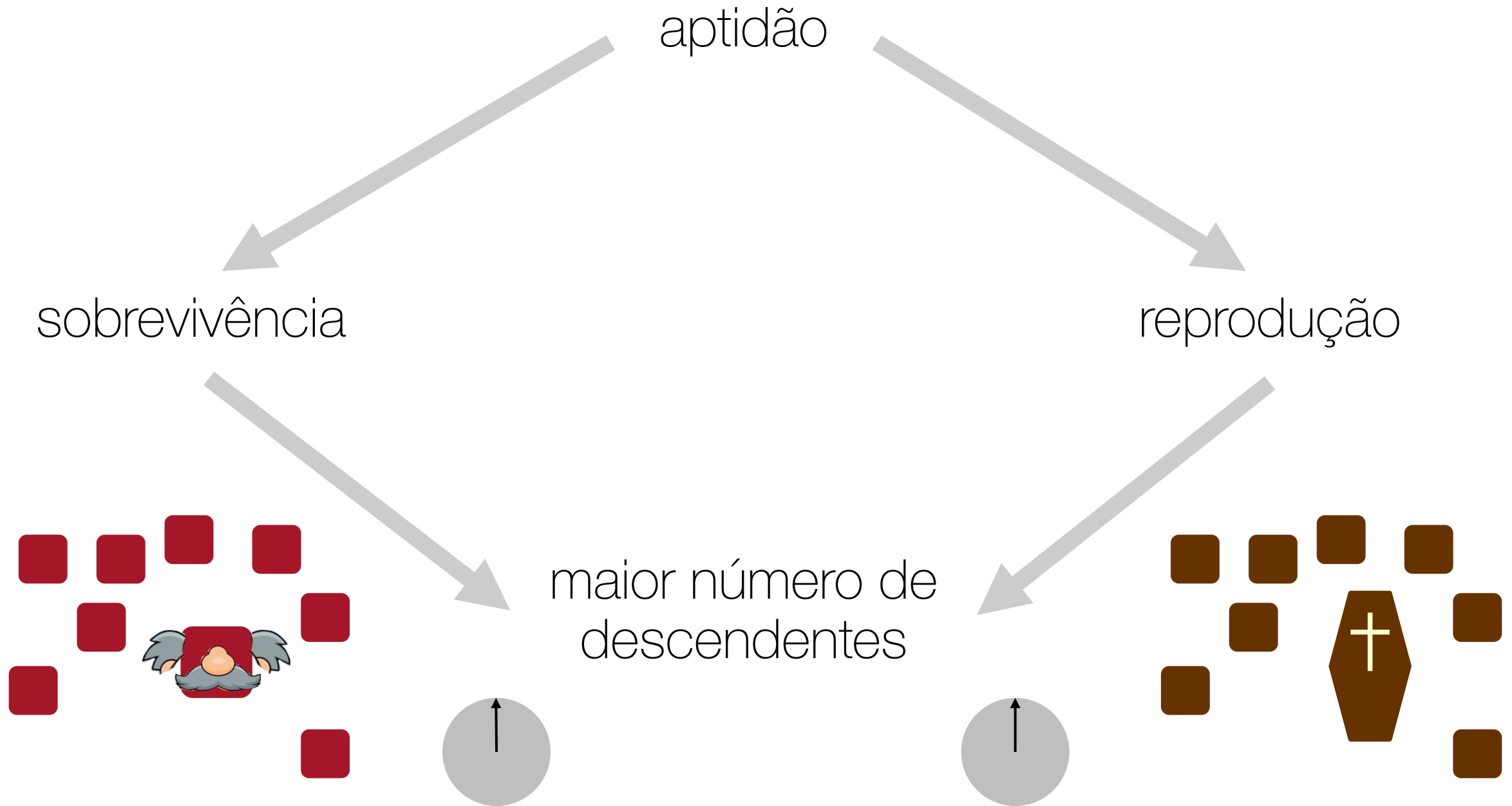


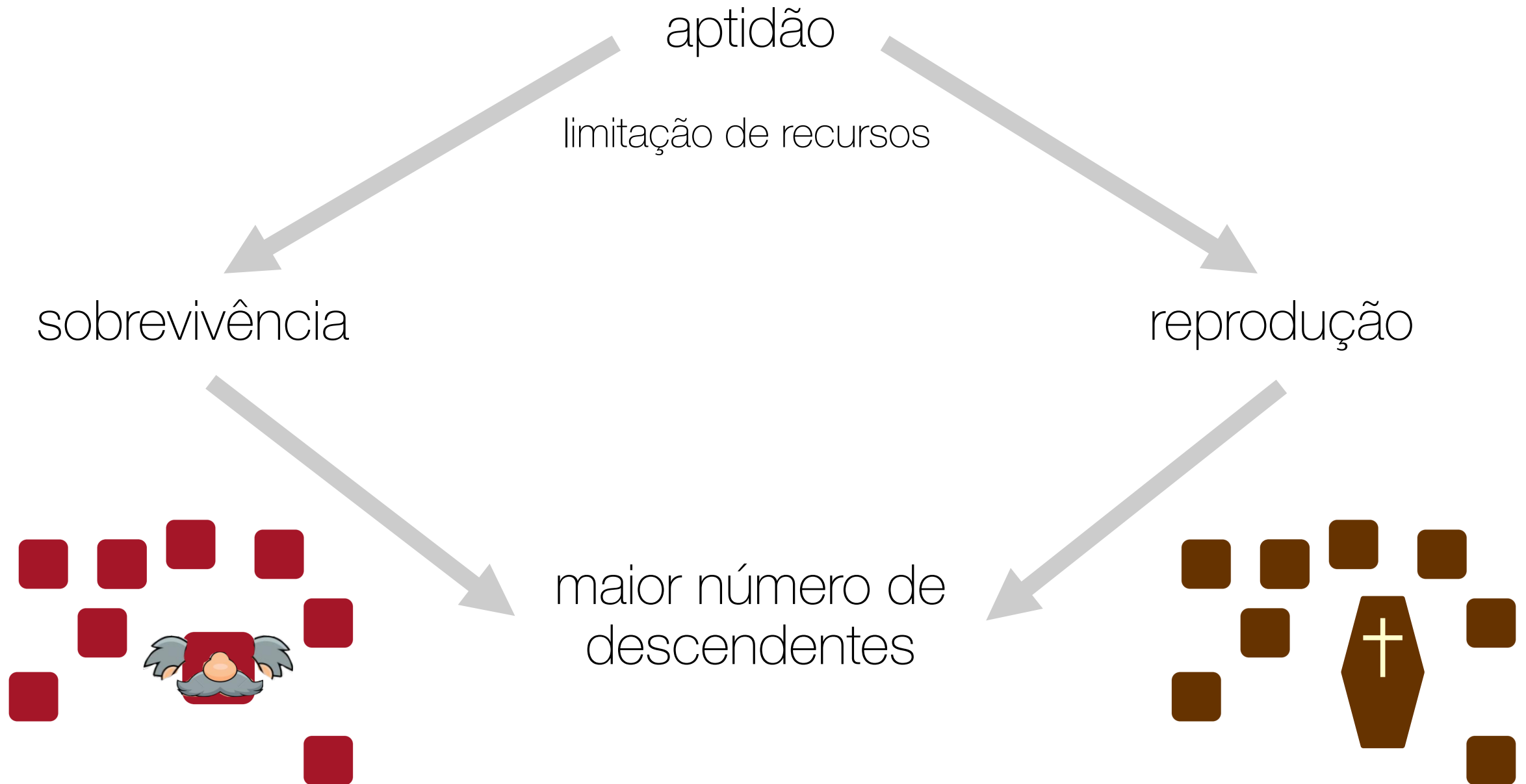


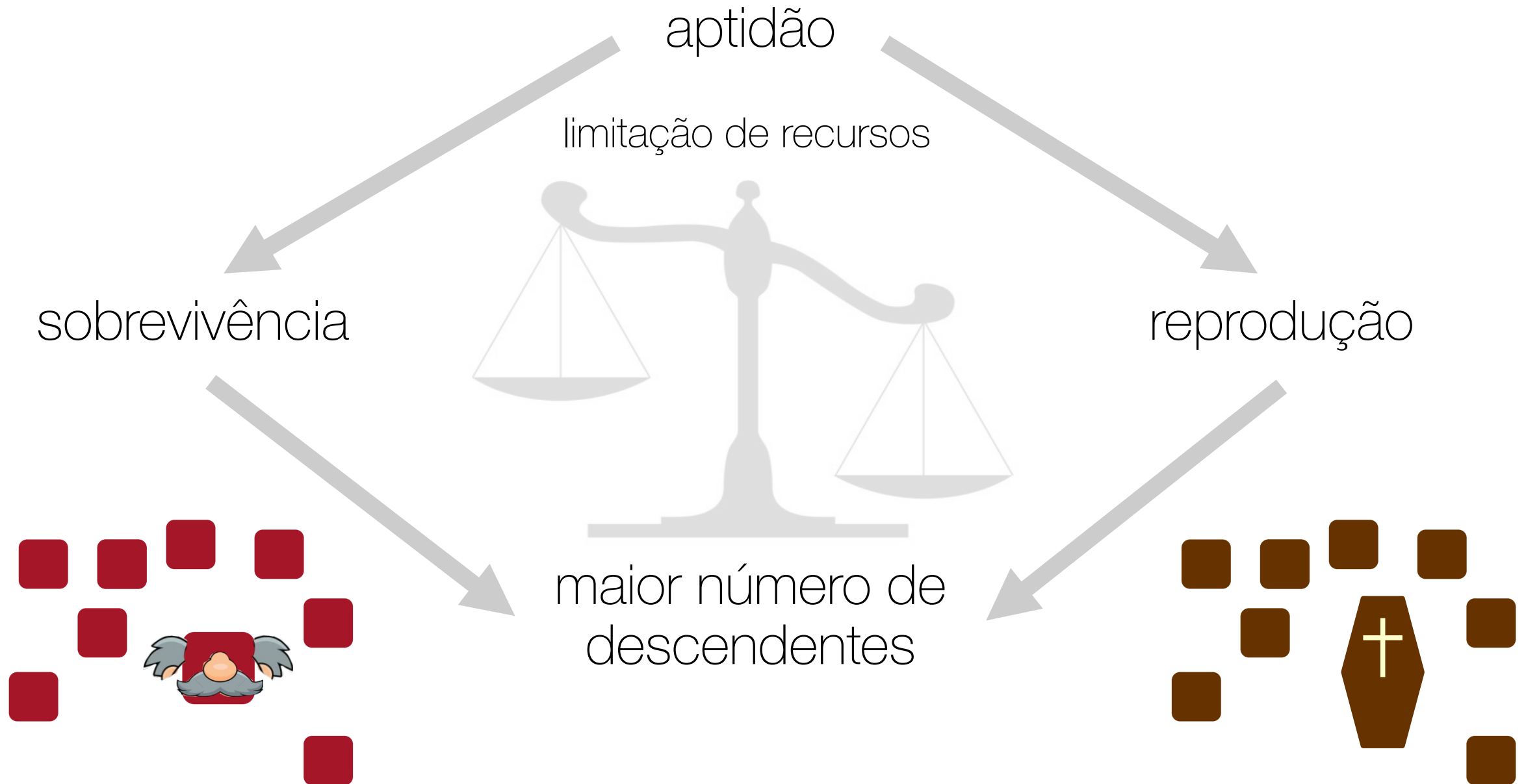














limitação de recursos

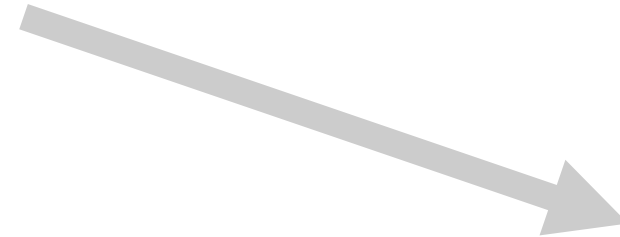
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persistência dos  
mais aptos

**adaptação**





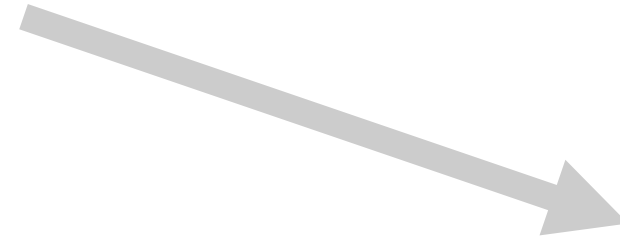
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**adaptação**



# seleção natural

limitação de recursos

competição ← batalha pela persistência

persistência dos  
mais aptos

**adaptação**



# seleção natural

limitação de recursos

competição

batalha pela persistência

persistência dos  
mais aptos

**exclusão  
competitiva**

**adaptação**



# seleção natural

limitação de recursos

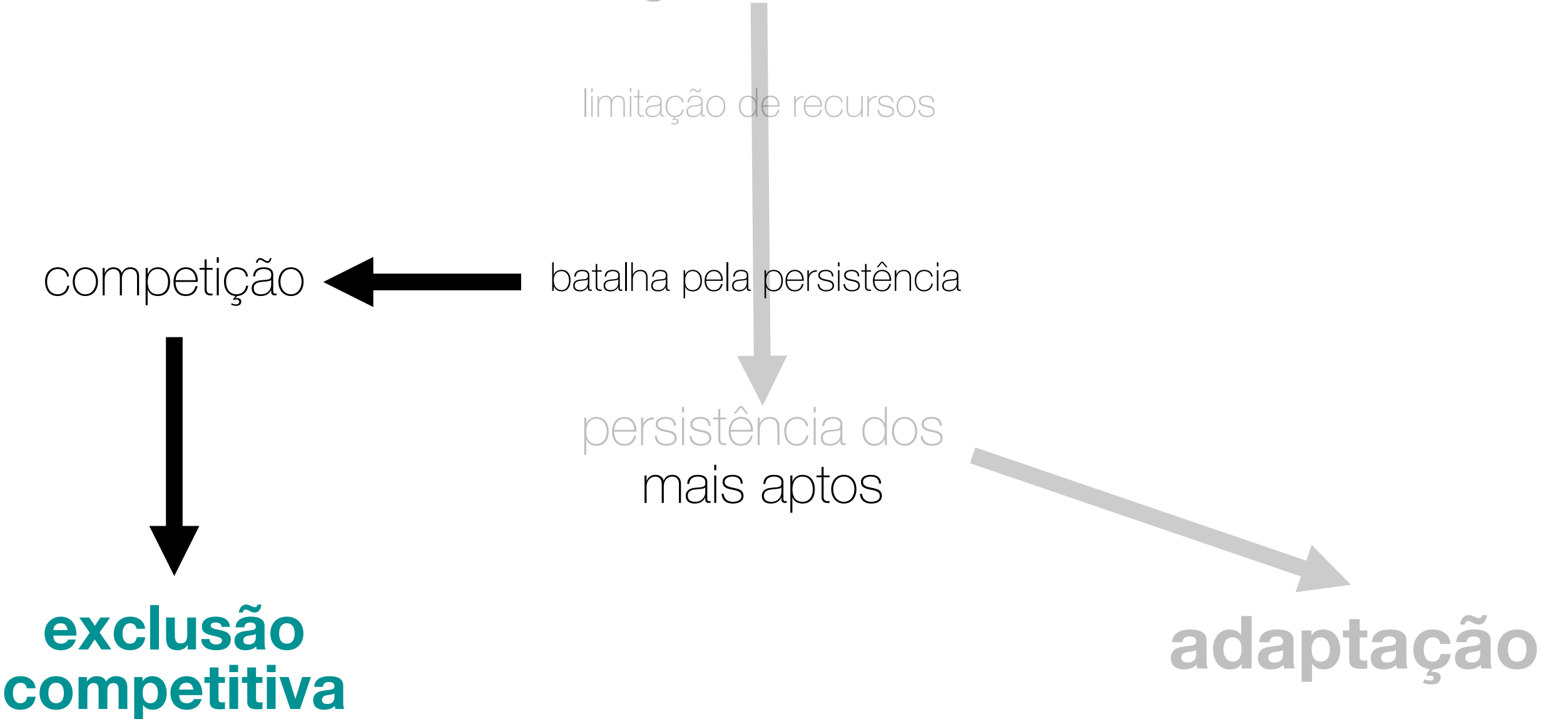
competição

batalha pela persistência

persistência dos  
mais aptos

**exclusão  
competitiva**

**adaptação**



# seleção natural

limitação de recursos

competição

batalha pela persistência

persistência dos  
mais aptos

=

melhores competidores

**exclusão  
competitiva**

**adaptação**



# seleção natural

limitação de recursos

competição

batalha pela persistência

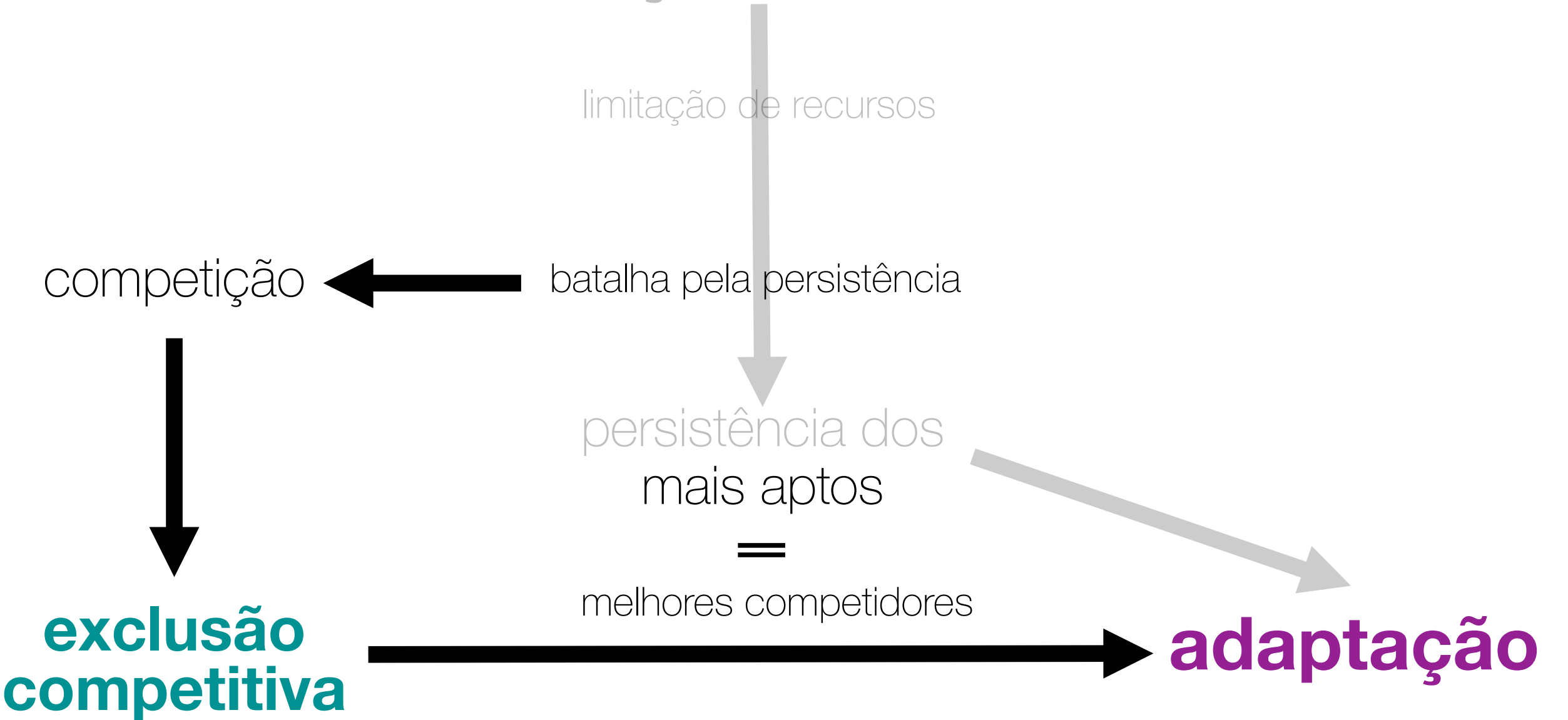
persistência dos  
mais aptos

=

melhores competidores

**exclusão  
competitiva**

**adaptação**



# seleção natural

Ecologia

Biologia  
Evolutiva

limitação de recursos

competição ← batalha pela persistência

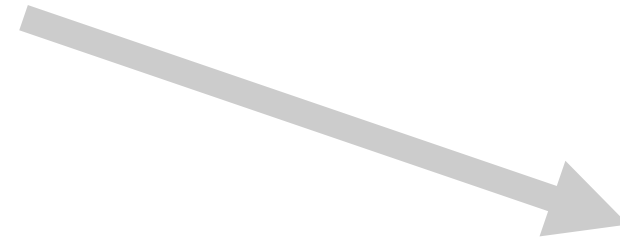
persistência dos  
mais aptos

=

melhores competidores

**exclusão  
competitiva**

**adaptação**



Ecologia

Biologia  
Evolutiva



Ecologia

Biologia  
Evolutiva

**exclusão  
competitiva**



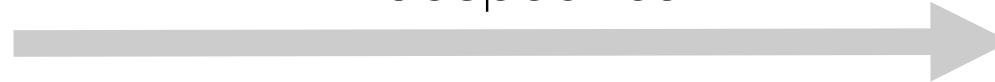
**adaptação**

Ecologia

Biologia  
Evolutiva

**exclusão  
competitiva**

intraespecífica



**adaptação**

Ecologia

Biologia  
Evolutiva

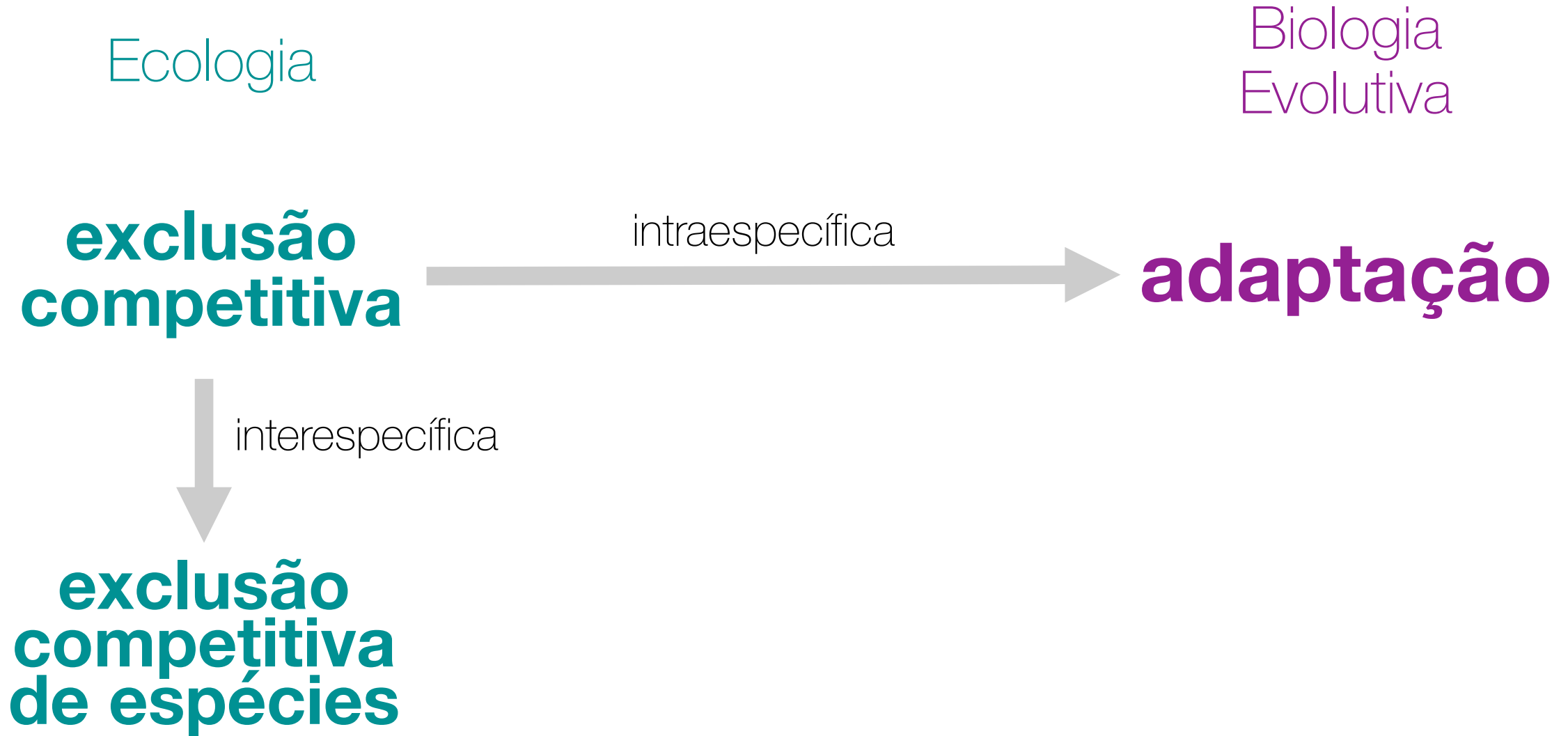
**exclusão  
competitiva**

intraespecífica

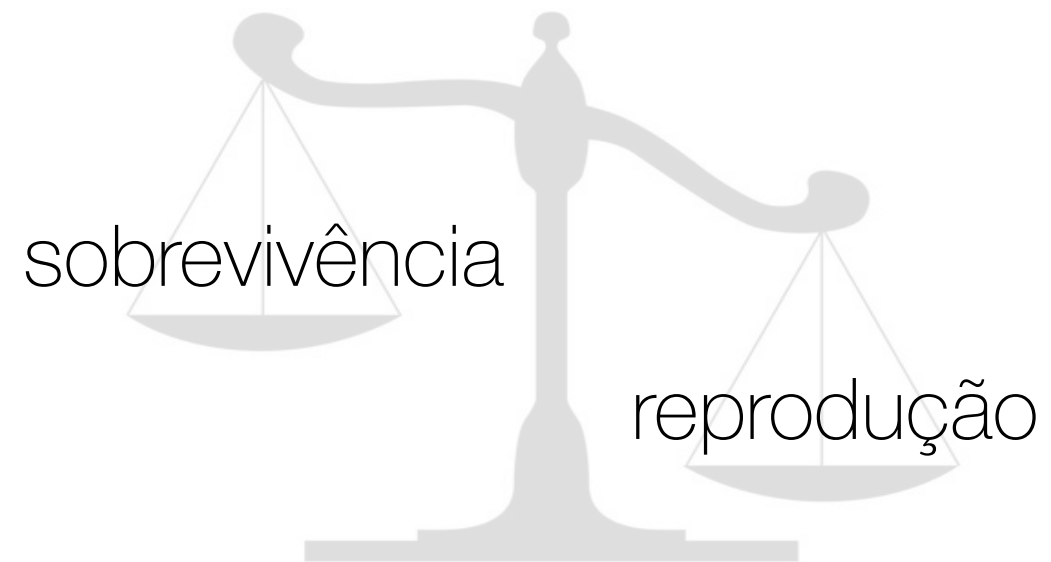
**adaptação**

interespecífica

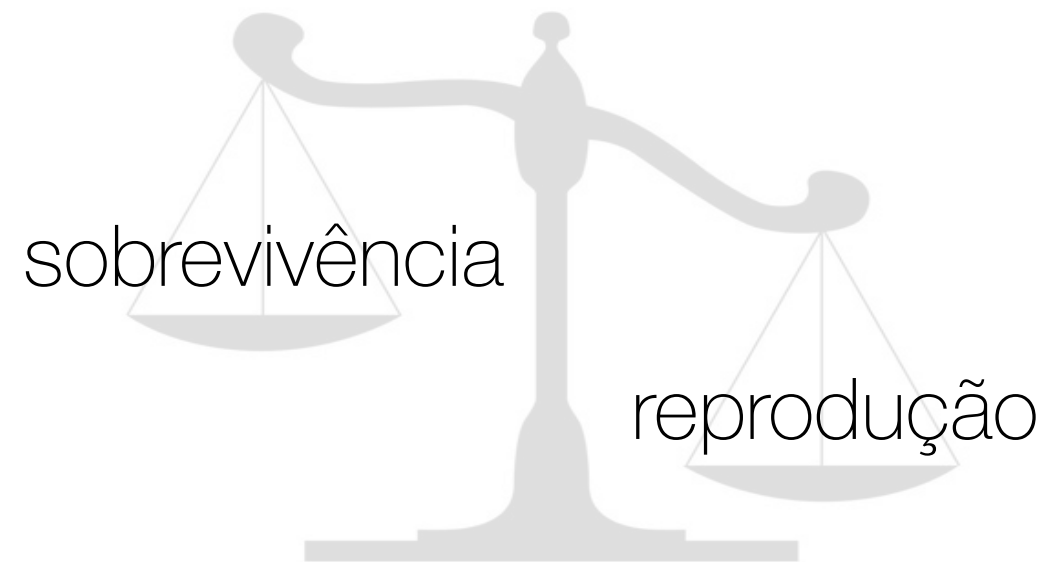
**exclusão  
competitiva  
de espécies**



estratégias de vida estão sujeitas à  
exclusão competitiva e adaptação



fatores ambientais



↓ recurso



↑ recurso

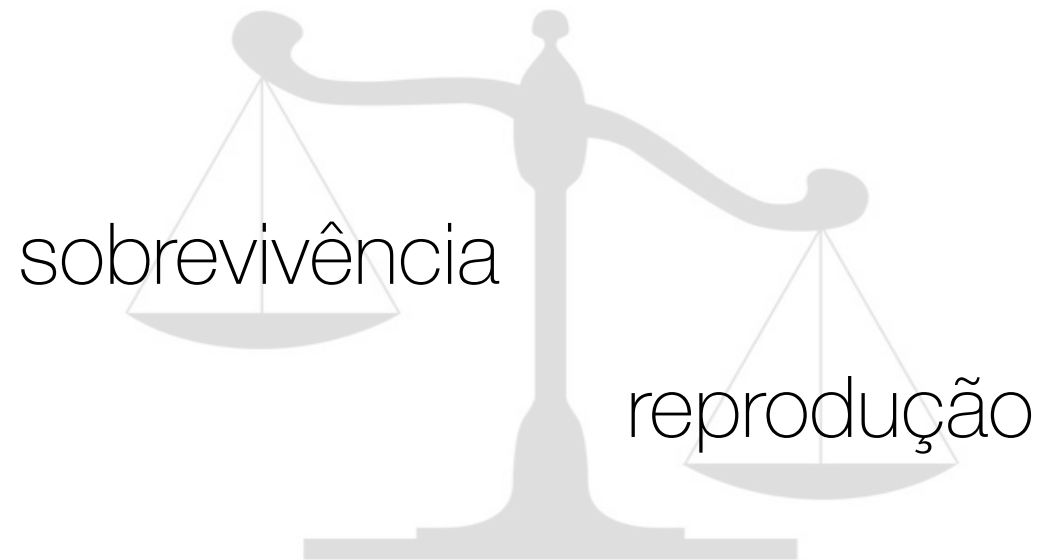




**distúrbio**



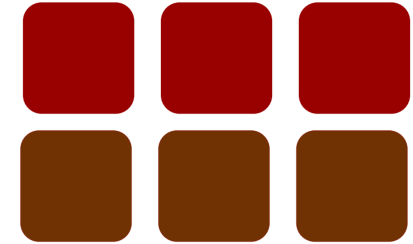
recurso



**distúrbio**

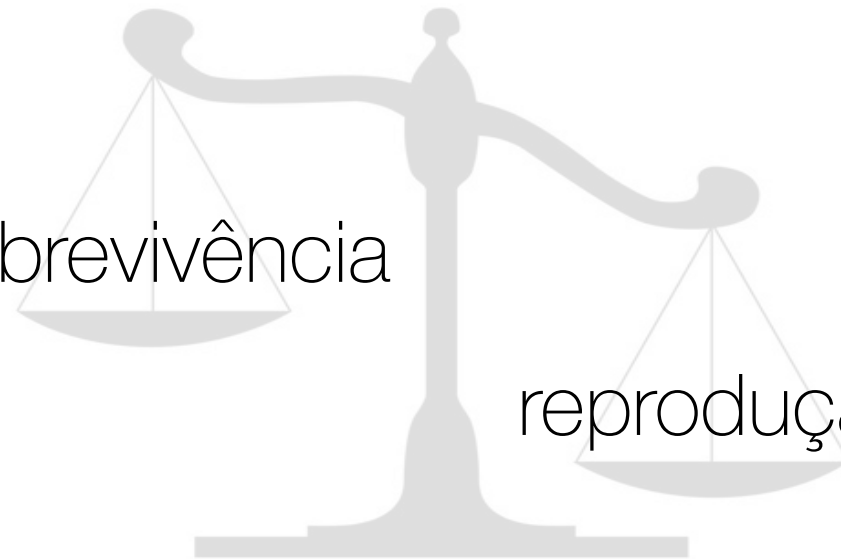


recurso



sobrevivência

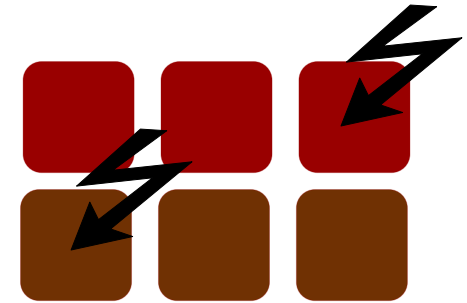
reprodução



**distúrbio**



recurso



sobrevivência

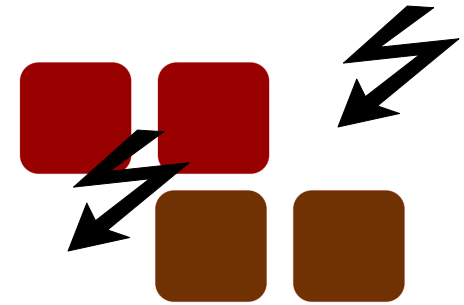
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**distúrbio**

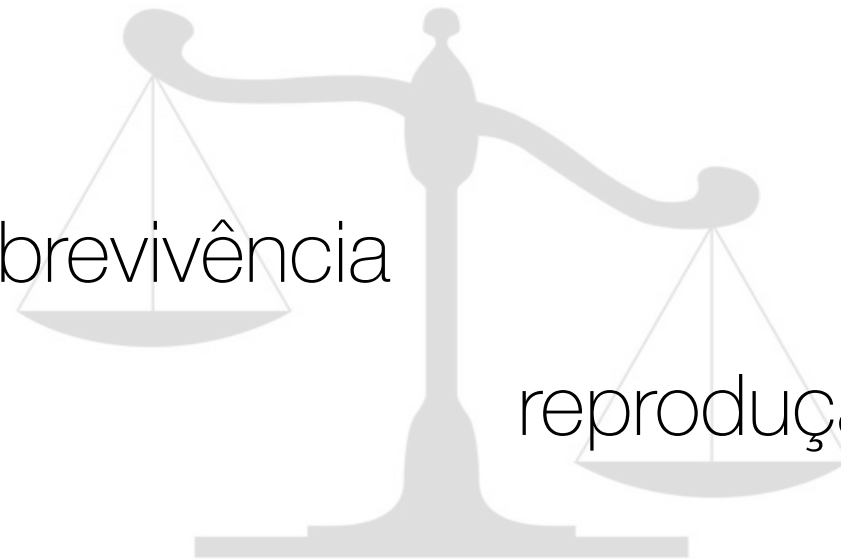


recurso



sobrevivência

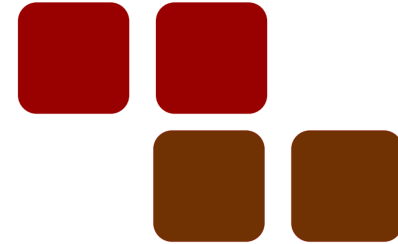
reprodução



**distúrbio**

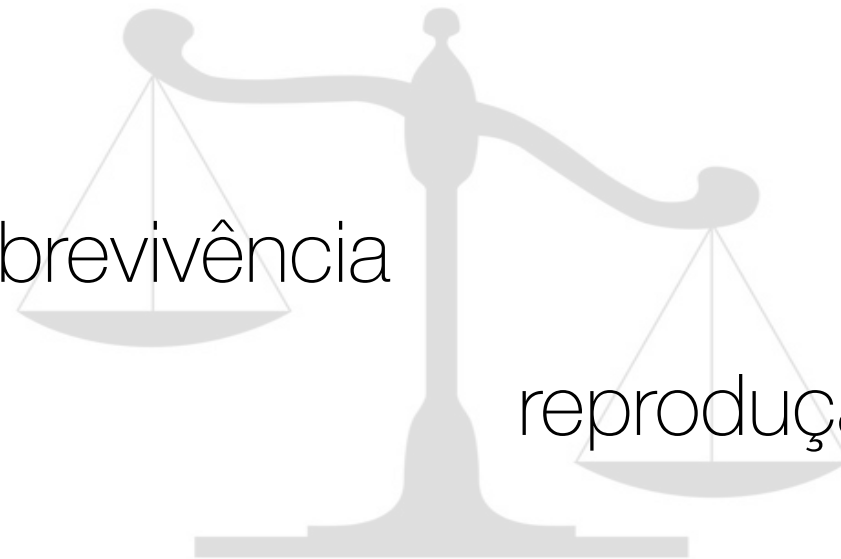


recurso



sobrevivência

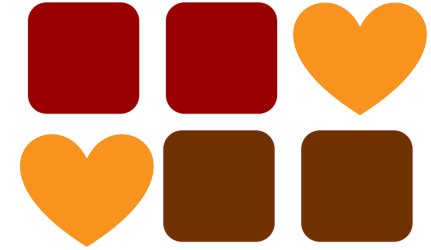
reprodução



**distúrbio**

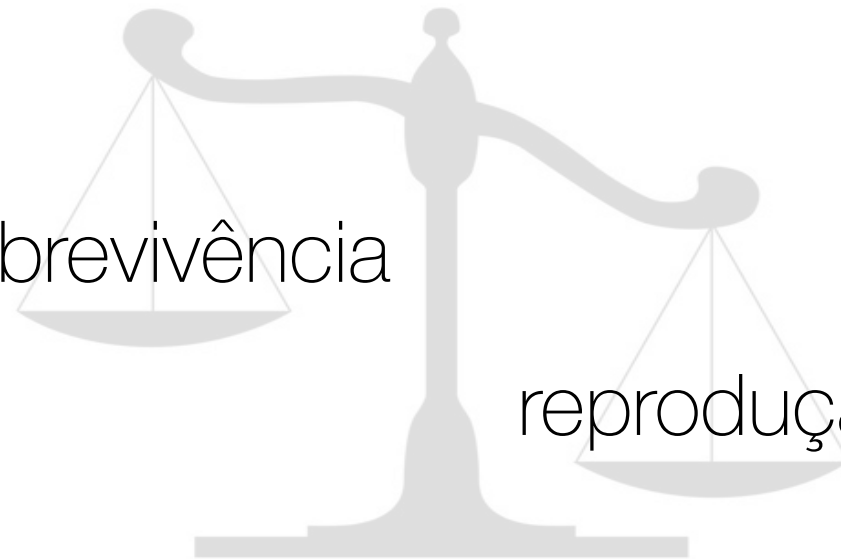


recurso



sobrevivência

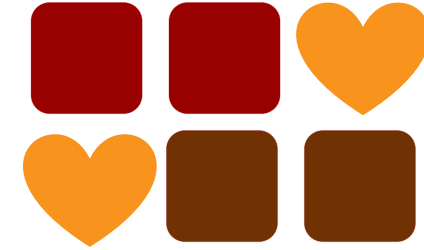
reprodução



**distúrbio**



↑ **recurso**



sobrevivência

**reprodução**



# distúrbio







## distúrbio

↓  
dinâmica  
ecológica

↓  
dinâmica  
evolutiva

mudança na frequência das  
estratégias de vida  
**na comunidade**  
a partir de alterações na  
**frequência relativa das  
espécies**

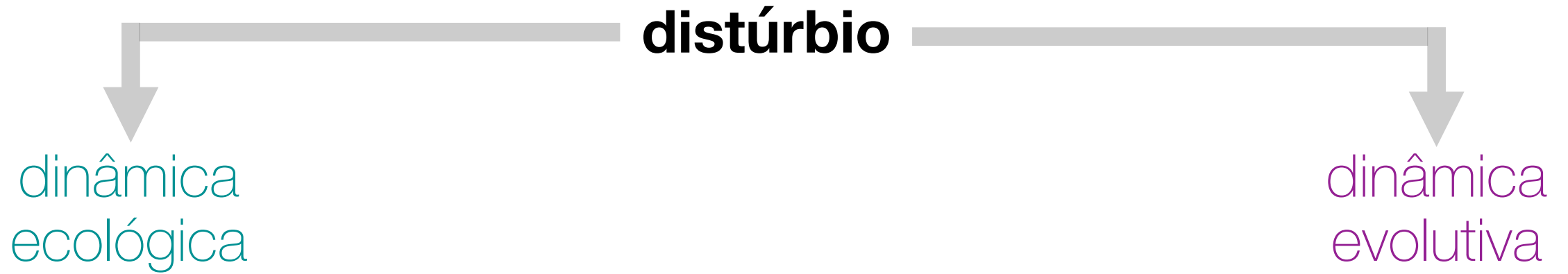
## distúrbio

dinâmica  
ecológica

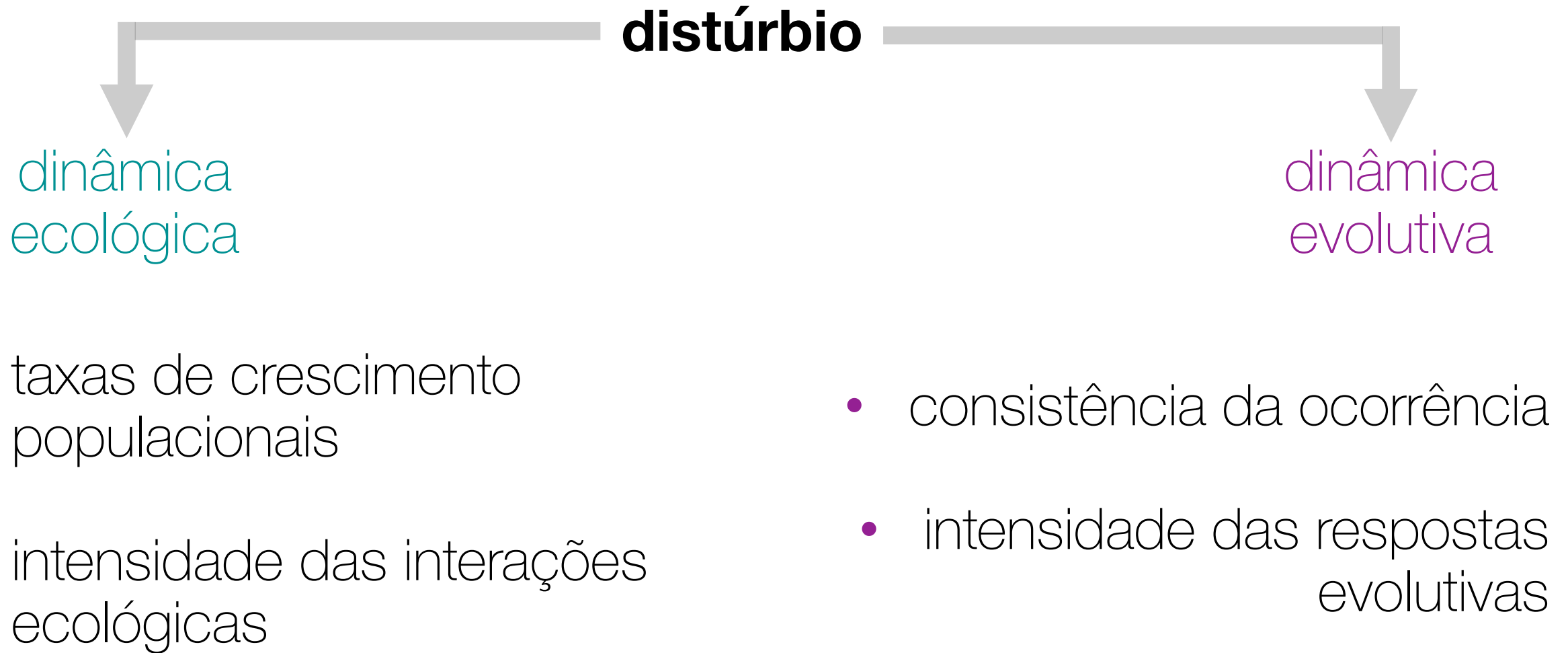
mudança na frequência das  
estratégias de vida  
**na comunidade**  
a partir de alterações na  
**frequência relativa das  
espécies**

dinâmica  
evolutiva

mudança na frequência das  
estratégias de vida  
**na população**  
a partir de alterações na  
**frequência relativa dos  
alelos**



- taxas de crescimento populacionais
- intensidade das interações ecológicas



# distúrbio

dinâmica  
ecológica

- comunidade
- exclusão competitiva de espécies

dinâmica  
evolutiva

- população
- adaptação

porém...

dinâmica  
ecológica



dinâmica  
evolutiva



porém...

dinâmica  
eco-evolutiva

dinâmica  
ecológica



dinâmica  
evolutiva

porém...

dinâmica  
ecológica

dinâmica  
eco-evolutiva



dinâmica  
evolutiva

- contextos multiespecíficos
- espécies sob evolução

logo...

dinâmica  
eco-evolutiva

dinâmica  
ecológica



dinâmica  
evolutiva

logo...

dinâmica  
eco-evolutiva

dinâmica  
ecológica



dinâmica  
evolutiva

 **distúrbio**

logo...

dinâmica  
eco-evolutiva

dinâmica  
ecológica



dinâmica  
evolutiva

 **distúrbio**

logo...

dinâmica  
eco-evolutiva

dinâmica  
ecológica



dinâmica  
evolutiva

 **distúrbio**

predições  
distintas e imprecisas



Como o **distúrbio**  determina

Como o **distúrbio**  determina  
as **estratégias de vida** presentes





Como o **distúrbio**  determina  
as **estratégias de vida** presentes  
  
em populações e comunidades sob **dinâmicas**

Como o **distúrbio**  determina  
as **estratégias de vida** presentes  
  
em populações e comunidades sob **dinâmicas**  
**evolutivas**, **ecológicas** e **eco-evolutivas**?

# modelo baseado em indivíduo

# modelo baseado em indivíduo

***parâmetros***

# modelo baseado em indivíduo



***parâmetros***

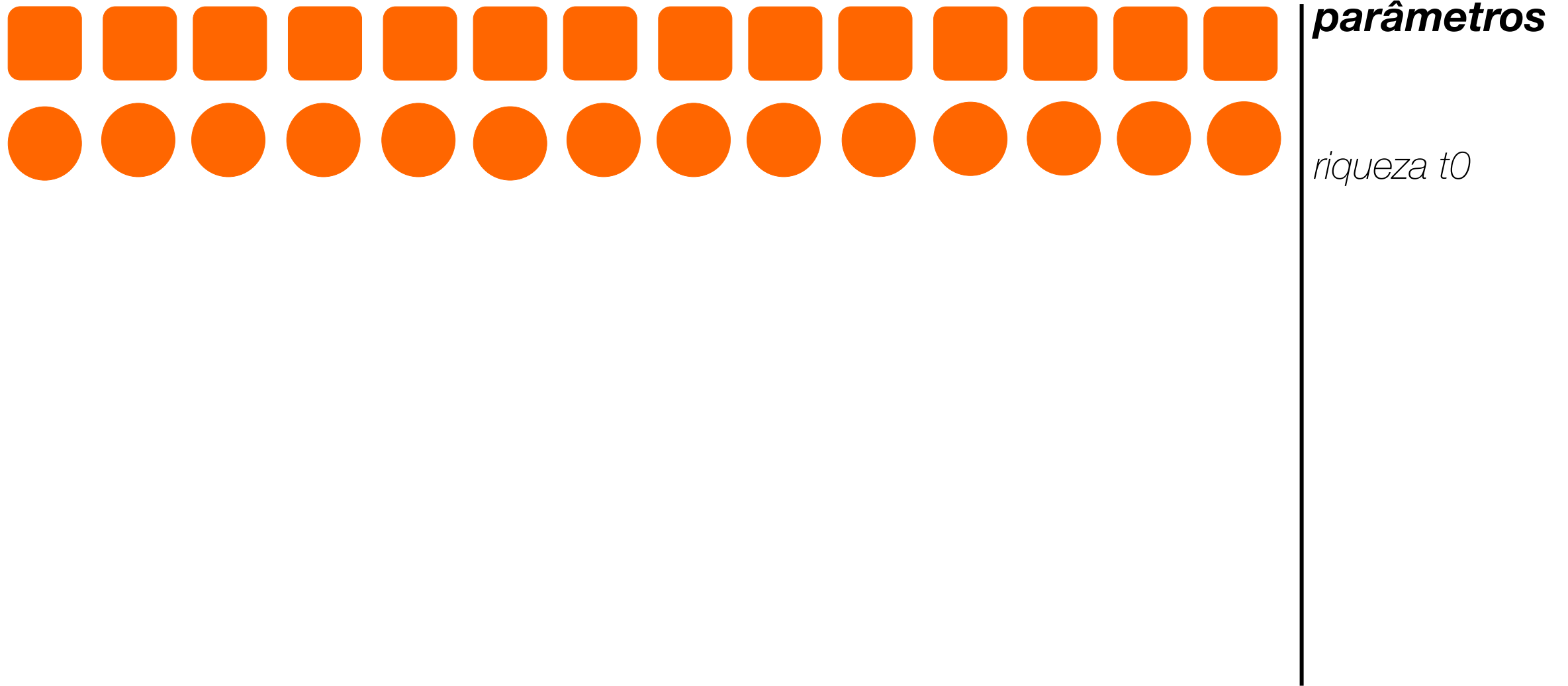
# modelo baseado em indivíduo



***parâmetros***

*riqueza  $t_0$*

# modelo baseado em indivíduo

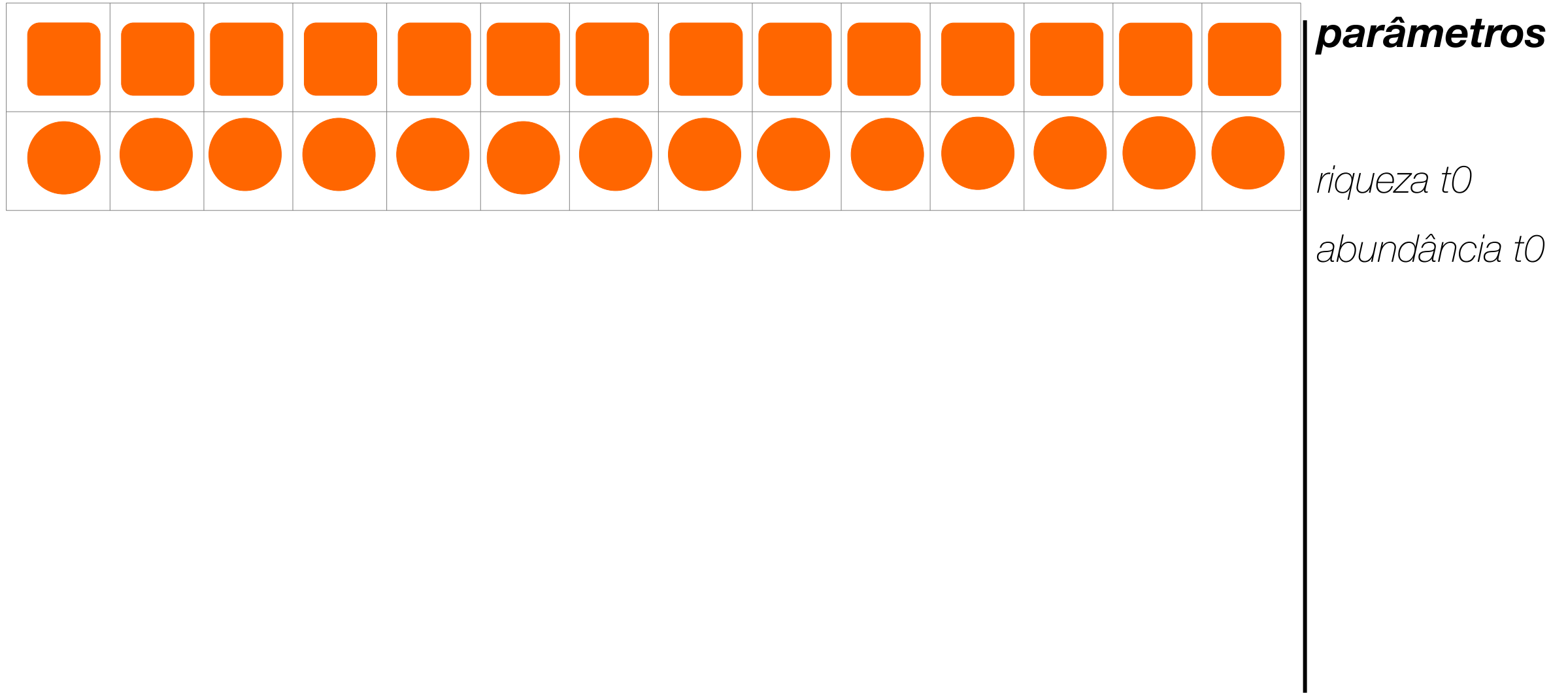


# modelo baseado em indivíduo





# modelo baseado em indivíduo



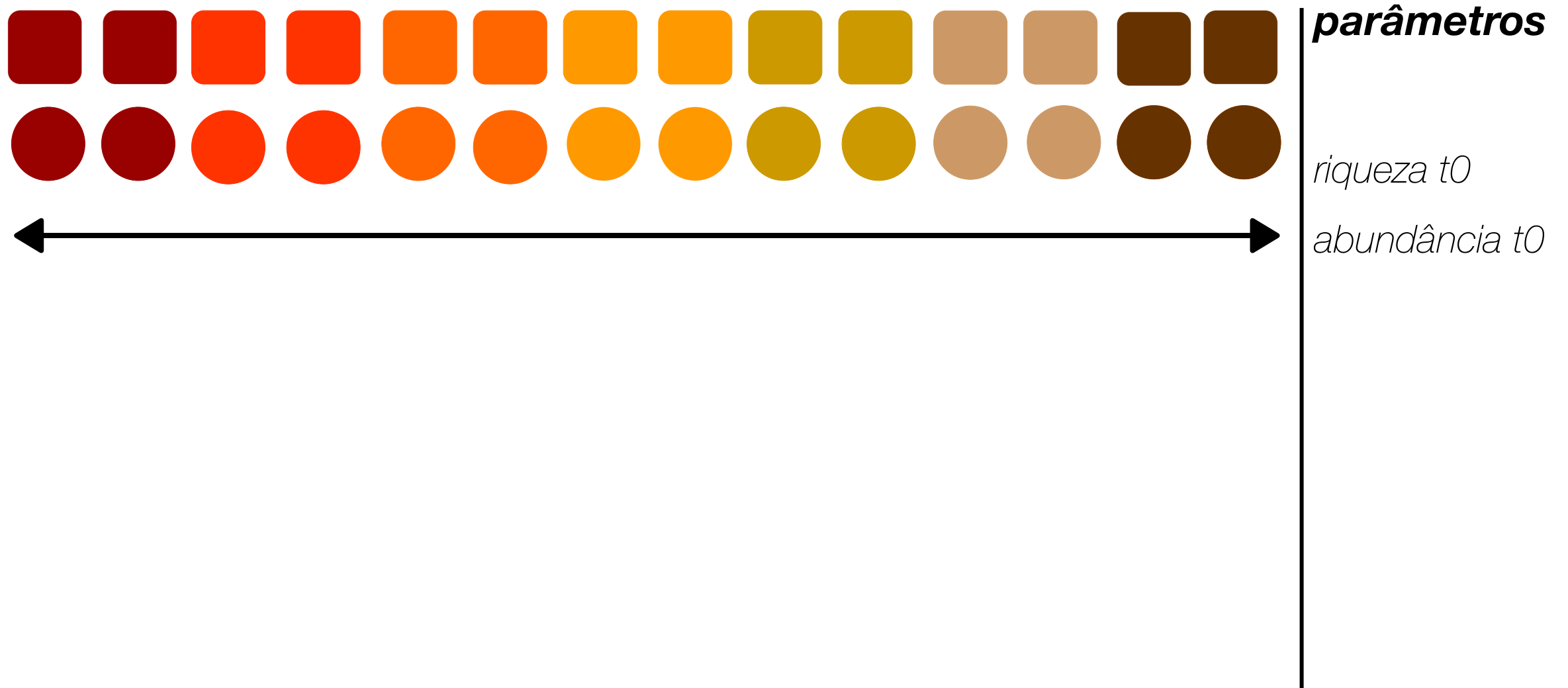
# modelo baseado em indivíduo



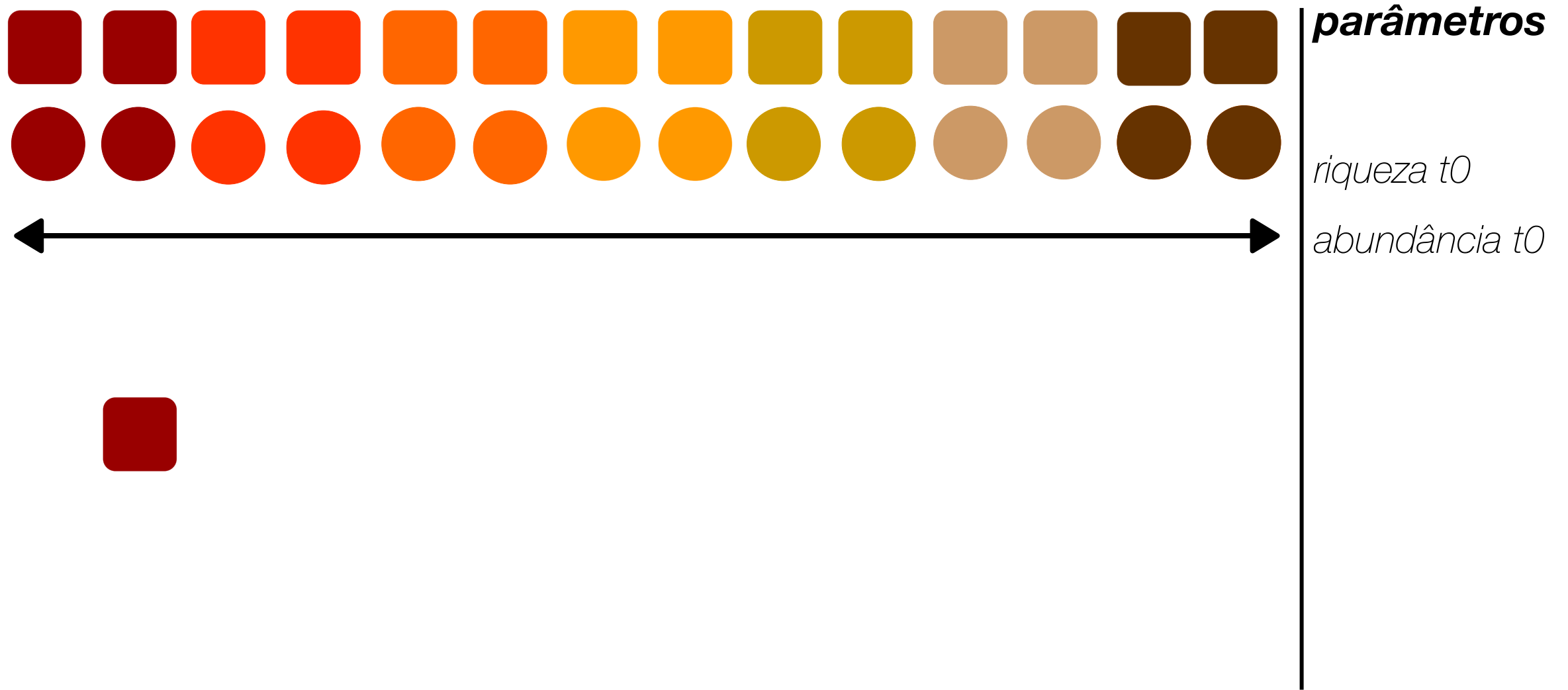
# modelo baseado em indivíduo



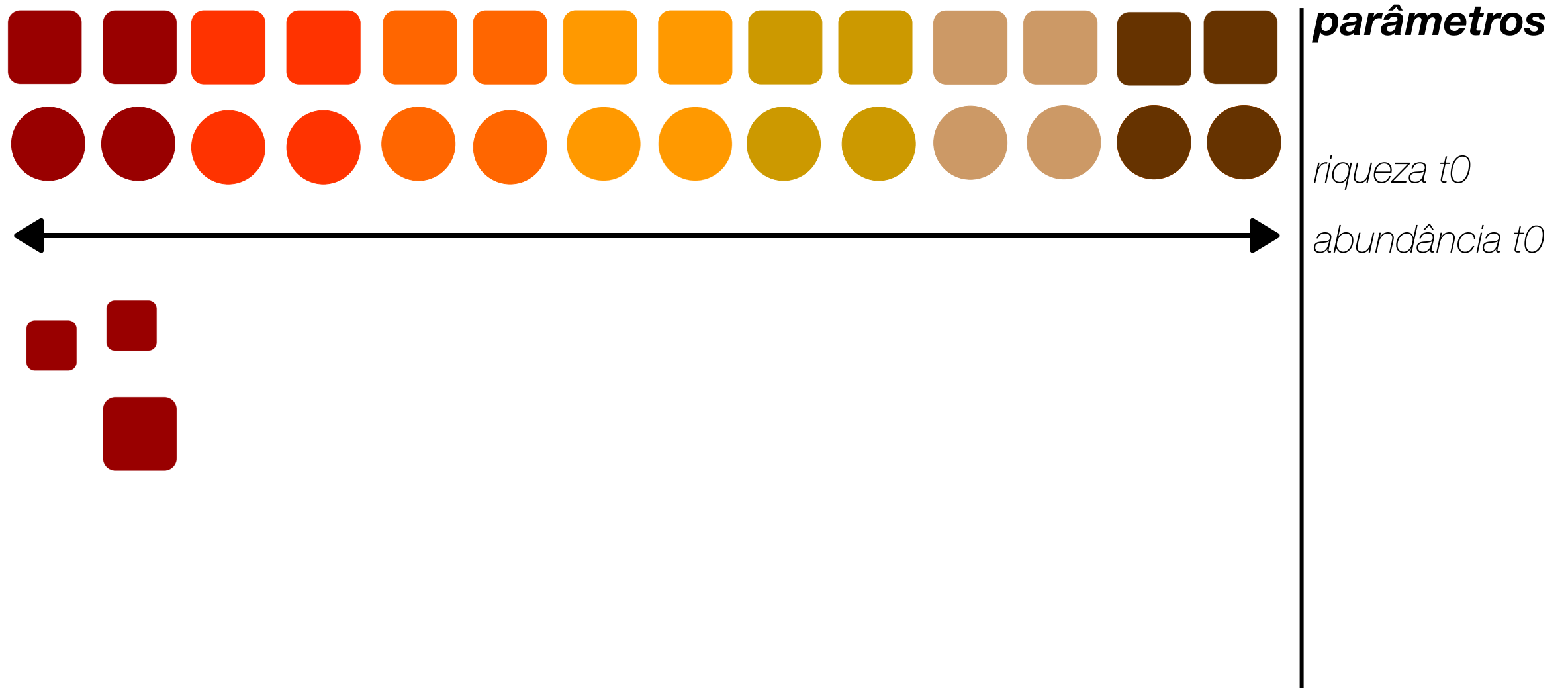
# modelo baseado em indivíduo



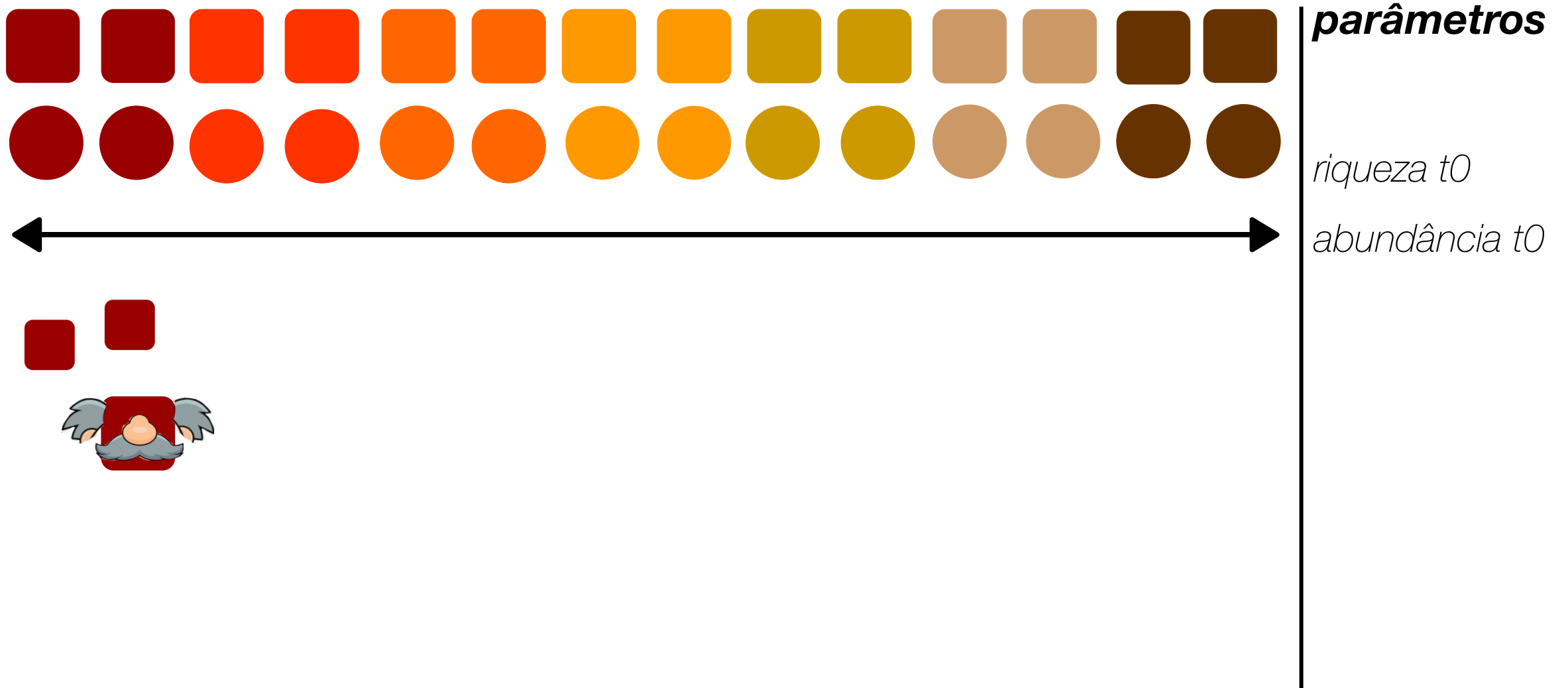
# modelo baseado em indivíduo



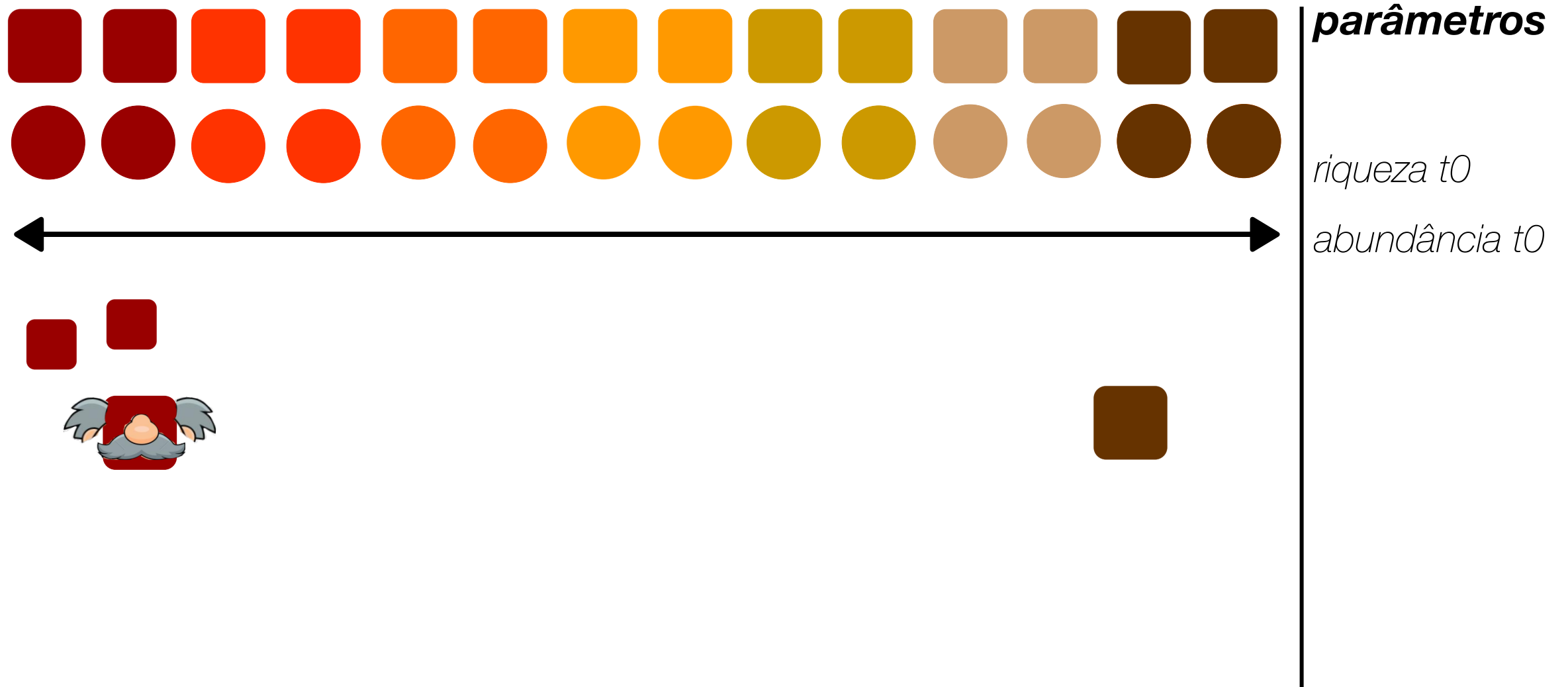
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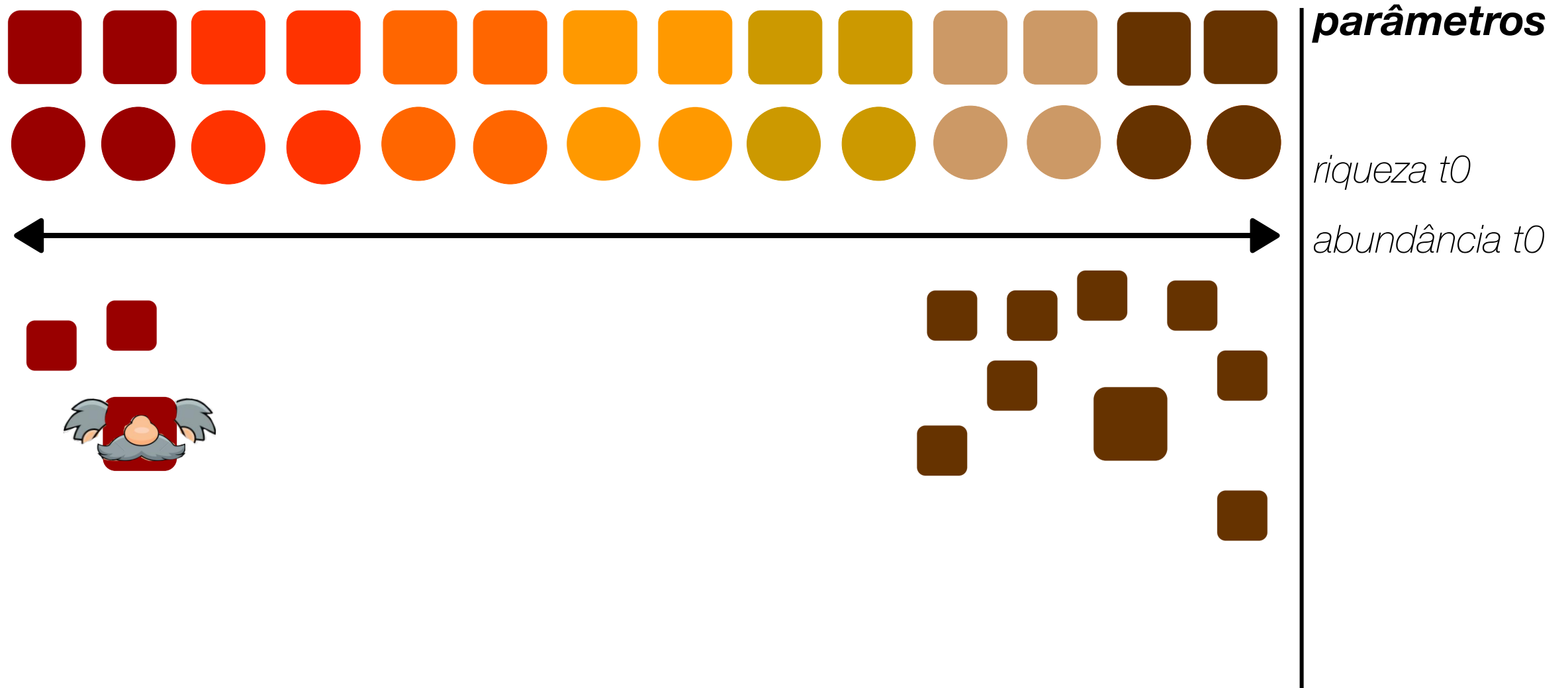


# modelo baseado em indivíduo

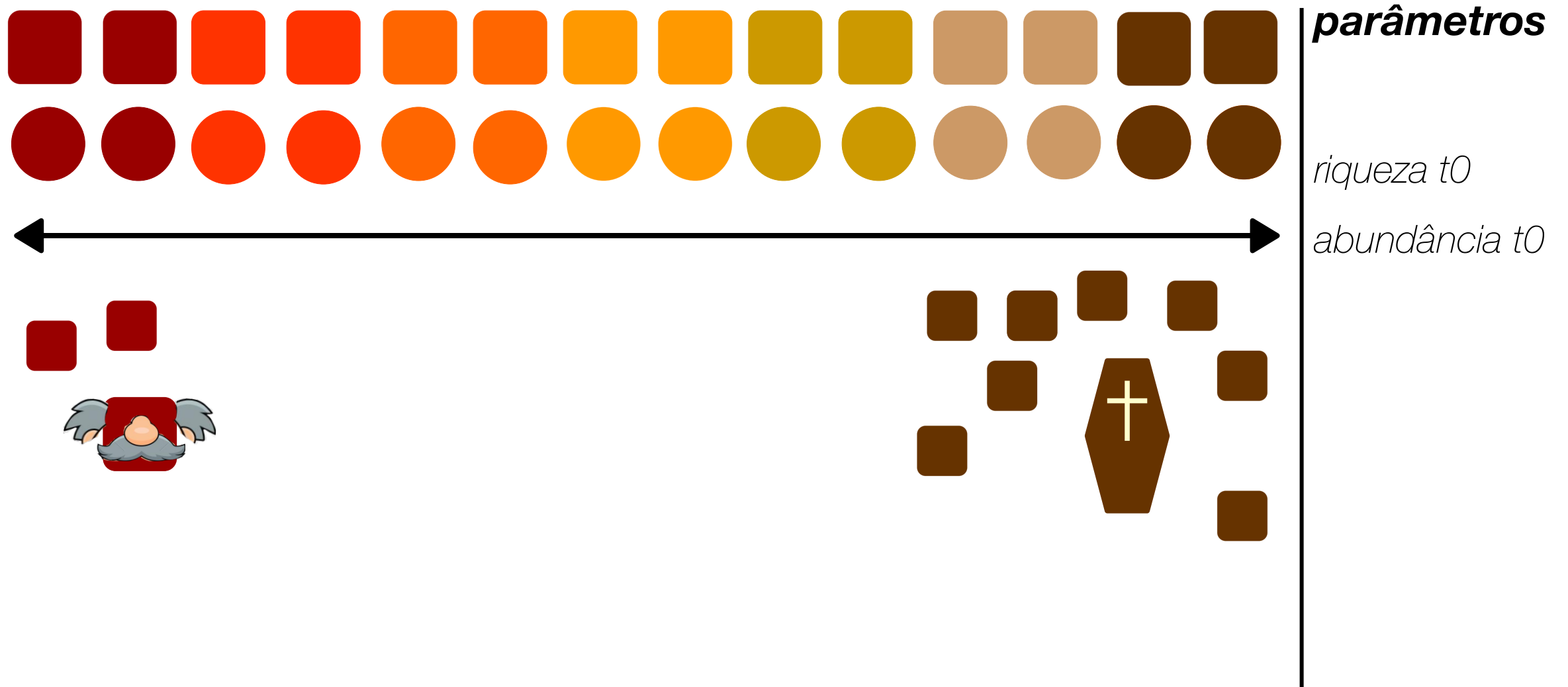




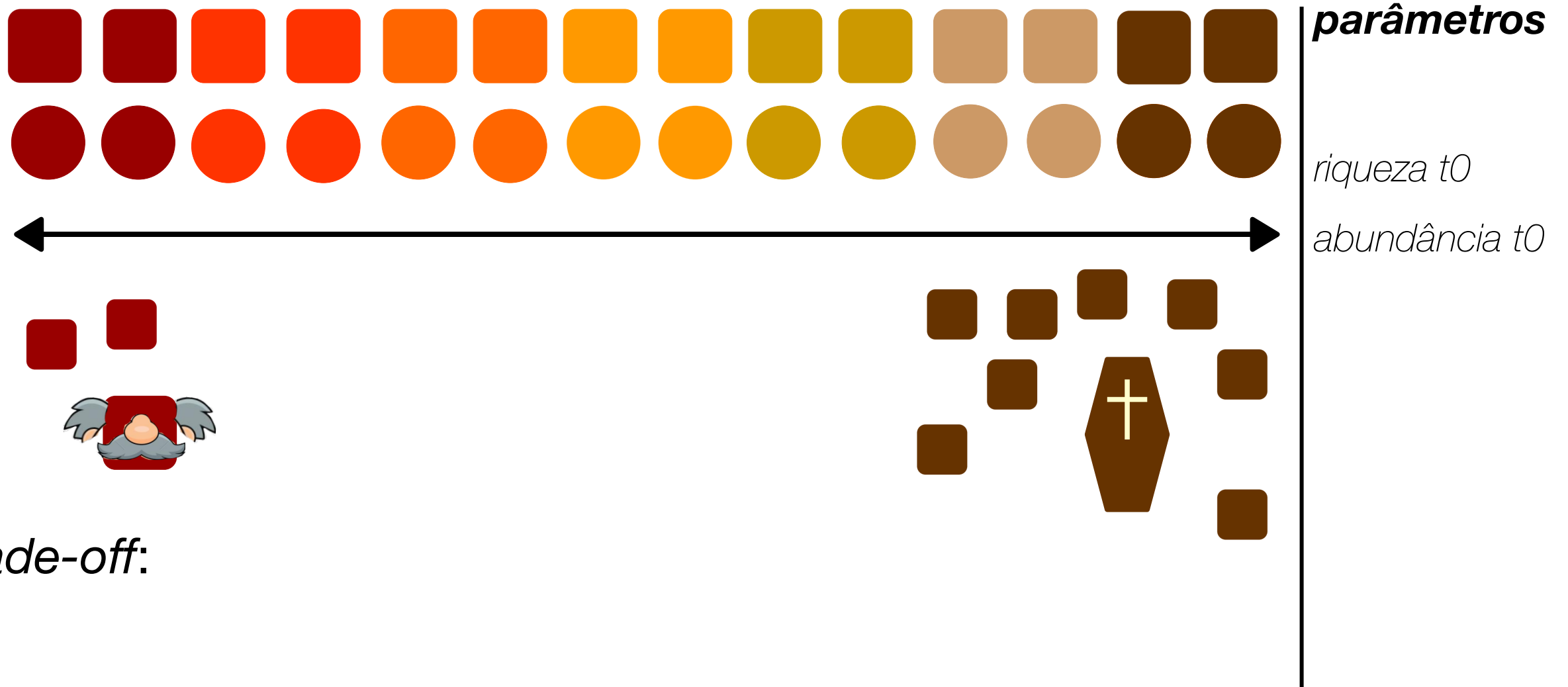
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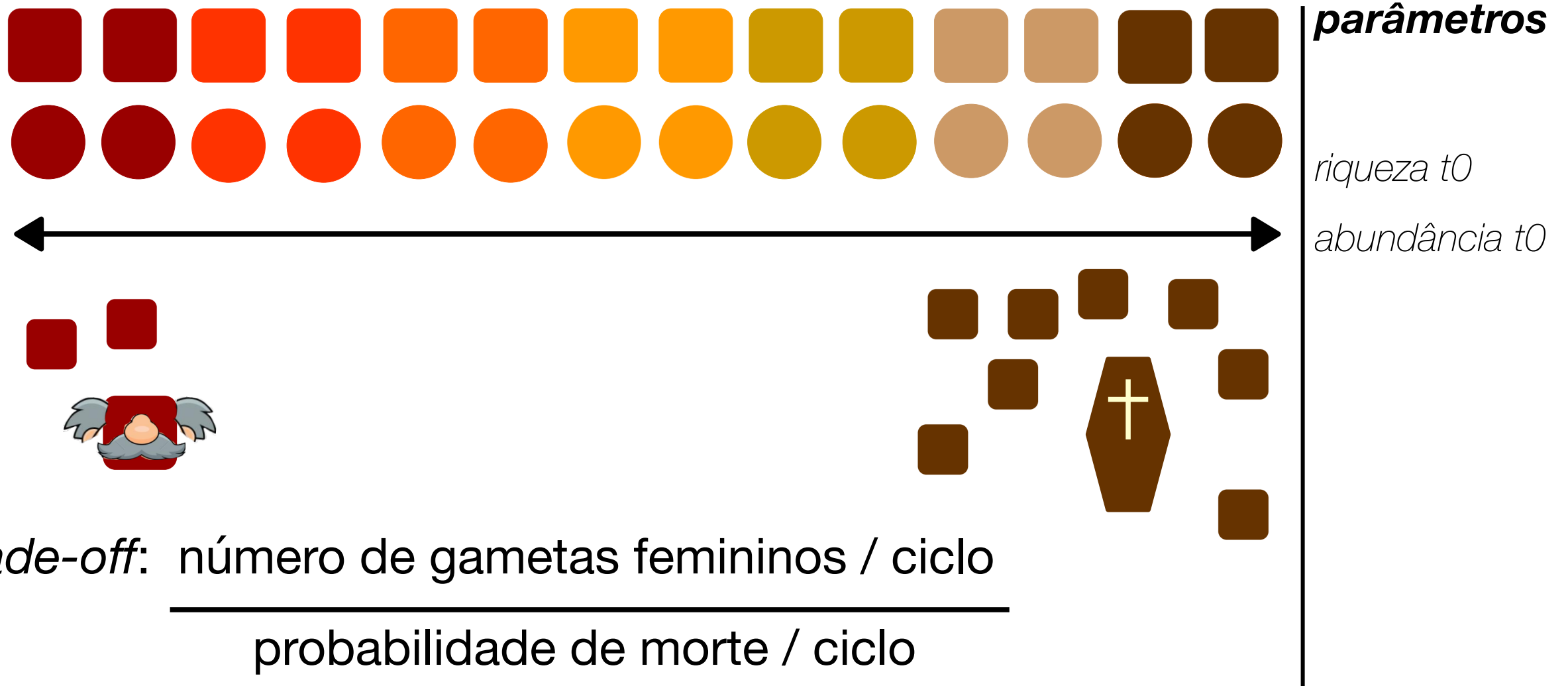
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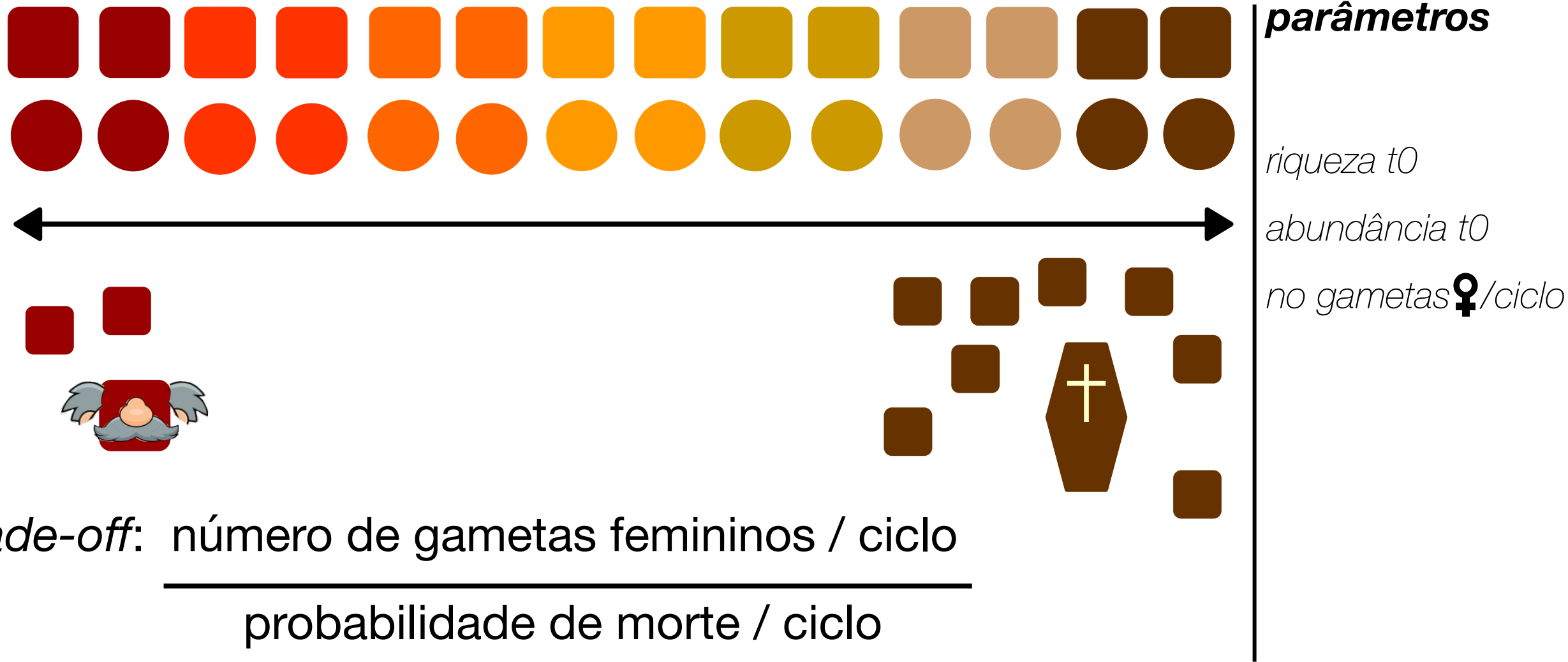
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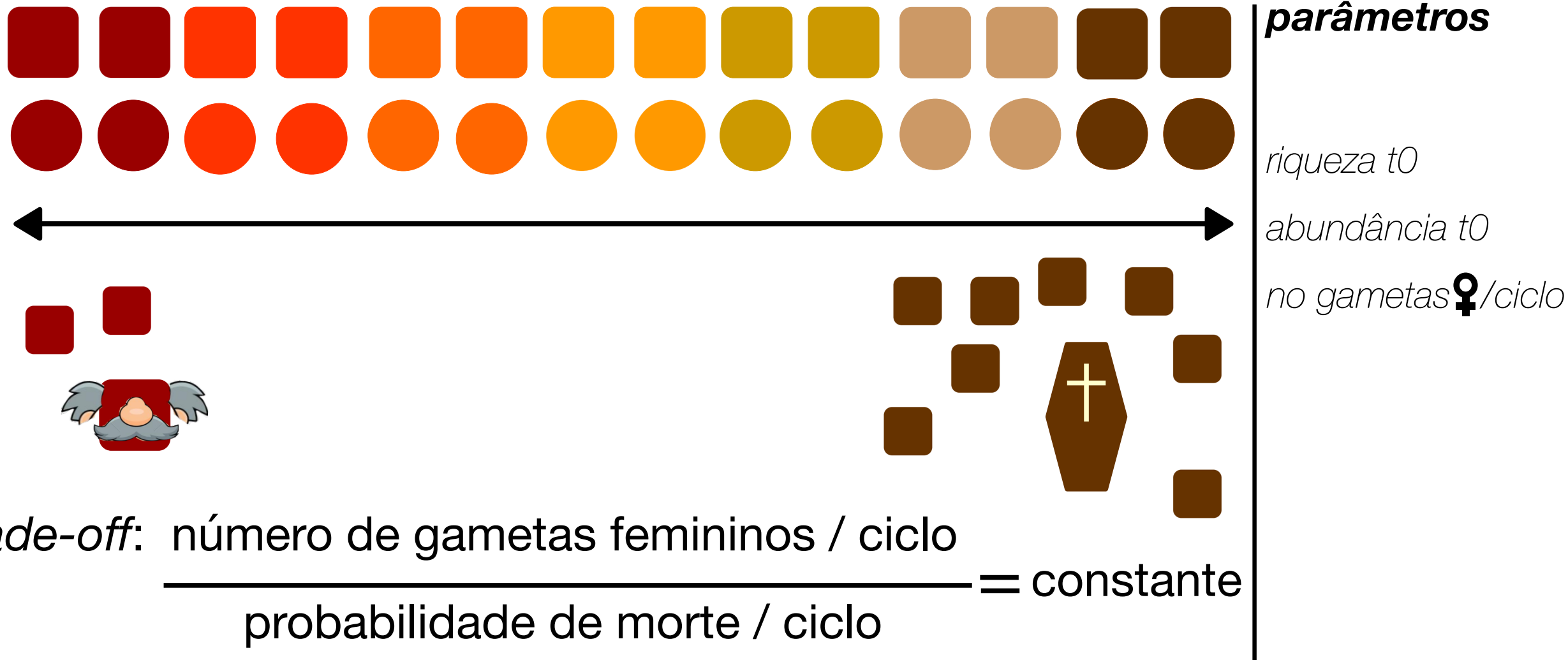
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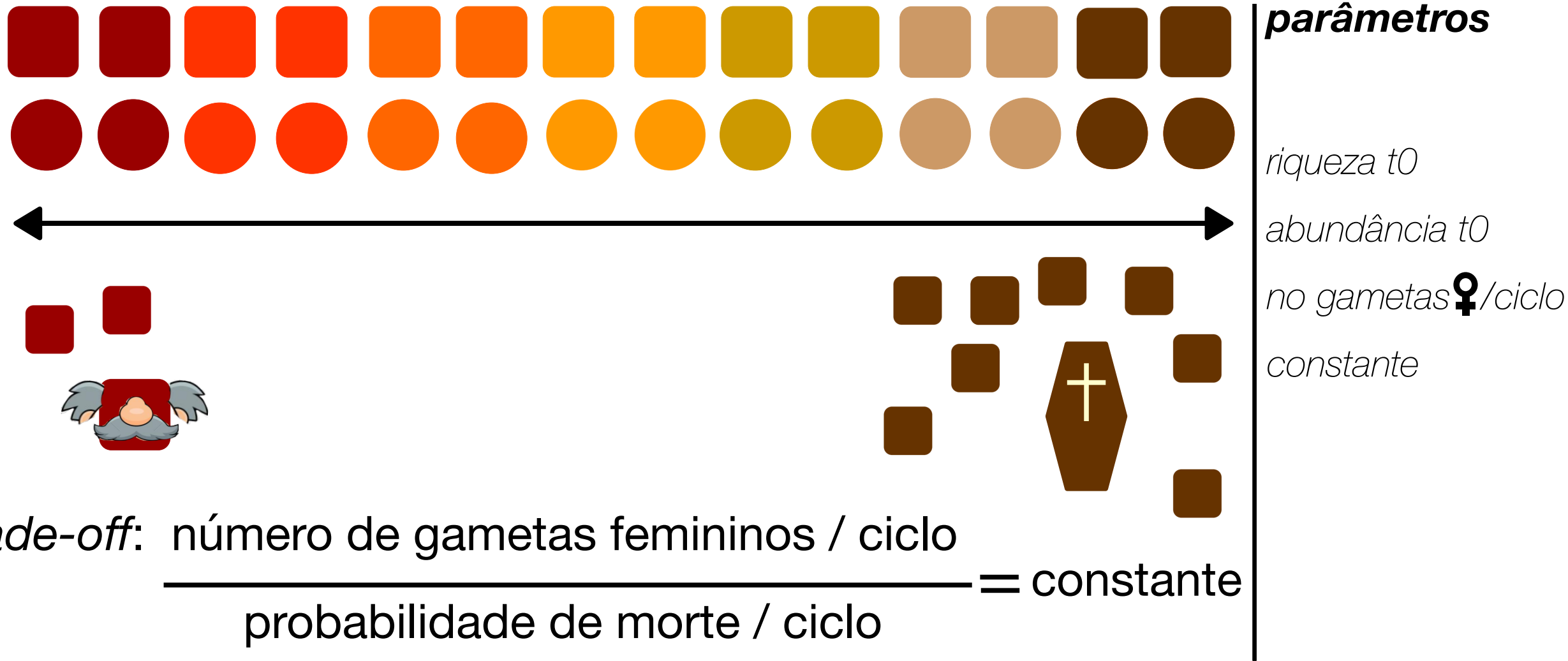
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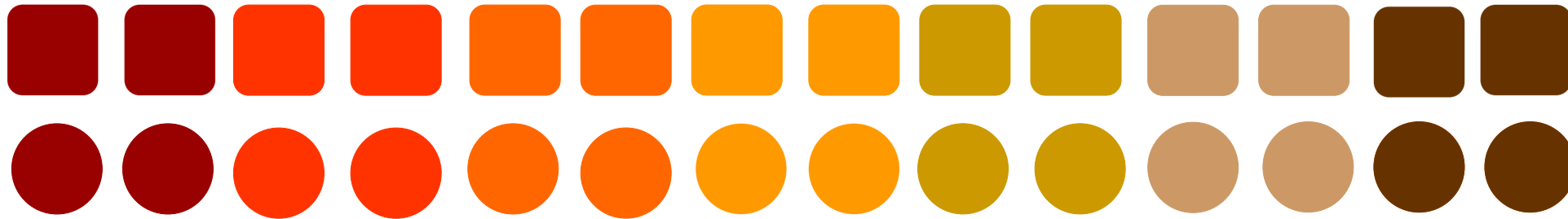
# modelo baseado em indivíduo



# modelo baseado em indivíduo



# modelo baseado em indivíduo



***parâmetros***

*riqueza  $t_0$*

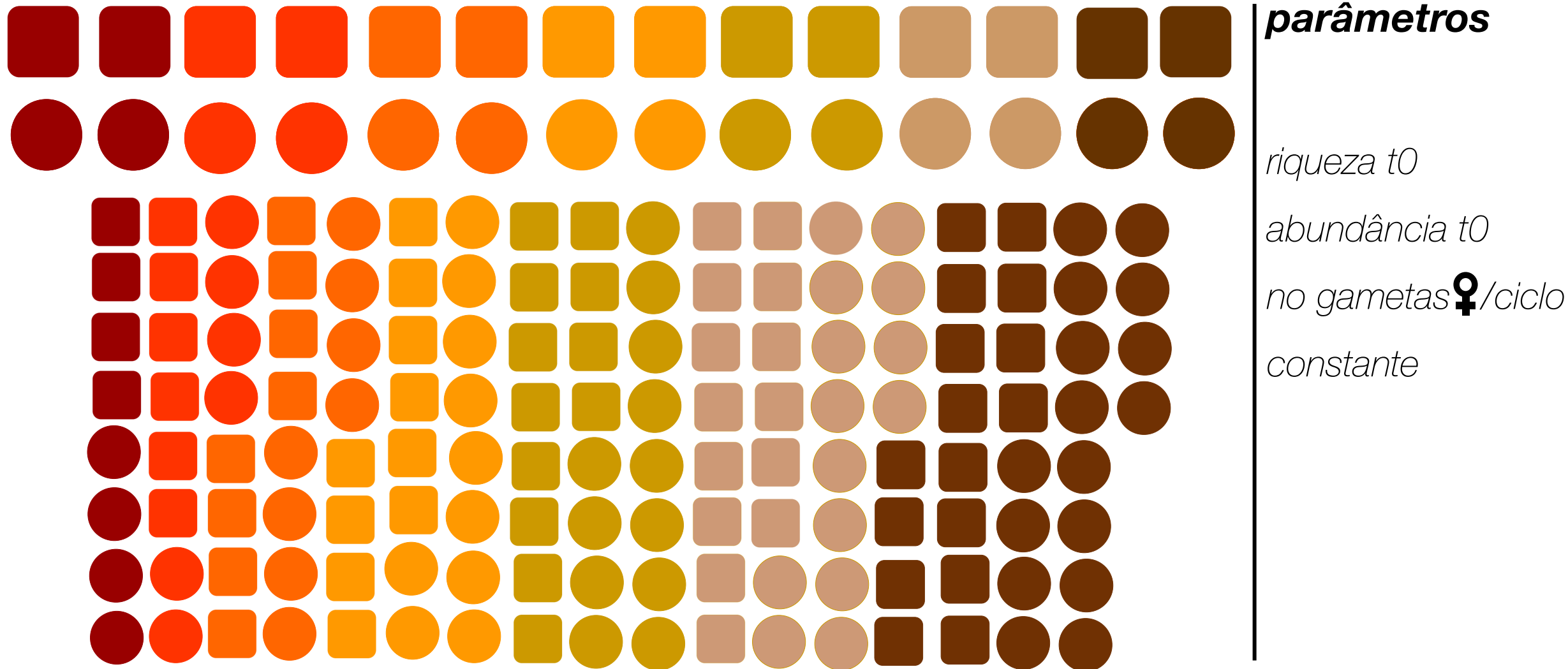
*abundância  $t_0$*

*no gametas ♀/ciclo*

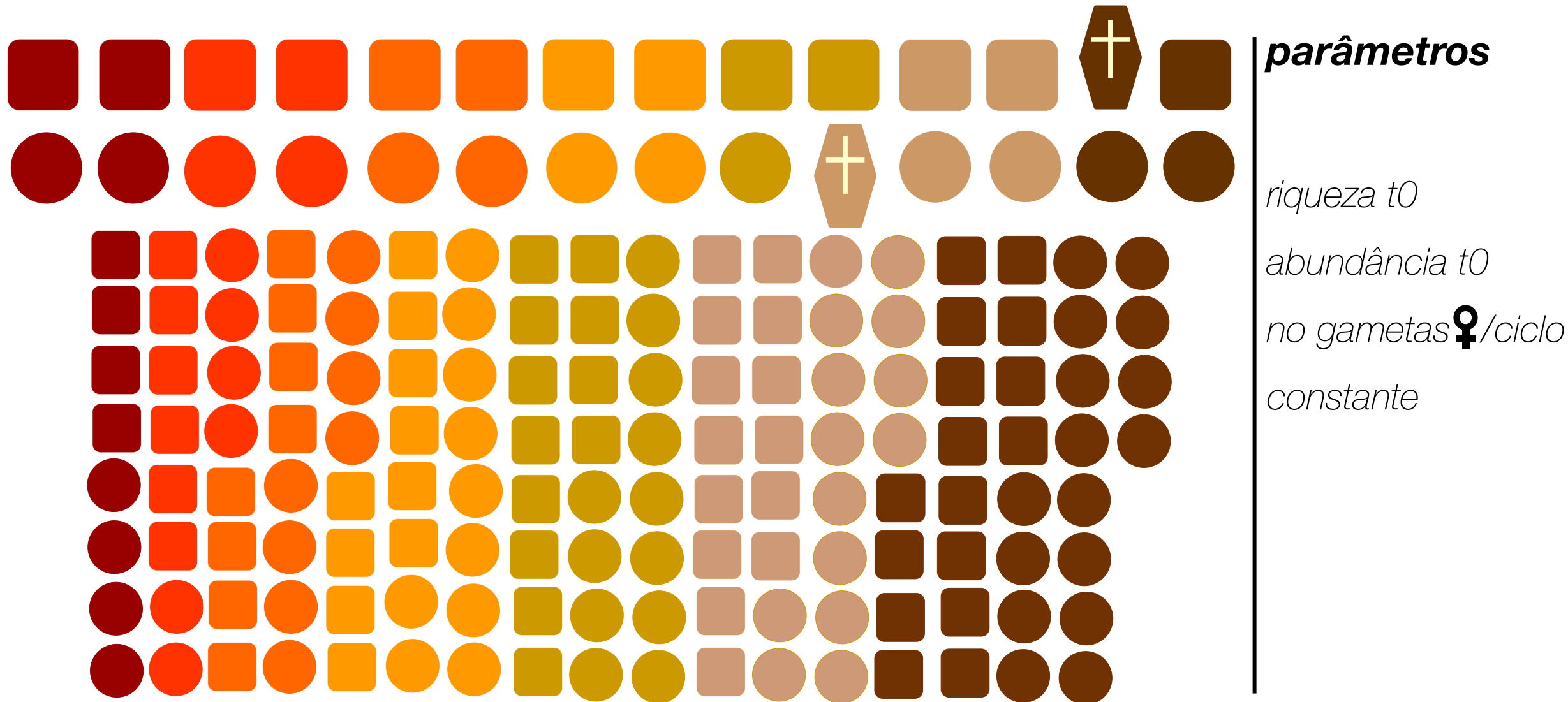
*constante*



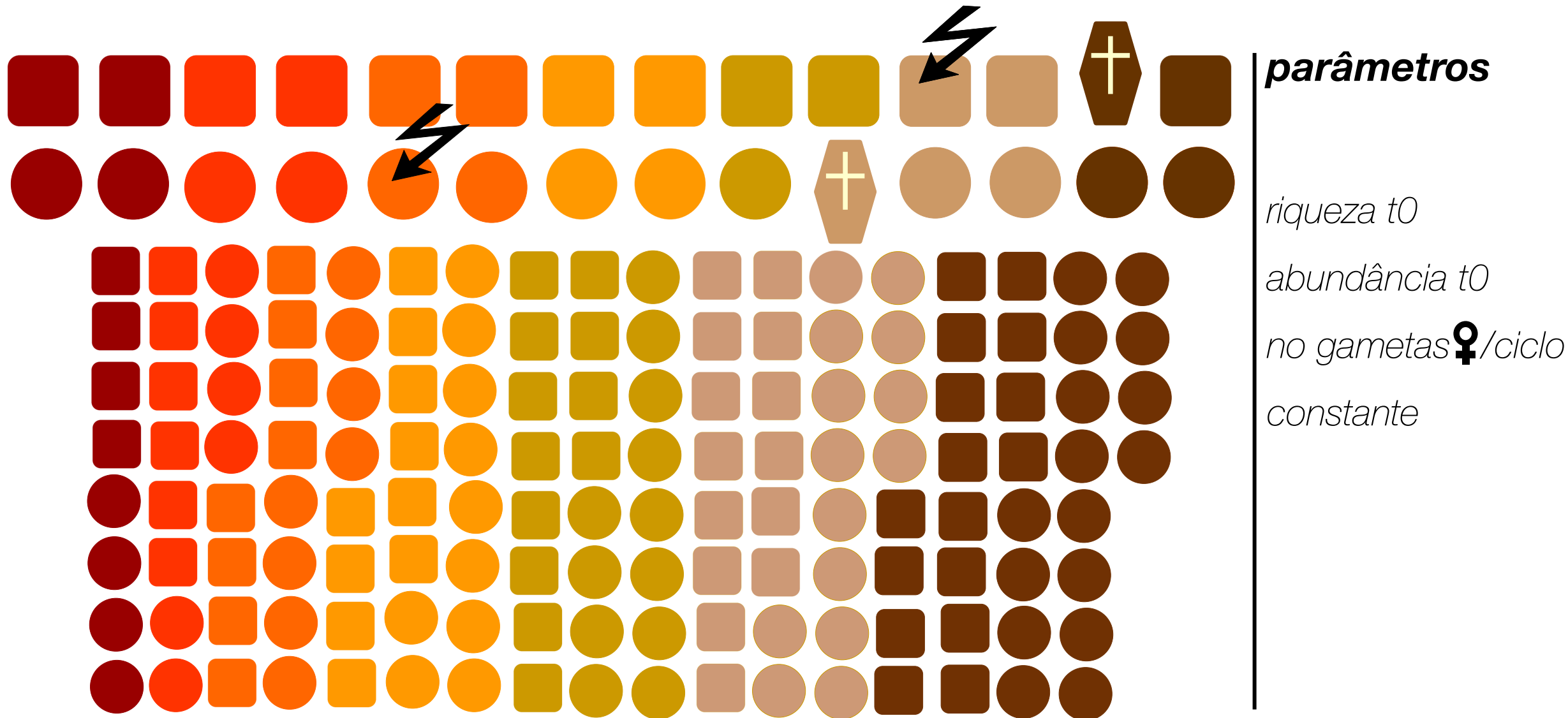
# modelo baseado em indivíduo



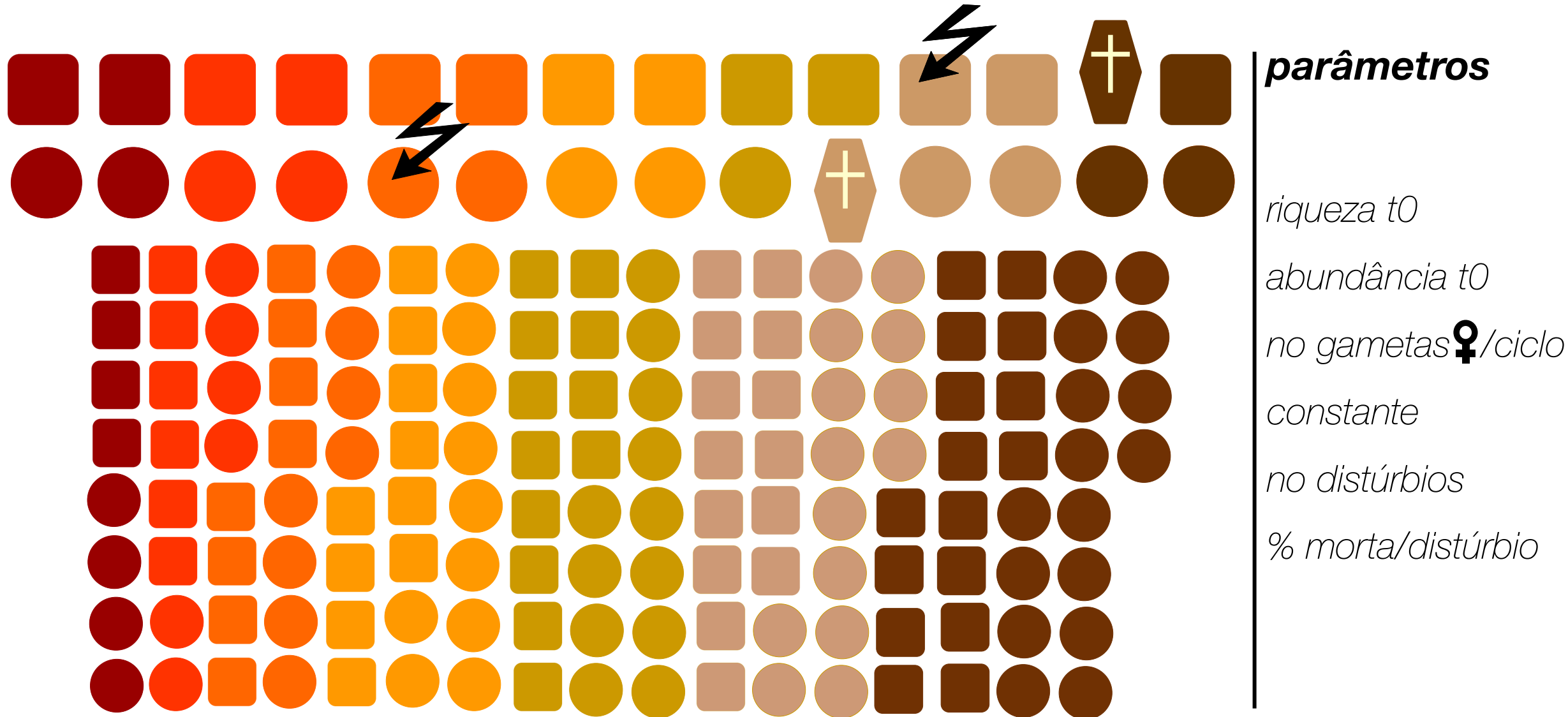
# modelo baseado em indivíduo



# modelo baseado em indivíduo



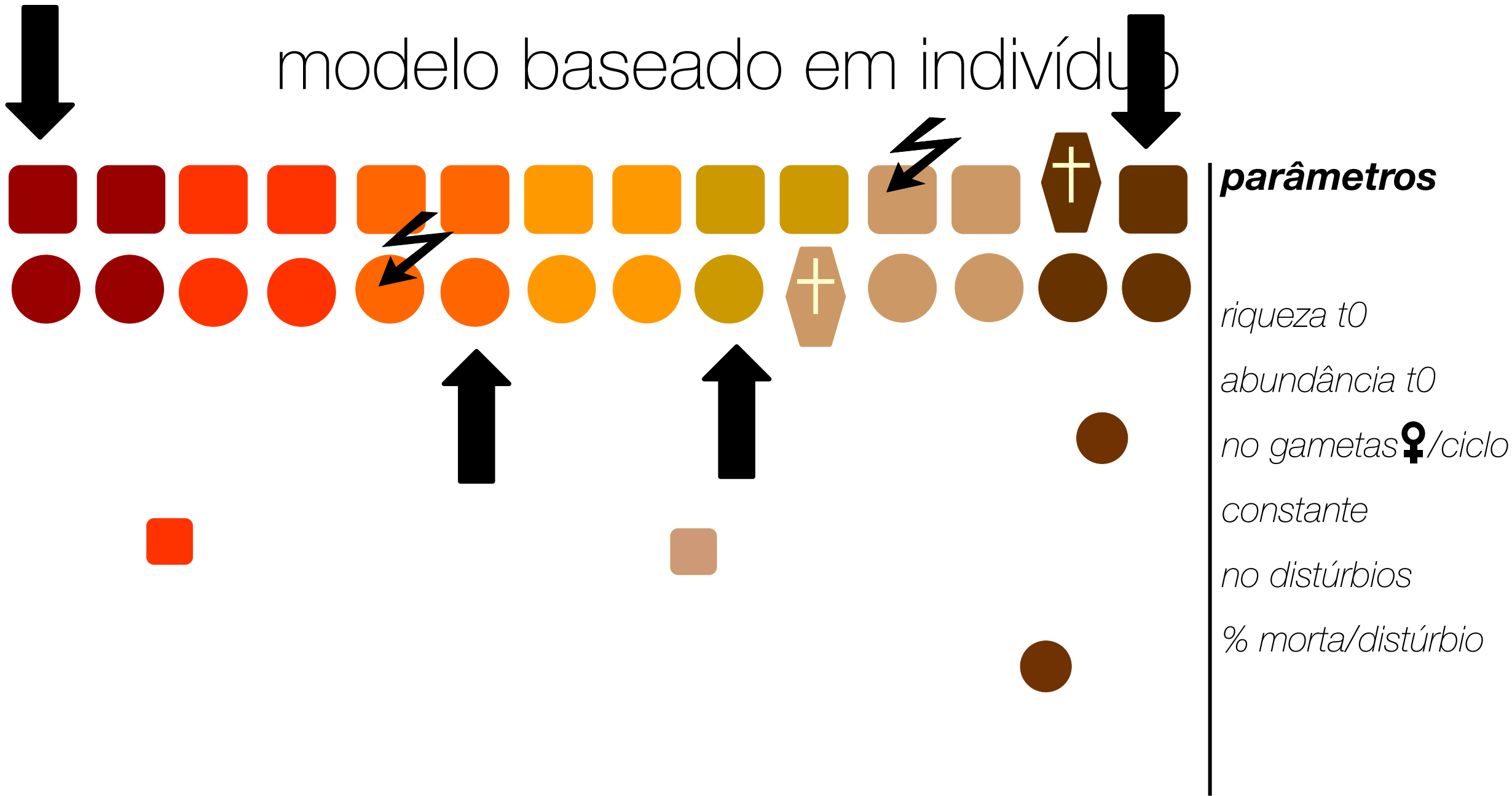
# modelo baseado em indivíduo



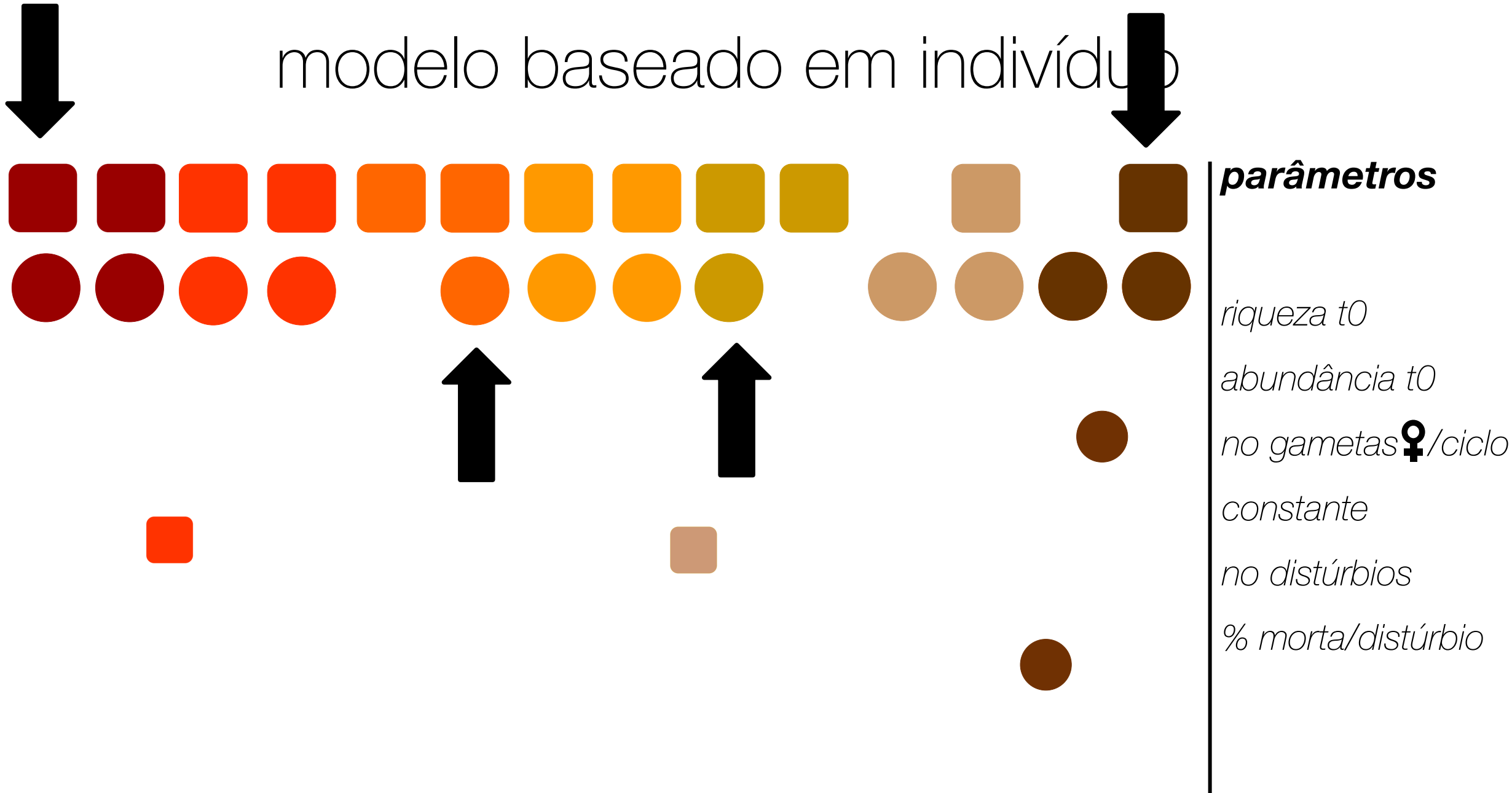
# modelo baseado em indivíduo



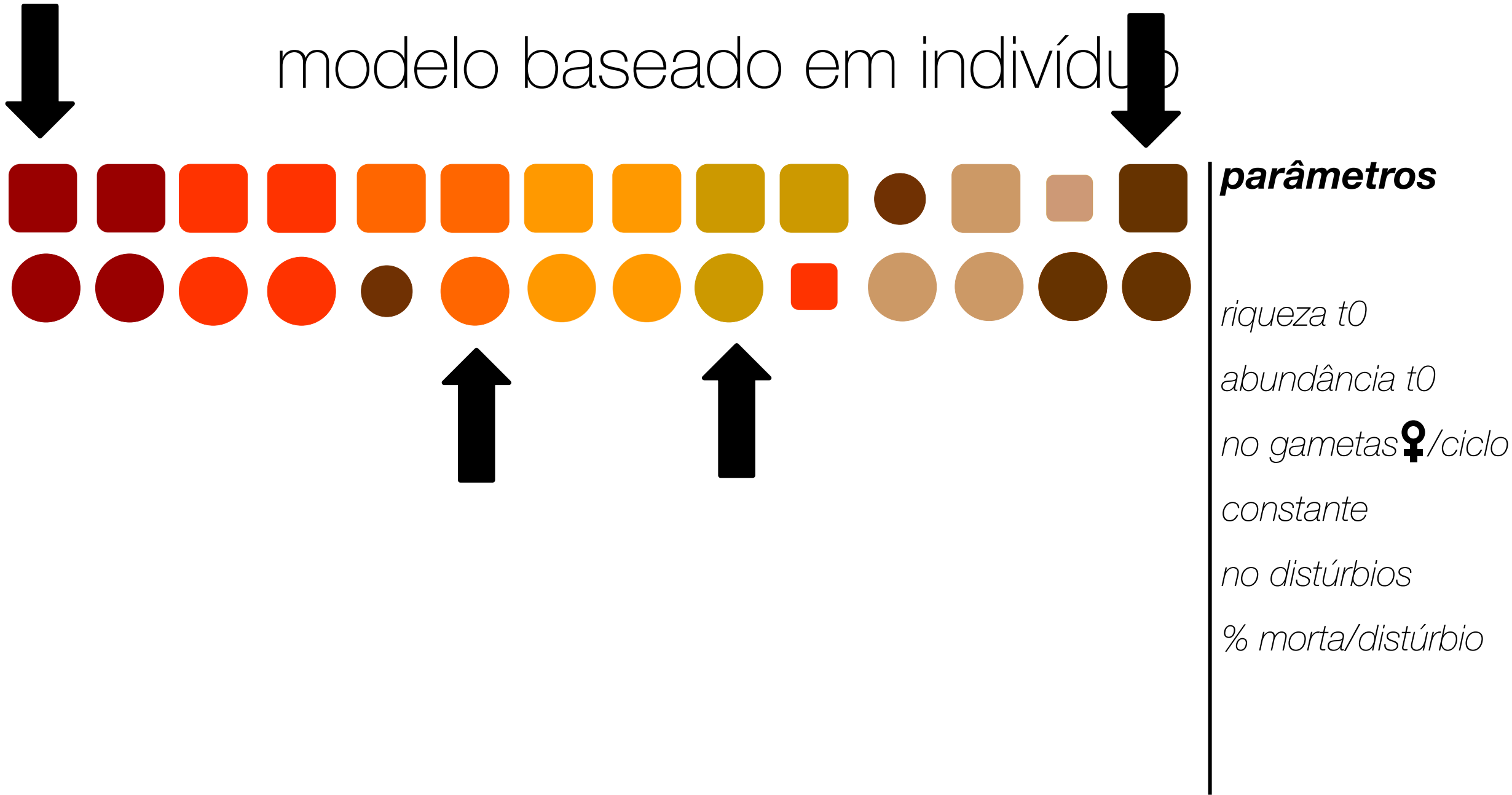
# modelo baseado em indivíduos



# modelo baseado em indivíduos

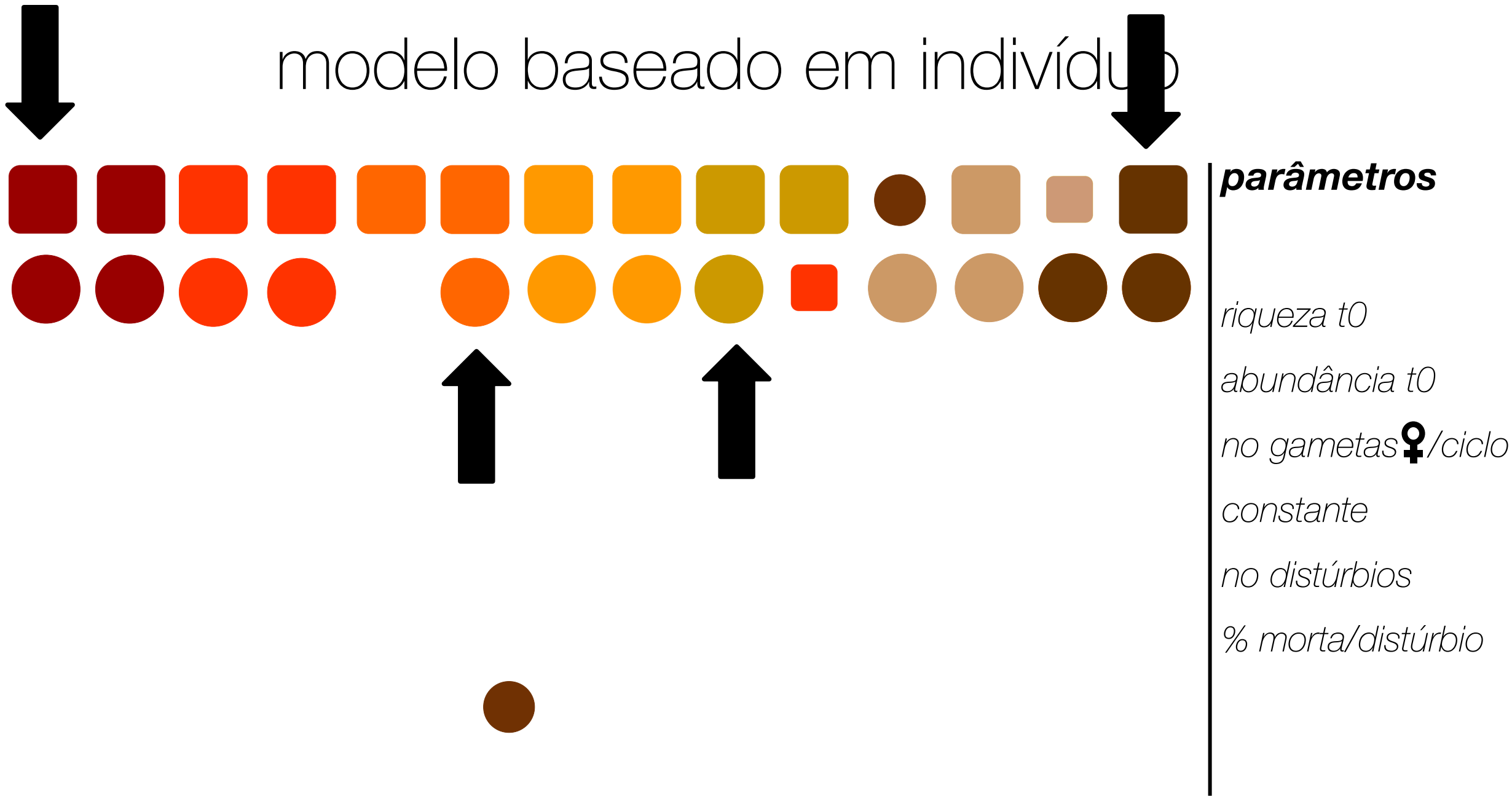


# modelo baseado em indivíduos

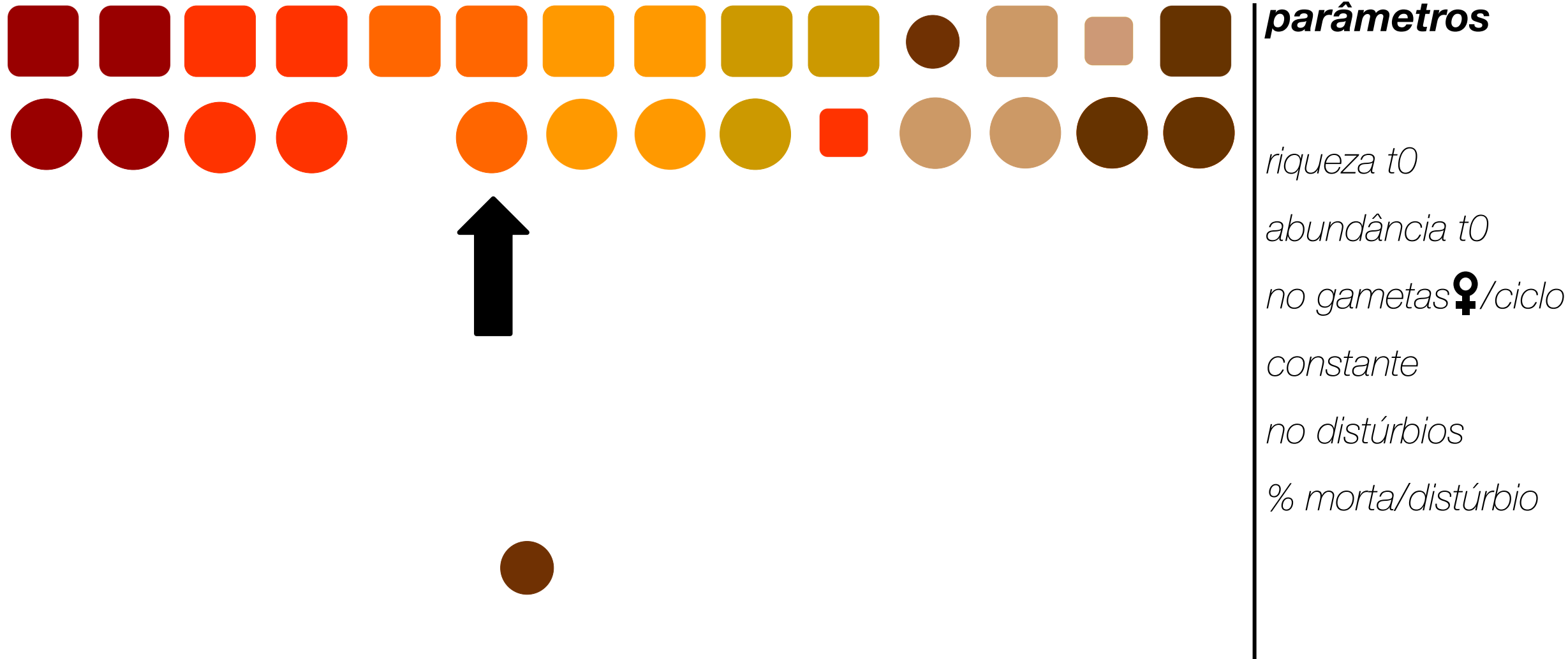




# modelo baseado em indivíduos



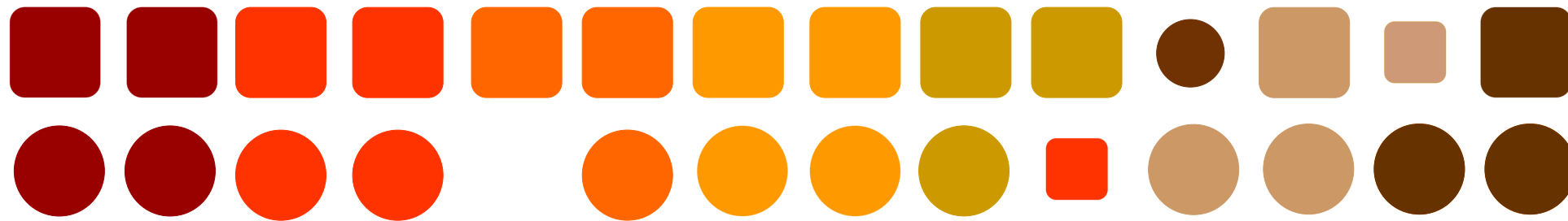
# modelo baseado em indivíduo



# modelo baseado em indivíduo



# modelo baseado em indivíduo



**parâmetros**

*riqueza t0*

*abundância t0*

*no gametas ♀/ciclo*

*constante*

*no distúrbios*

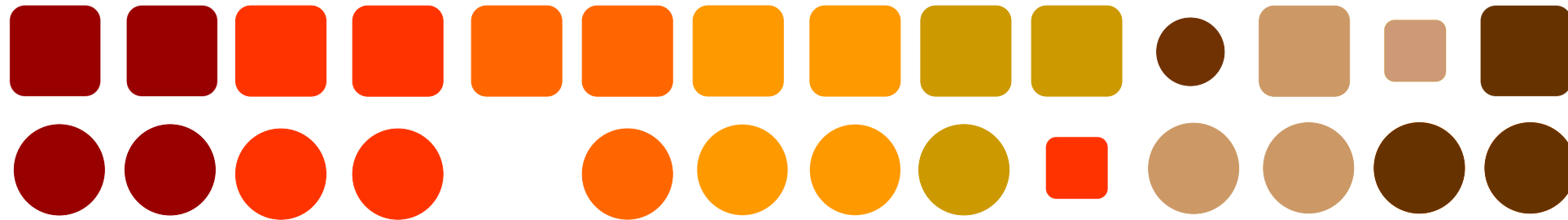
*% morta/distúrbio*

$$\frac{\text{brown circle} + \text{orange circle}}{2}$$

# modelo baseado em indivíduo



# modelo baseado em indivíduo



**parâmetros**

*riqueza  $t_0$*

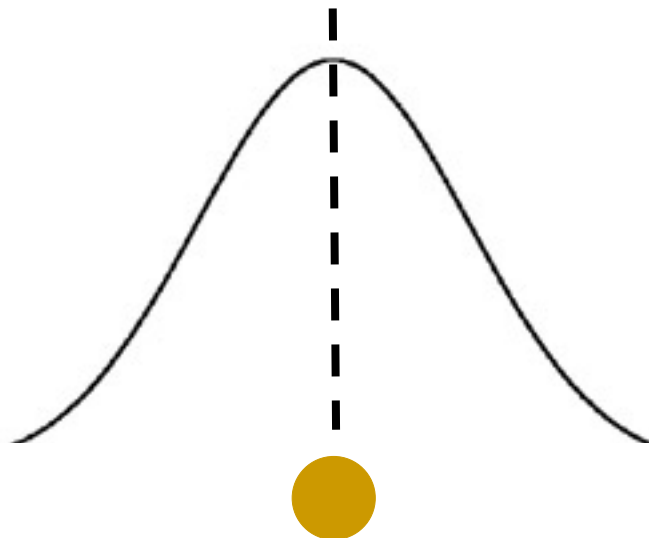
*abundância  $t_0$*

*no gametas ♀/ciclo*

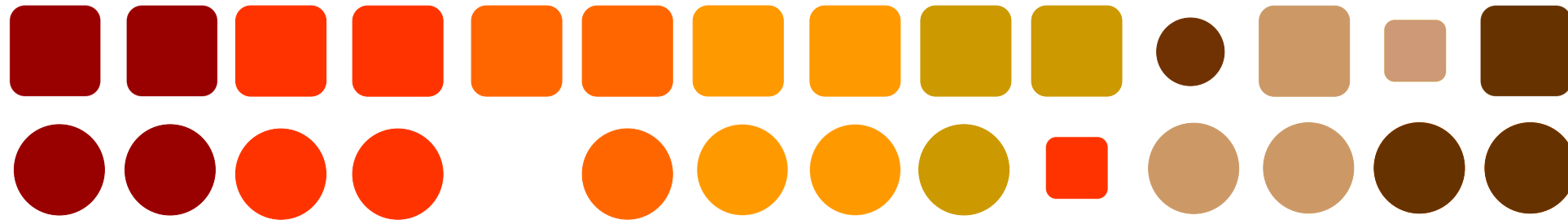
*constante*

*no distúrbios*

*% morta/distúrbio*



# modelo baseado em indivíduo



**parâmetros**

*riqueza  $t_0$*

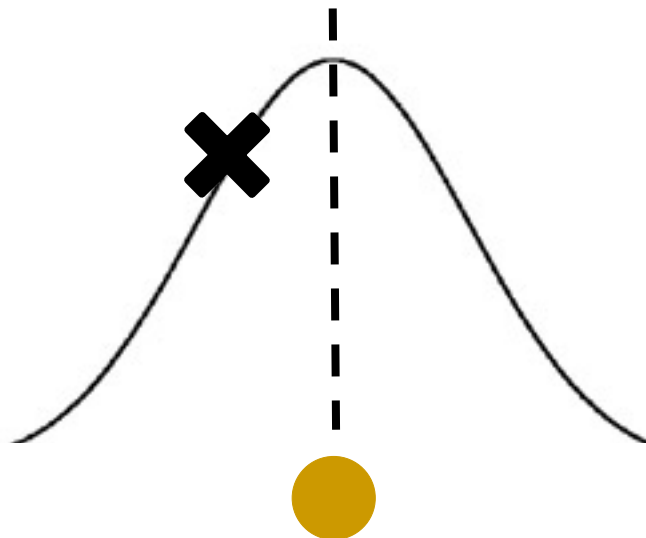
*abundância  $t_0$*

*no gametas ♀/ciclo*

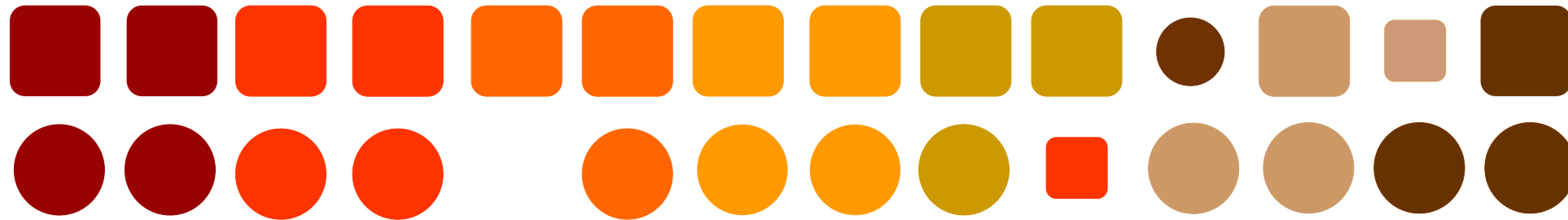
*constante*

*no distúrbios*

*% morta/distúrbio*



# modelo baseado em indivíduo



**parâmetros**

*riqueza  $t_0$*

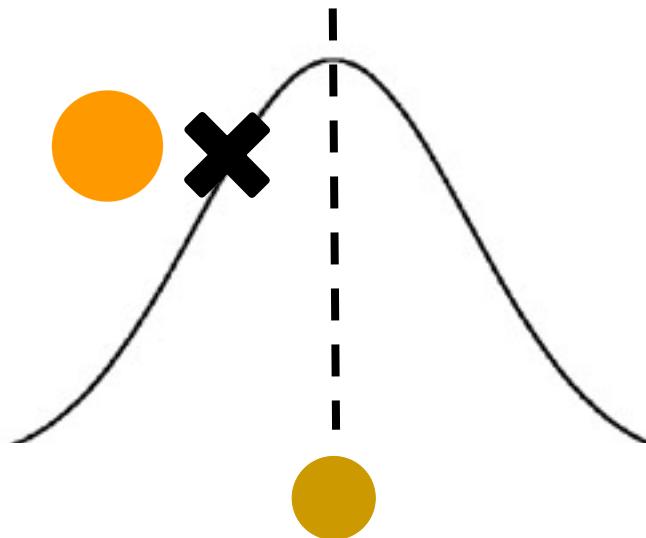
*abundância  $t_0$*

*no gametas ♀/ciclo*

*constante*

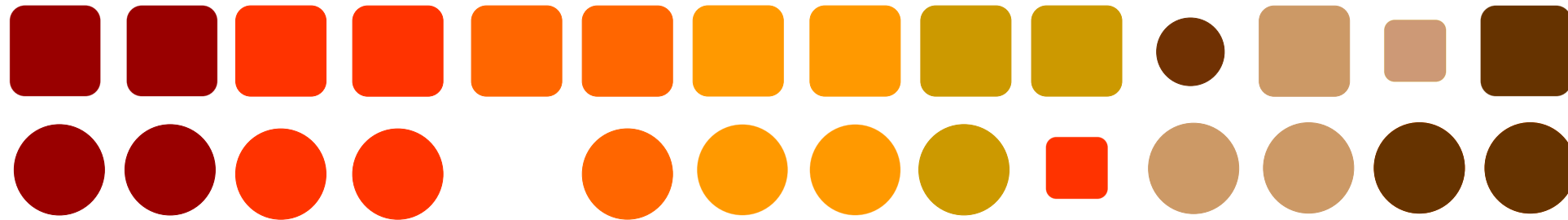
*no distúrbios*

*% morta/distúrbio*





# modelo baseado em indivíduo



**parâmetros**

*riqueza  $t_0$*

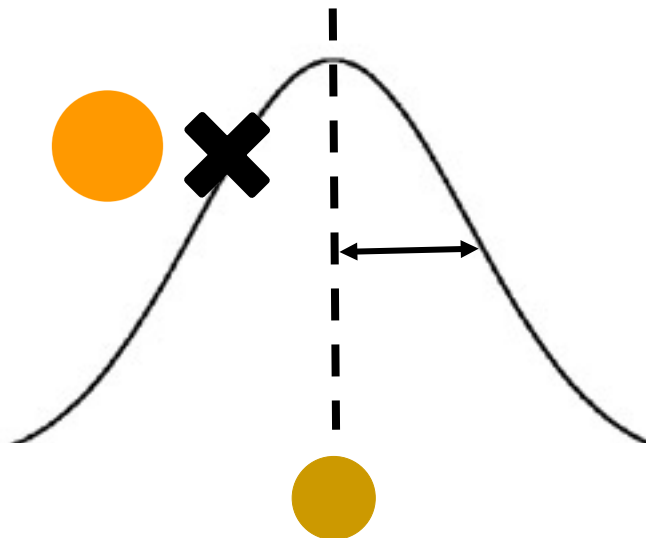
*abundância  $t_0$*

*no gametas ♀/ciclo*

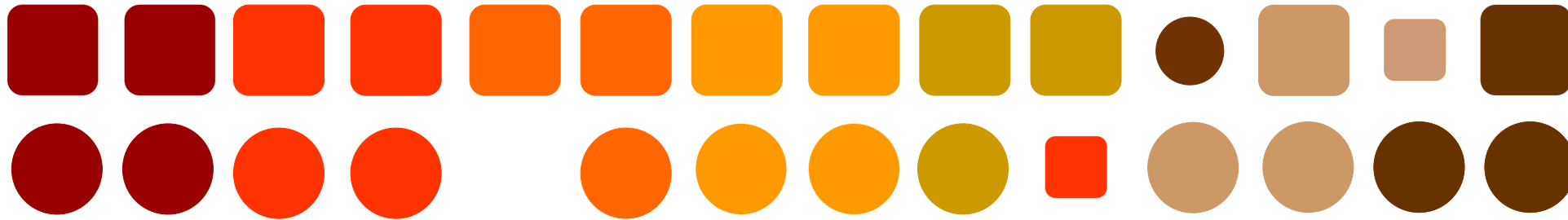
*constante*

*no distúrbios*

*% morta/distúrbio*



# modelo baseado em indivíduo



**parâmetros**

*riqueza  $t_0$*

*abundância  $t_0$*

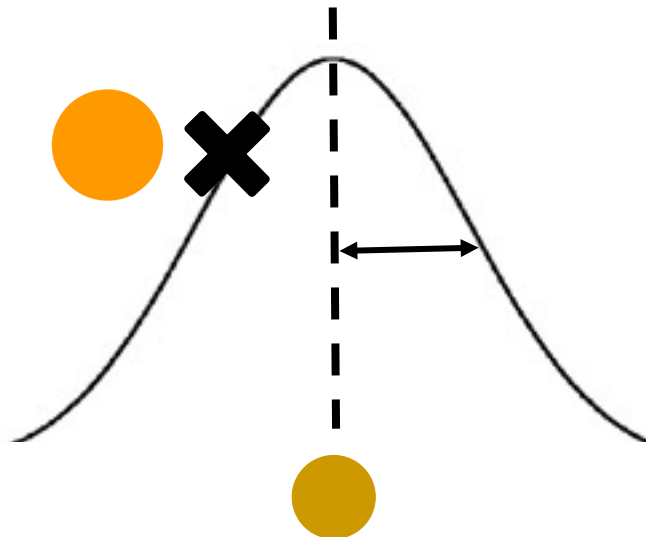
*no gametas ♀/ciclo*

*constante*

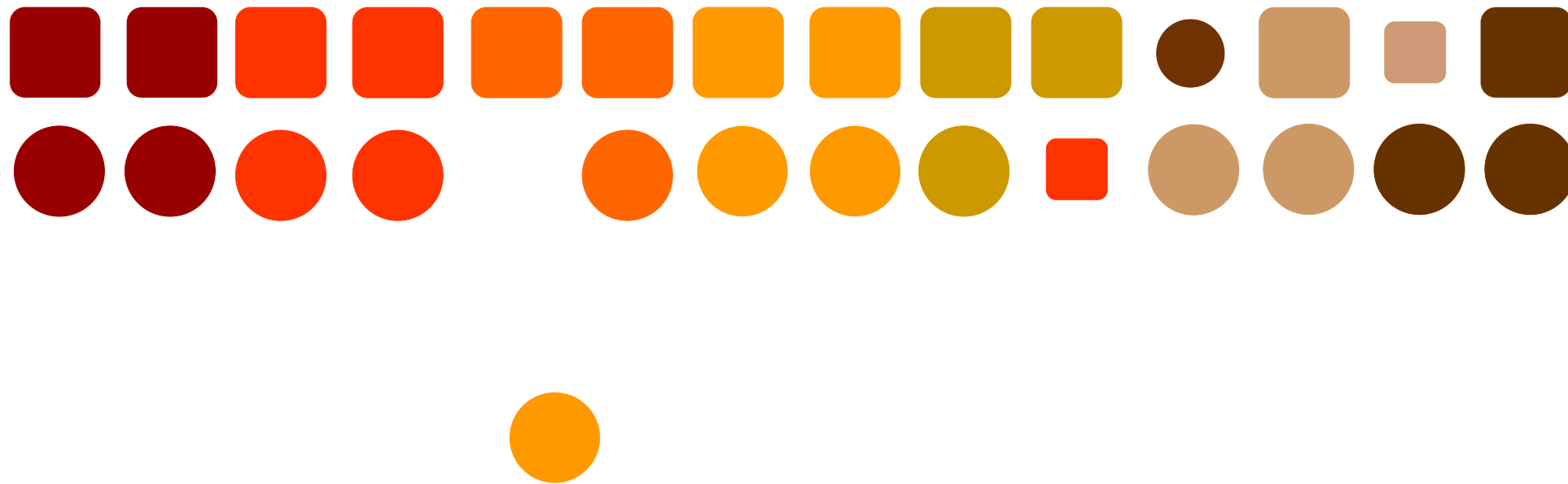
*no distúrbios*

*% morta/distúrbio*

*taxa de mutação*



# modelo baseado em indivíduo



**parâmetros**

*riqueza  $t_0$*

*abundância  $t_0$*

*no gametas ♀/ciclo*

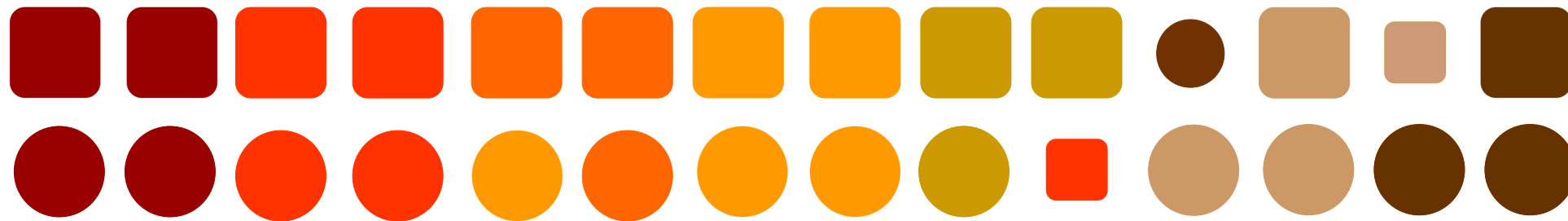
*constante*

*no distúrbios*

*% morta/distúrbio*

*taxa de mutação*

# modelo baseado em indivíduo



**parâmetros**

*riqueza  $t_0$*

*abundância  $t_0$*

*no gametas ♀/ciclo*

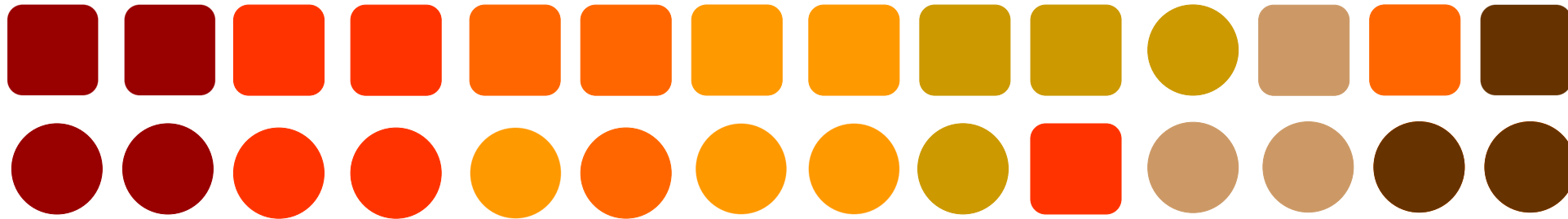
*constante*

*no distúrbios*

*% morta/distúrbio*

*taxa de mutação*

# modelo baseado em indivíduo



**parâmetros**

*riqueza  $t_0$*

*abundância  $t_0$*

*no gametas ♀/ciclo*

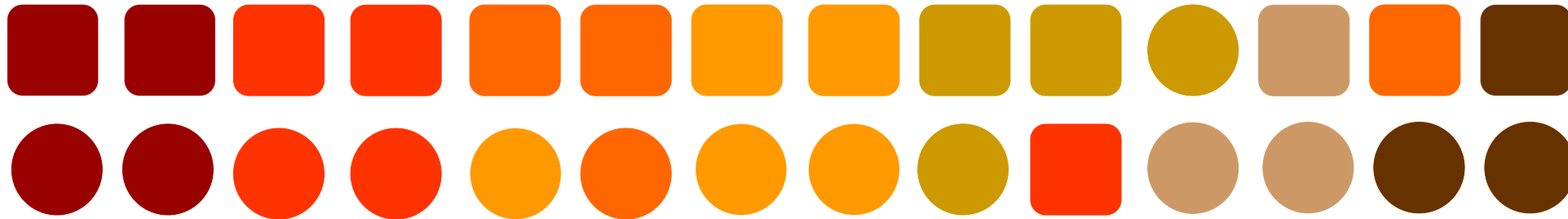
*constante*

*no distúrbios*

*% morta/distúrbio*

*taxa de mutação*

# modelo baseado em indivíduo



***parâmetros***

*riqueza  $t_0$*

*abundância  $t_0$*

*no gametas ♀/ciclo*

*constante*

*no distúrbios*

*% morta/distúrbio*

*taxa de mutação*

*no tempos*

# cenários simulados

# cenários simulados

**evolutivo**

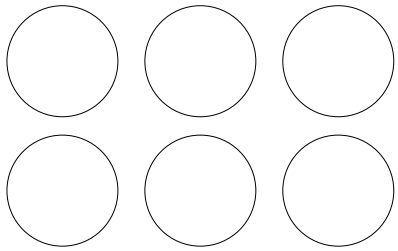
**ecológico**

**eco-evolutivo**



# cenários simulados

**evolutivo**

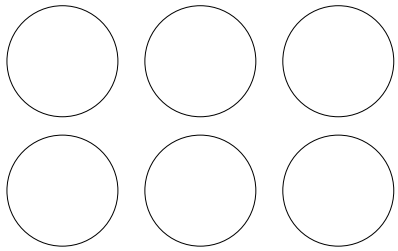


**ecológico**

**eco-evolutivo**

# cenários simulados

**evolutivo**



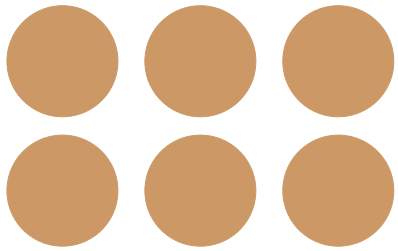
1 espécie

**ecológico**

**eco-evolutivo**

# cenários simulados

**evolutivo**



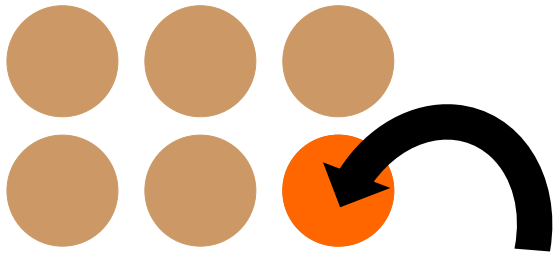
1 espécie

**ecológico**

**eco-evolutivo**

# cenários simulados

**evolutivo**



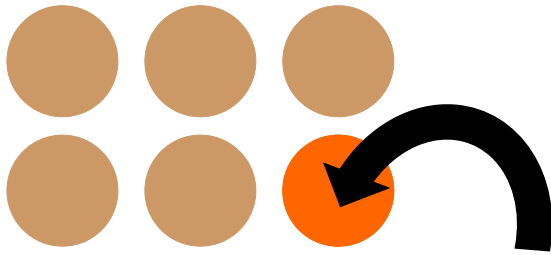
1 espécie

**ecológico**

**eco-evolutivo**

# cenários simulados

**evolutivo**



1 espécie

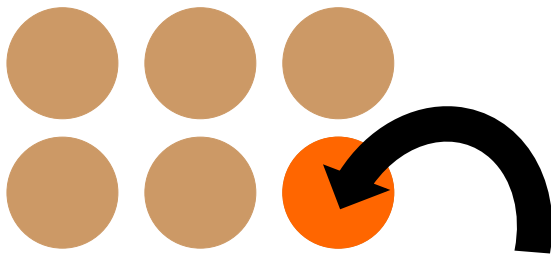
mutação  $> 0$

**ecológico**

**eco-evolutivo**

# cenários simulados

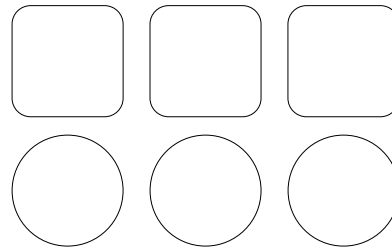
## evolutivo



1 espécie

mutação  $> 0$

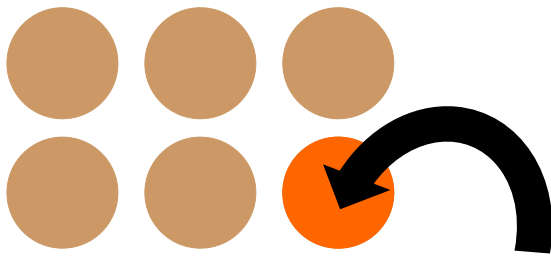
## ecológico



## eco-evolutivo

# cenários simulados

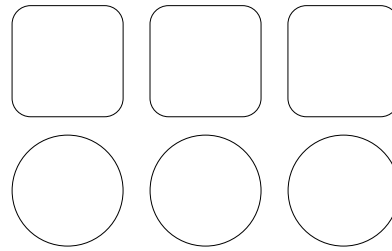
## evolutivo



1 espécie

mutação  $> 0$

## ecológico

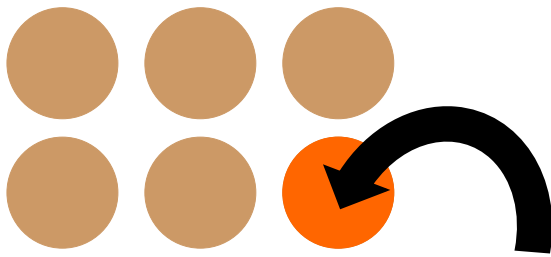


+ 1 espécie

## eco-evolutivo

# cenários simulados

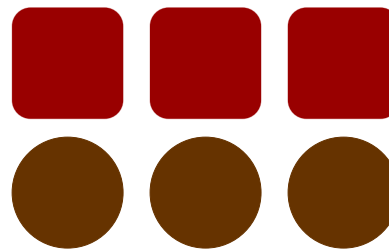
## evolutivo



1 espécie

mutação  $> 0$

## ecológico



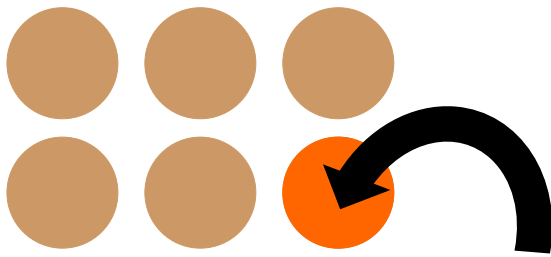
+ 1 espécie

## eco-evolutivo



# cenários simulados

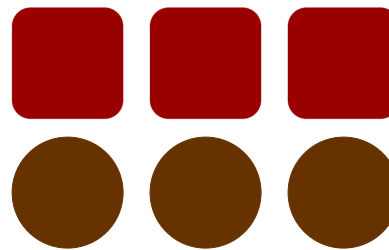
## evolutivo



1 espécie

mutação  $> 0$

## ecológico



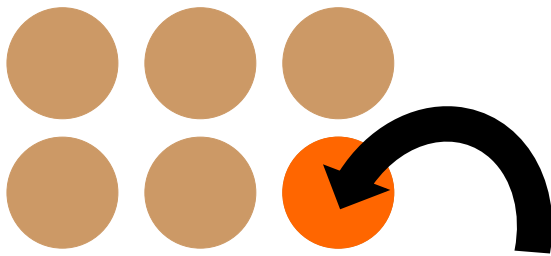
+ 1 espécie

mutação = 0

## eco-evolutivo

# cenários simulados

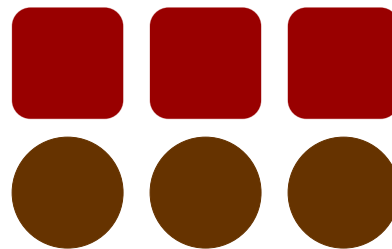
## evolutivo



1 espécie

mutação  $> 0$

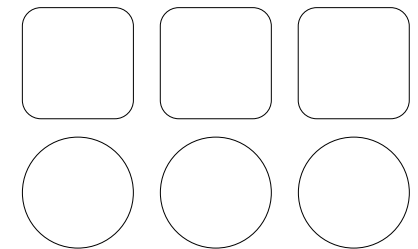
## ecológico



+ 1 espécie

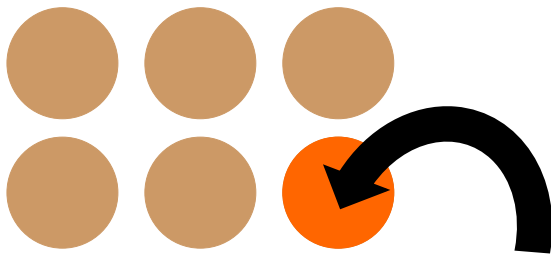
mutação  $= 0$

## eco-evolutivo



# cenários simulados

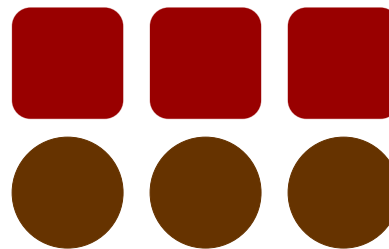
## evolutivo



1 espécie

mutação  $> 0$

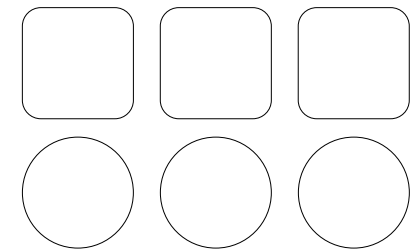
## ecológico



+ 1 espécie

mutação = 0

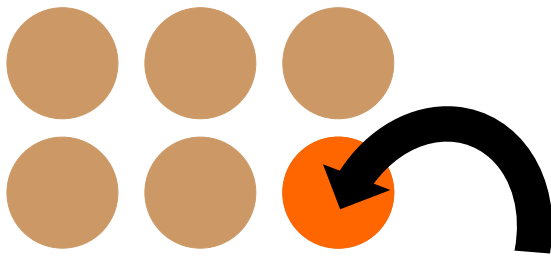
## eco-evolutivo



+ 1 espécie

# cenários simulados

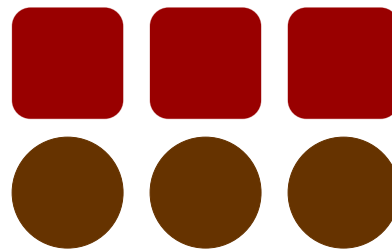
## evolutivo



1 espécie

mutação  $> 0$

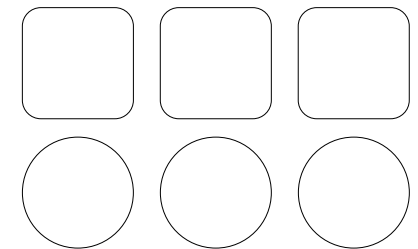
## ecológico



**+ 1 espécie**

mutação = 0

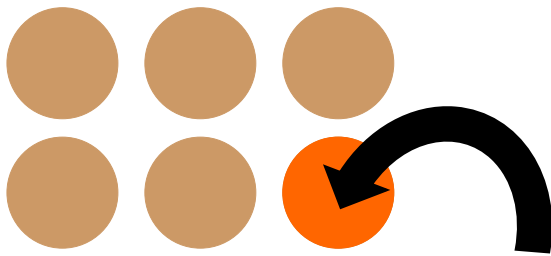
## eco-evolutivo



**+ 1 espécie**

# cenários simulados

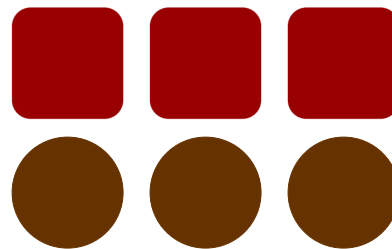
## evolutivo



1 espécie

mutação  $> 0$

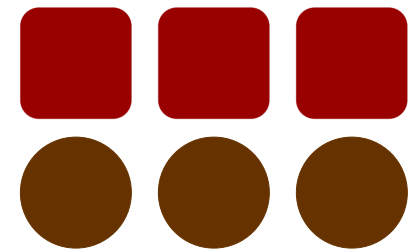
## ecológico



**+ 1 espécie**

mutação = 0

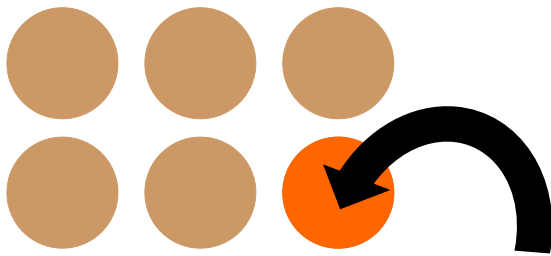
## eco-evolutivo



**+ 1 espécie**

# cenários simulados

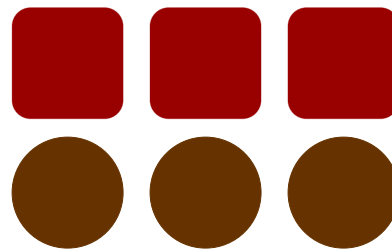
## evolutivo



1 espécie

mutação  $> 0$

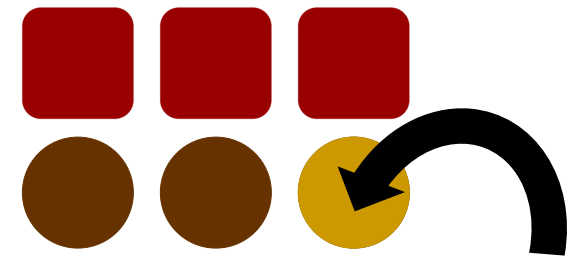
## ecológico



**+ 1 espécie**

mutação = 0

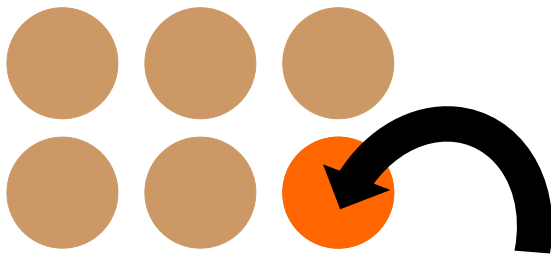
## eco-evolutivo



**+ 1 espécie**

# cenários simulados

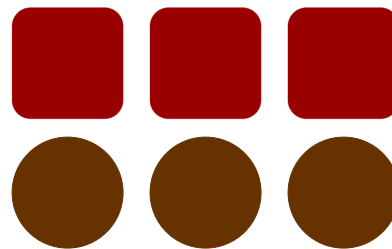
## evolutivo



1 espécie

mutação  $> 0$

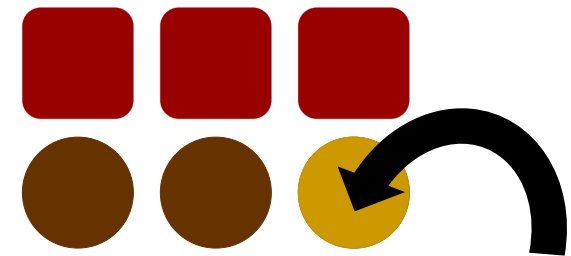
## ecológico



**+ 1 espécie**

mutação = 0

## eco-evolutivo

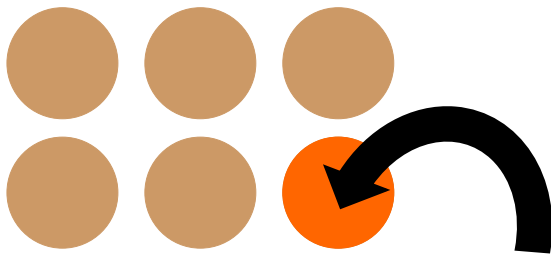


**+ 1 espécie**

mutação  $> 0$

# cenários simulados

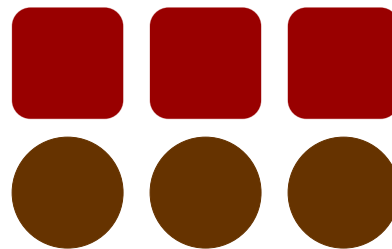
## evolutivo



1 espécie

**mutação > 0**

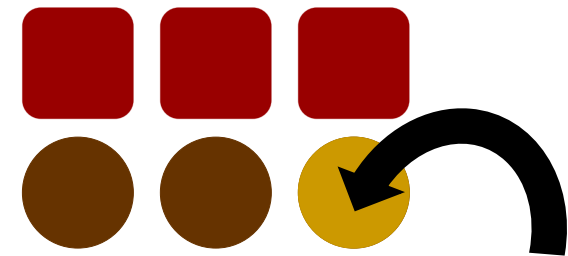
## ecológico



**+ 1 espécie**

mutação = 0

## eco-evolutivo

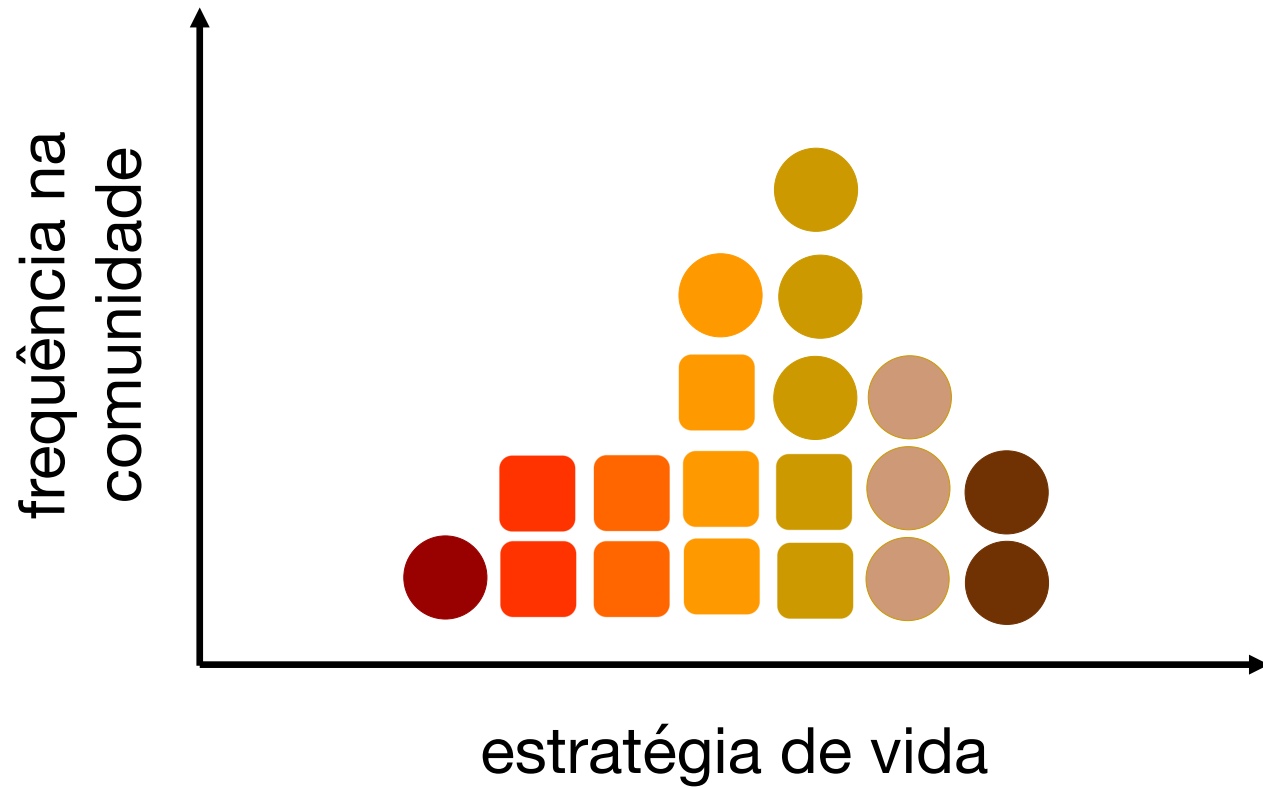


**+ 1 espécie**

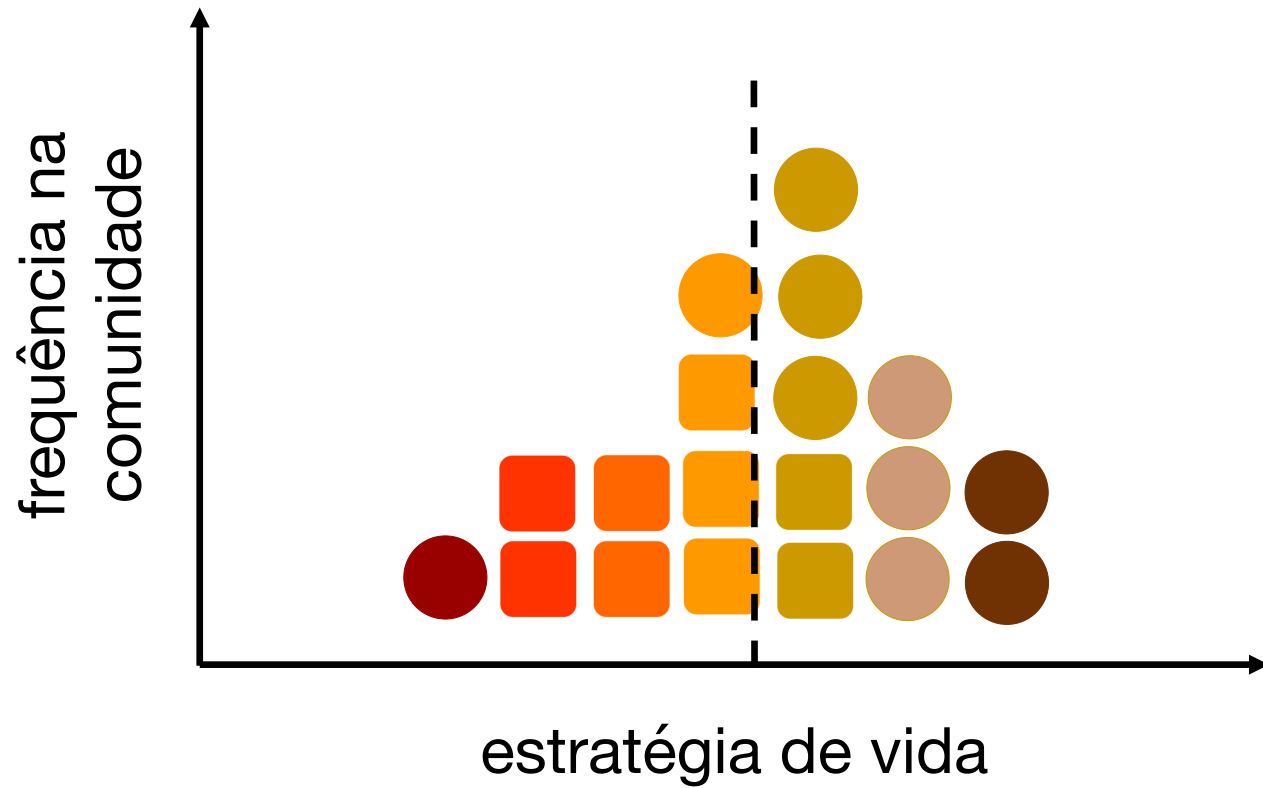
**mutação > 0**



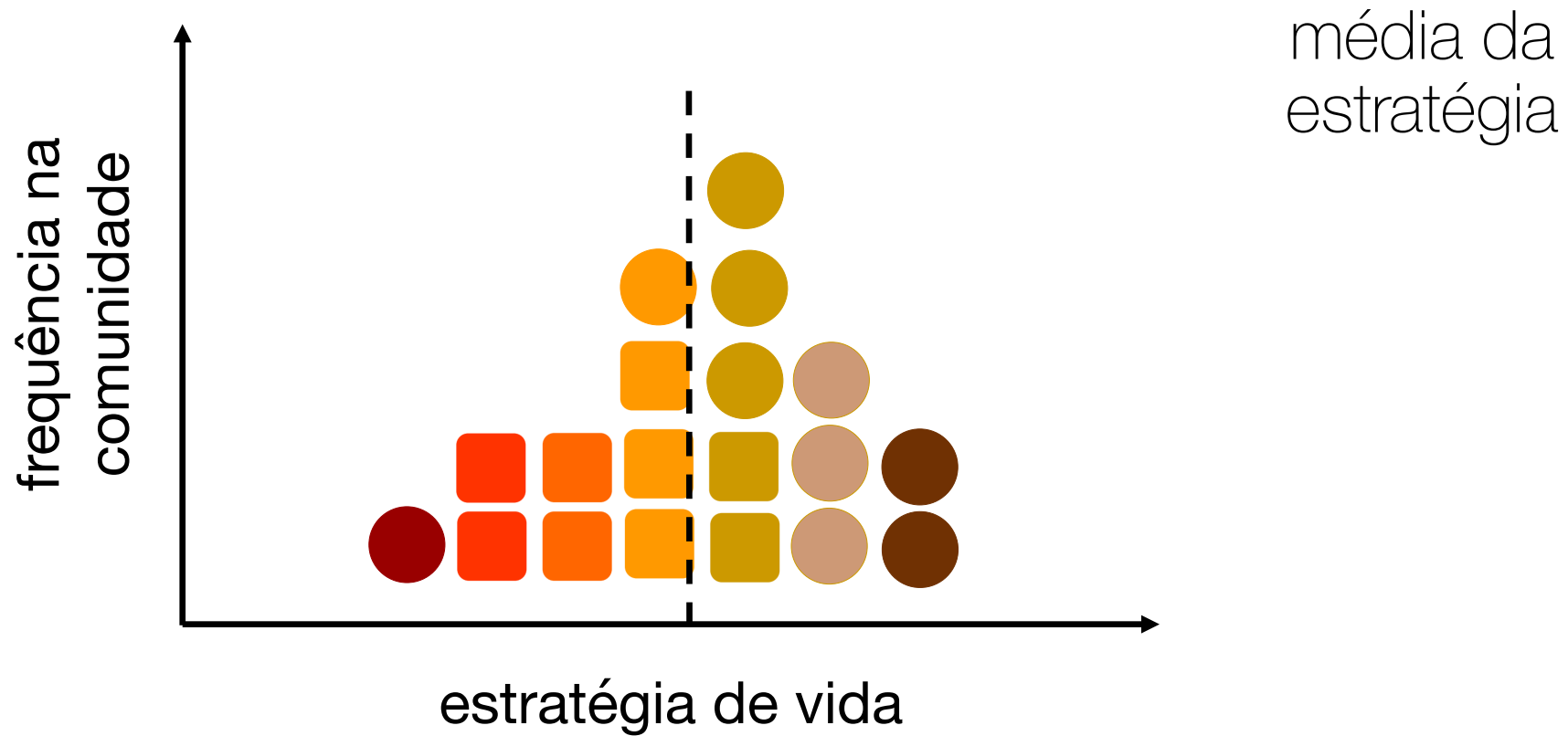
# variáveis de interesse



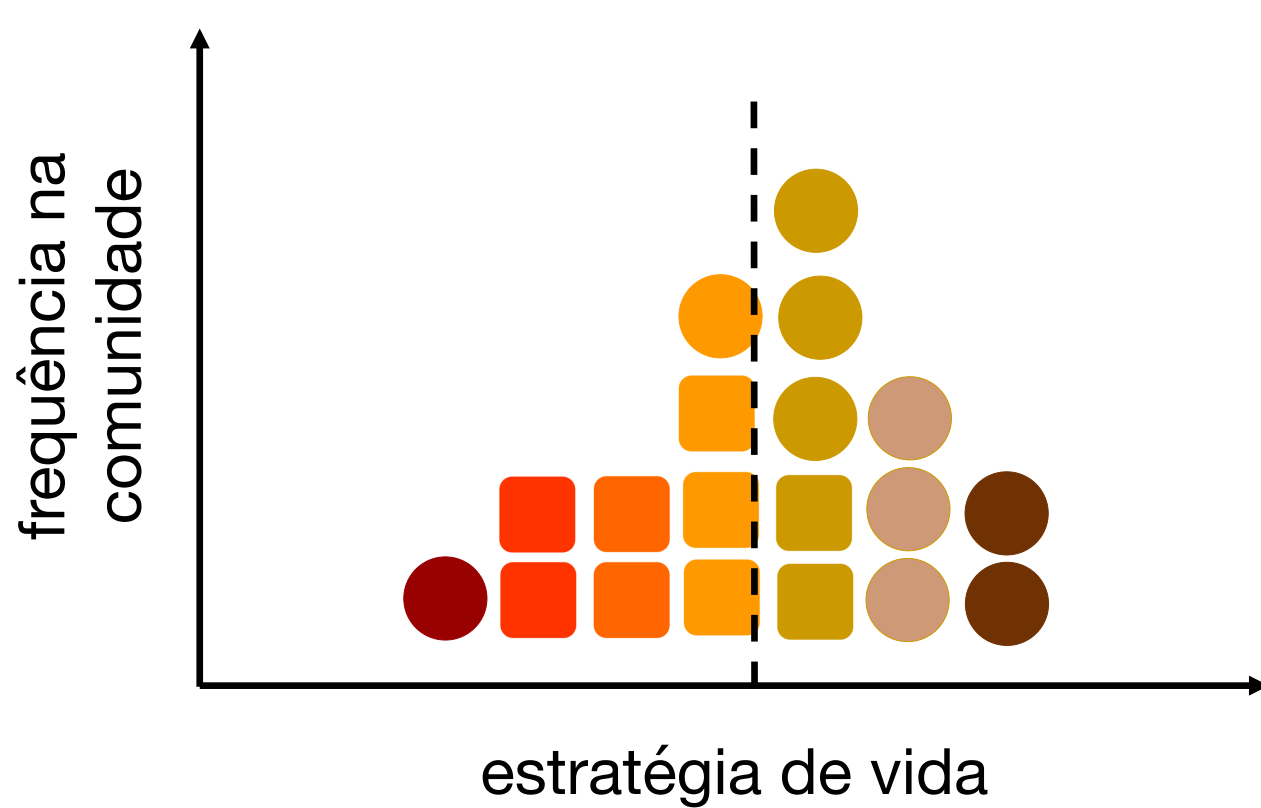
# variáveis de interesse



# variáveis de interesse



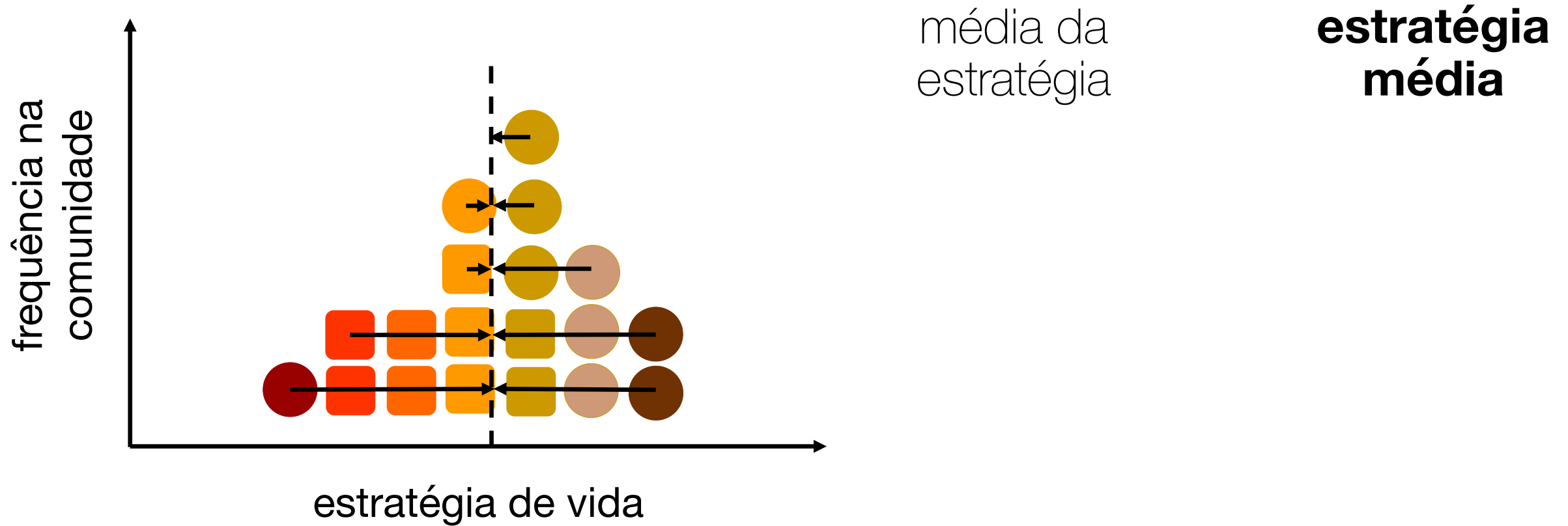
# variáveis de interesse



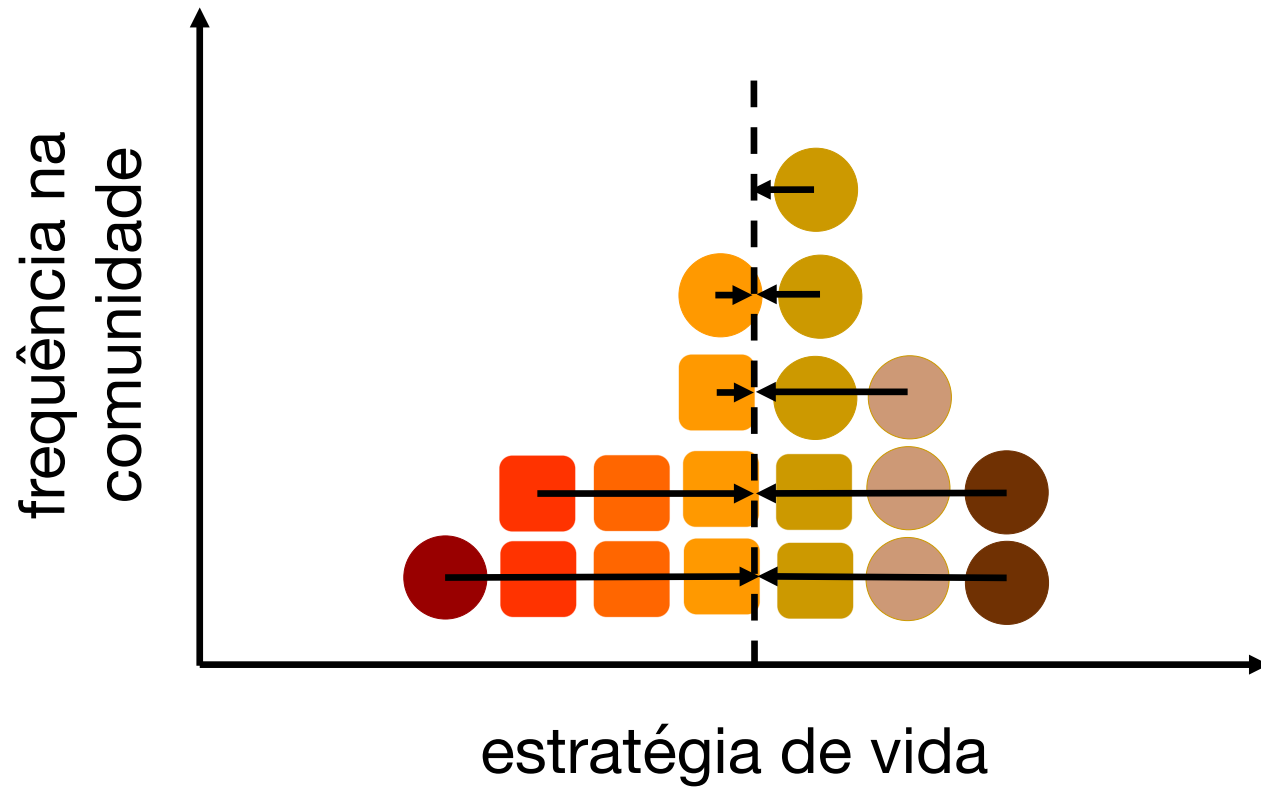
média da  
estratégia

**estratégia  
média**

# variáveis de interesse



# variáveis de interesse

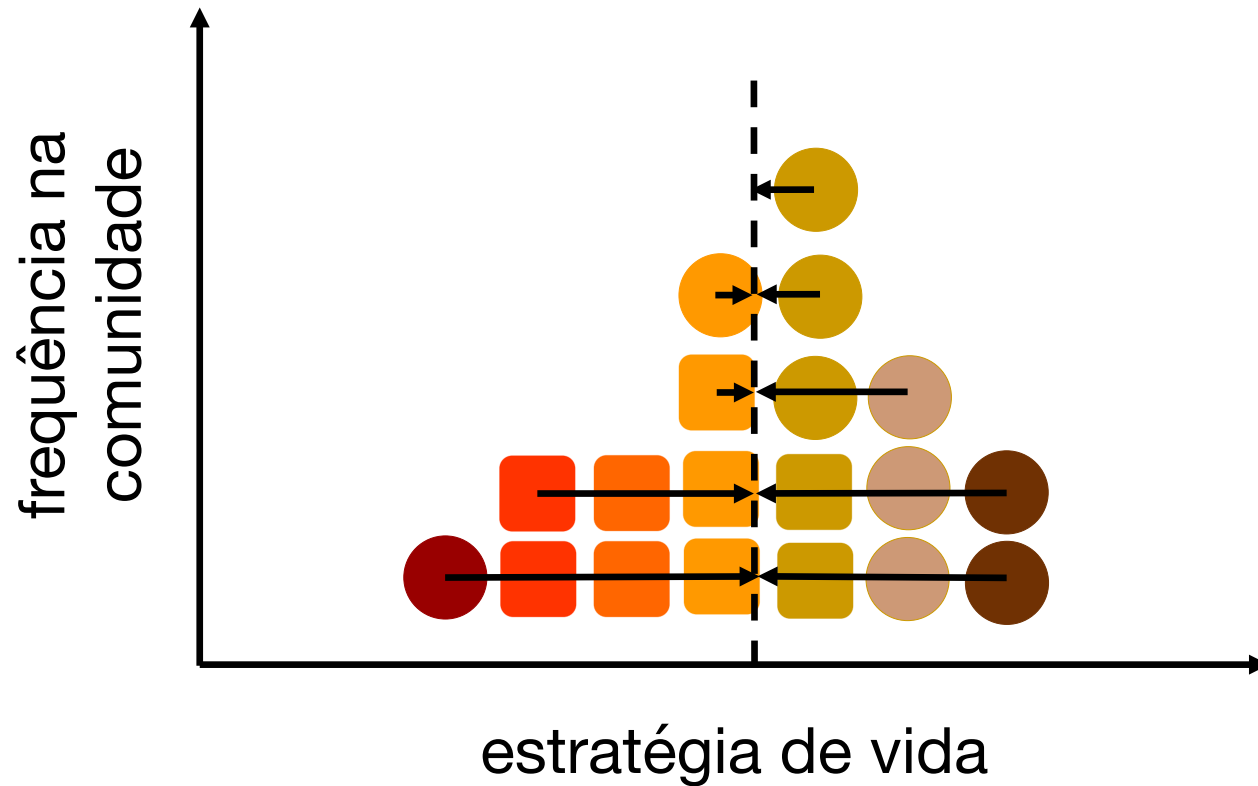


média da  
estratégia

variância total  
da estratégia

**estratégia  
média**

# variáveis de interesse



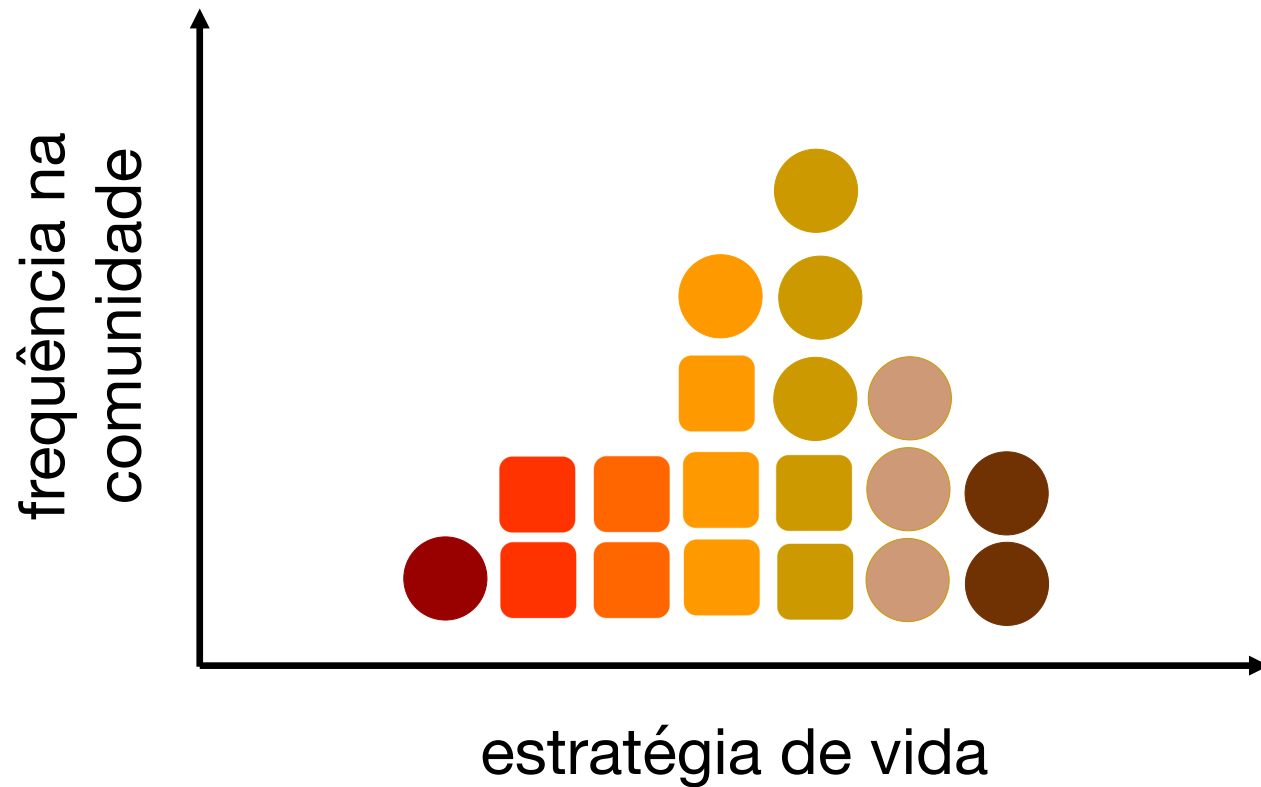
média da  
estratégia

variância total  
da estratégia

**estratégia  
média**

**diversidade  
de estratégias**

# variáveis de interesse



média da  
estratégia

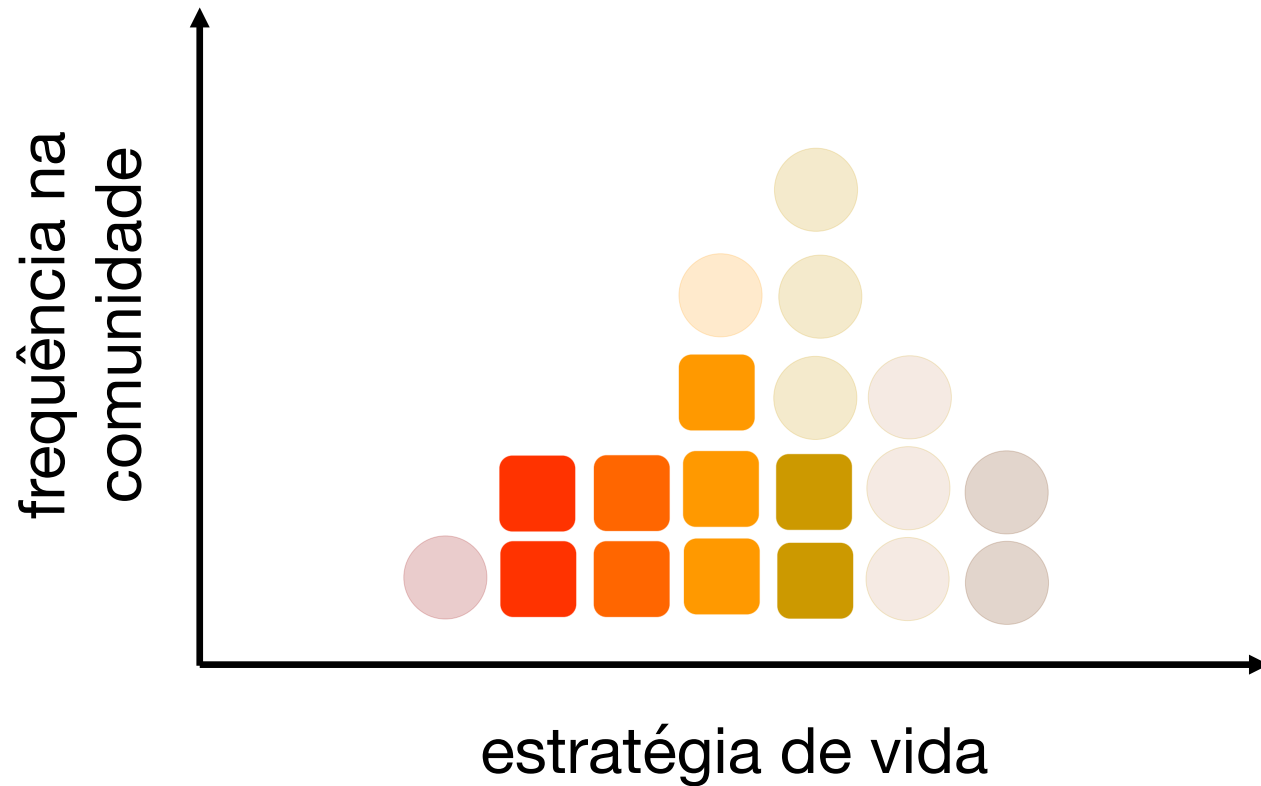
variância total  
da estratégia

**estratégia  
média**

**diversidade  
de estratégias**



# variáveis de interesse



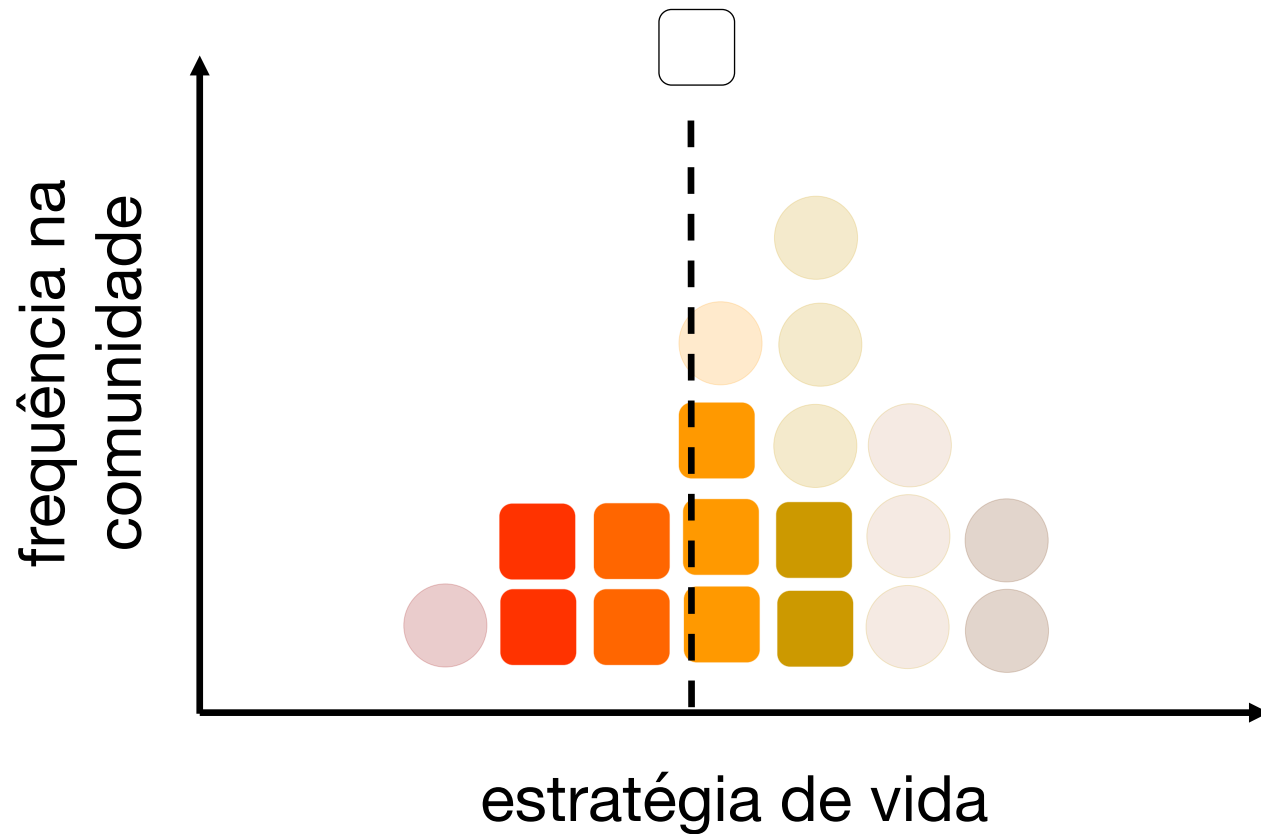
média da  
estratégia

variância total  
da estratégia

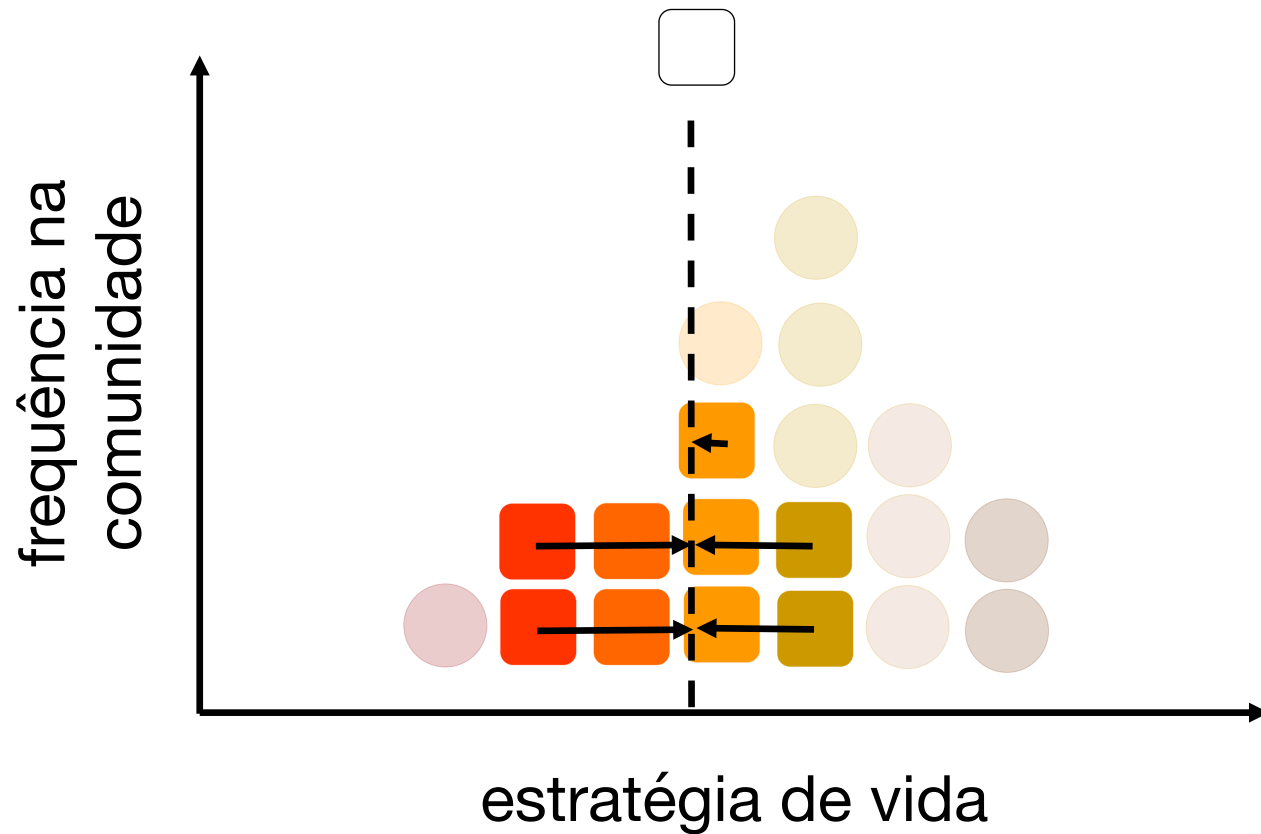
**estratégia  
média**

**diversidade  
de estratégias**

# variáveis de interesse



# variáveis de interesse



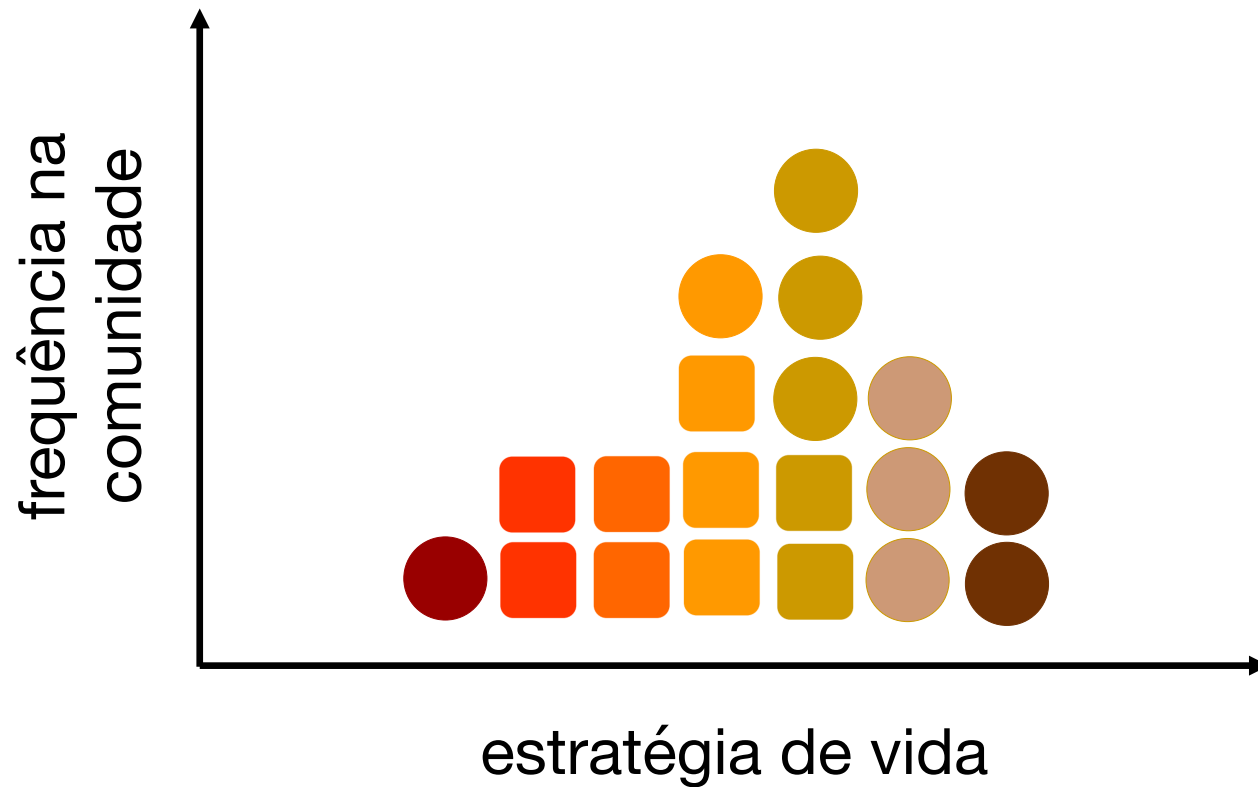
média da  
estratégia

variância total  
da estratégia

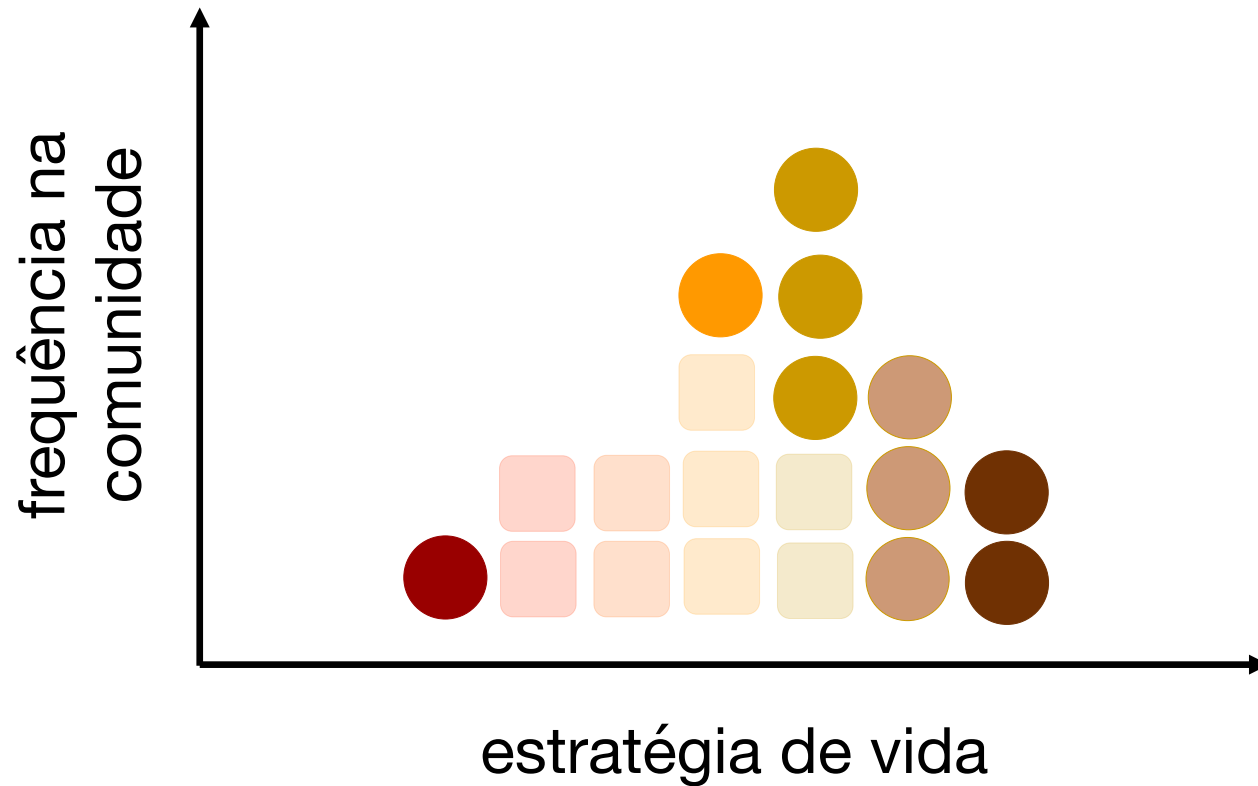
**estratégia  
média**

**diversidade  
de estratégias**

# variáveis de interesse



# variáveis de interesse



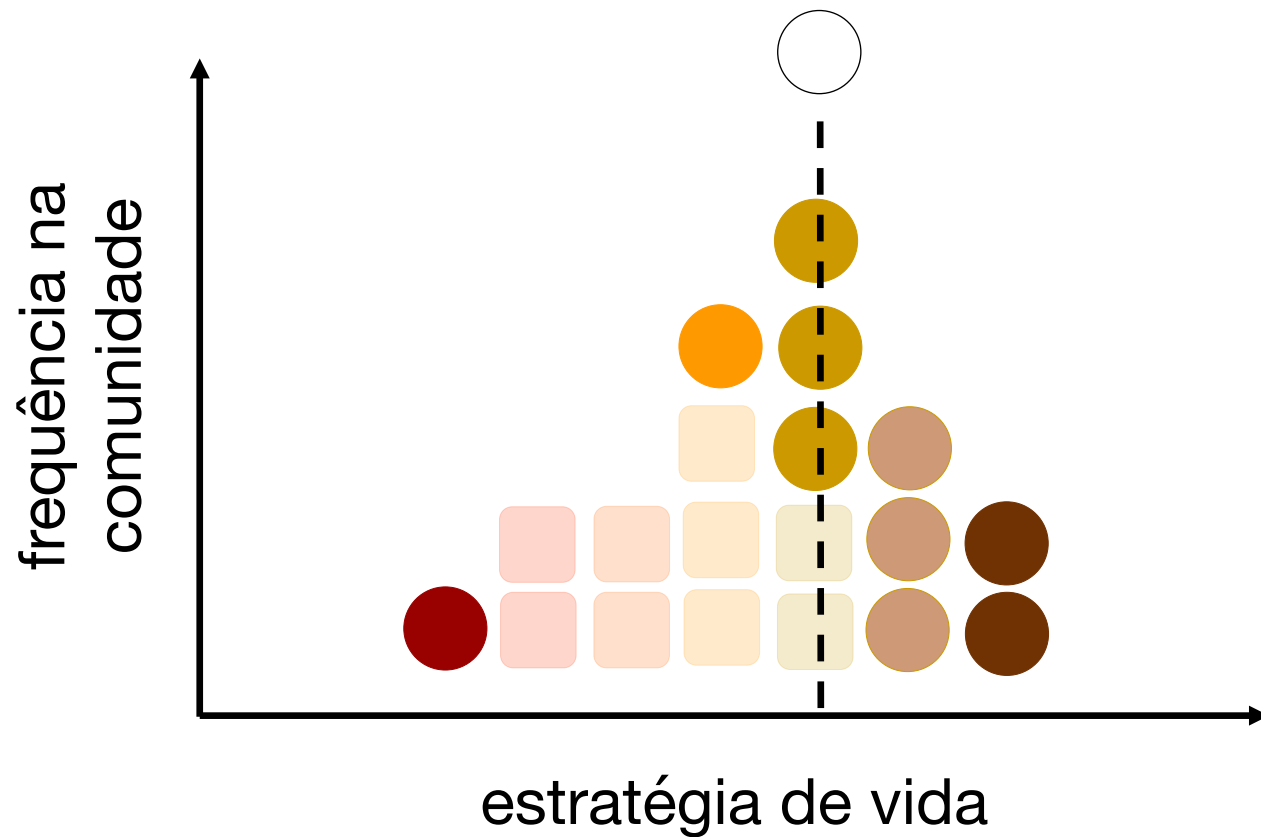
média da  
estratégia

variância total  
da estratégia

**estratégia  
média**

**diversidade  
de estratégias**

# variáveis de interesse



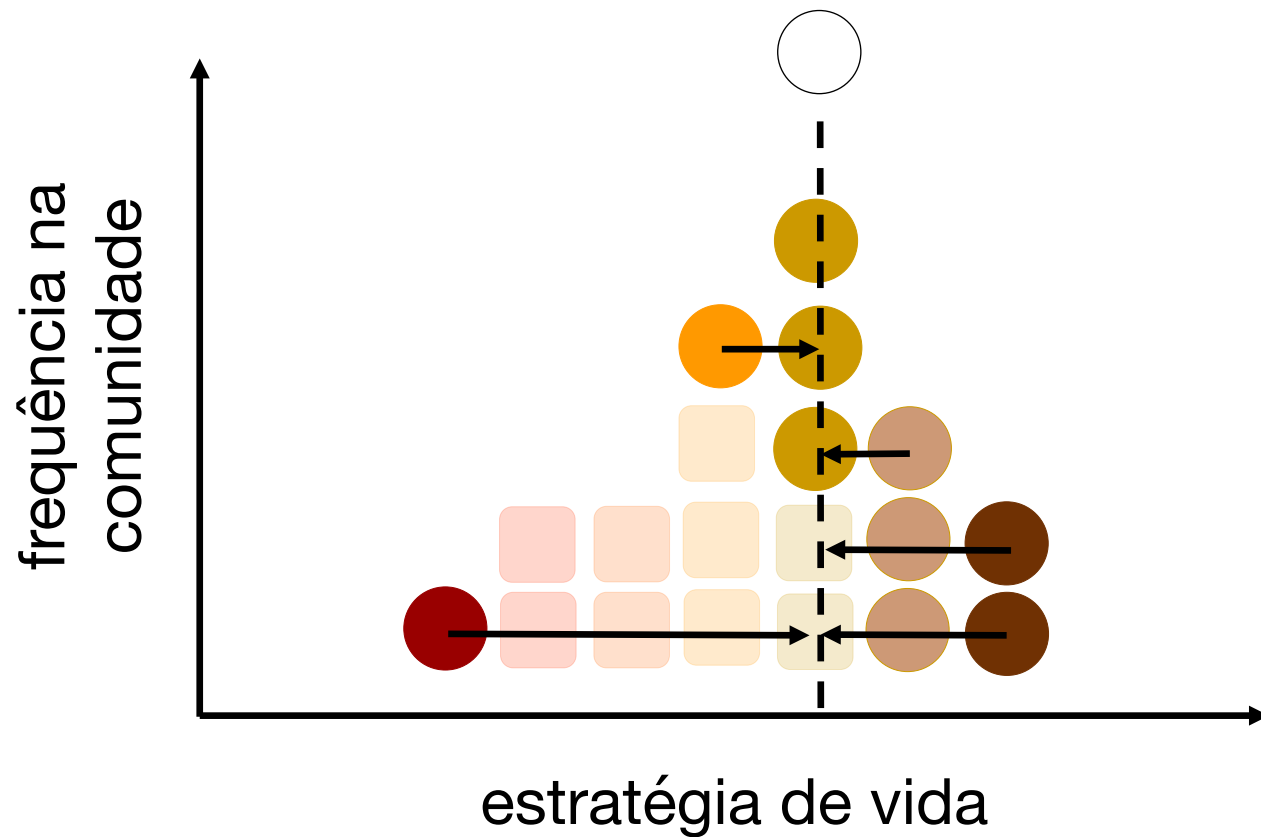
média da  
estratégia

variância total  
da estratégia

**estratégia  
média**

**diversidade  
de estratégias**

# variáveis de interesse



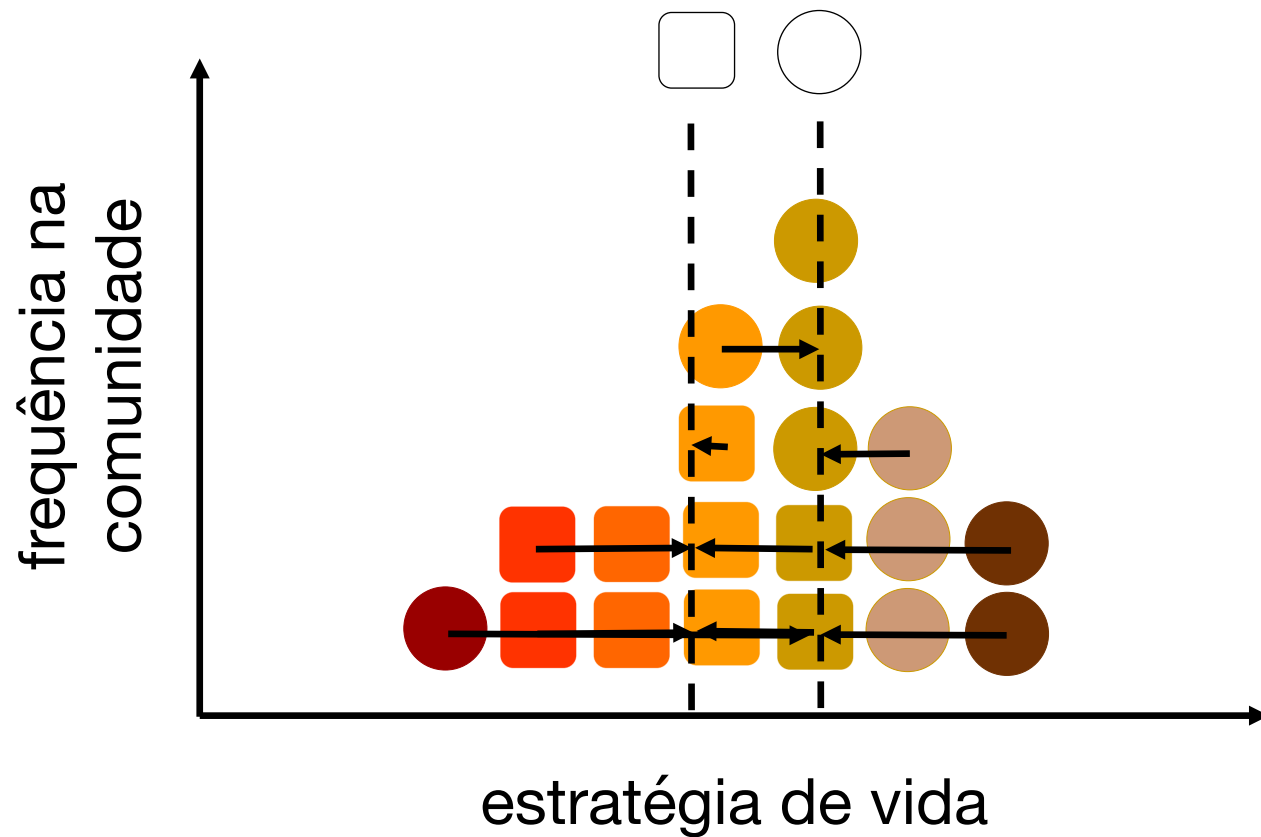
média da  
estratégia

variância total  
da estratégia

**estratégia  
média**

**diversidade  
de estratégias**

# variáveis de interesse



média da  
estratégia

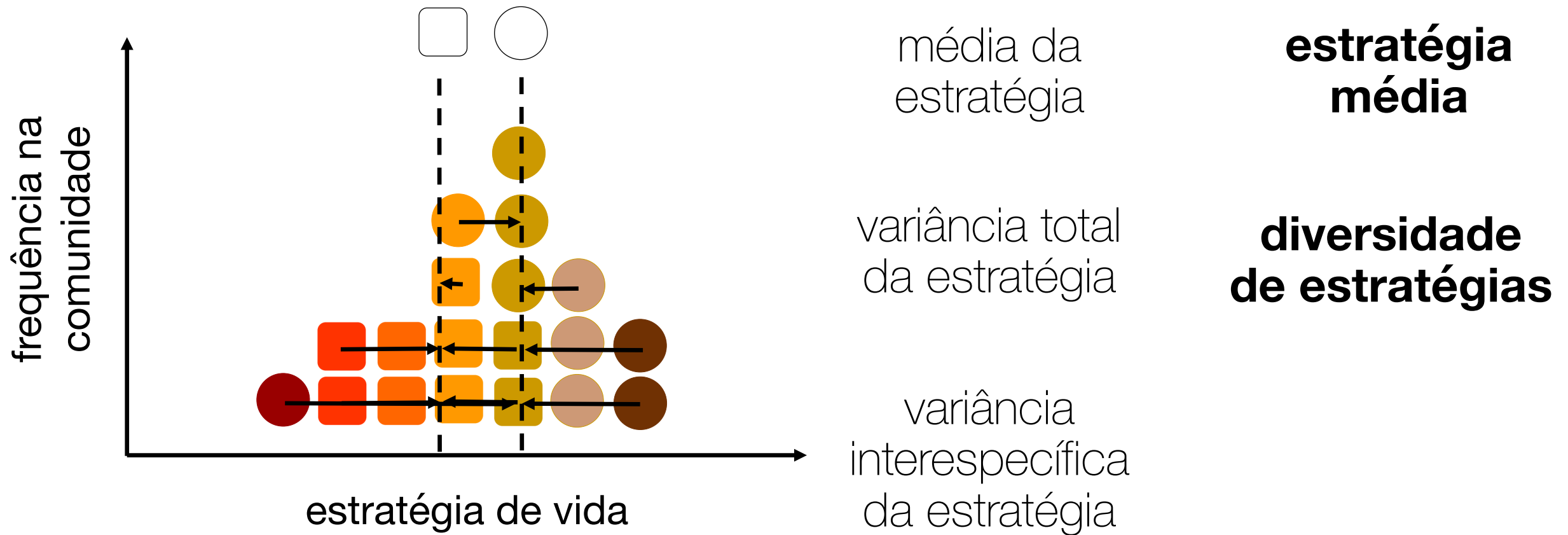
variância total  
da estratégia

**estratégia  
média**

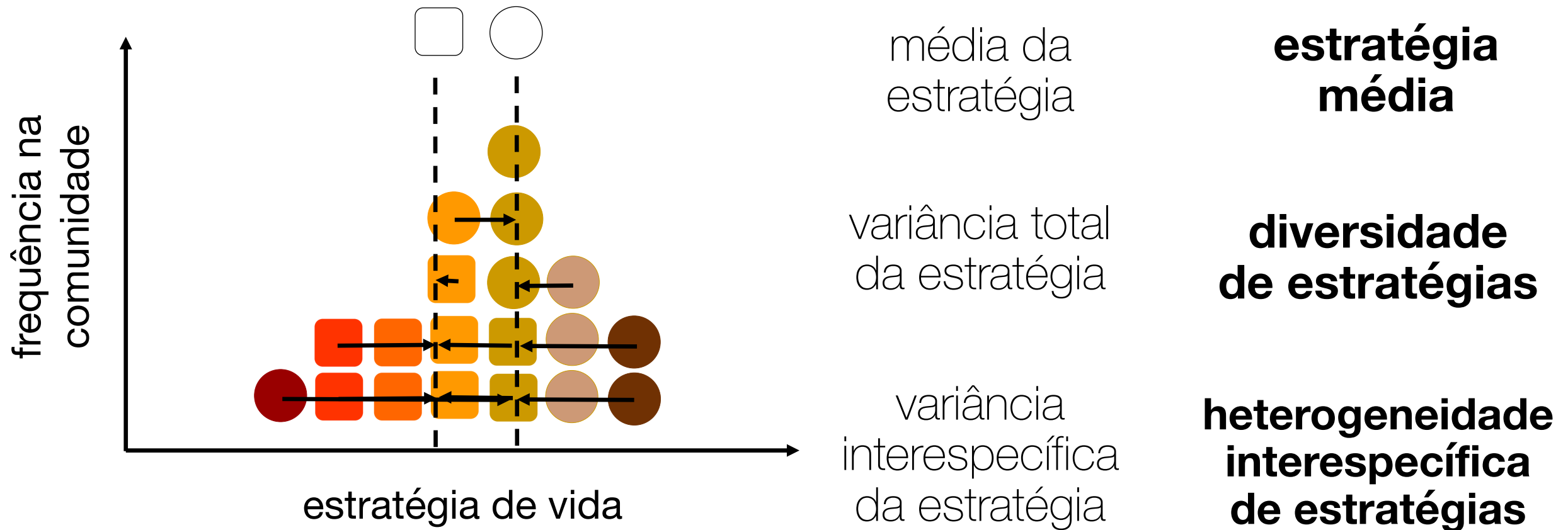
**diversidade  
de estratégias**



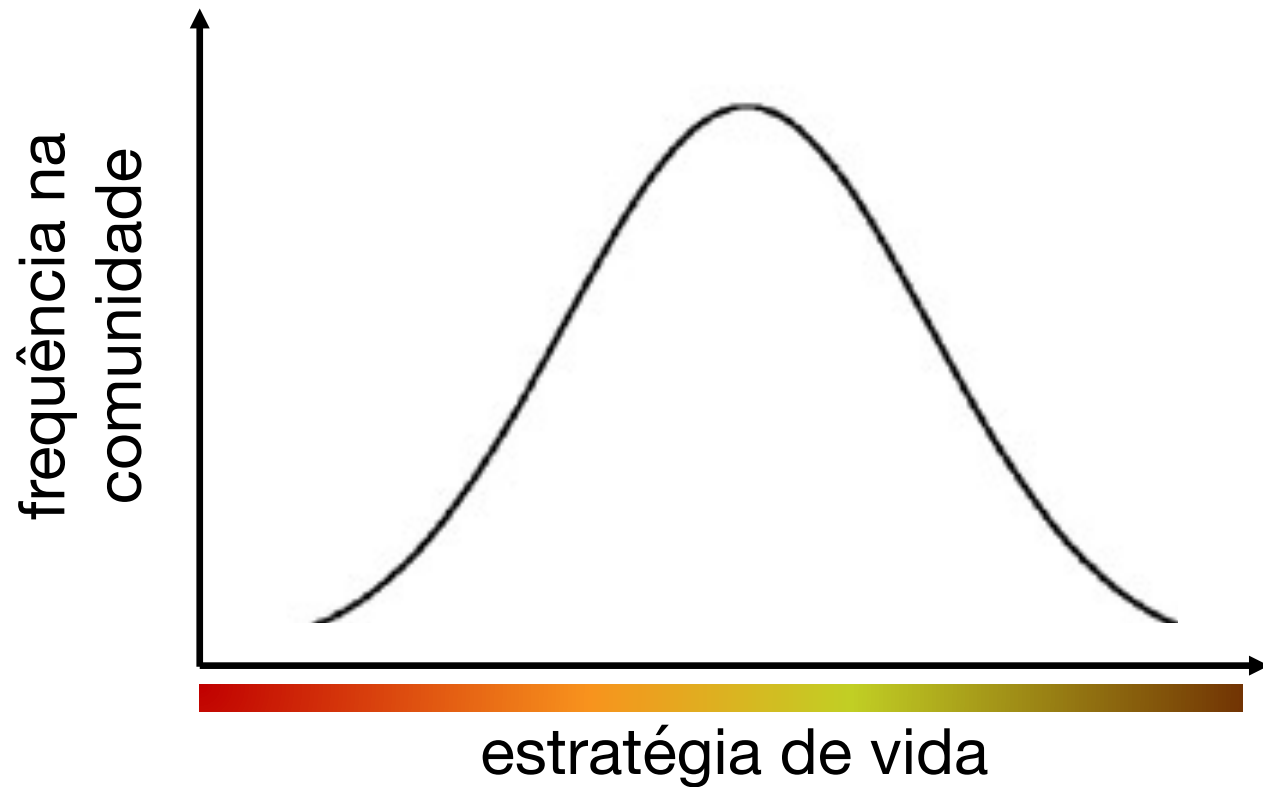
# variáveis de interesse



# variáveis de interesse



# variáveis de interesse



média da  
estratégia

**estratégia  
média**

variância total  
da estratégia

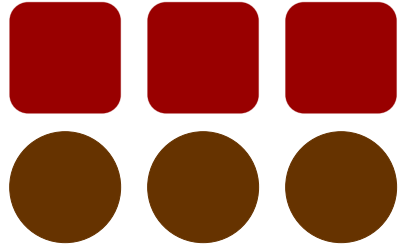
**diversidade  
de estratégias**

variância  
interespecífica  
da estratégia

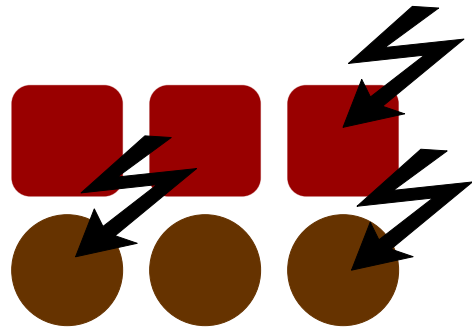
**heterogeneidade  
interespecífica  
de estratégias**

variável preditora

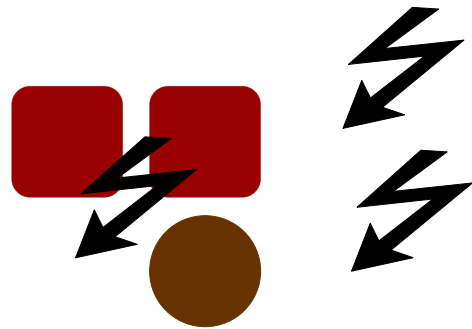
variável preditora



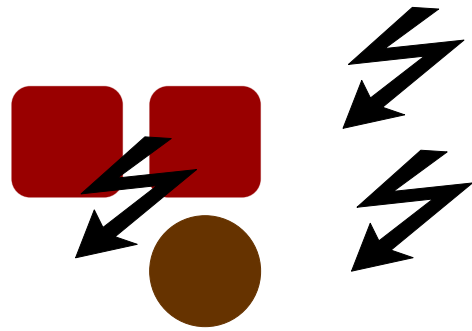
variável preditora



variável preditora



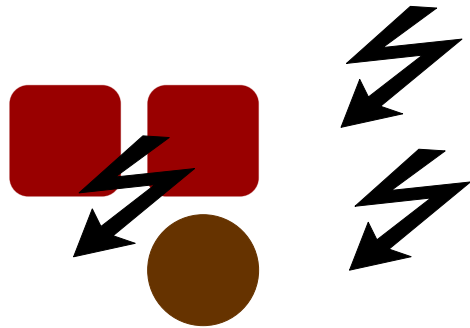
# variável preditora



50%



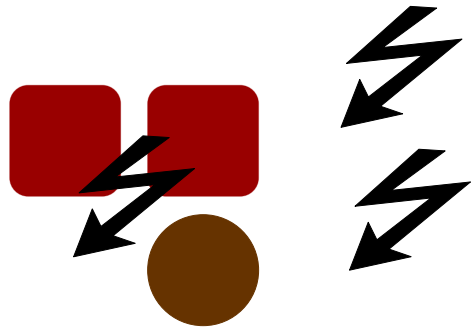
variável preditora



50%

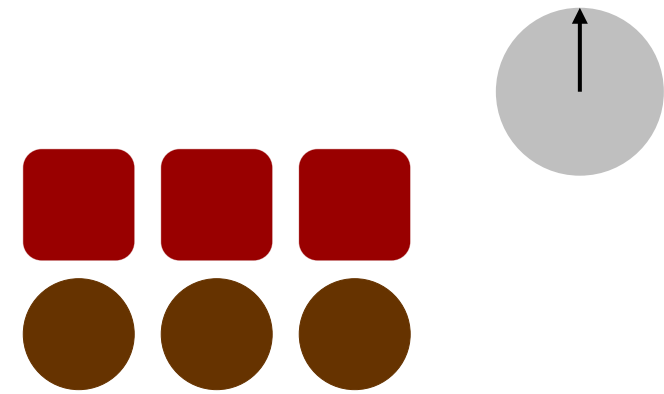
**intensidade  
do distúrbio**

variável preditora

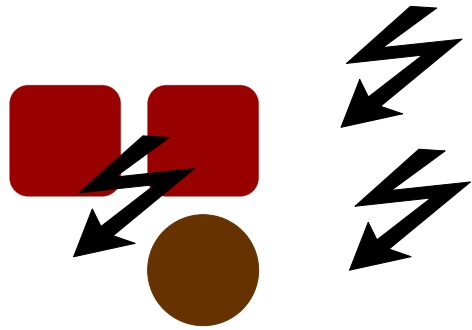


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**intensidade  
do distúrbio**

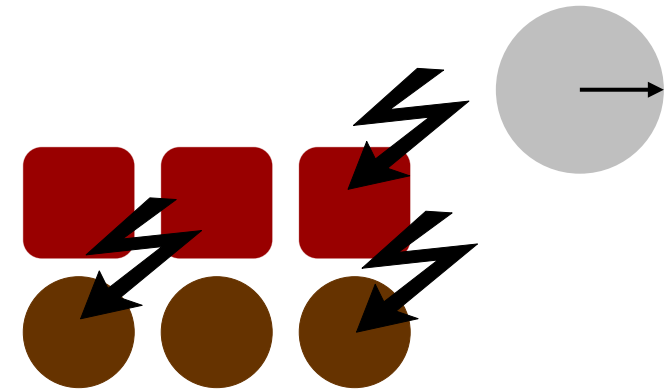


variável preditora

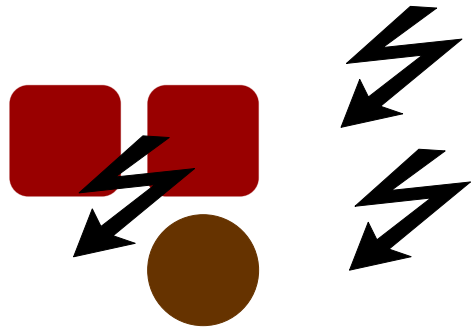


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**intensidade  
do distúrbio**

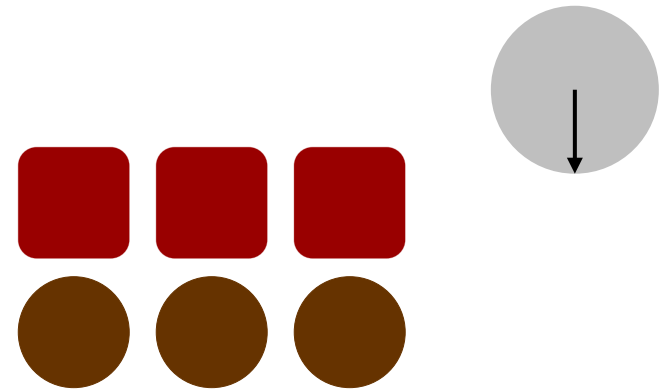


variável preditora

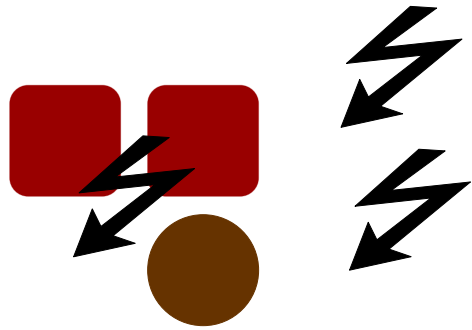


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**intensidade  
do distúrbio**

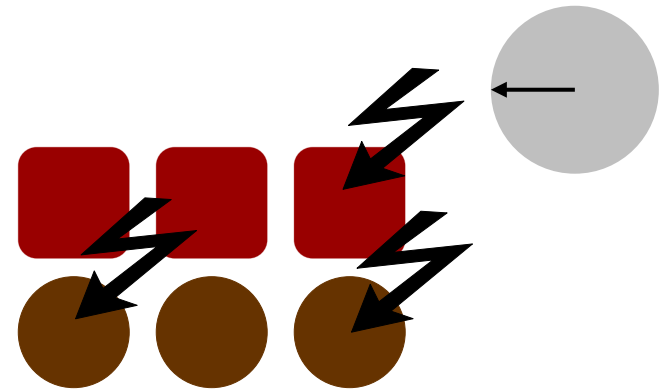


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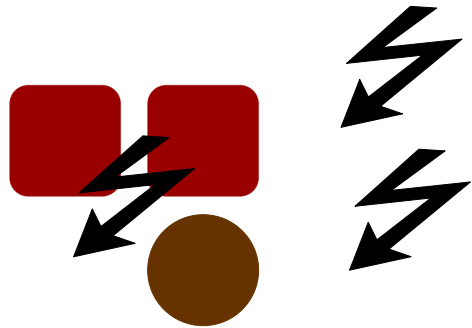


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**intensidade  
do distúrbio**

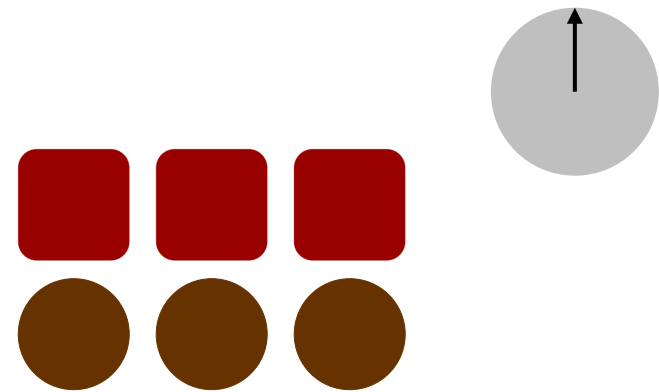


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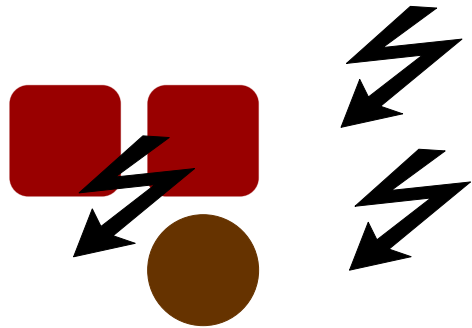


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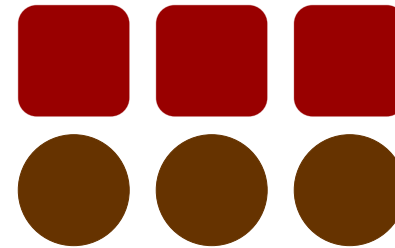
**intensidade  
do distúrbio**



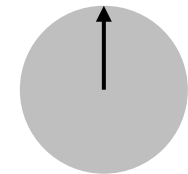
# variável preditora



50%

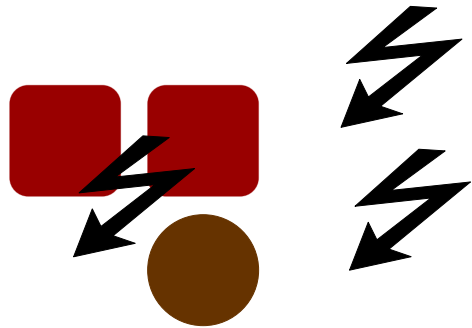


2 eventos



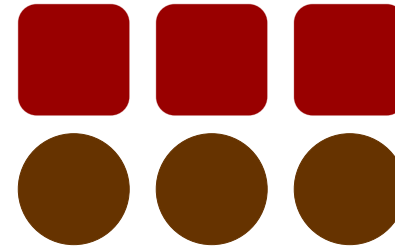
**intensidade  
do distúrbio**

# variável preditora



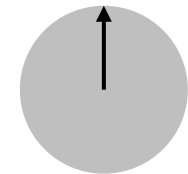
50%

**intensidade  
do distúrbio**



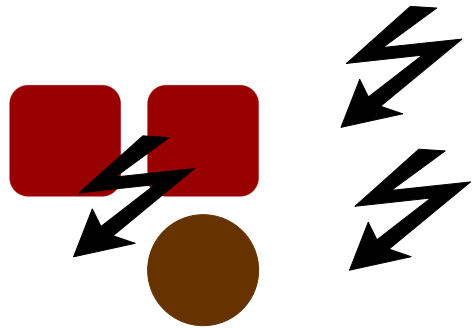
2 eventos

**número de  
eventos de  
distúrbio**



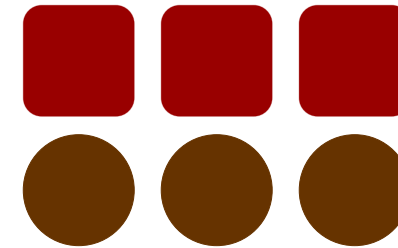


# variável preditora



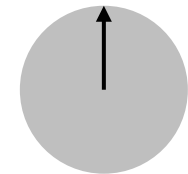
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**intensidade  
do distúrbio**

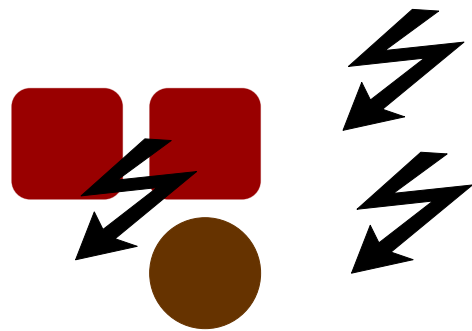


2 eventos

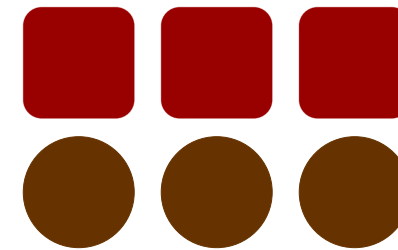
**número de  
eventos de  
distúrbio**



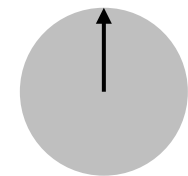
# variável preditora



50%

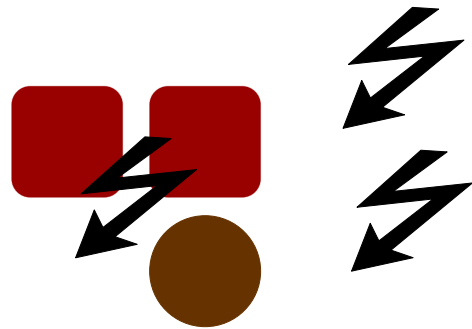


2 eventos

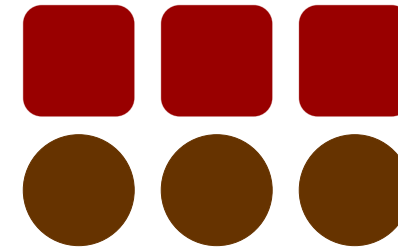


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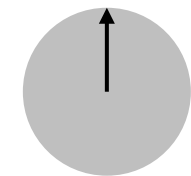
# variável preditora



50%



2 eventos



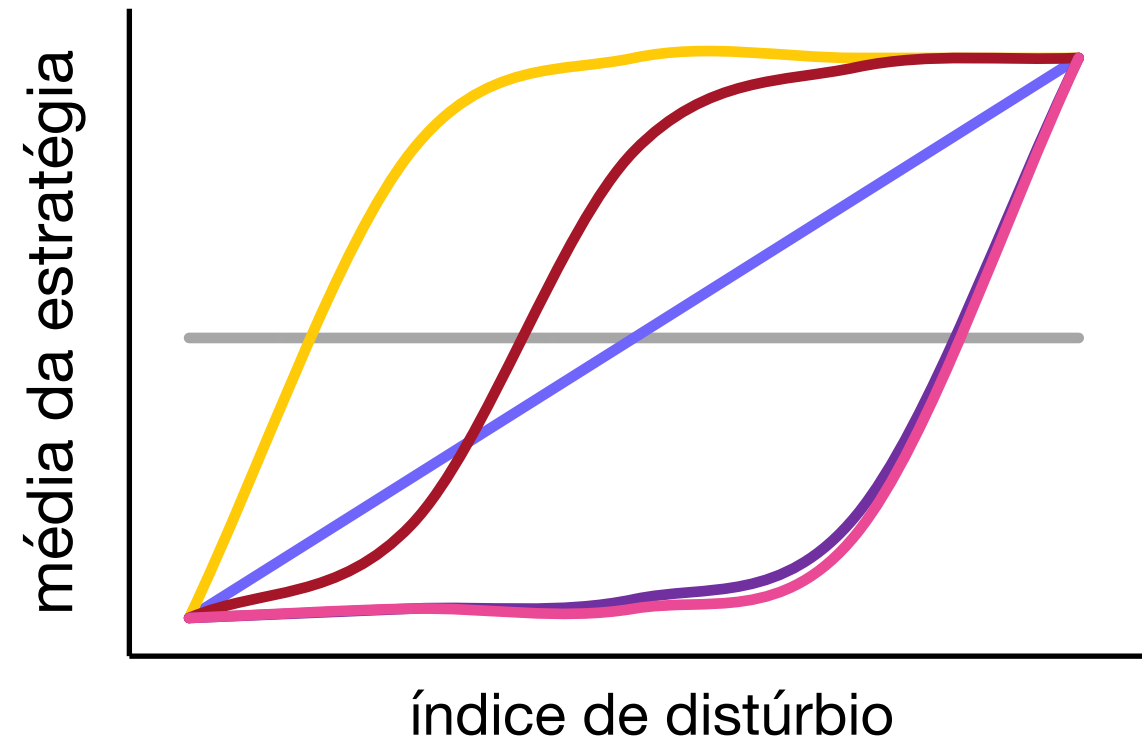
**índice de  
distúrbio**

# análise dos dados

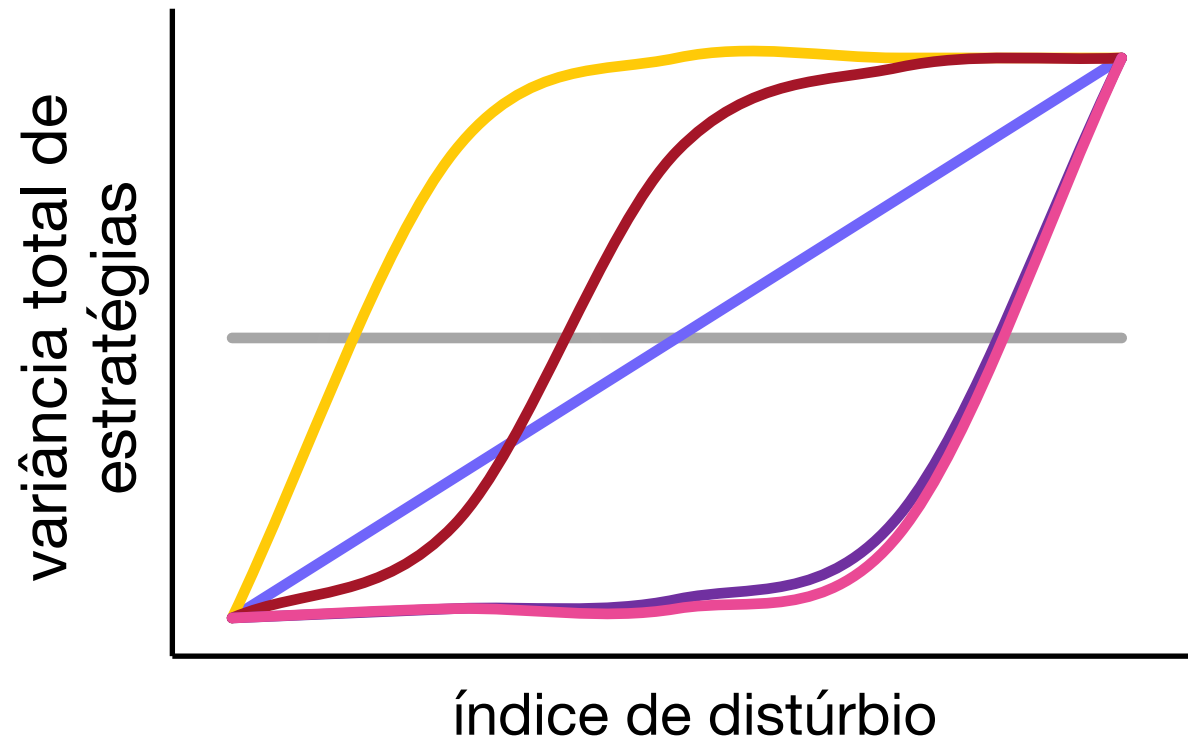
modelos

estratégia média ~ distúrbio

estratégia média  $\sim$  distúrbio

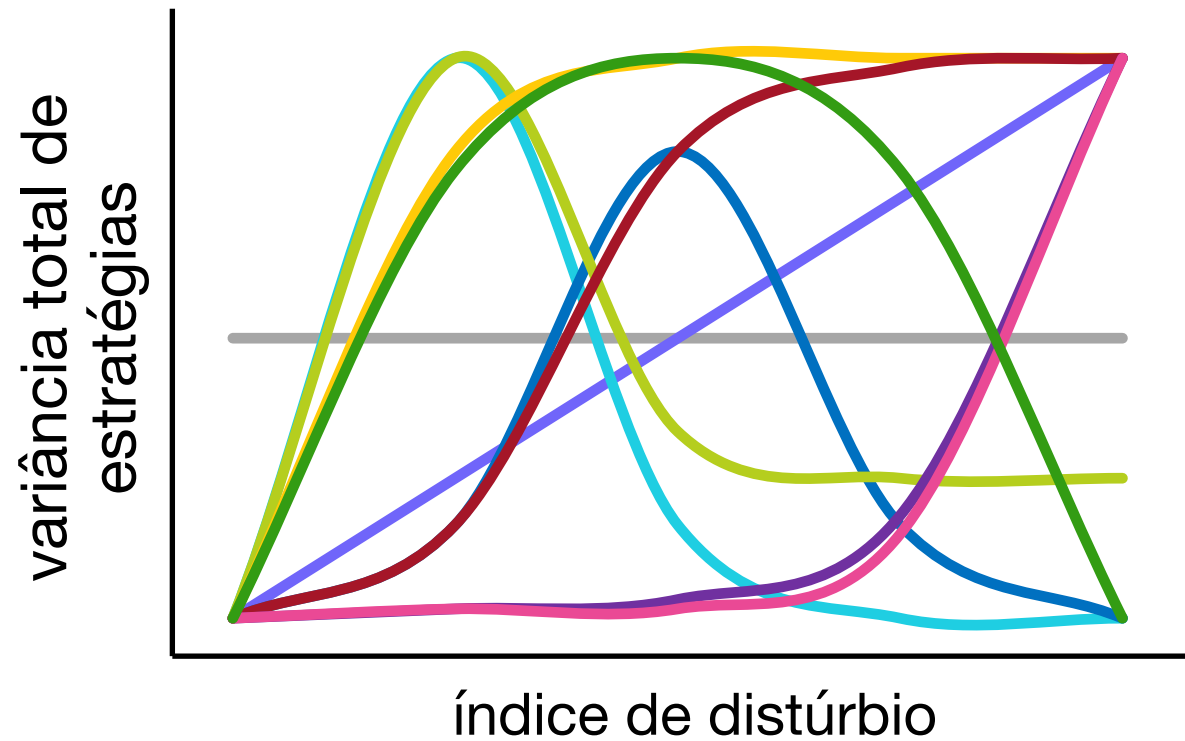


diversidade de estratégias ~ distúrbio

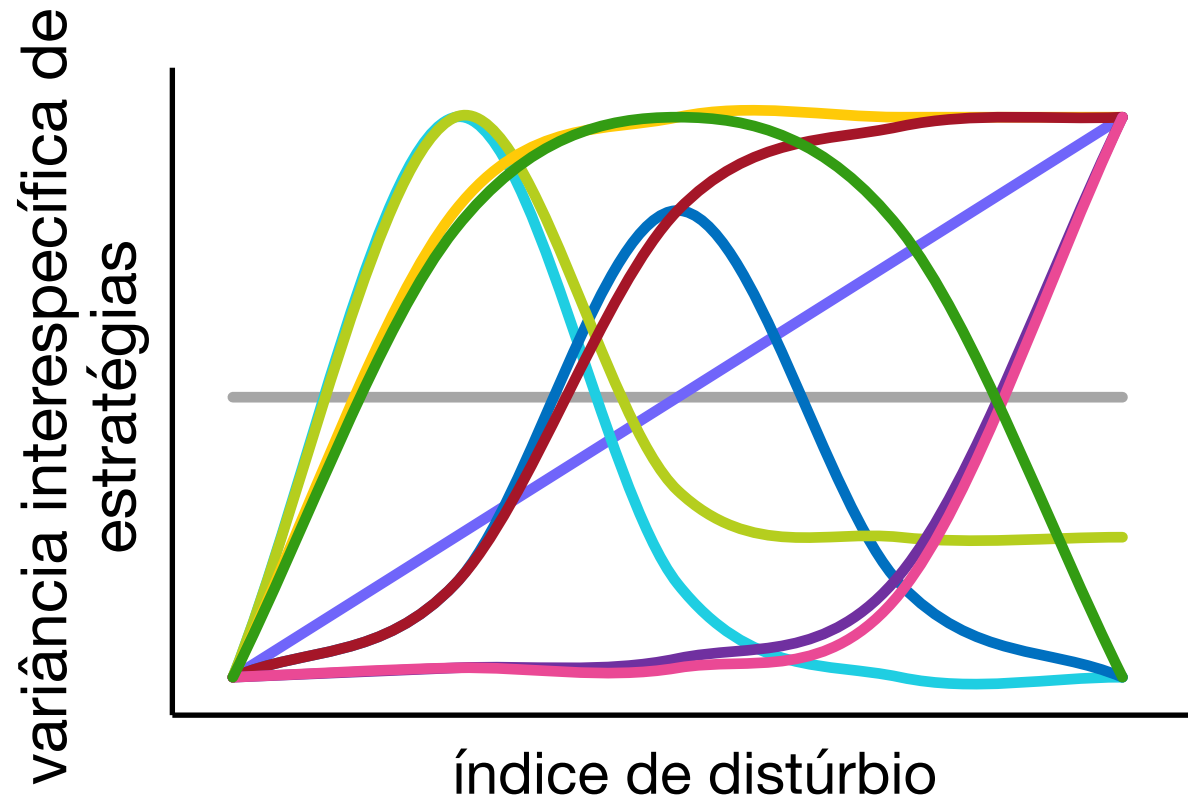




diversidade de estratégias ~ distúrbio



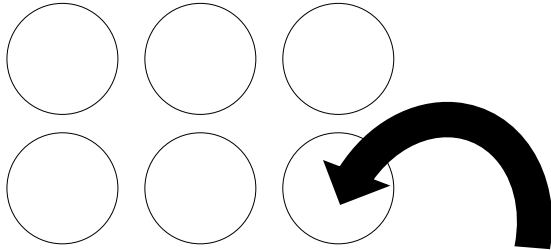
heterogeneidade interespecífica de ~ distúrbio  
estratégias



# seleção de modelos

# 8 seleções de modelo

## evolutivo

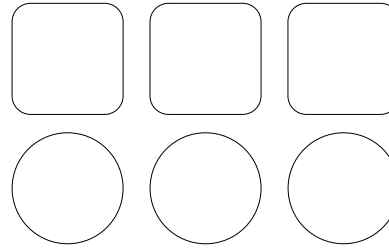


estratégia média

diversidade  
de estratégias

-

## ecológico

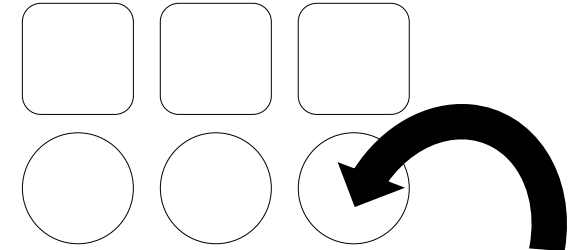


estratégia média

diversidade  
de estratégias

heterogeneidade  
interespecífica de  
estratégias

## eco-evolutivo

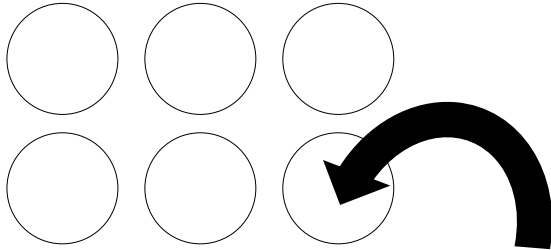


estratégia média

diversidade  
de estratégias

heterogeneidade  
interespecífica de  
estratégias

## evolutivo

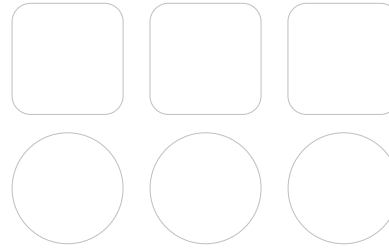


estratégia média

diversidade  
de estratégias

-

## ecológico

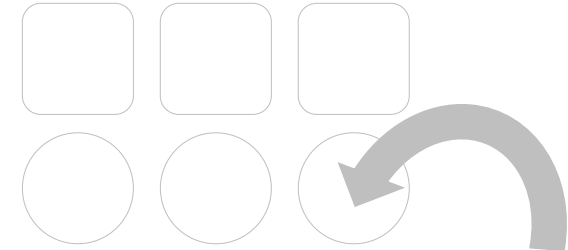


estratégia média

diversidade  
de estratégias

heterogeneidade  
interespecífica de  
estratégias

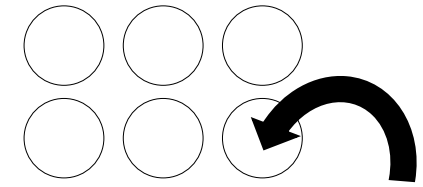
## eco-evolutivo



estratégia média

diversidade  
de estratégias

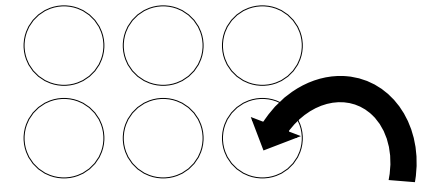
heterogeneidade  
interespecífica de  
estratégias



**evolutivo**

# estratégia média

resultados e discussão ● ● ●



**evolutivo**

# estratégia média

resultados e discussão ● ● ●

Média do índice de estratégia de vida

1

0,75

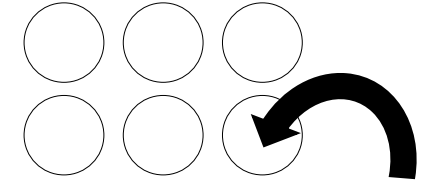
0,5

0,25

0

0 50 · 10<sup>3</sup> 100 · 10<sup>3</sup> 150 · 10<sup>3</sup> 200 · 10<sup>3</sup> 250 · 10<sup>3</sup> 300 · 10<sup>3</sup>

Índice de distúrbio (mortes acumuladas / tamanho da comunidade)

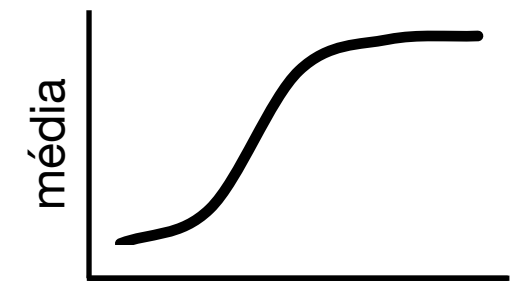
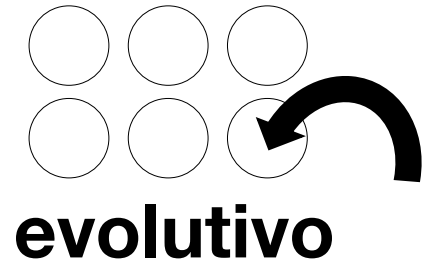
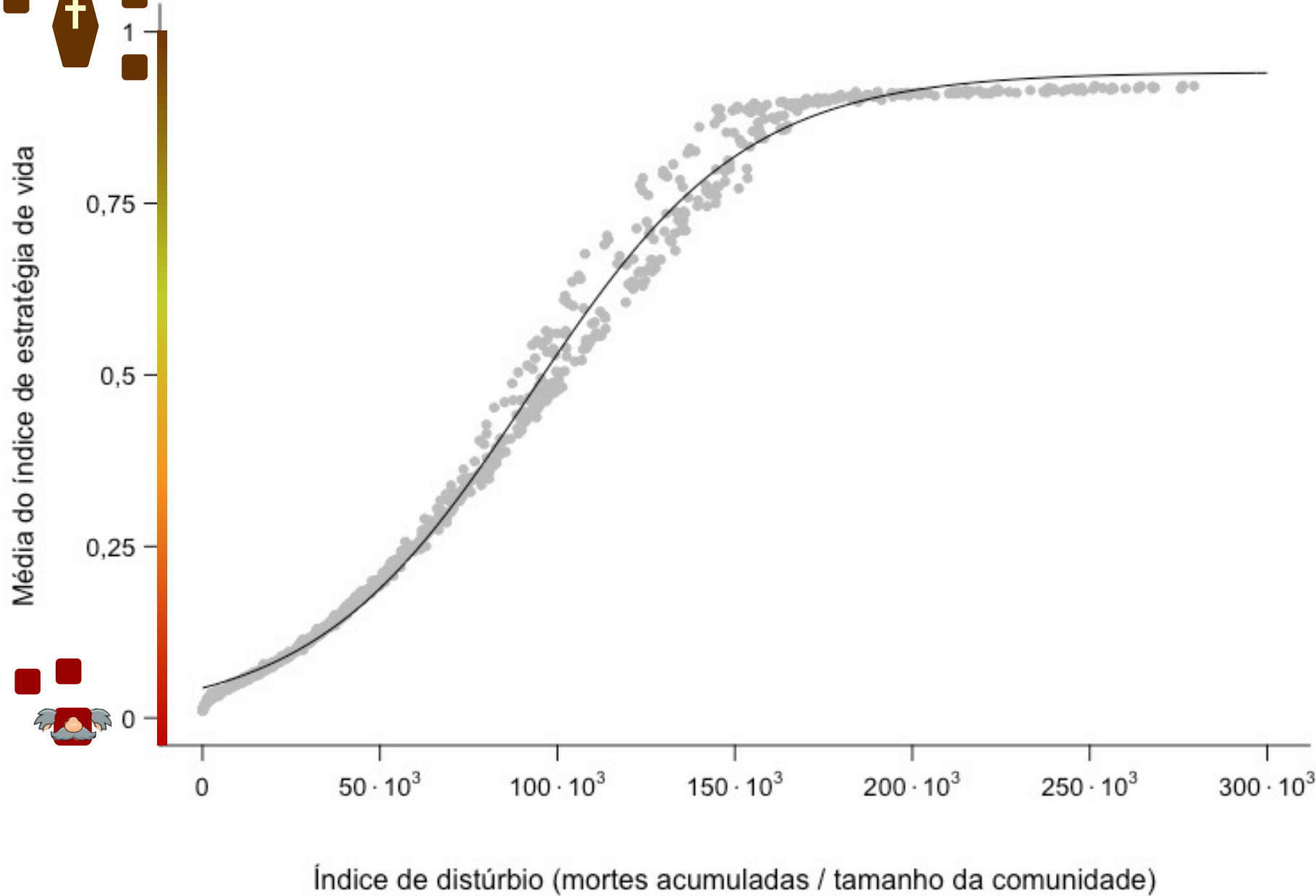


**evolutivo**



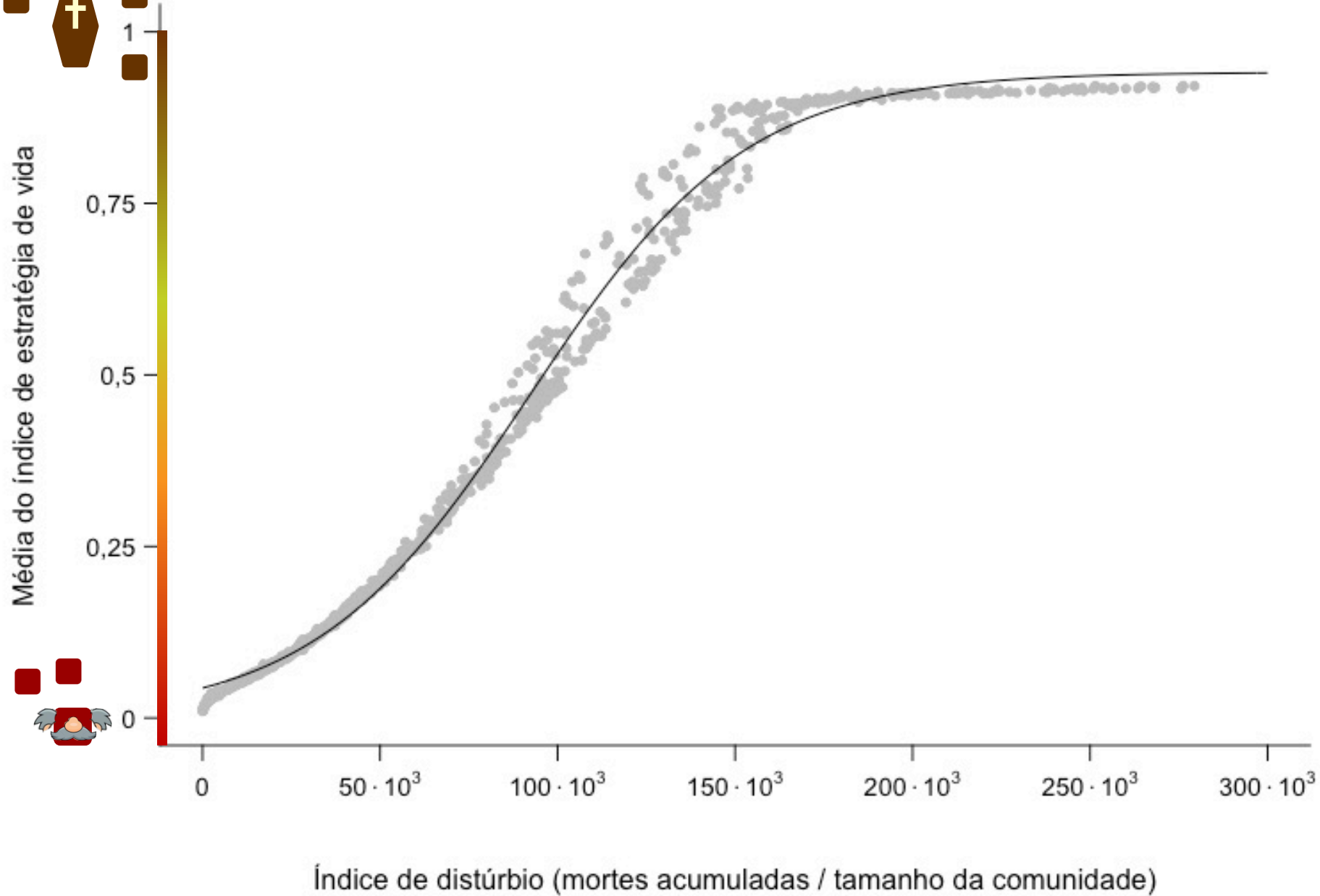
# estratégia média

resultados e discussão ● ● ●

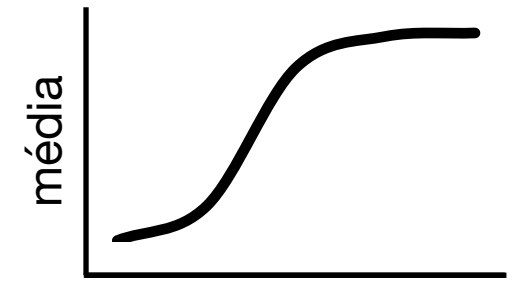


# estratégia média

resultados e discussão



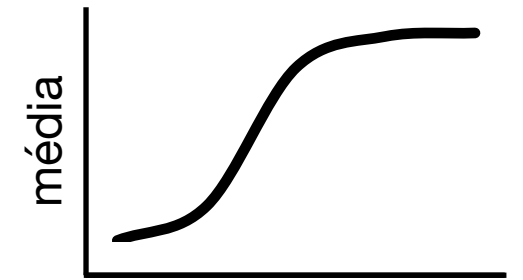
evolutivo



# seleção natural

- variação herdável
- componente da aptidão

resultados e discussão ● ● ●



# seleção natural

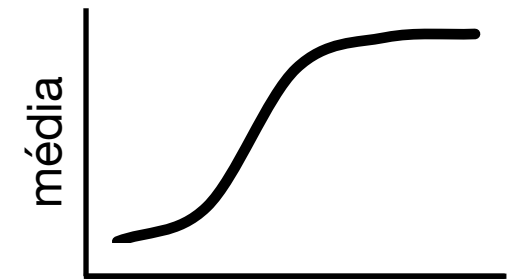
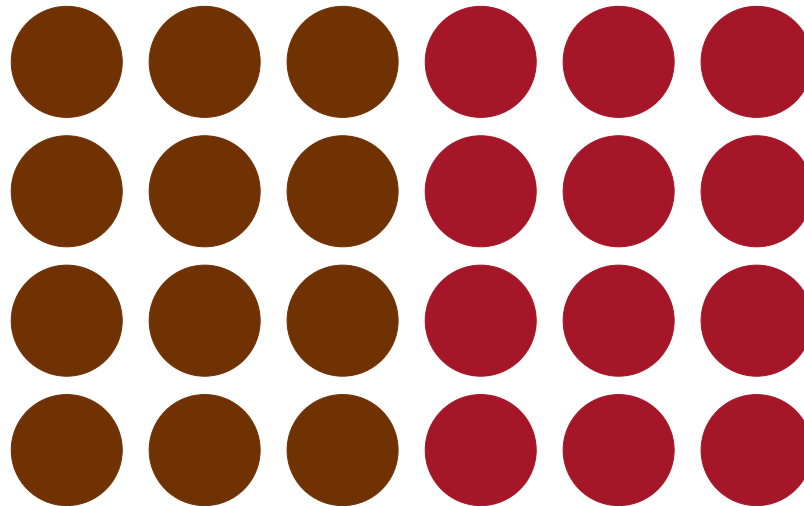
resultados e discussão ● ● ●

- variação herdável
- componente da aptidão

banco

● x 96

● x 24



# seleção natural

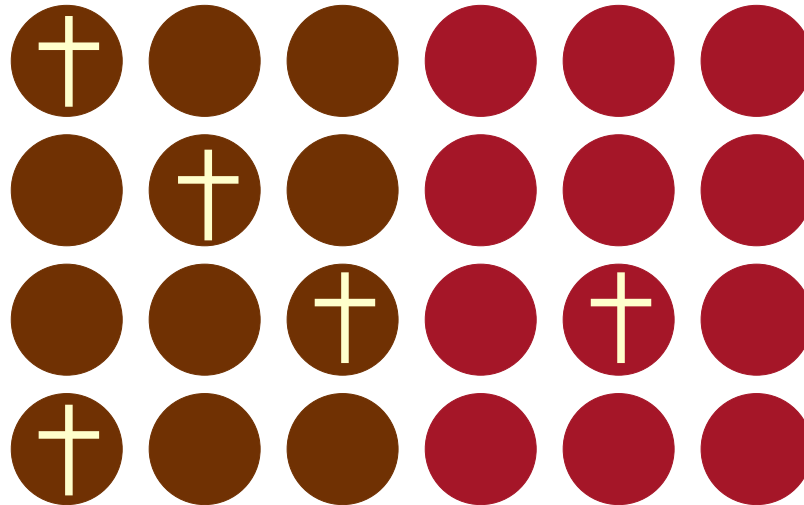
resultados e discussão ● ● ●

- variação herdável
- componente da aptidão

banco

● x 96

● x 24



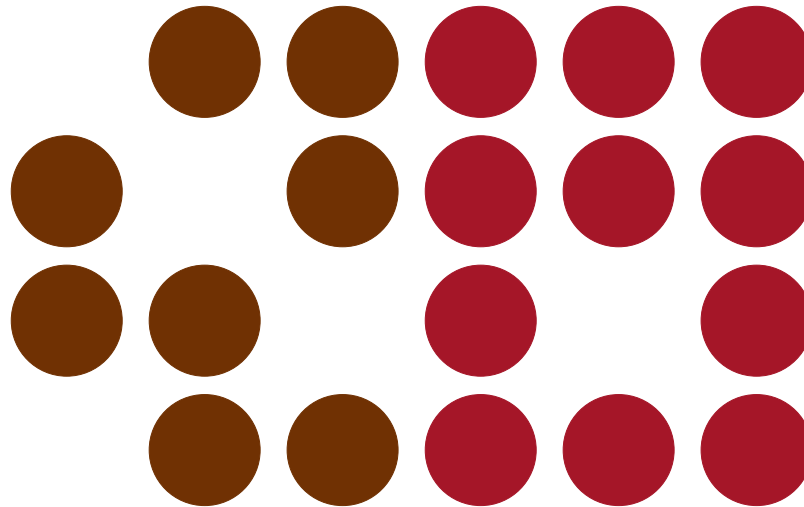
# seleção natural

- variação herdável
- componente da aptidão

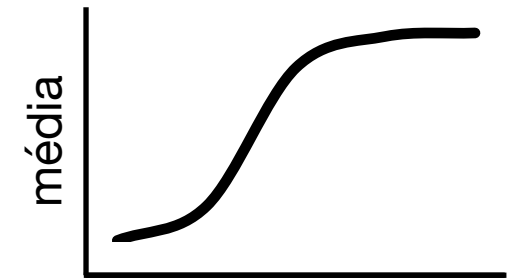
banco

● x 96

● x 24



resultados e discussão ● ● ●



# seleção natural

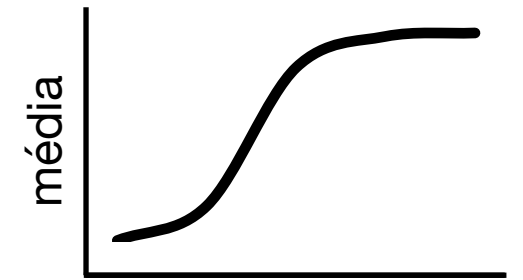
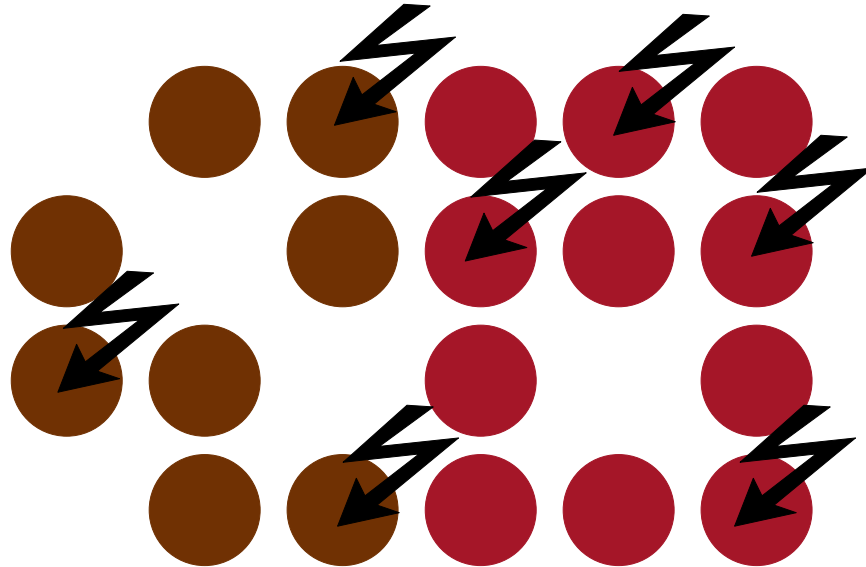
resultados e discussão ● ● ●

- variação herdável
- componente da aptidão

banco

● x 96

● x 24



# seleção natural

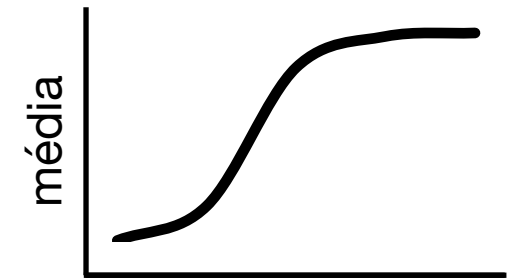
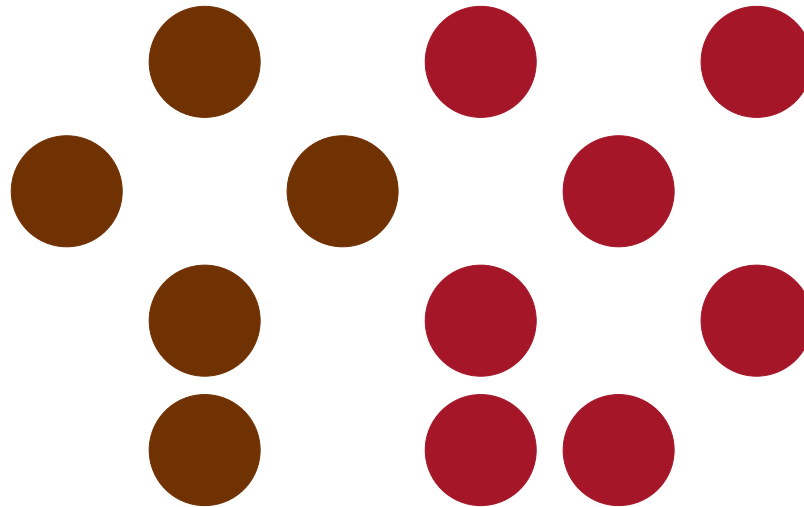
resultados e discussão ● ● ●

- variação herdável
- componente da aptidão

banco

● x 96

● x 24





# seleção natural

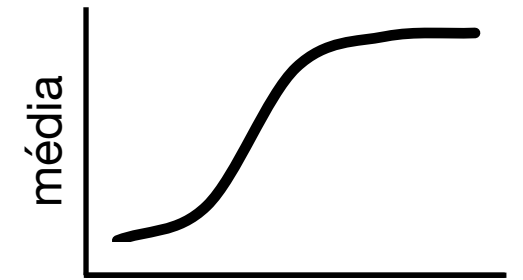
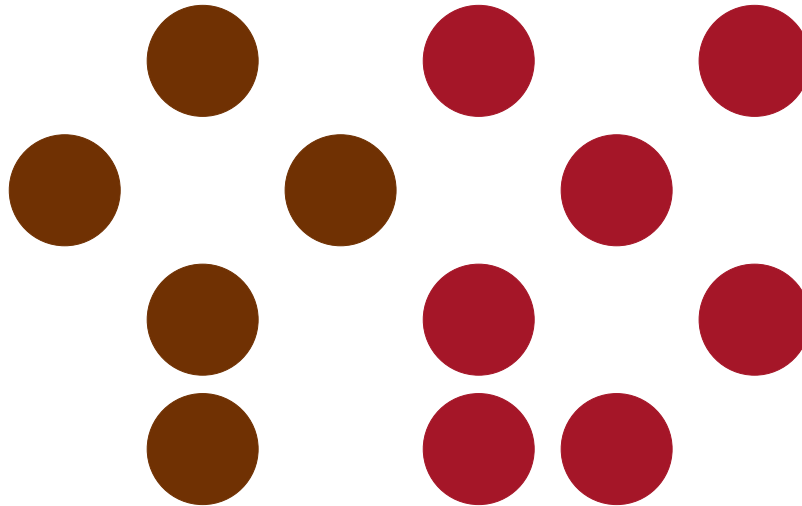
resultados e discussão ● ● ●

- variação herdável
- componente da aptidão

banco

● x 96 9

● x 24 3



# seleção natural

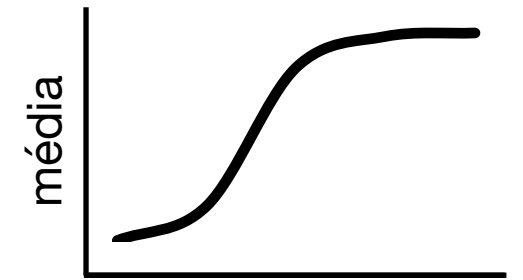
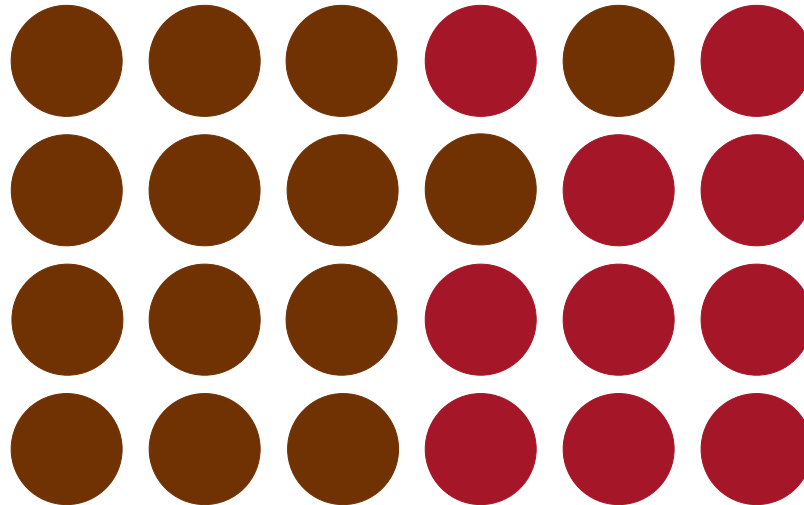
resultados e discussão ● ● ●

- variação herdável
- componente da aptidão

banco

● x 112

● x 20



# seleção natural

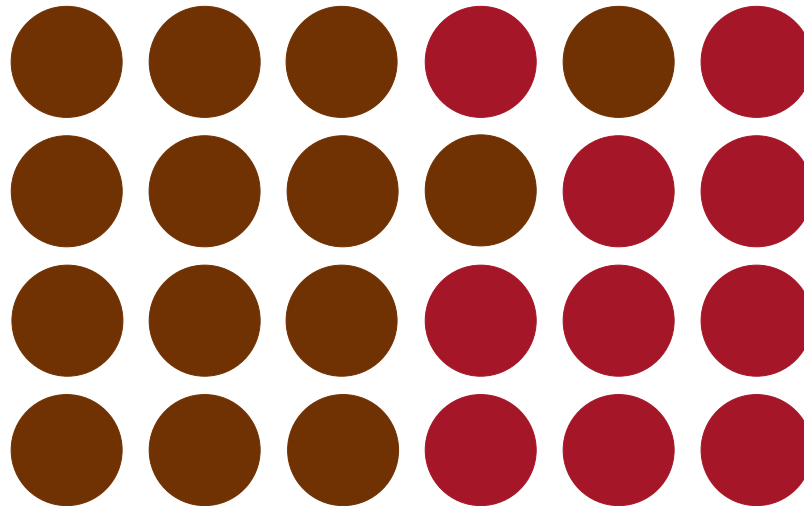
resultados e discussão ● ● ●

- variação herdável
- componente da aptidão

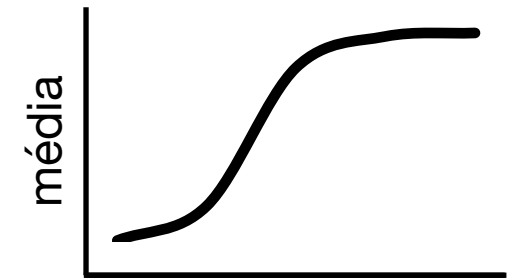
banco

● x 112

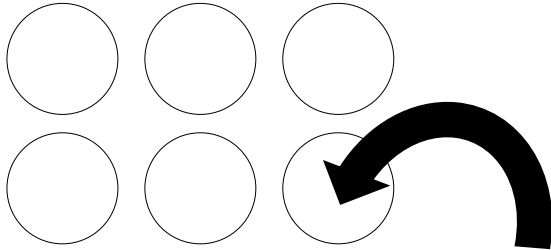
● x 20



estratégia de maior fecundidade mais apta



## evolutivo

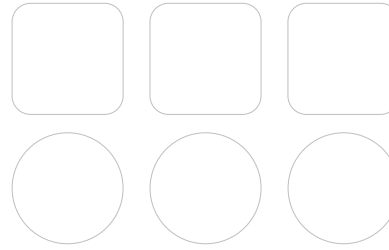


estratégia média

diversidade  
de estratégias

-

## ecológico

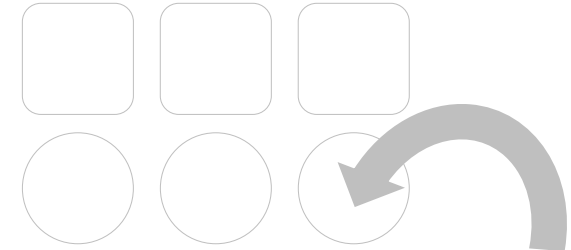


estratégia média

diversidade  
de estratégias

heterogeneidade  
interespecífica de  
estratégias

## eco-evolutivo

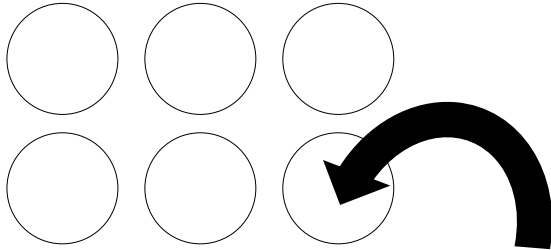


estratégia média

diversidade  
de estratégias

heterogeneidade  
interespecífica de  
estratégias

## evolutivo

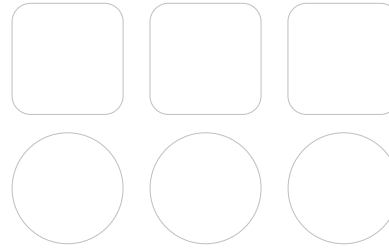


estratégia média

diversidade  
de estratégias

–

## ecológico

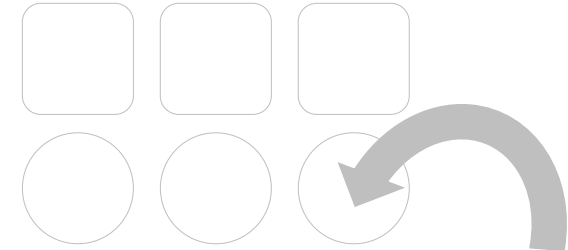


estratégia média

diversidade  
de estratégias

heterogeneidade  
interespecífica de  
estratégias

## eco-evolutivo



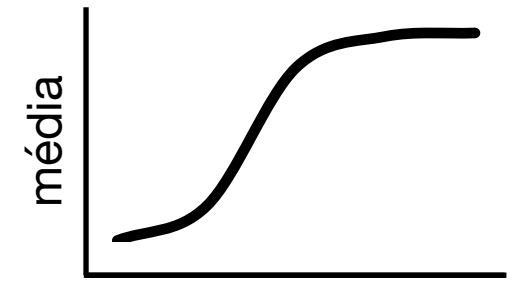
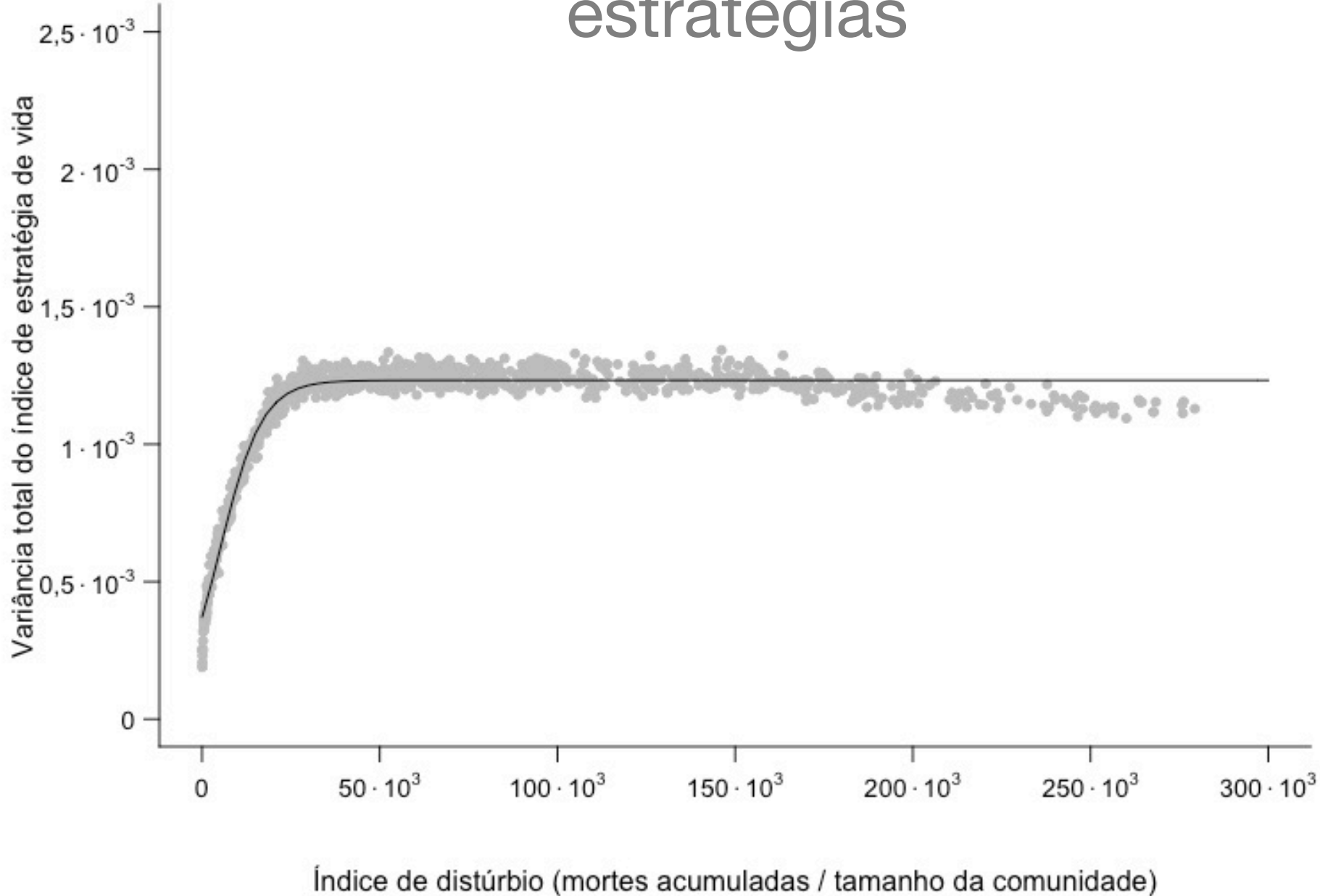
estratégia média

diversidade  
de estratégias

heterogeneidade  
interespecífica de  
estratégias

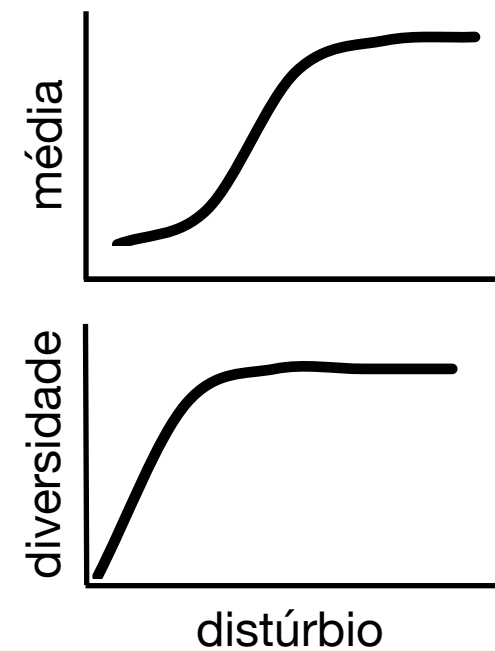
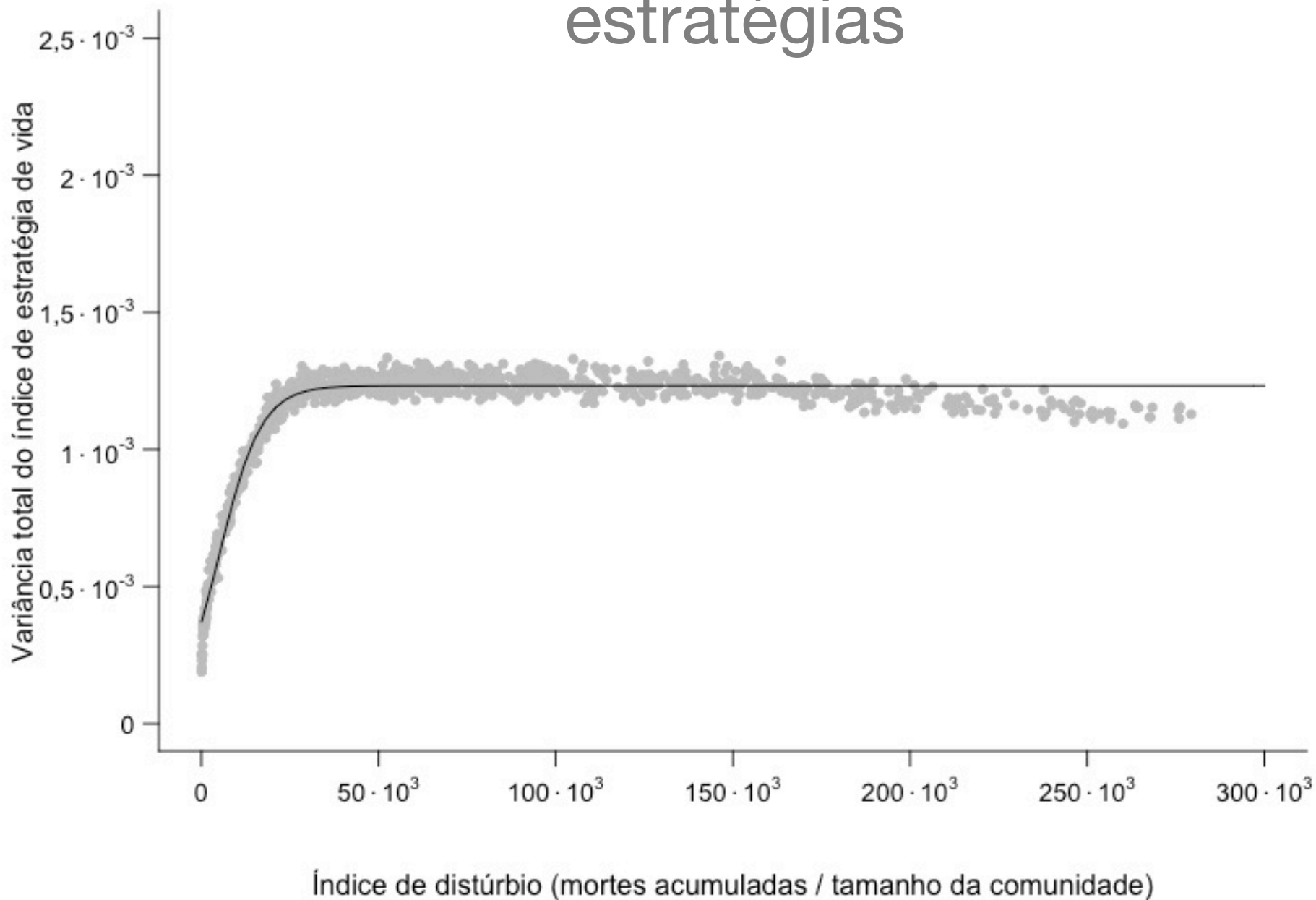
# diversidade de estratégias

resultados e discussão ● ● ●



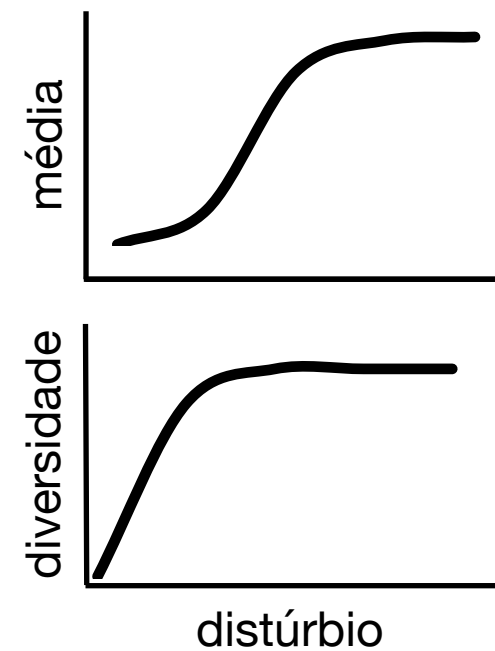
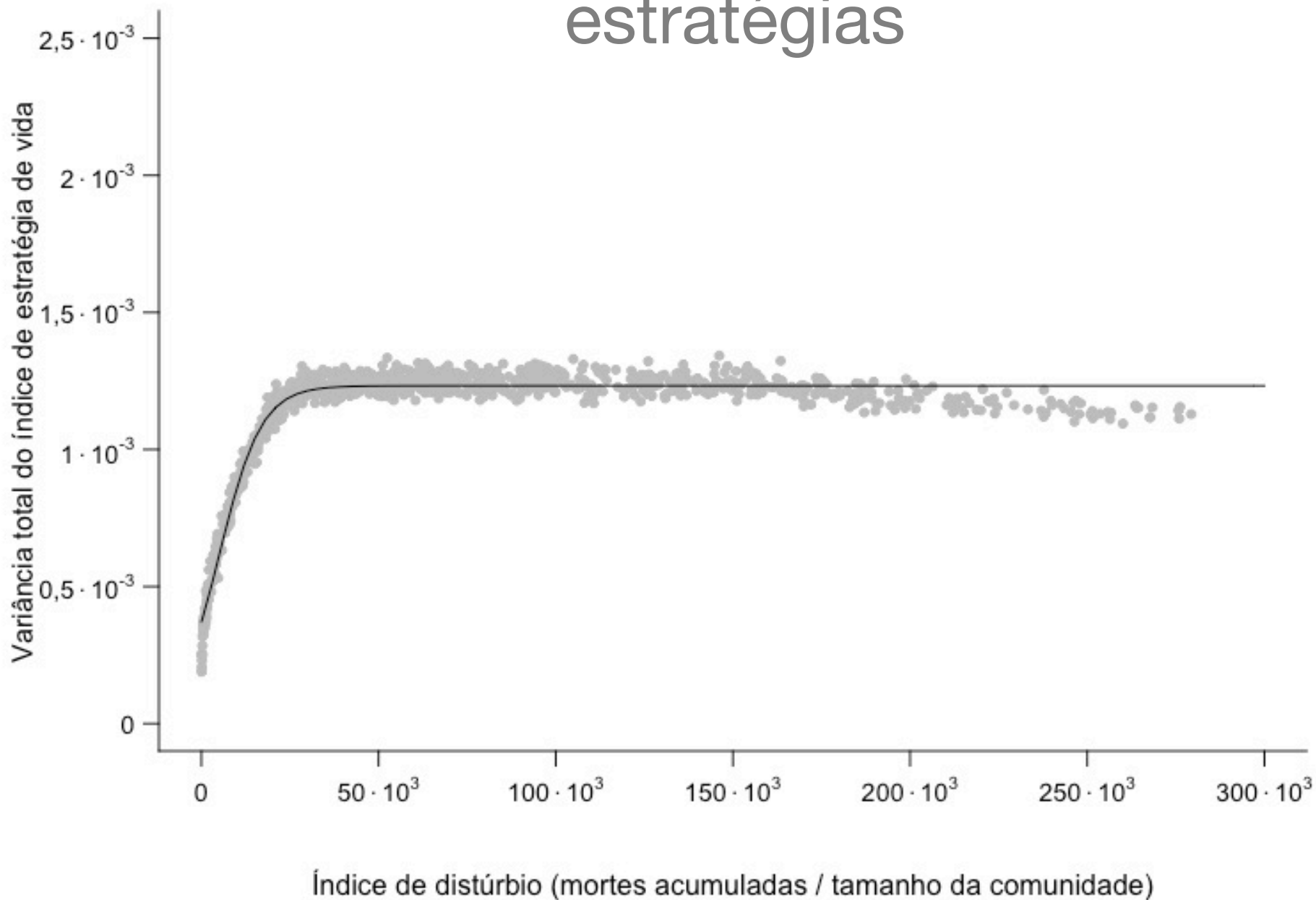
# diversidade de estratégias

resultados e discussão ● ● ●



# diversidade de estratégias

resultados e discussão





# mutação + amostragem

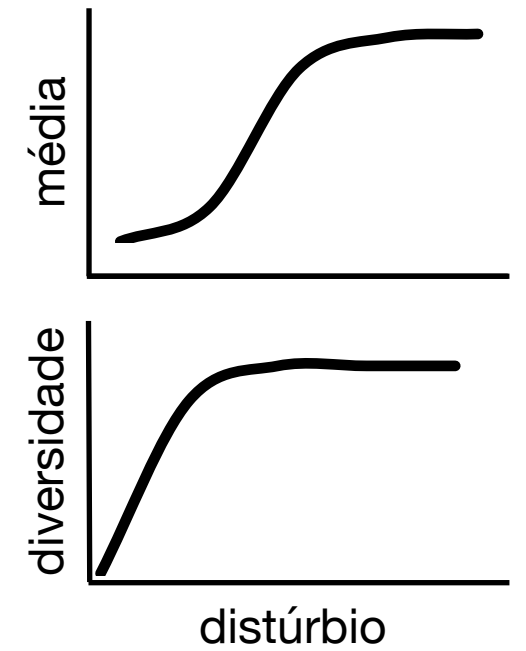
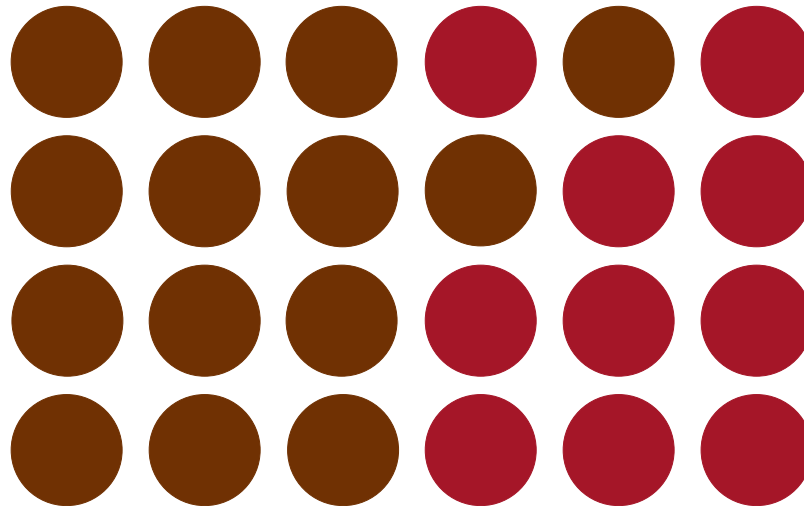
resultados e discussão ● ● ●



banco

● x 112

● x 20

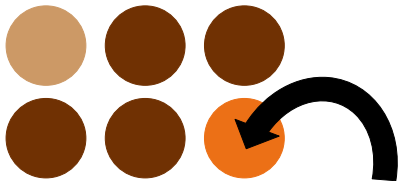
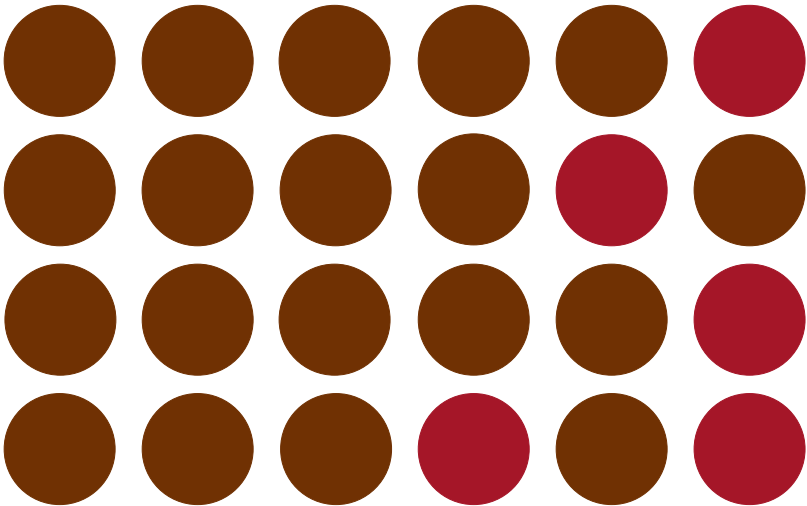


# mutação + amostragem

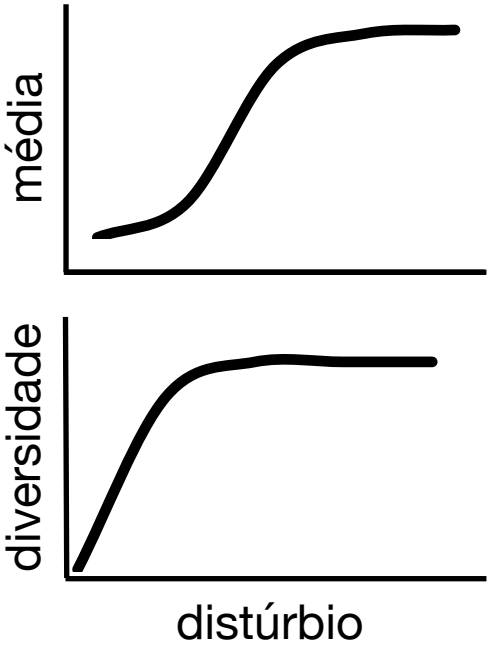
banco

● x 152

● x 10



**evolutivo**

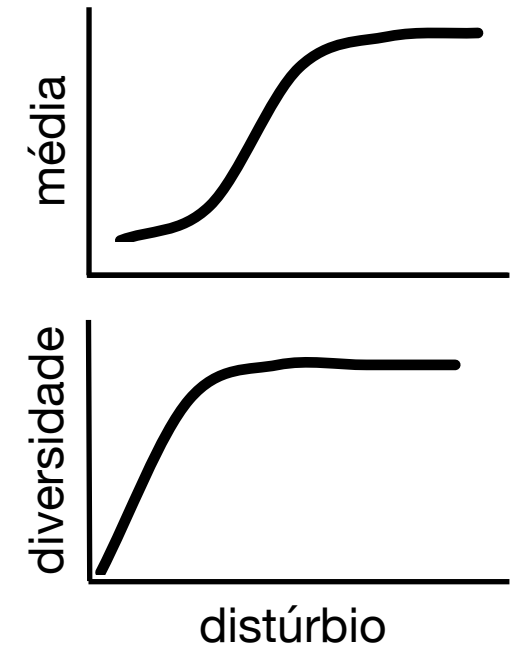
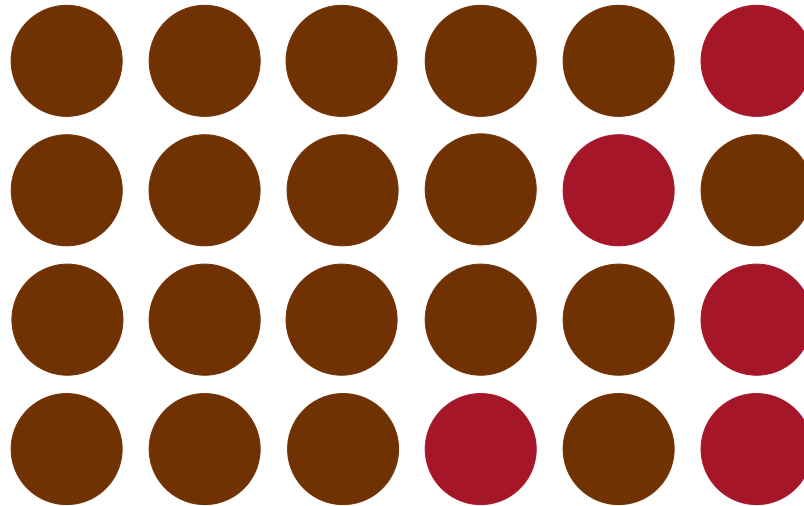
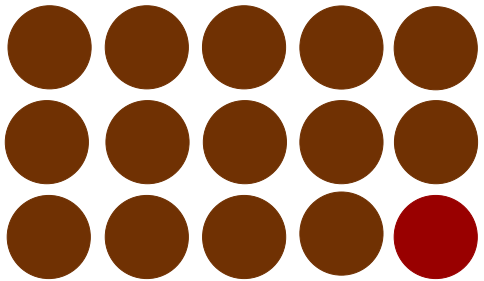


# mutação + amostragem

resultados e discussão ● ● ●

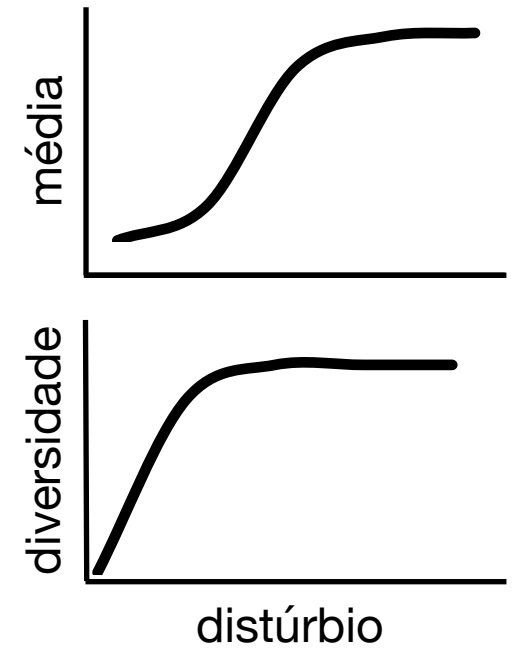
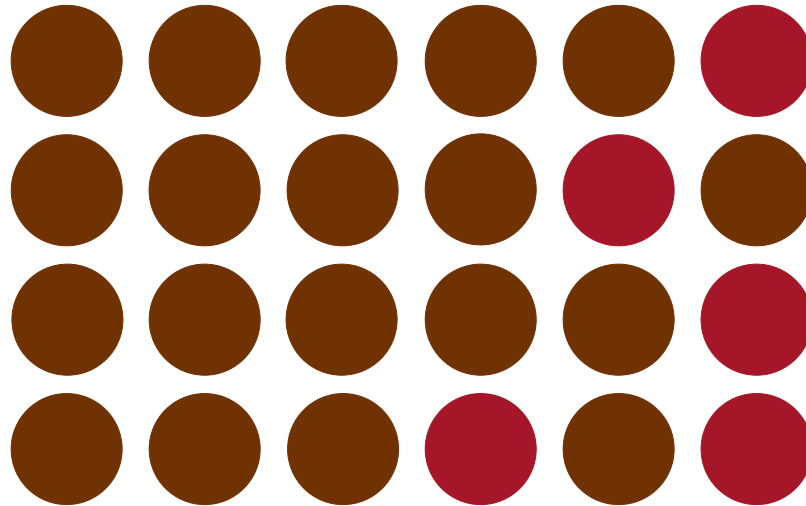
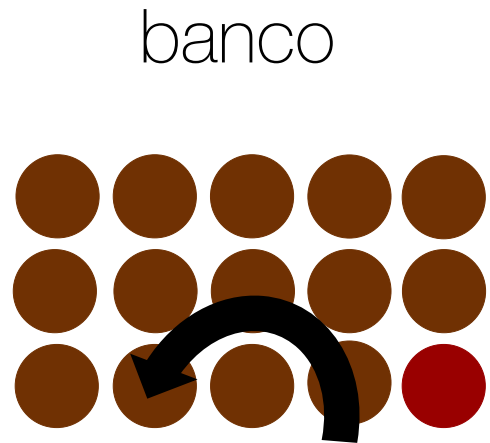


banco



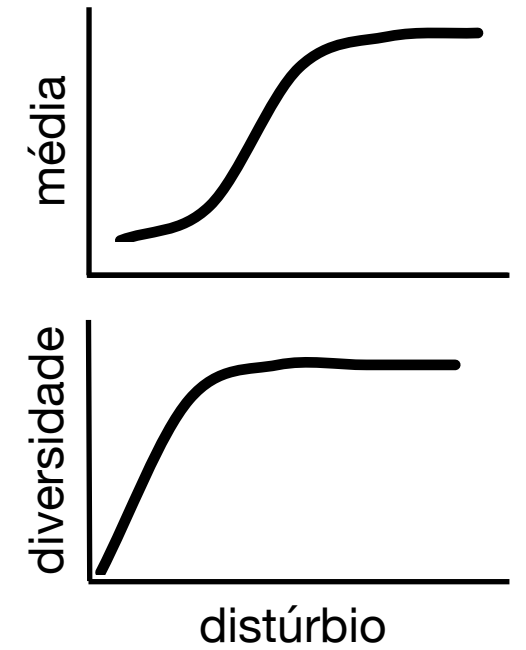
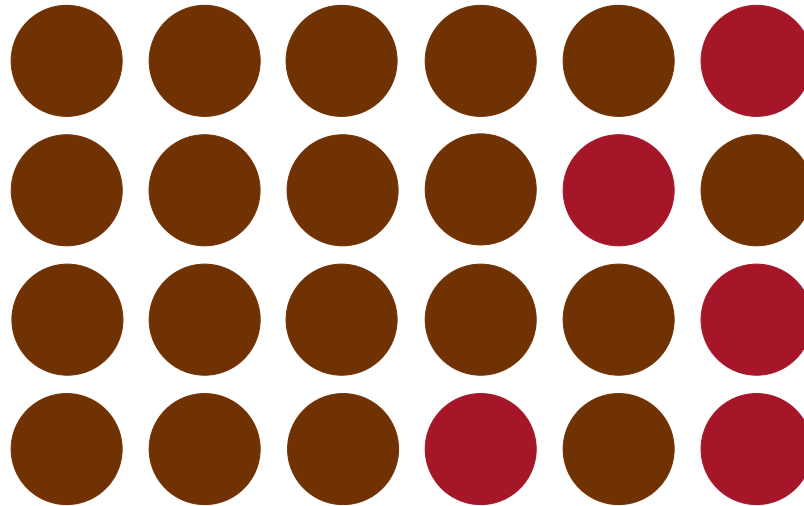
# mutação + amostragem

resultados e discussão ● ● ●

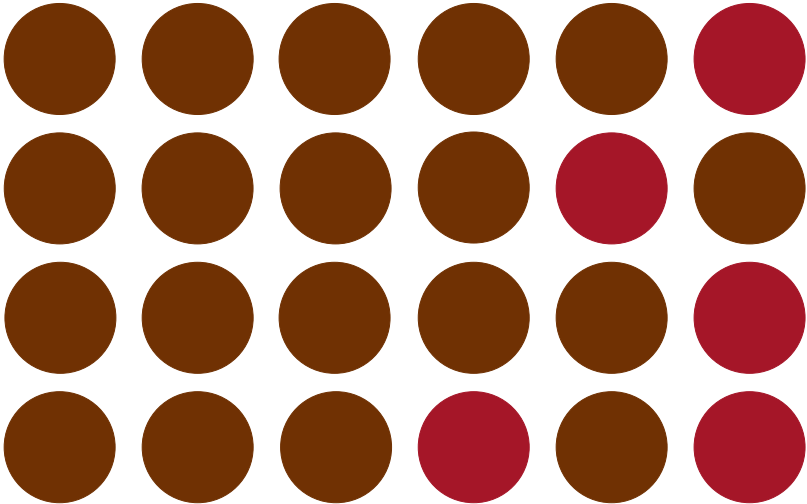


# mutação + amostragem

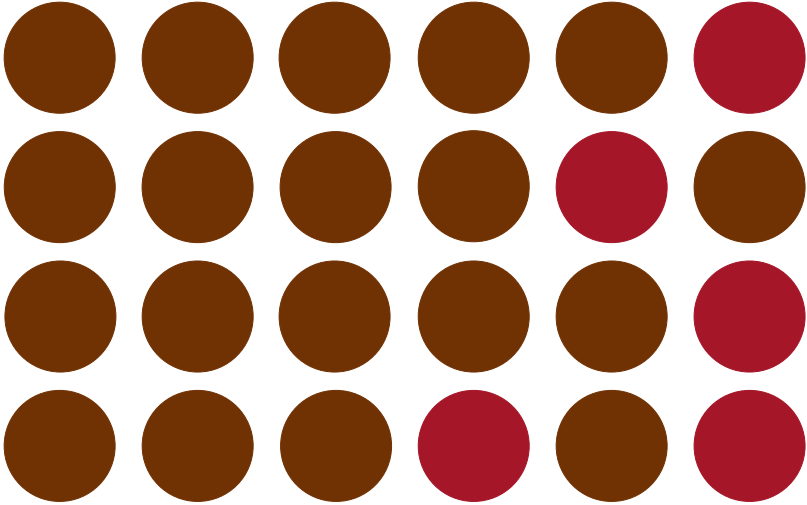
resultados e discussão ● ● ●



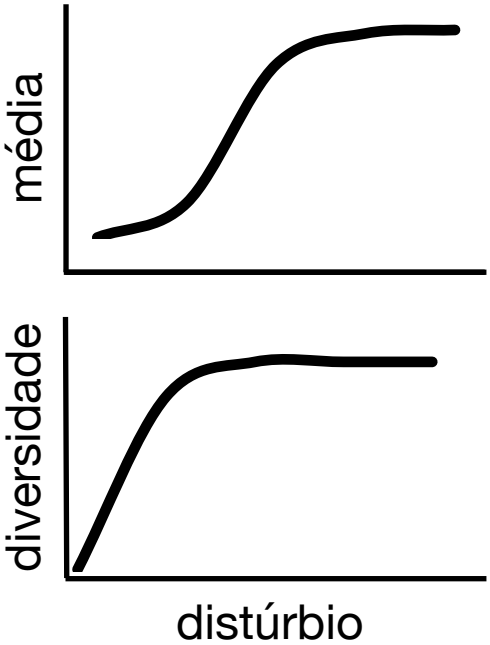
# mutação + amostragem



↓  
**distúrbio**

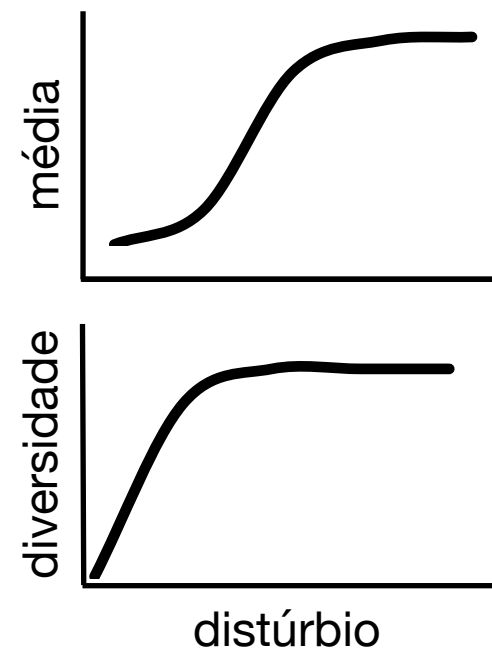
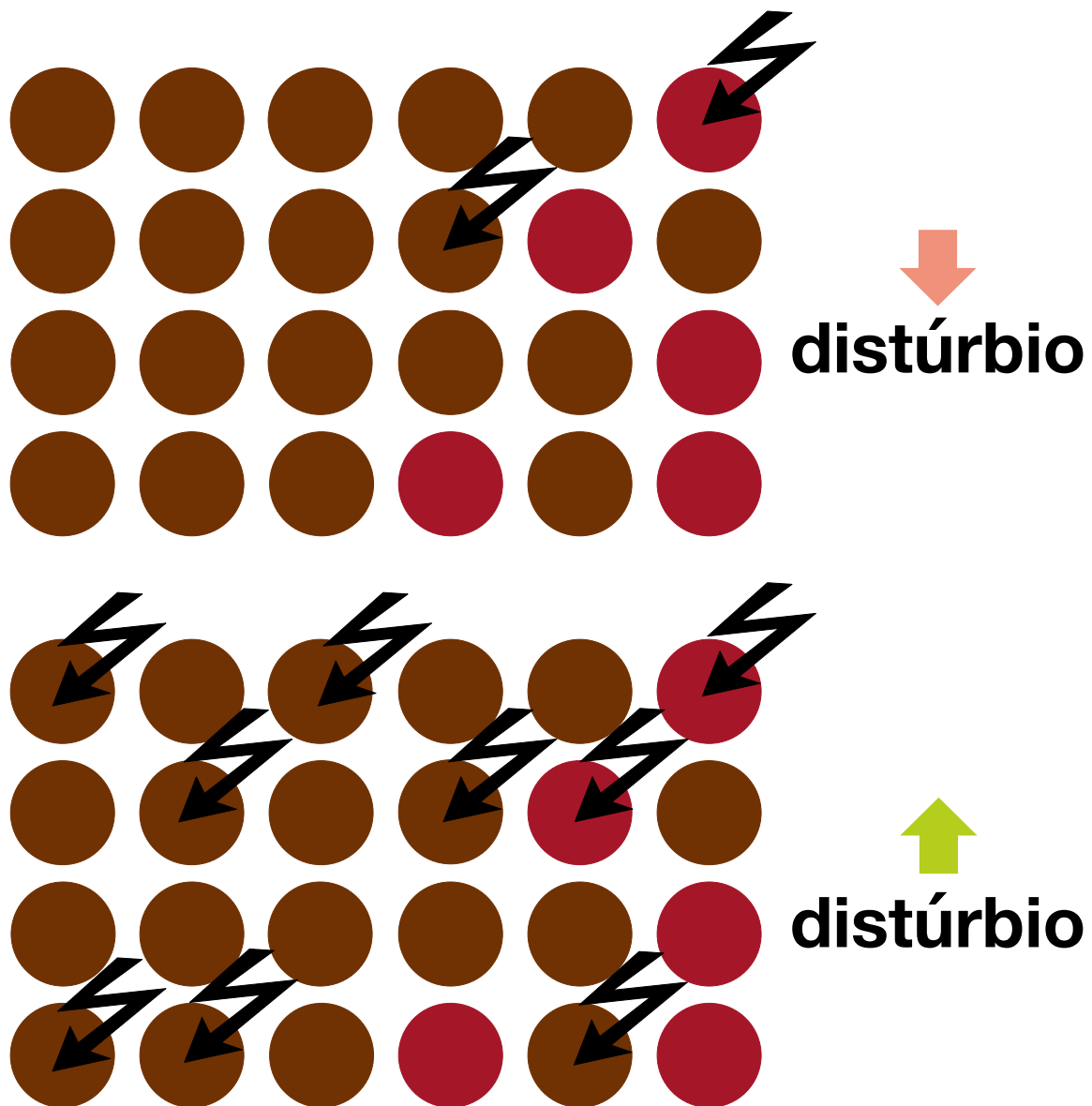


↑  
**distúrbio**

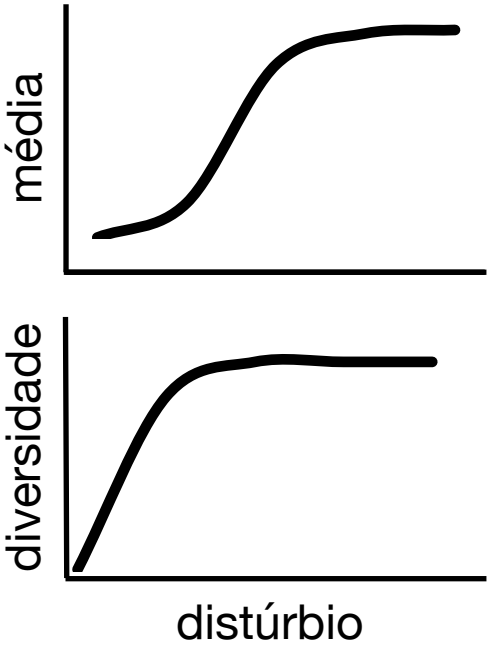
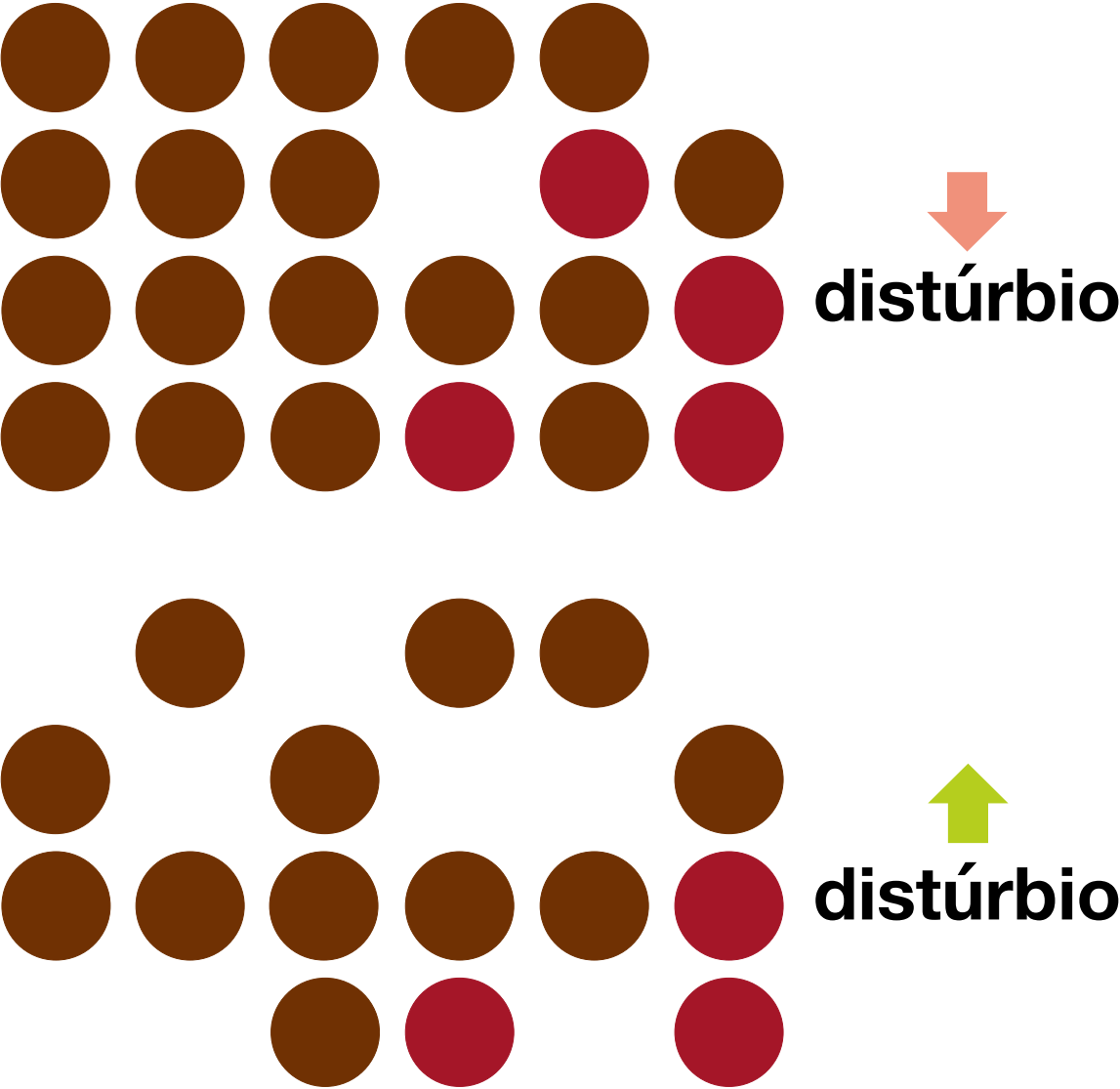


# mutação + amostragem

resultados e discussão ● ● ●

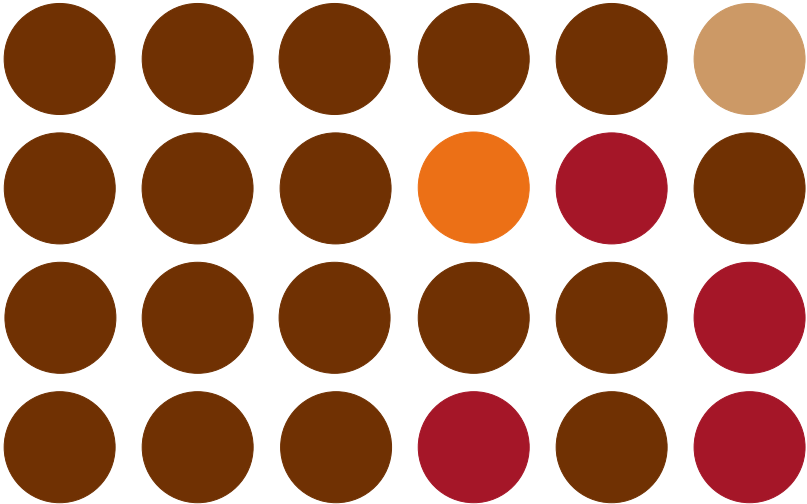


# mutação + amostragem





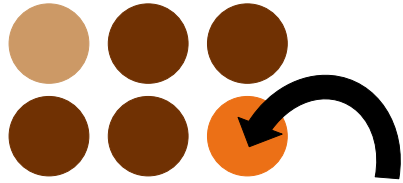
# mutação + amostragem



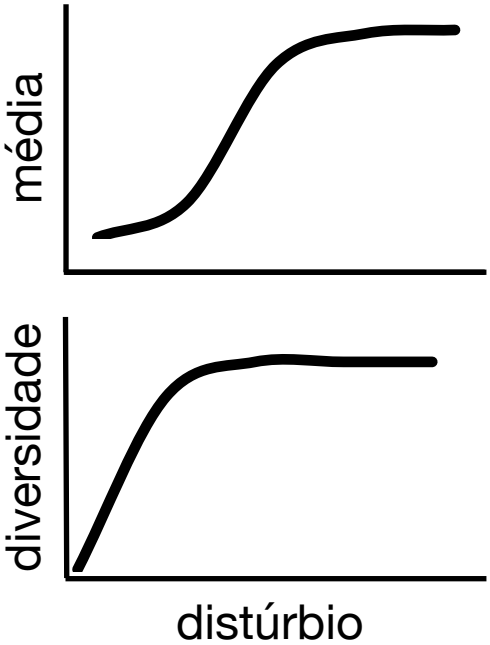
↓  
**distúrbio**



↑  
**distúrbio**

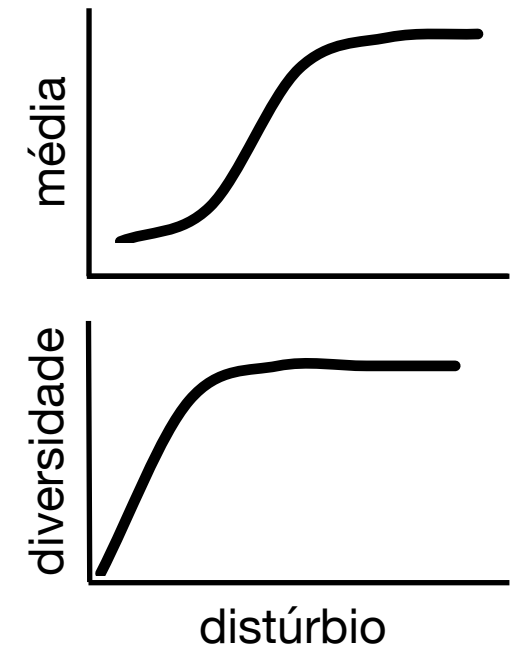
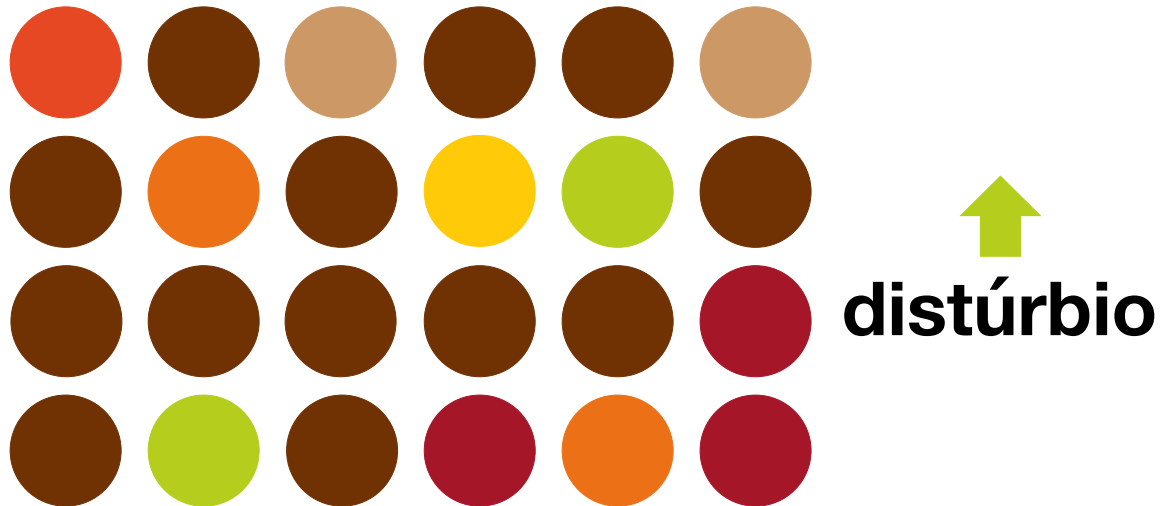


**evolutivo**



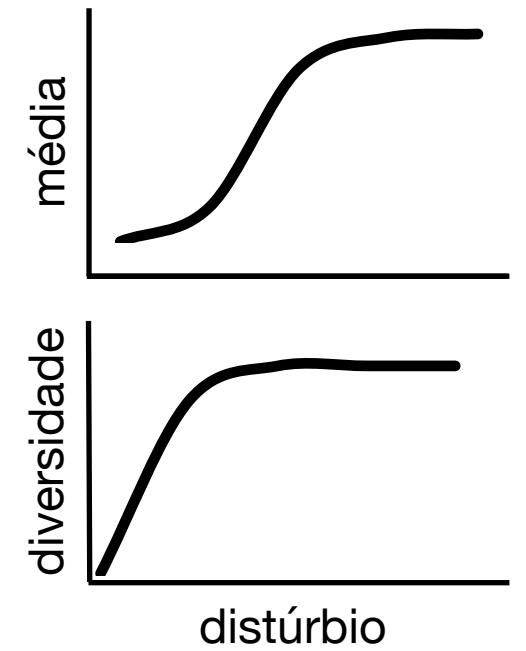
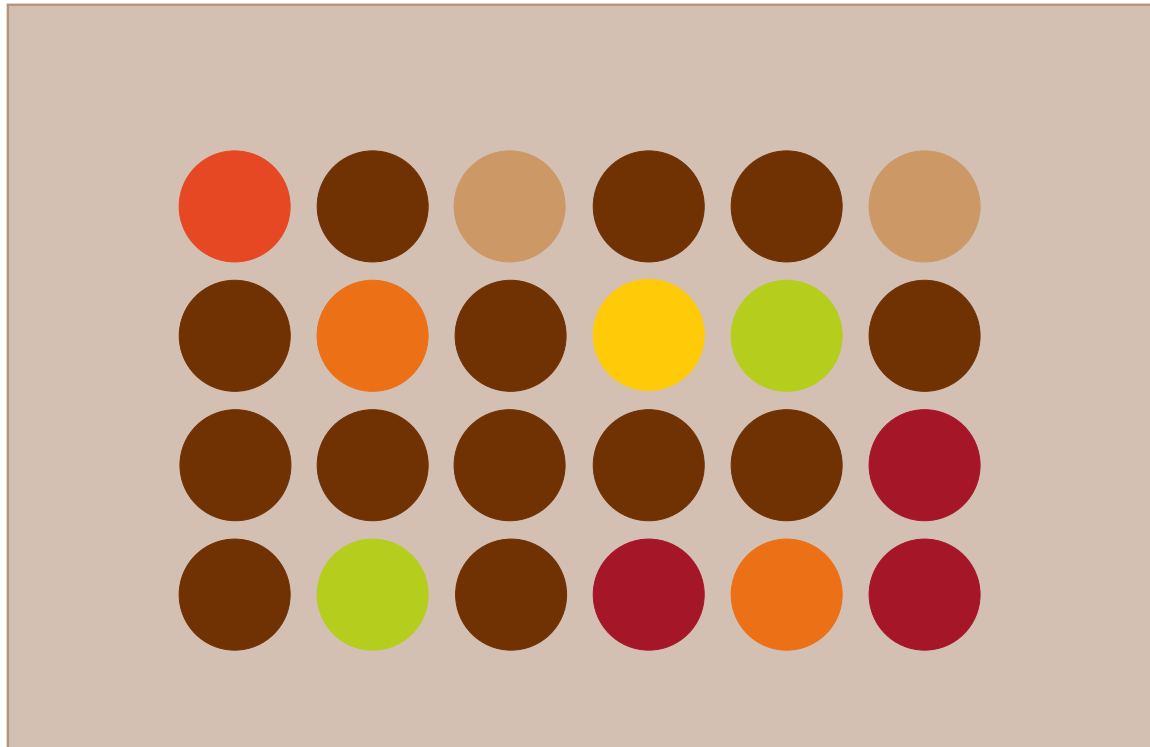
# mutação

resultados e discussão ● ● ●

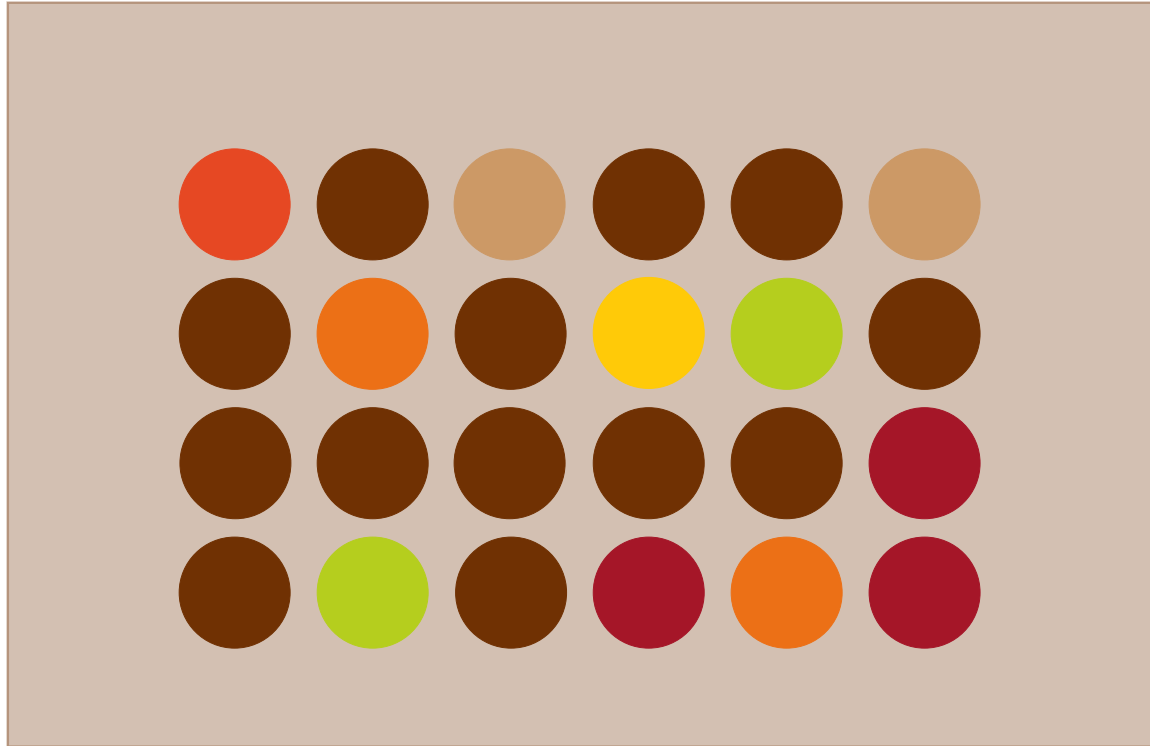


# mutação

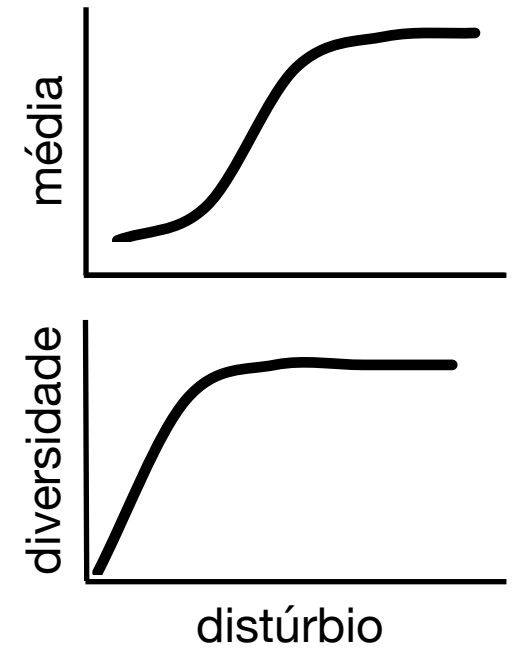
resultados e discussão ● ● ●



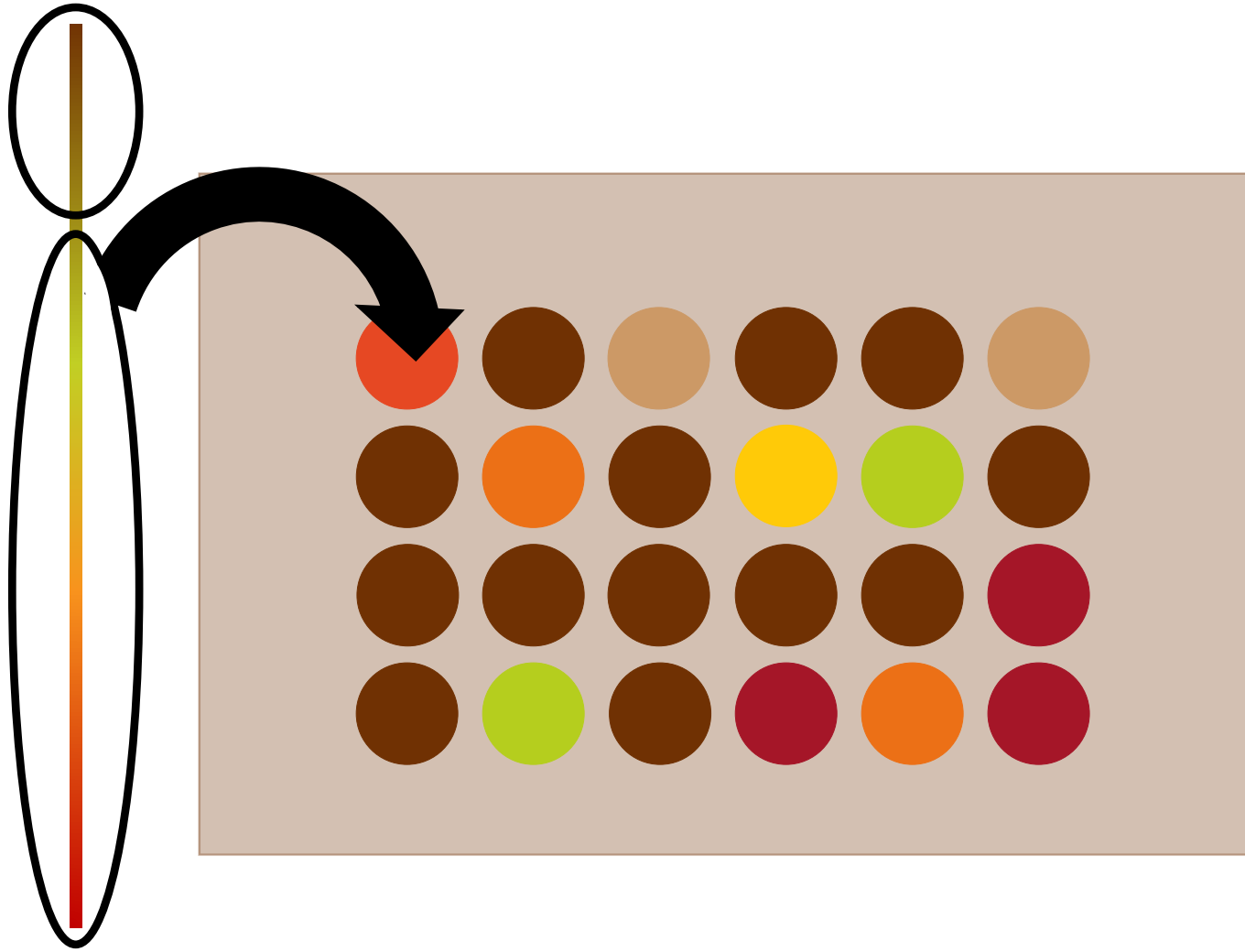
# mutação



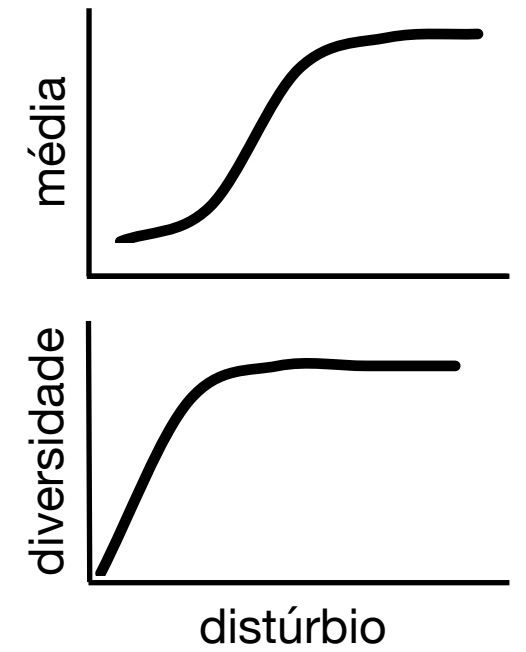
resultados e discussão ● ● ●



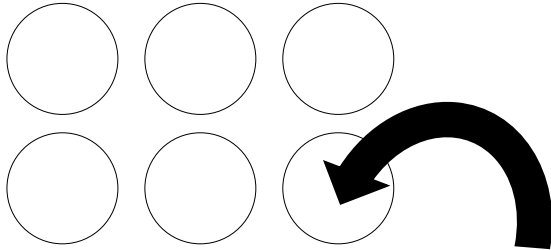
# mutação



resultados e discussão ● ● ●



## evolutivo

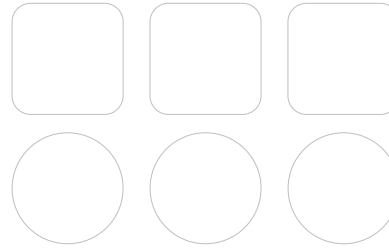


estratégia média

diversidade  
de estratégias

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## ecológico

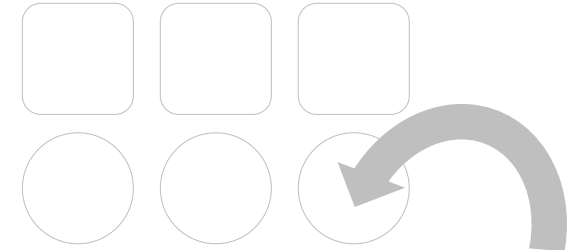


estratégia média

diversidade  
de estratégias

heterogeneidade  
interespecífica de  
estratégias

## eco-evolutivo

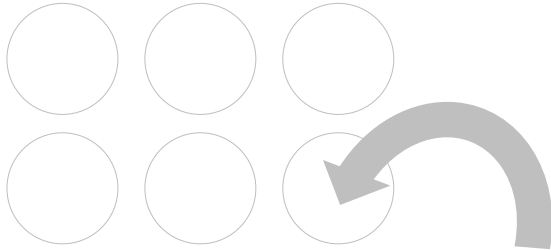


estratégia média

diversidade  
de estratégias

heterogeneidade  
interespecífica de  
estratégias

## evolutivo

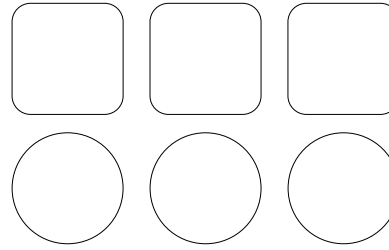


estratégia média

diversidade  
de estratégias

-

## ecológico

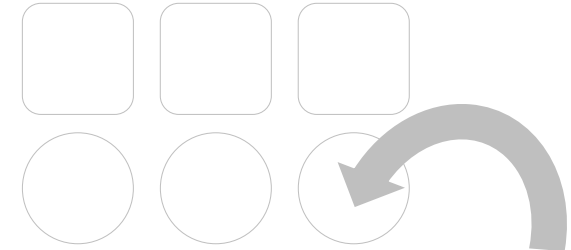


estratégia média

diversidade  
de estratégias

heterogeneidade  
interespecífica de  
estratégias

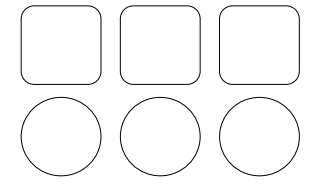
## eco-evolutivo



estratégia média

diversidade  
de estratégias

heterogeneidade  
interespecífica de  
estratégias

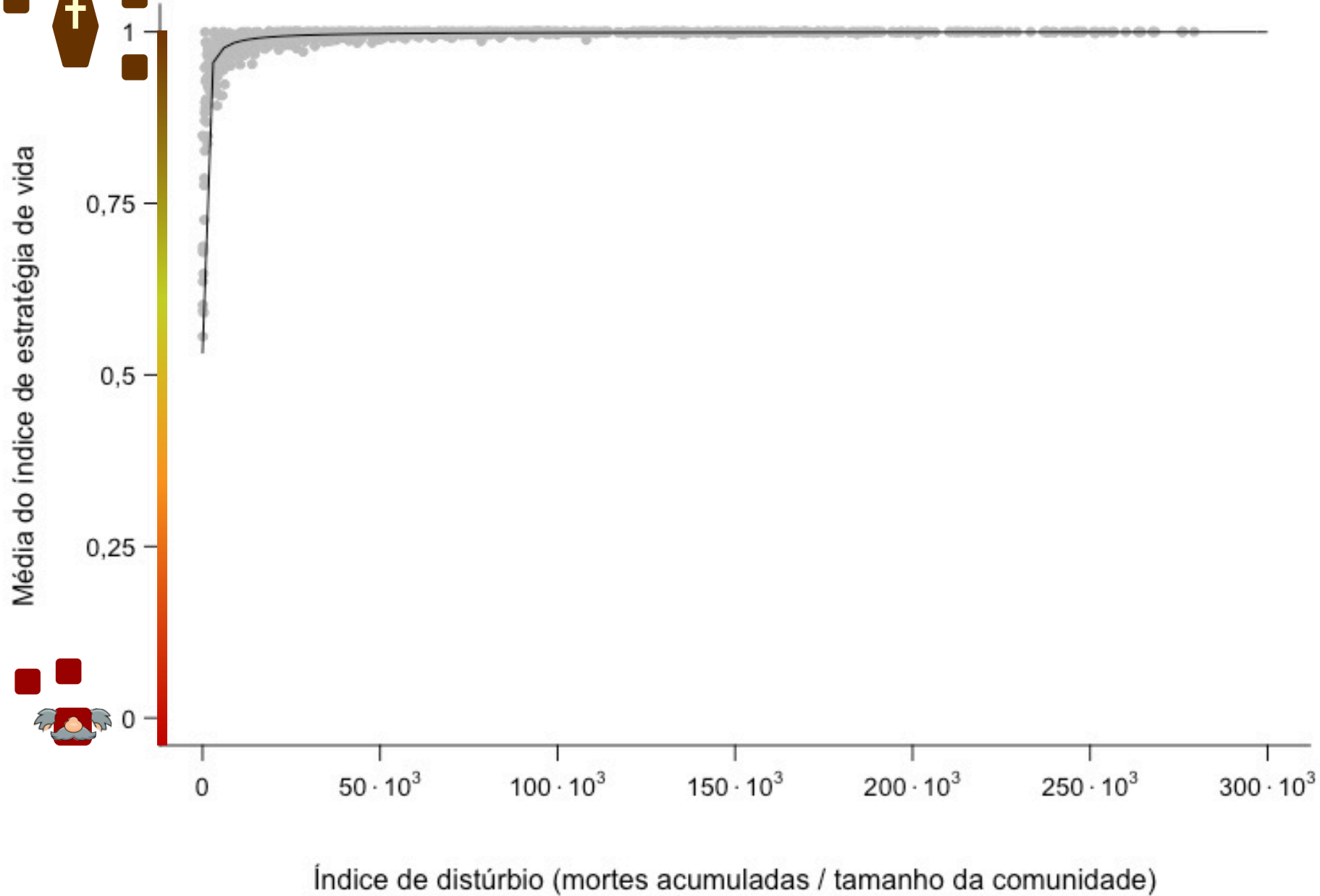


**ecológico**



# estratégia média

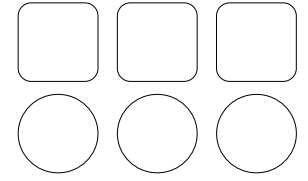
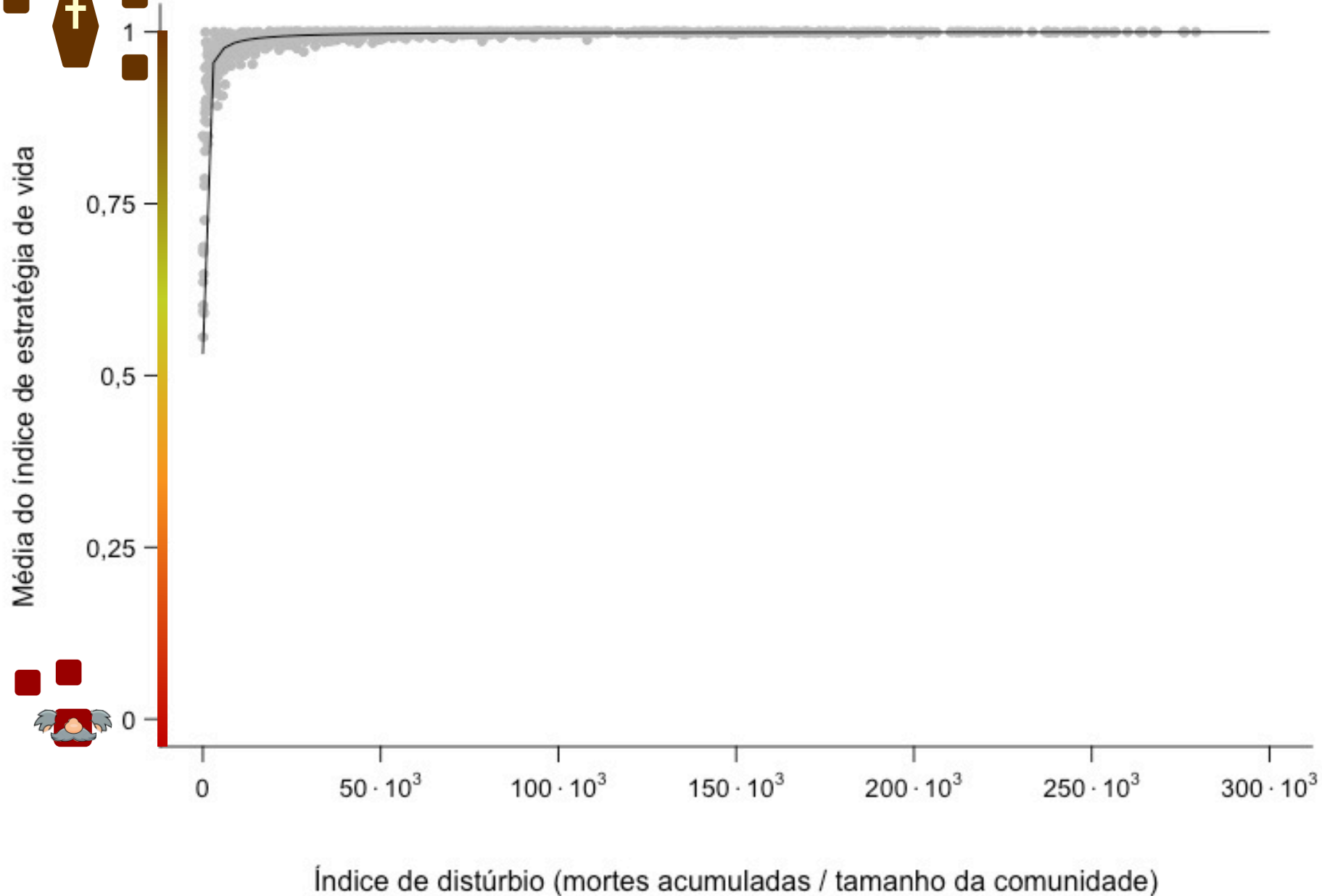
resultados e discussão ● ● ●



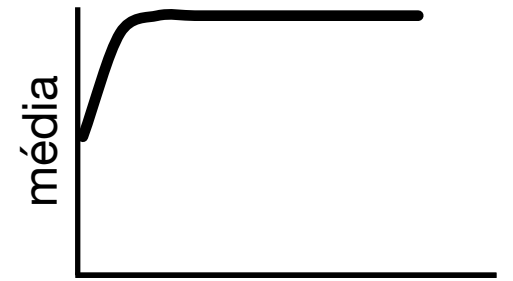
ecológico

# estratégia média

resultados e discussão ● ● ●

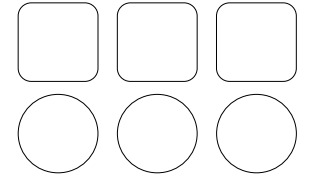
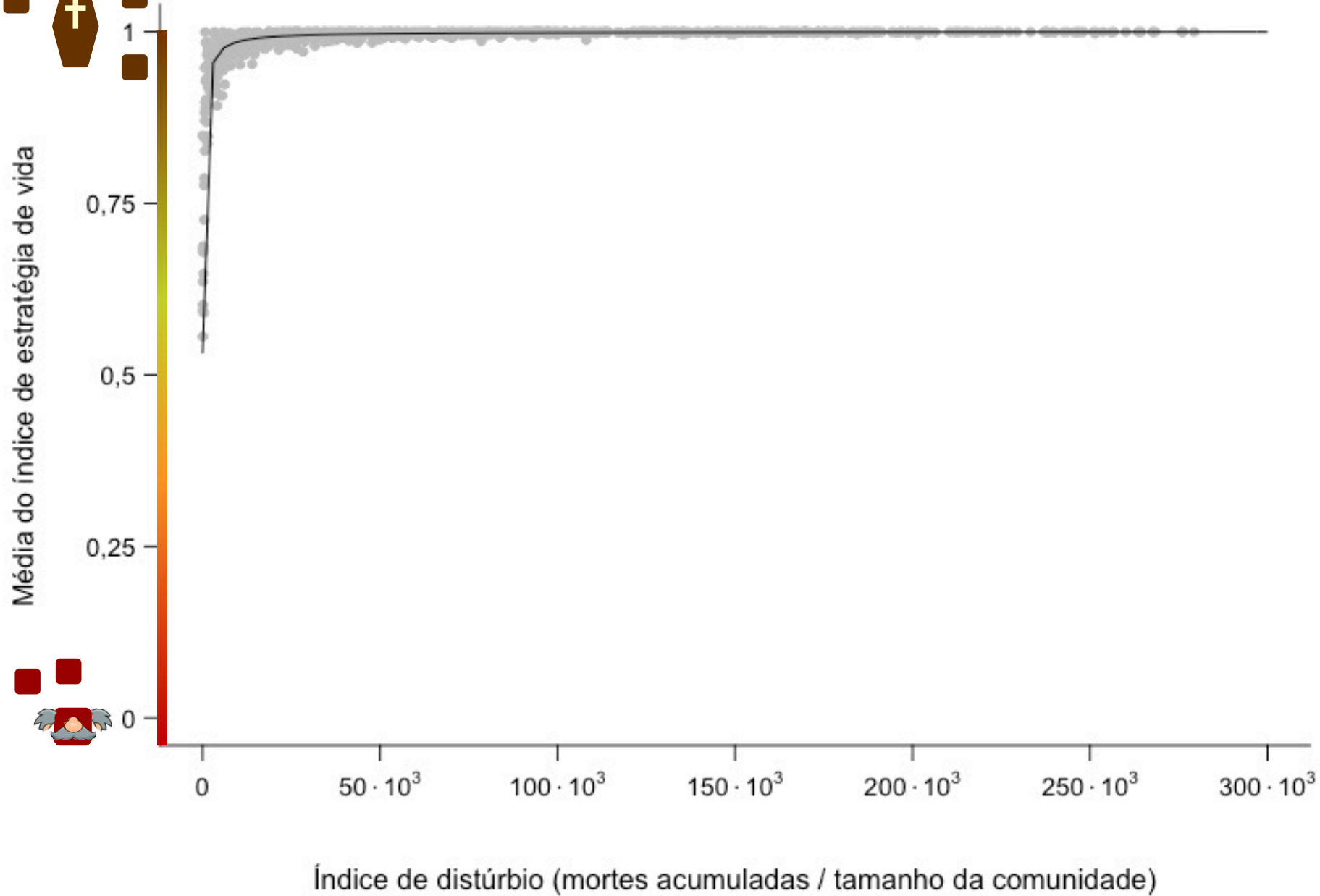


**ecológico**

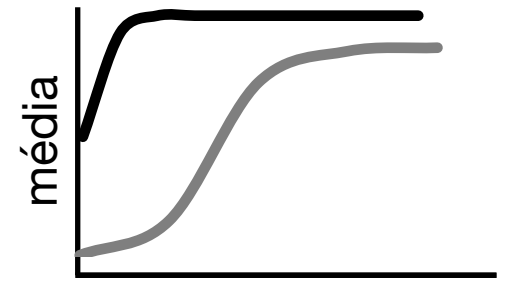


# estratégia média

resultados e discussão ● ● ●

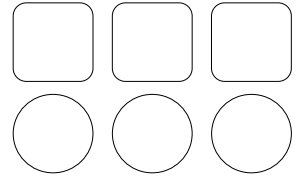
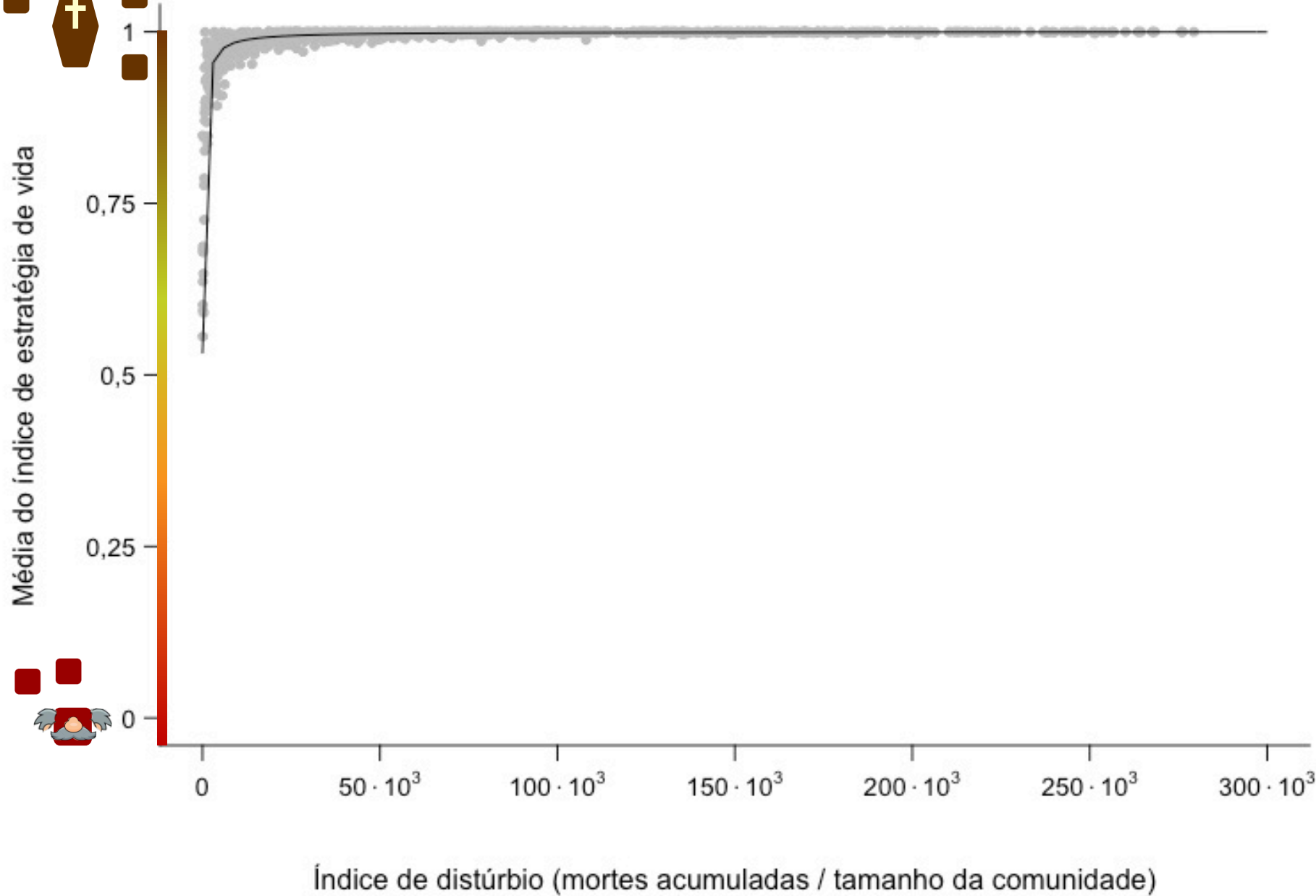


**ecológico**

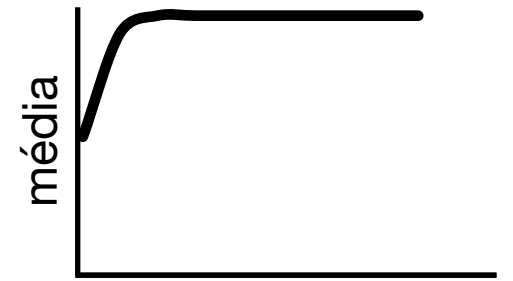


# estratégia média

resultados e discussão ● ● ●

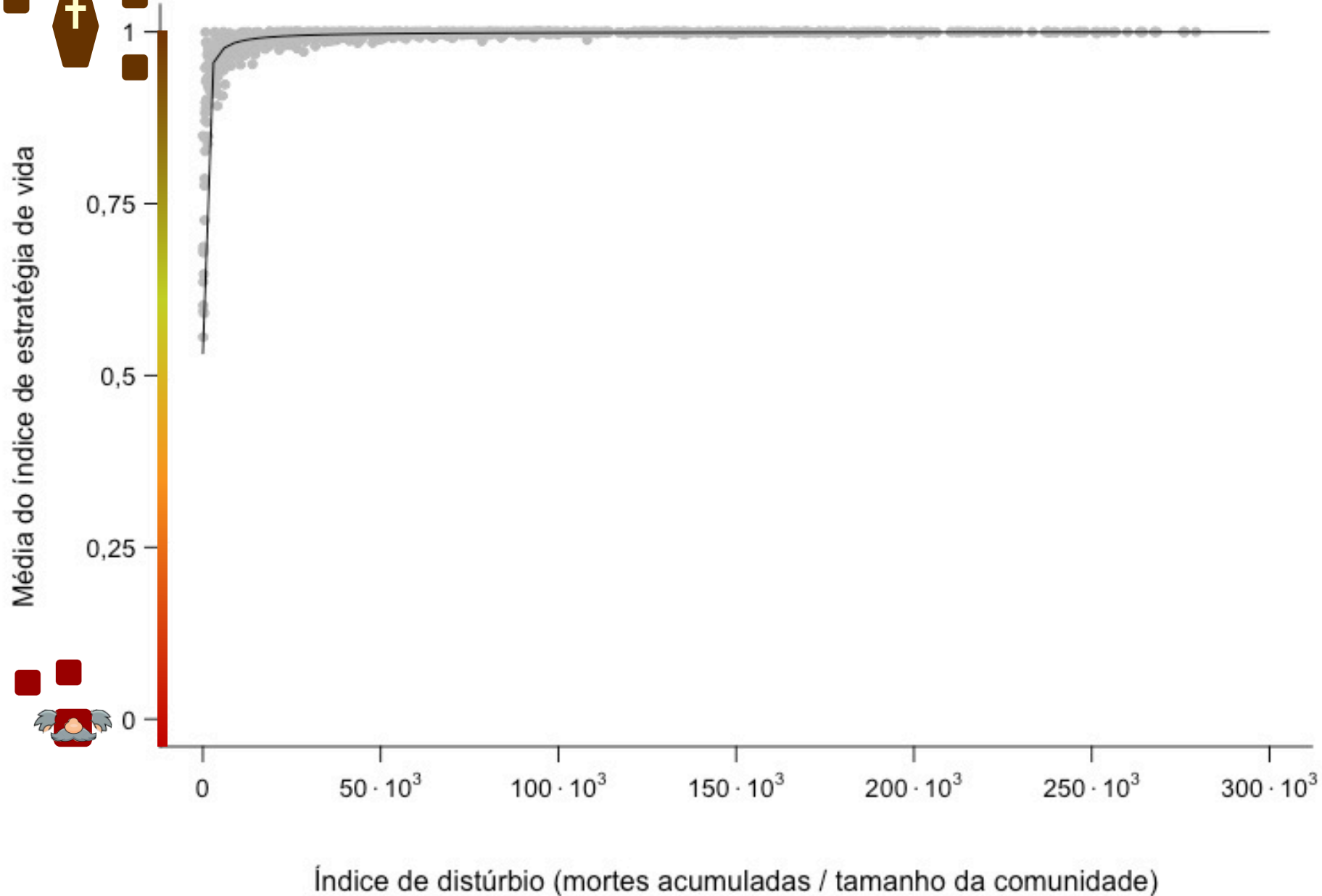


**ecológico**

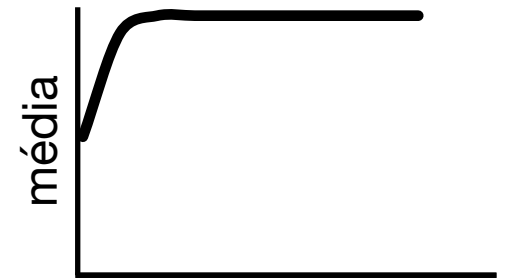


# estratégia média

resultados e discussão

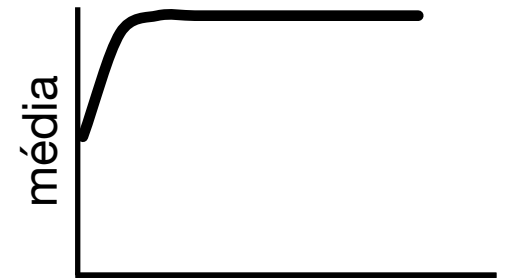


ecológico



# exclusão competitiva de espécies

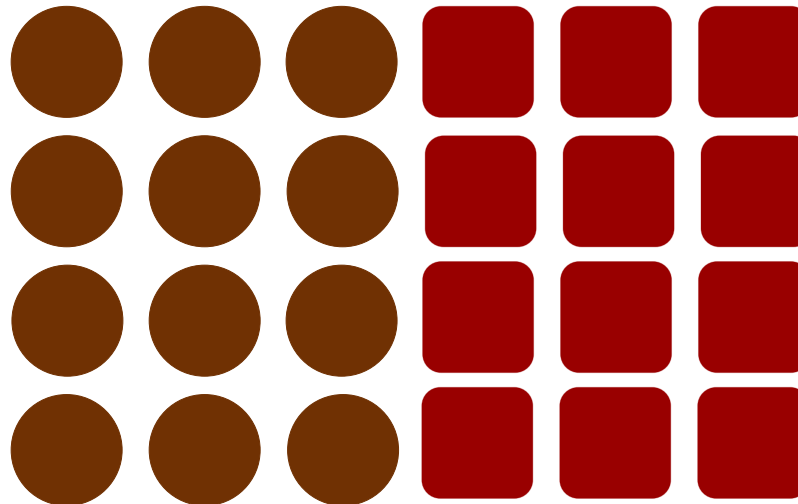
  
**ecológico**



banco

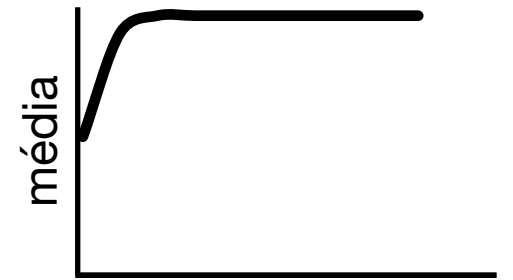
 x 96

 x 24



# exclusão competitiva de espécies

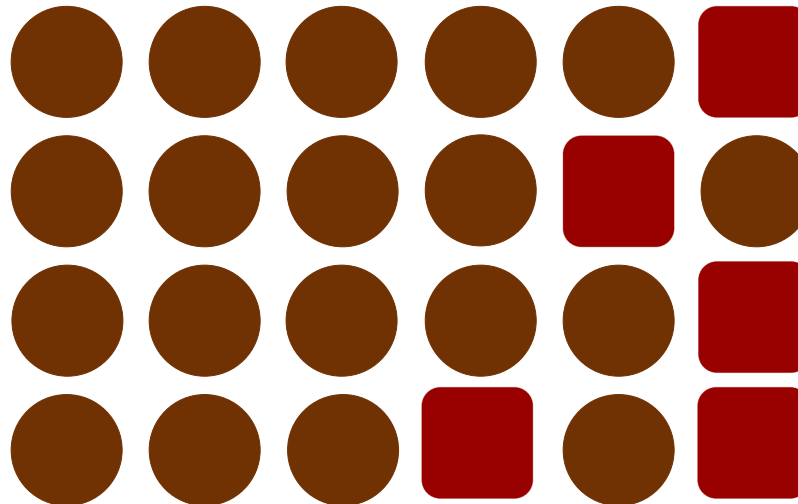
ecológico



banco

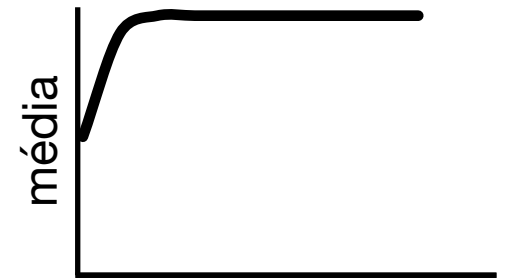
● x 152

■ x 10



# exclusão competitiva de espécies

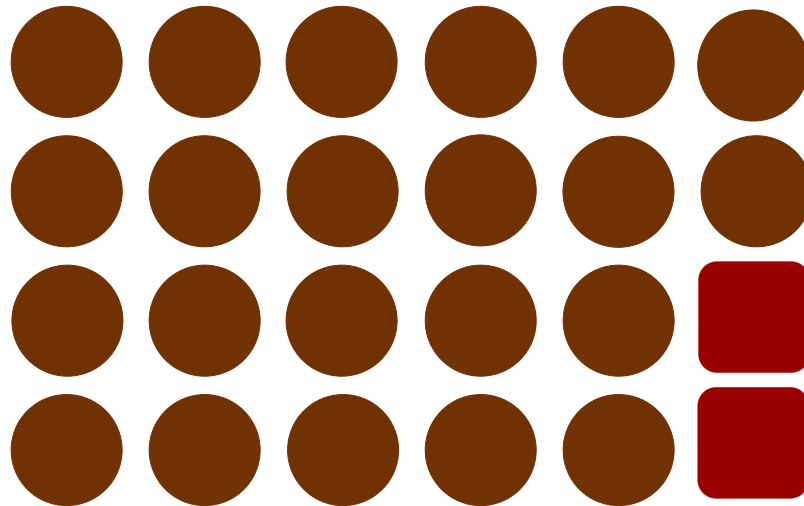
● ● ●  
● ● ●  
**ecológico**



banco

● x 176

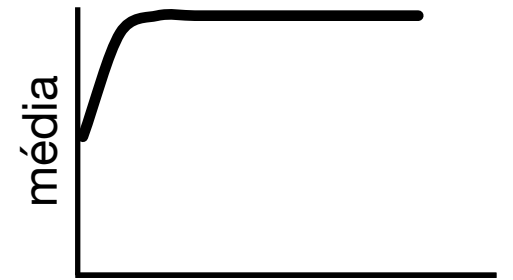
■ x 4





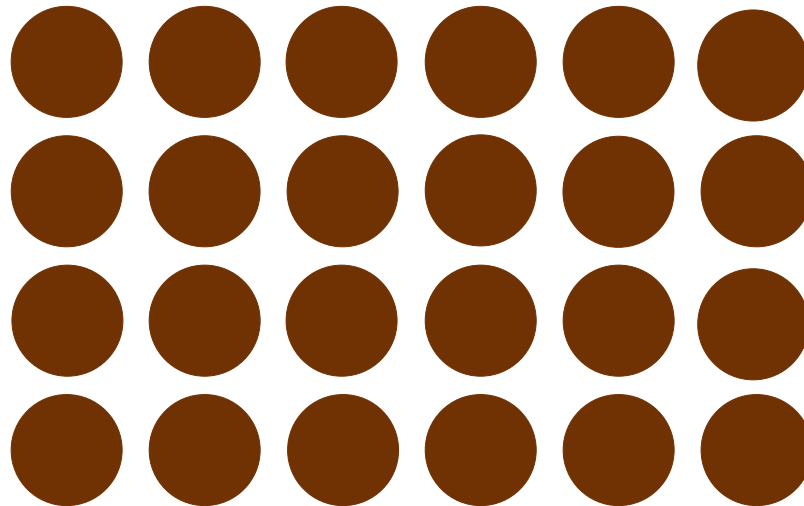
# exclusão competitiva de espécies

● ● ●  
● ● ●  
**ecológico**



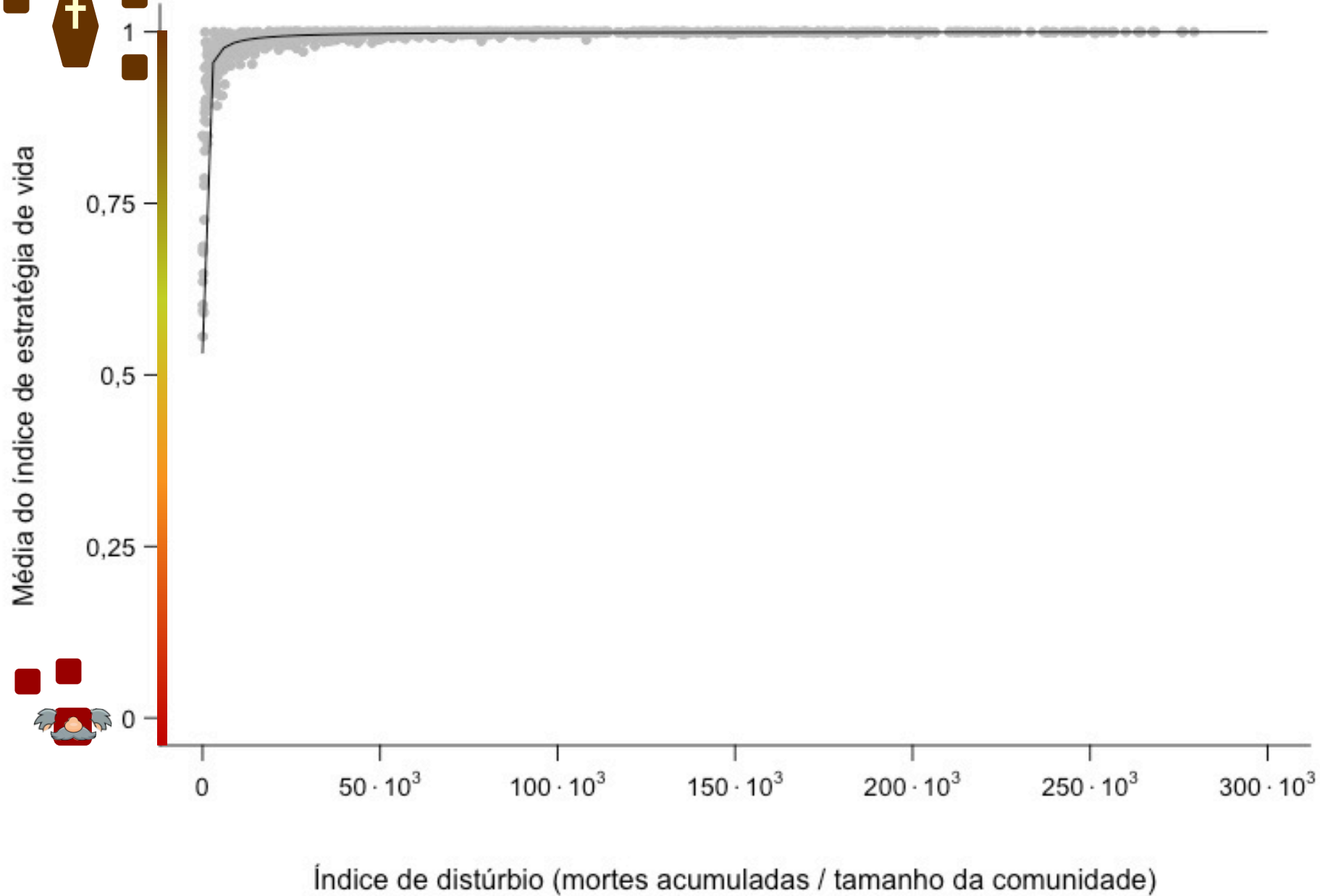
banco

● x 176

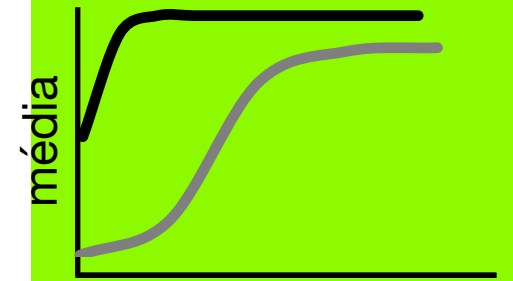


# estratégia média

resultados e discussão



ecológico

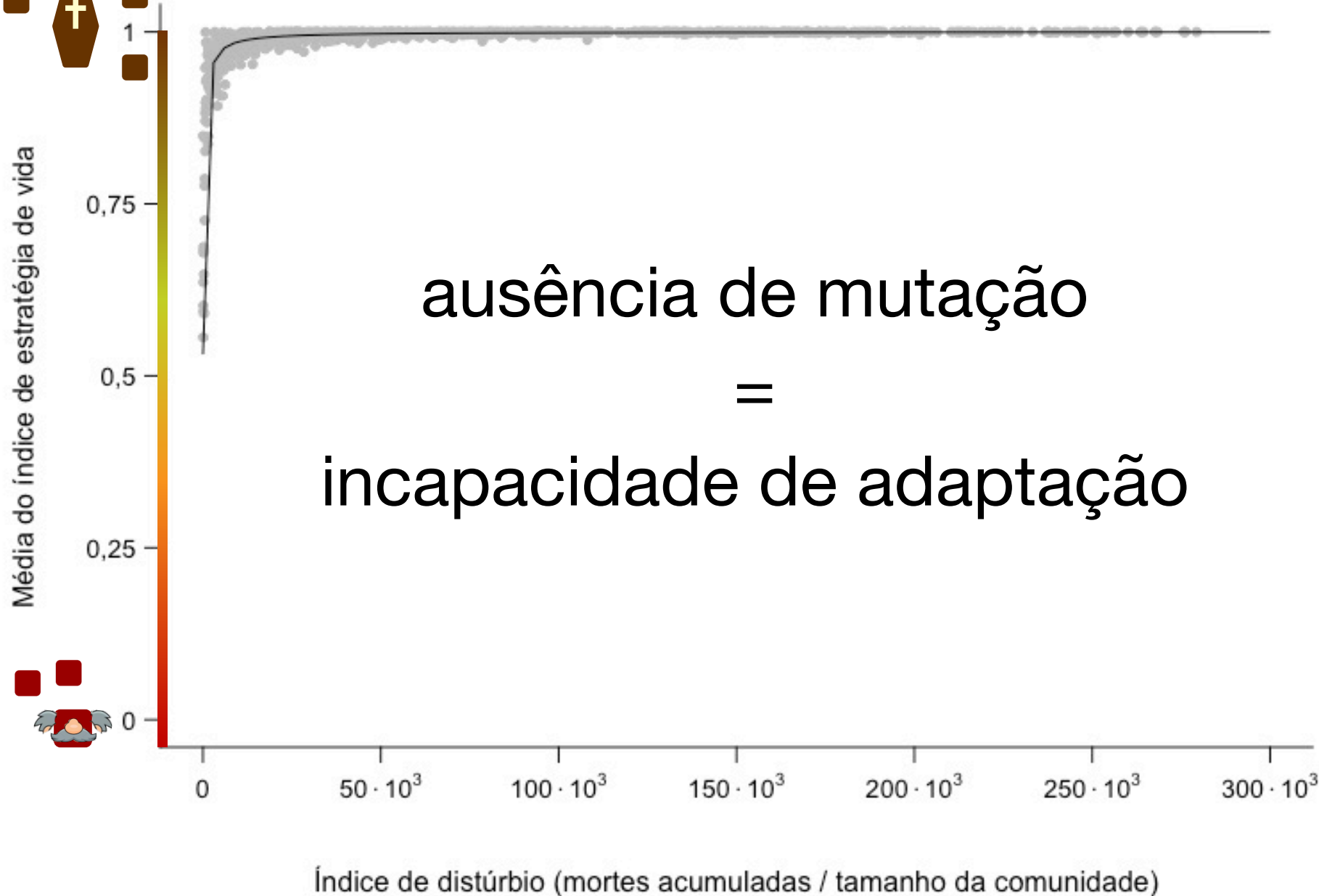


# estratégia média

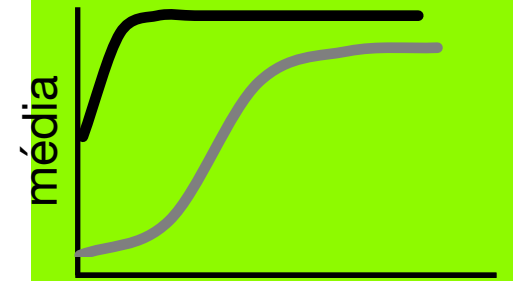
ausência de mutação

=

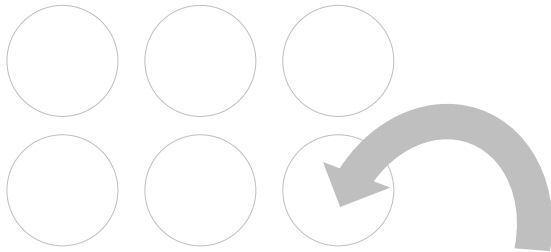
incapacidade de adaptação



ecológico



## evolutivo

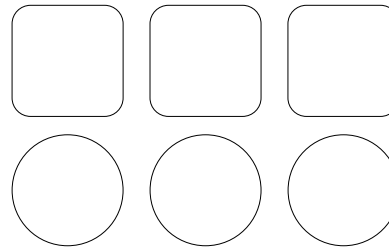


estratégia média

diversidade  
de estratégias

-

## ecológico

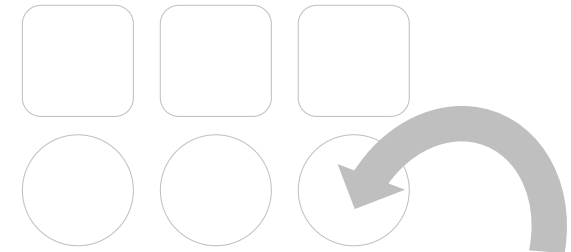


estratégia média

diversidade  
de estratégias

heterogeneidade  
interespecífica de  
estratégias

## eco-evolutivo

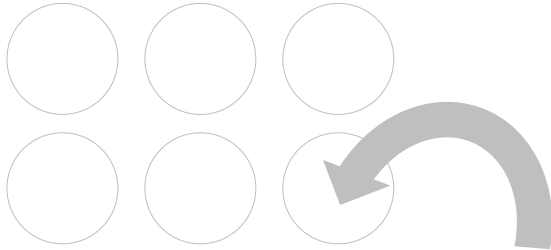


estratégia média

diversidade  
de estratégias

heterogeneidade  
interespecífica de  
estratégias

## evolutivo

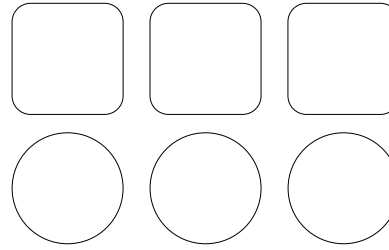


estratégia média

diversidade  
de estratégias

-

## ecológico

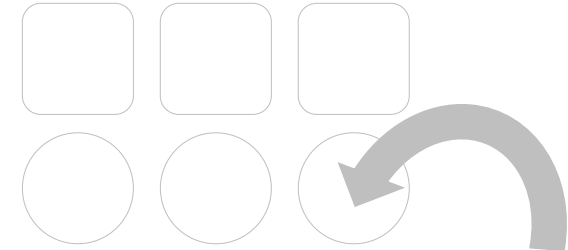


estratégia média

diversidade  
de estratégias

heterogeneidade  
interespecífica de  
estratégias

## eco-evolutivo

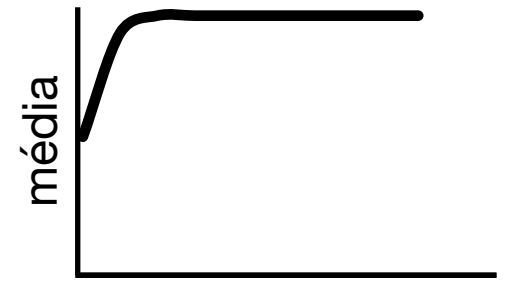
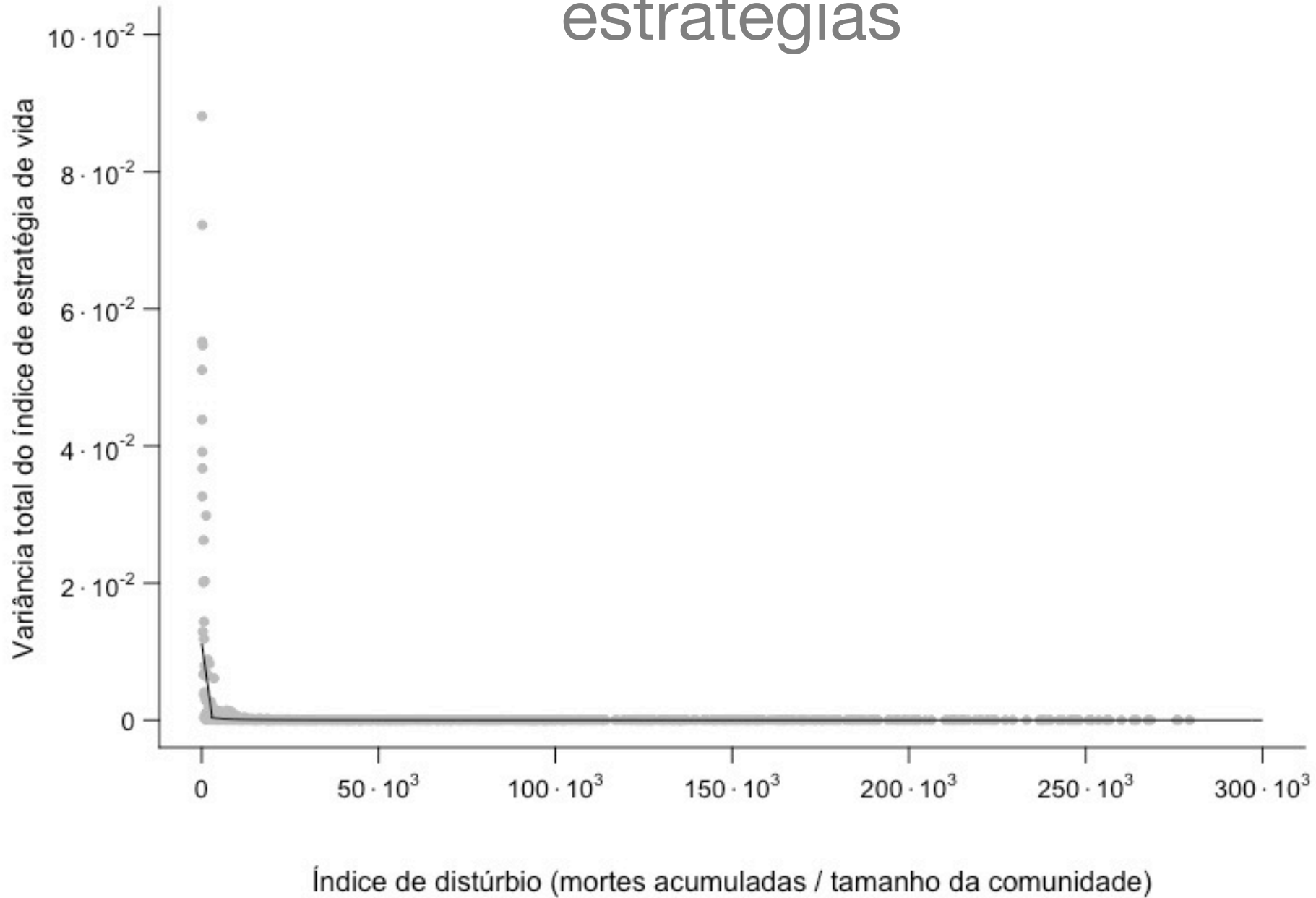


estratégia média

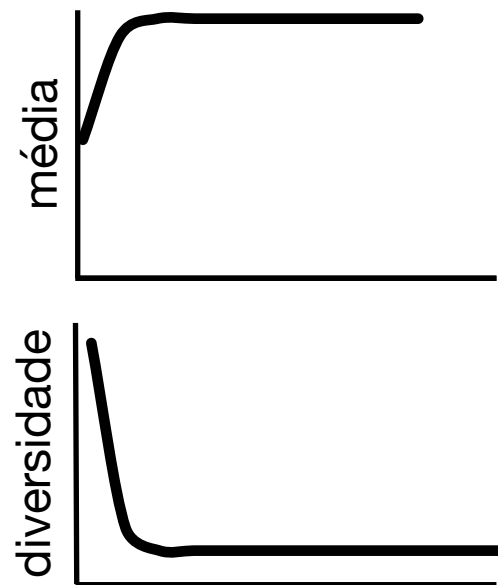
diversidade  
de estratégias

heterogeneidade  
interespecífica de  
estratégias

# diversidade de estratégias

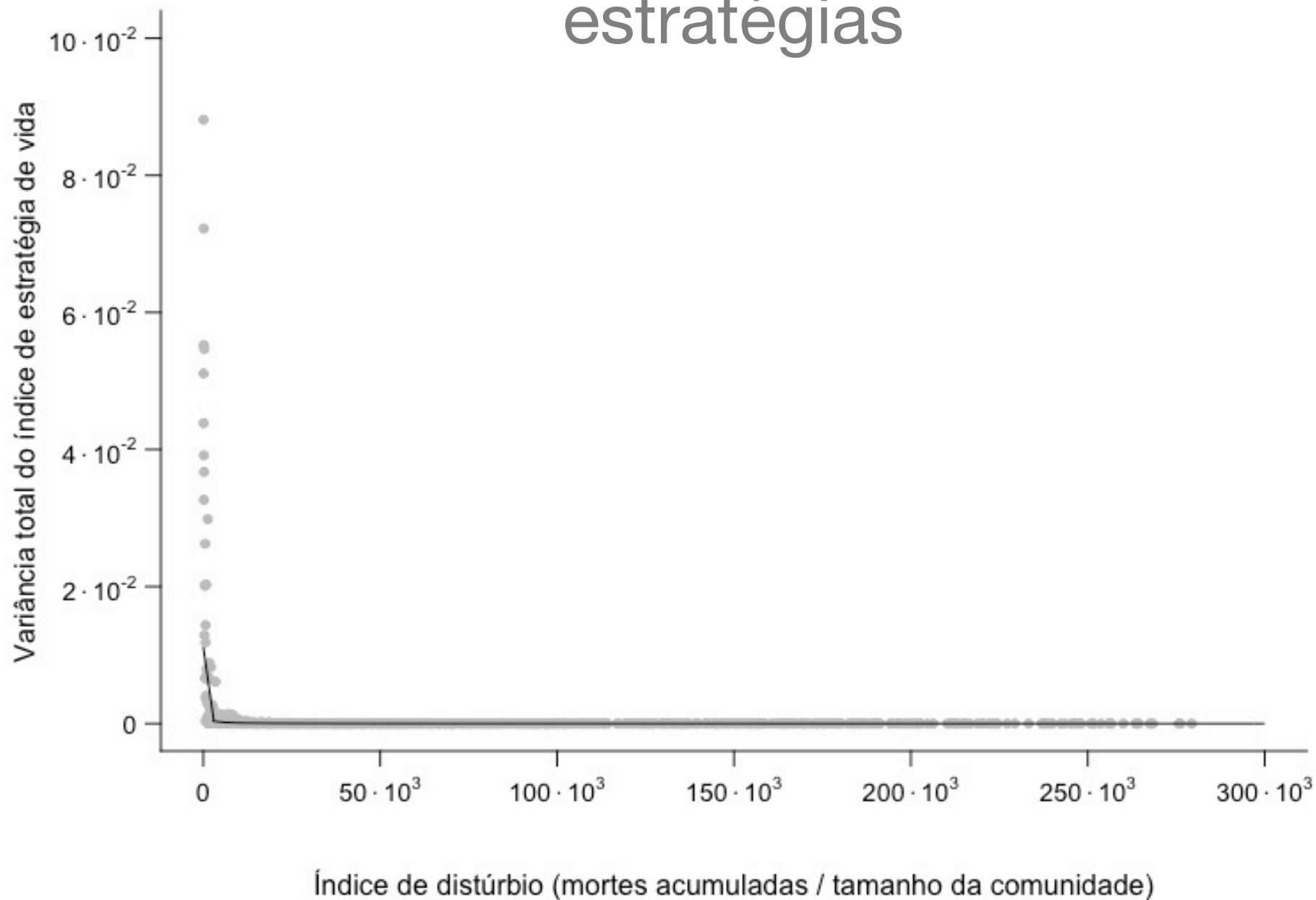


## resultados e discussão ● ● ●

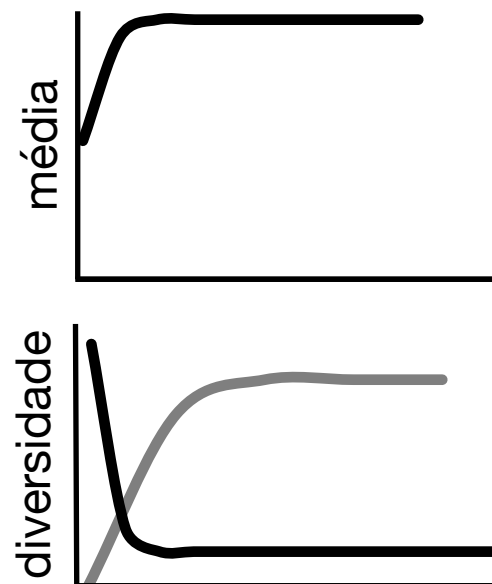


# diversidade de estratégias

resultados e discussão ● ● ●

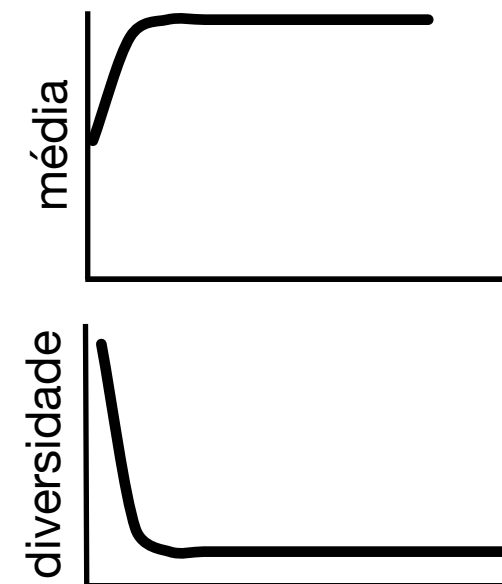


ecológico

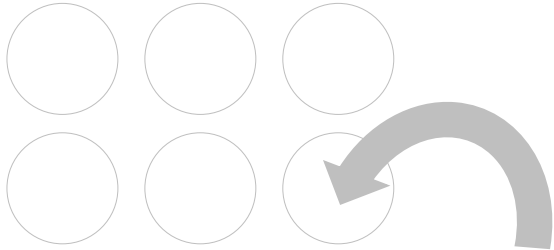




## resultados e discussão ● ● ●



## evolutivo

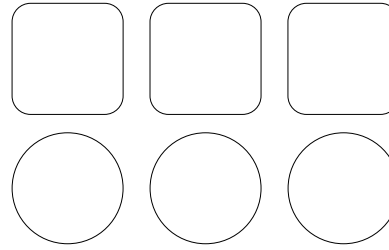


estratégia média

diversidade  
de estratégias

-

## ecológico

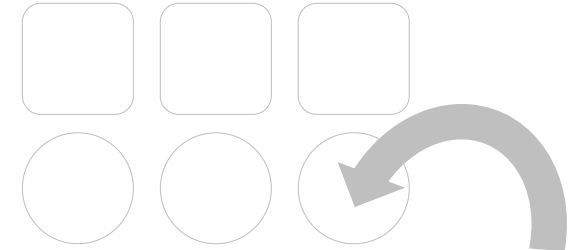


estratégia média

diversidade  
de estratégias

heterogeneidade  
interespecífica de  
estratégias

## eco-evolutivo

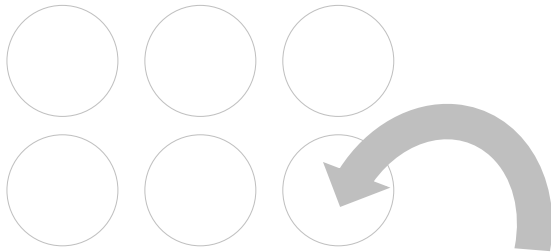


estratégia média

diversidade  
de estratégias

heterogeneidade  
interespecífica de  
estratégias

## evolutivo

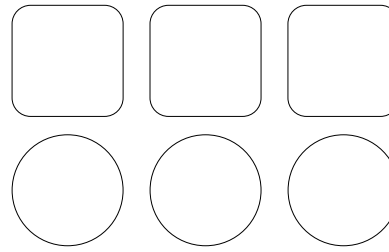


estratégia média

diversidade  
de estratégias

–

## ecológico

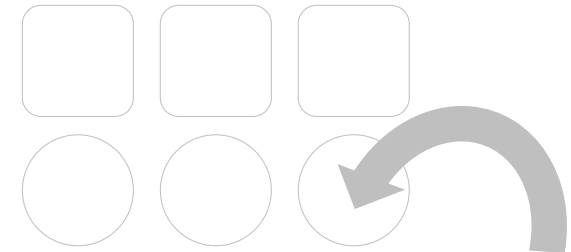


estratégia média

diversidade  
de estratégias

heterogeneidade  
interespecífica de  
estratégias

## eco-evolutivo

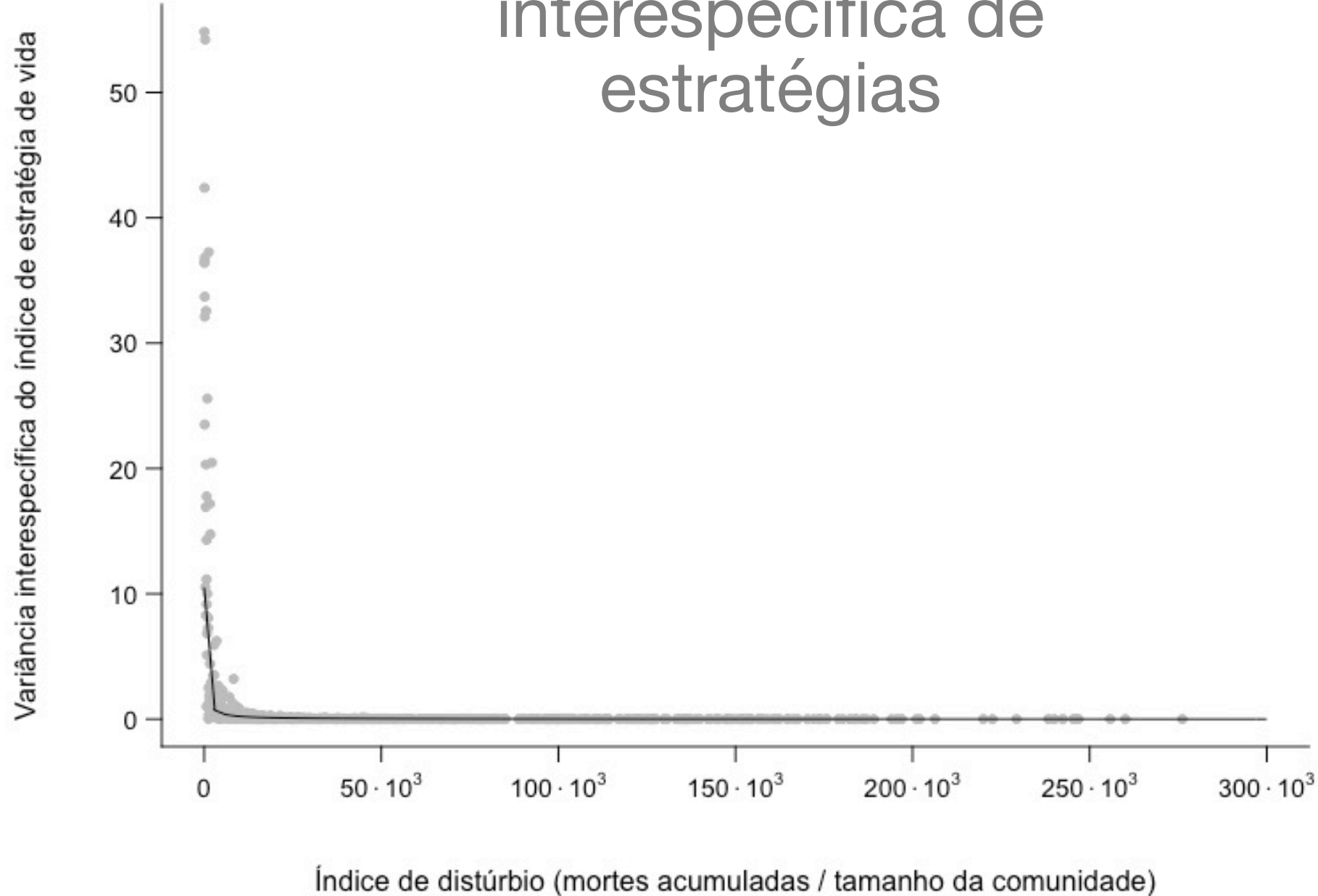


estratégia média

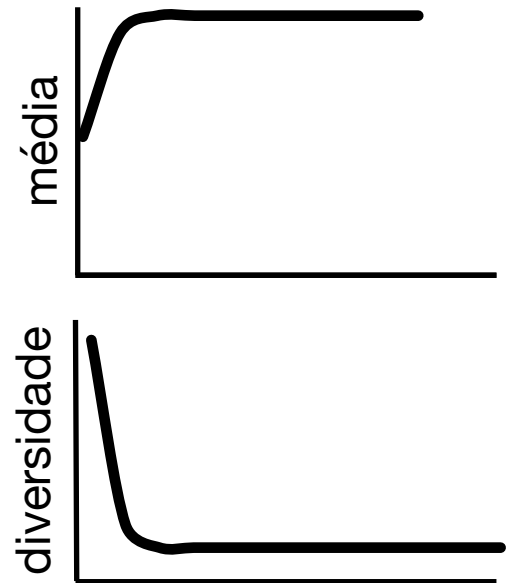
diversidade  
de estratégias

heterogeneidade  
interespecífica de  
estratégias

# heterogeneidade interespecífica de estratégias

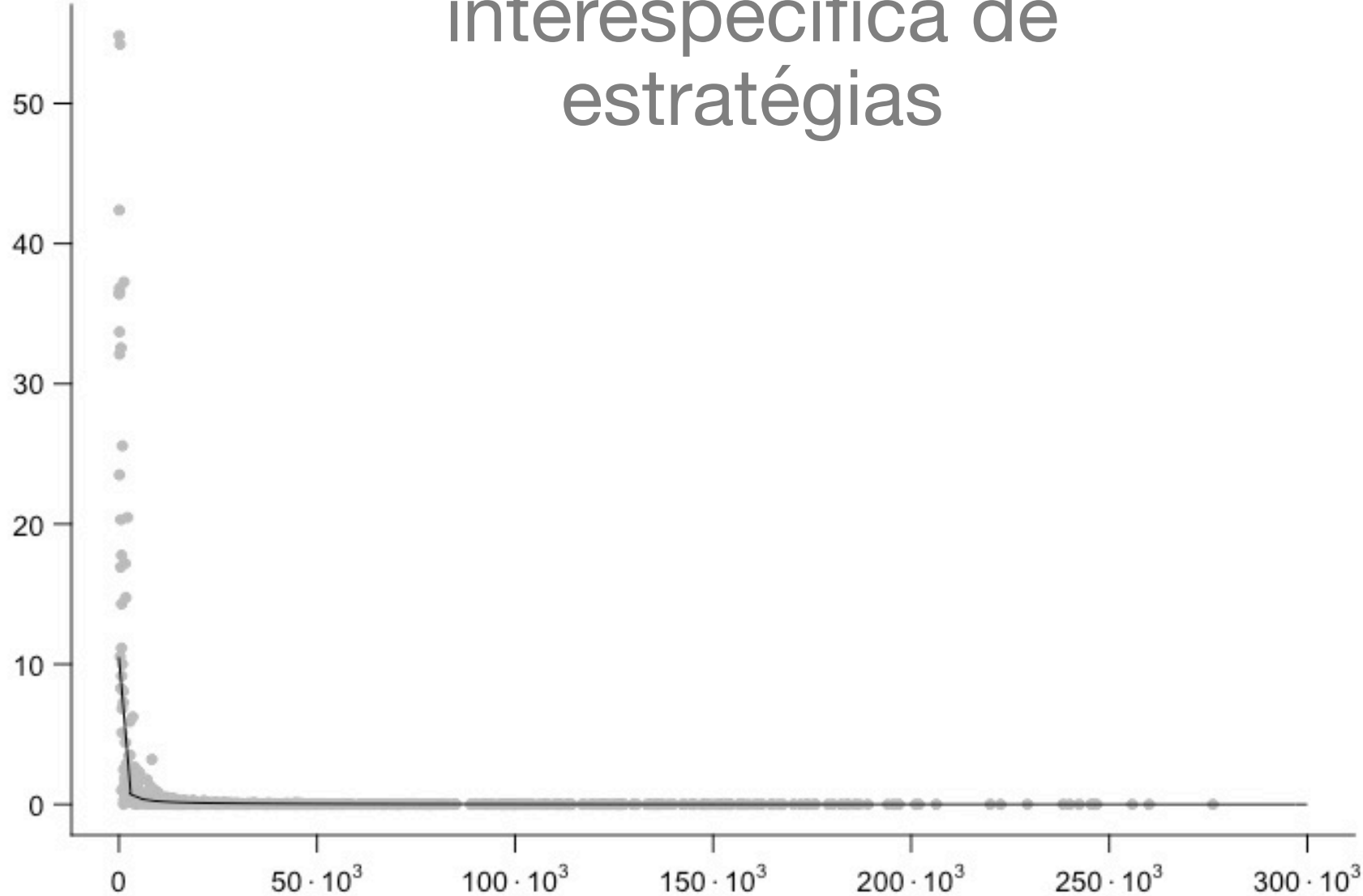


ecológico



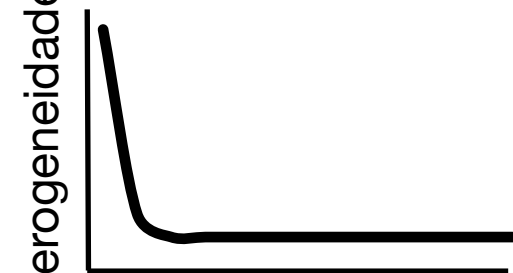
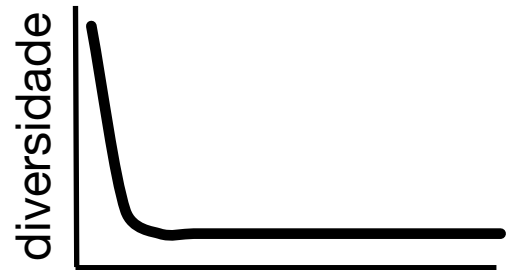
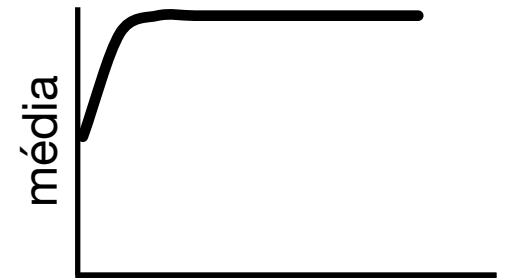
# heterogeneidade interespecífica de estratégias

Variação interespecífica do índice de estratégia de vida



Índice de distúrbio (mortes acumuladas / tamanho da comunidade)

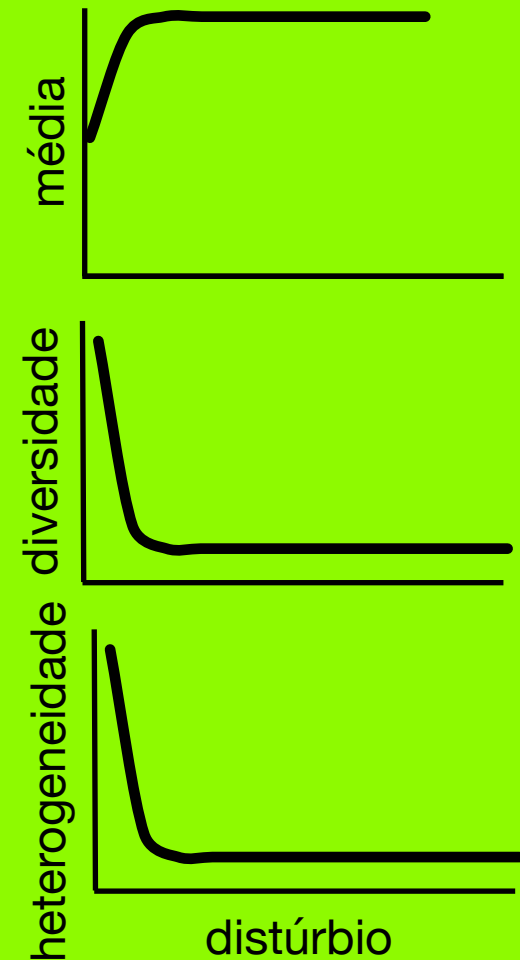
ecológico



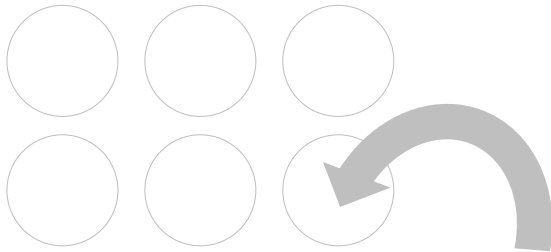
distúrbio

## Queda na diversidade:

- Maiores chances de **morte de populações inteiras** por distúrbio
- Redução nos tamanhos populacionais:
  - **Exclusão competitiva mais rápida**
  - Efeito simultâneo da **deriva ecológica**



## evolutivo

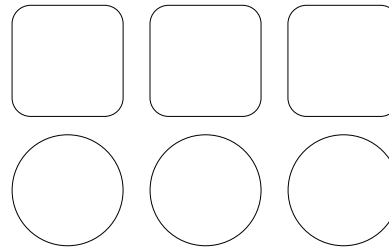


estratégia média

diversidade  
de estratégias

–

## ecológico

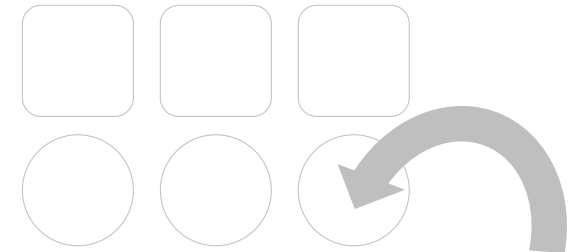


estratégia média

diversidade  
de estratégias

heterogeneidade  
interespecífica de  
estratégias

## eco-evolutivo

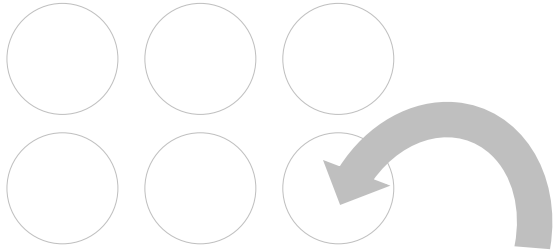


estratégia média

diversidade  
de estratégias

heterogeneidade  
interespecífica de  
estratégias

## evolutivo

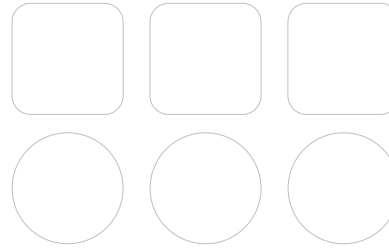


estratégia média

diversidade  
de estratégias

-

## ecológico

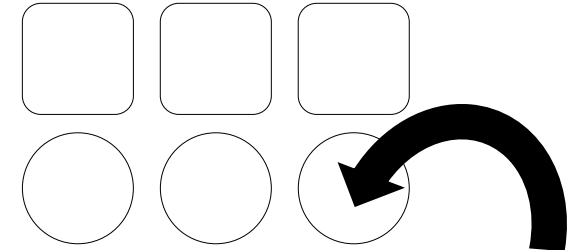


estratégia média

diversidade  
de estratégias

heterogeneidade  
interespecífica de  
estratégias

## eco-evolutivo

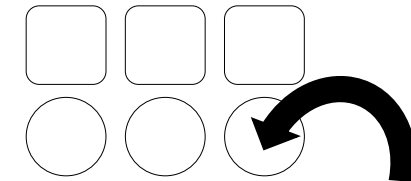


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diversidade  
de estratégias

heterogeneidade  
interespecífica de  
estratégias

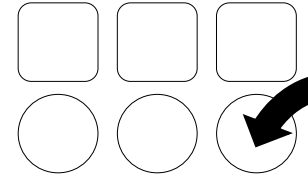




**eco-evolutivo**

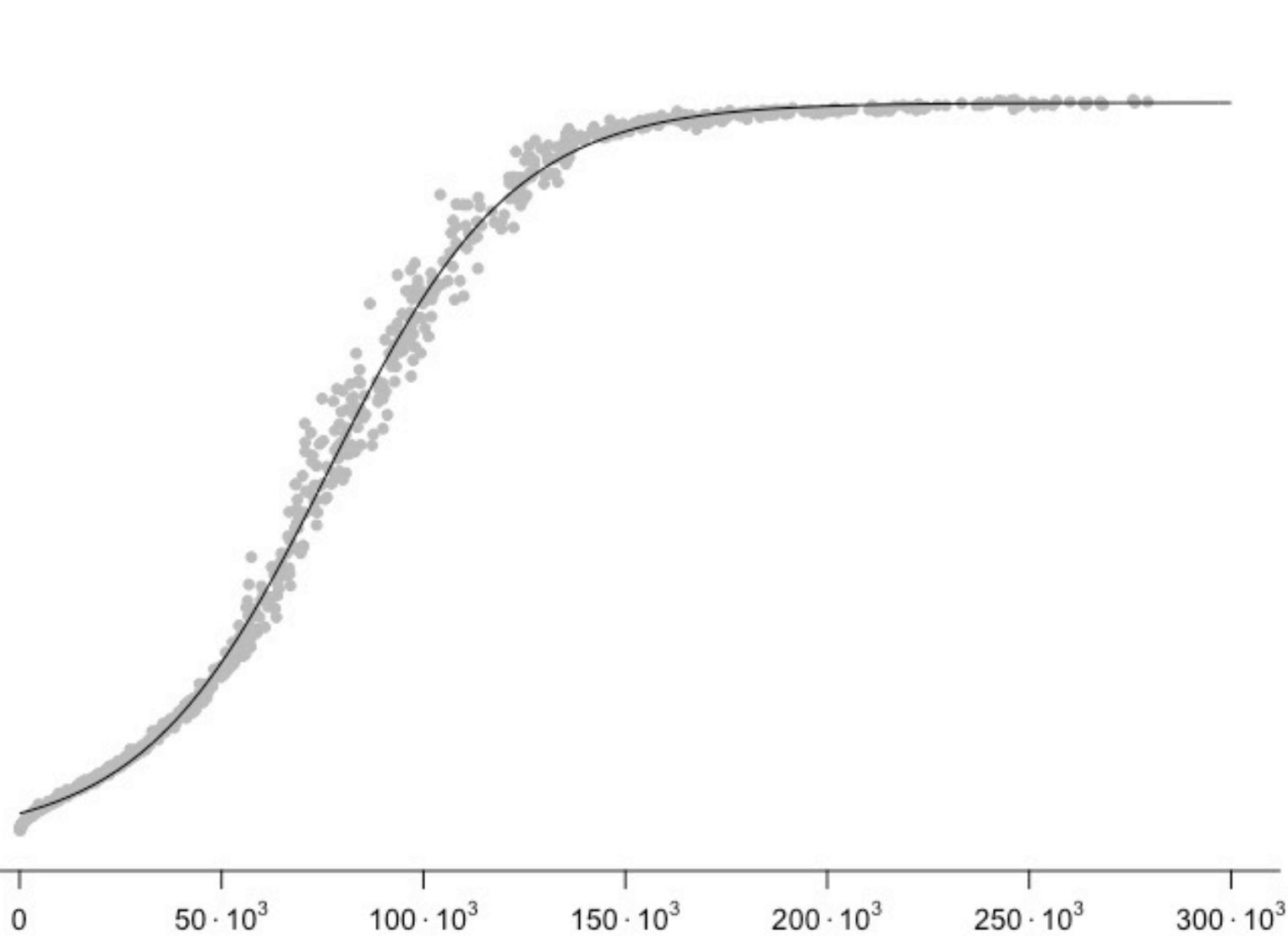
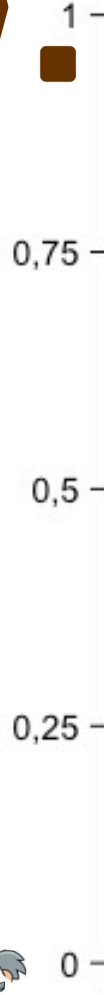
# estratégia média

resultados e discussão ● ● ●



**eco-evolutivo**

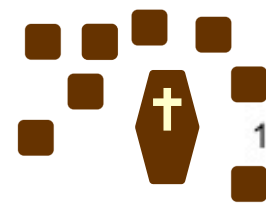
Média do índice de estratégia de vida



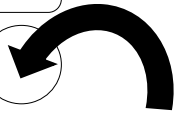
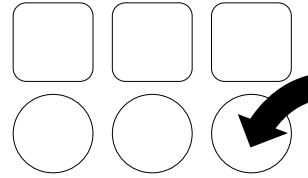
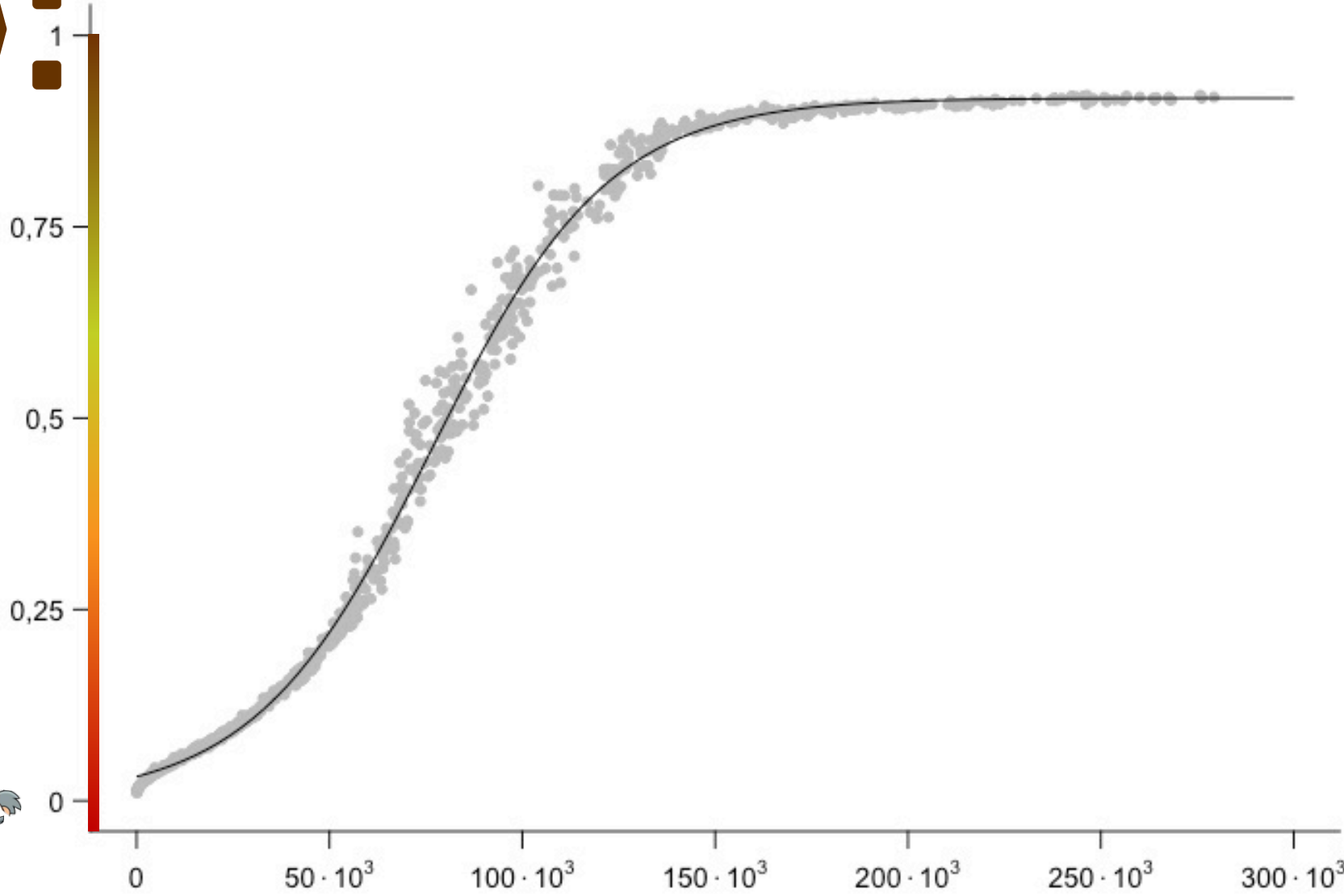
Índice de distúrbio (mortes acumuladas / tamanho da comunidade)

# estratégia média

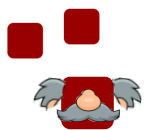
resultados e discussão ● ● ●



Média do índice de estratégia de vida



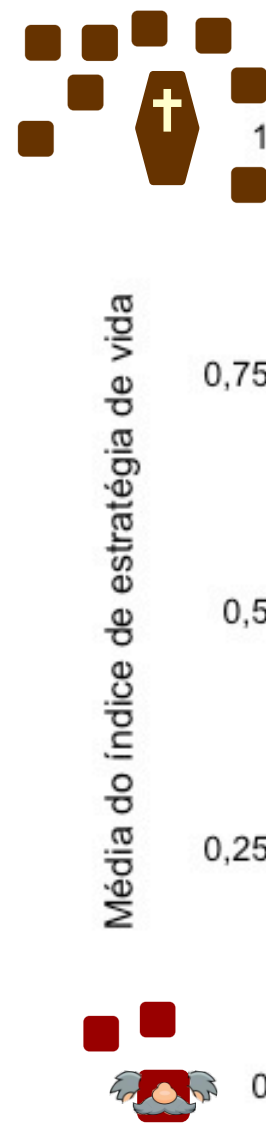
**eco-evolutivo**



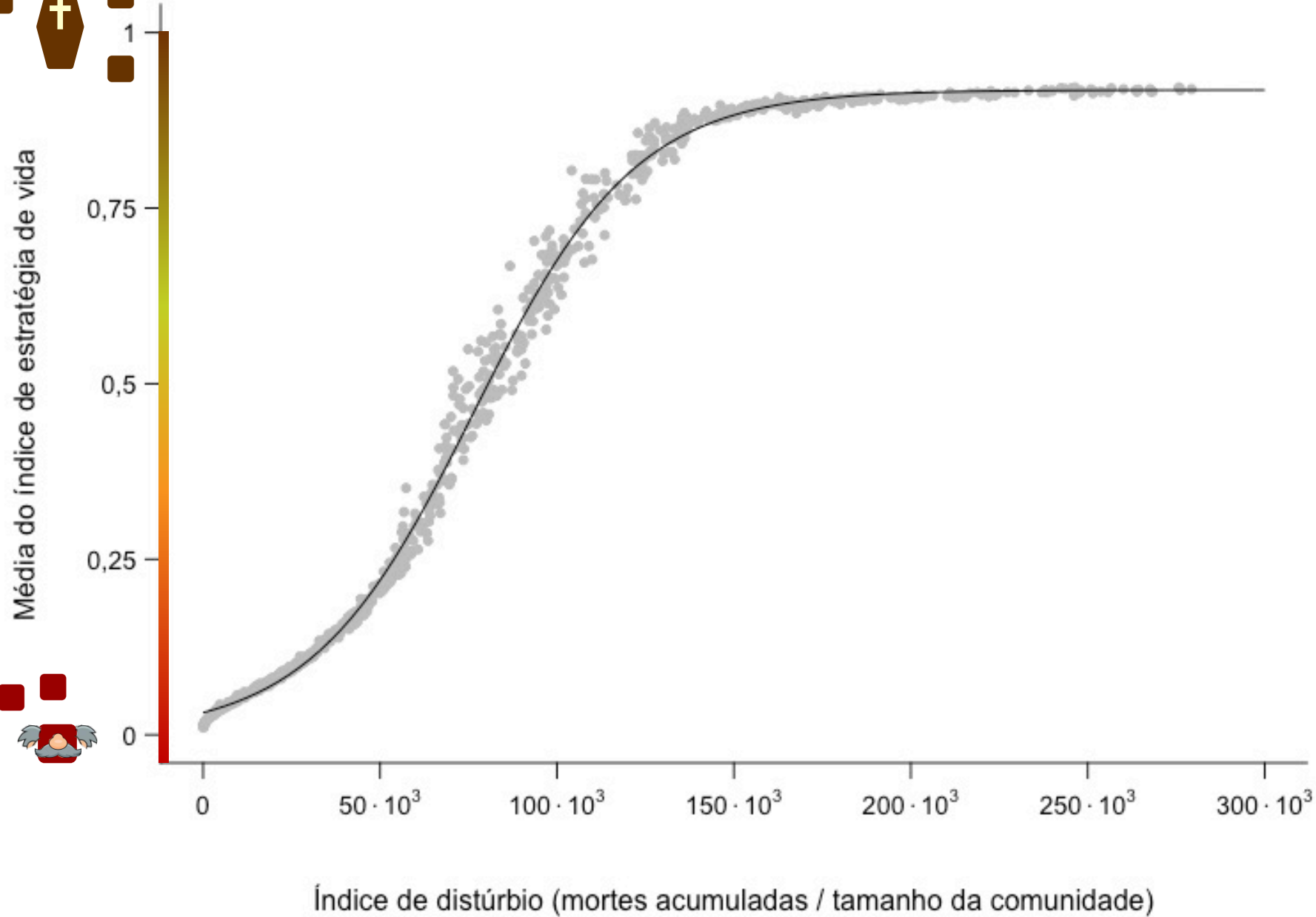
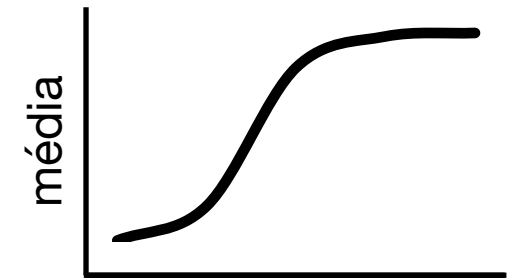
Índice de distúrbio (mortes acumuladas / tamanho da comunidade)

# estratégia média

resultados e discussão

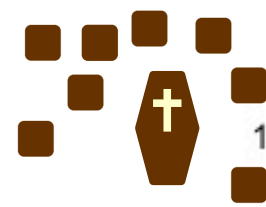


eco-evolutivo

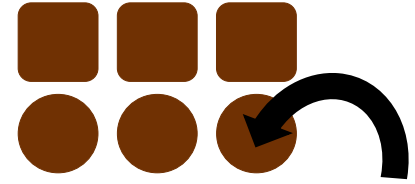
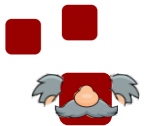
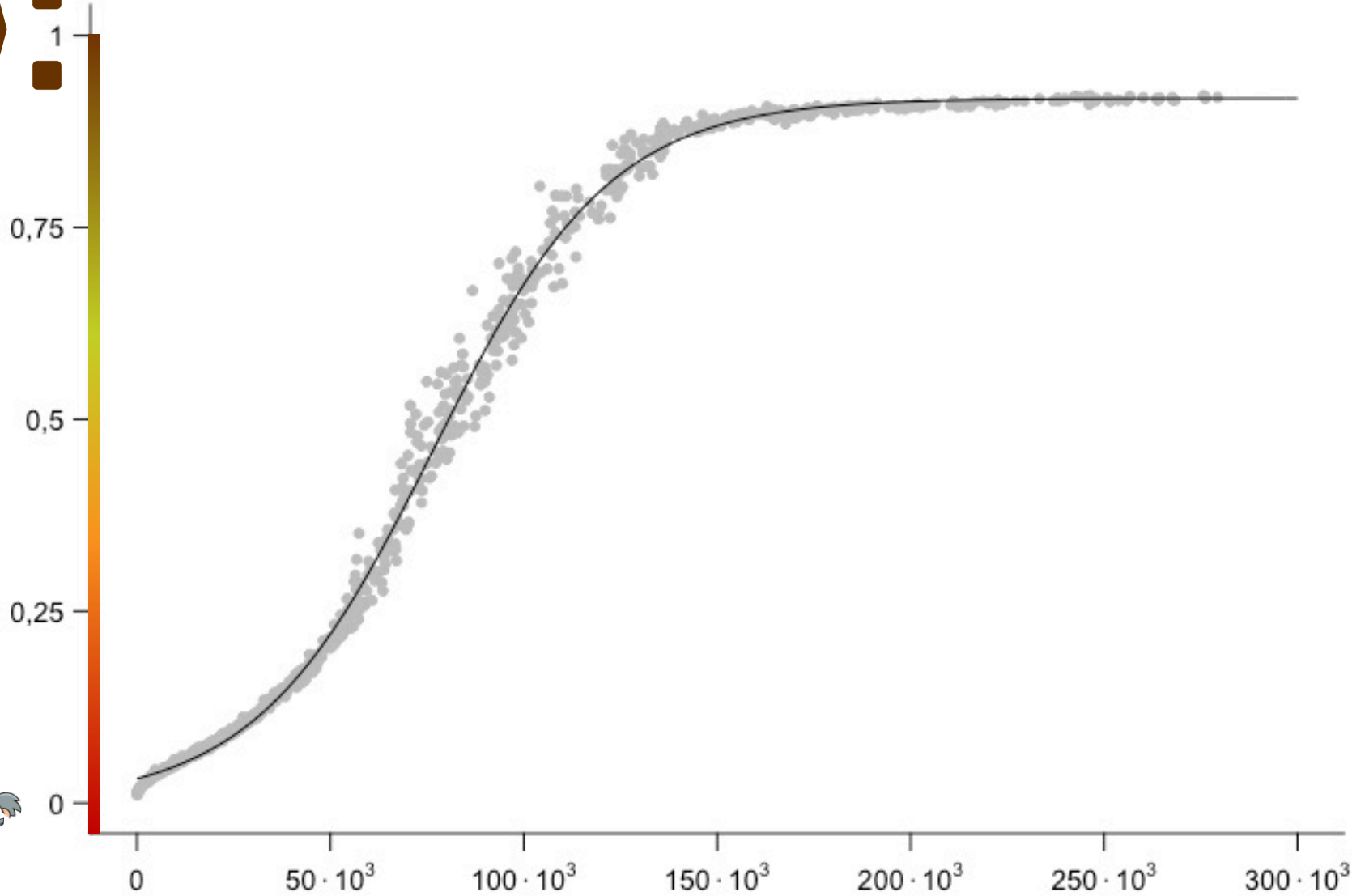


# estratégia média

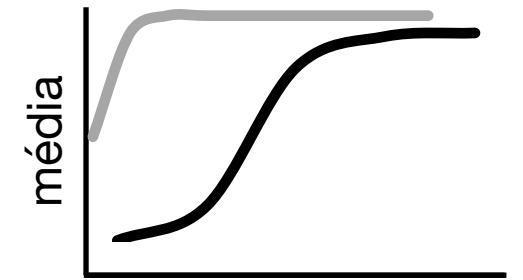
resultados e discussão ● ● ●



Média do índice de estratégia de vida



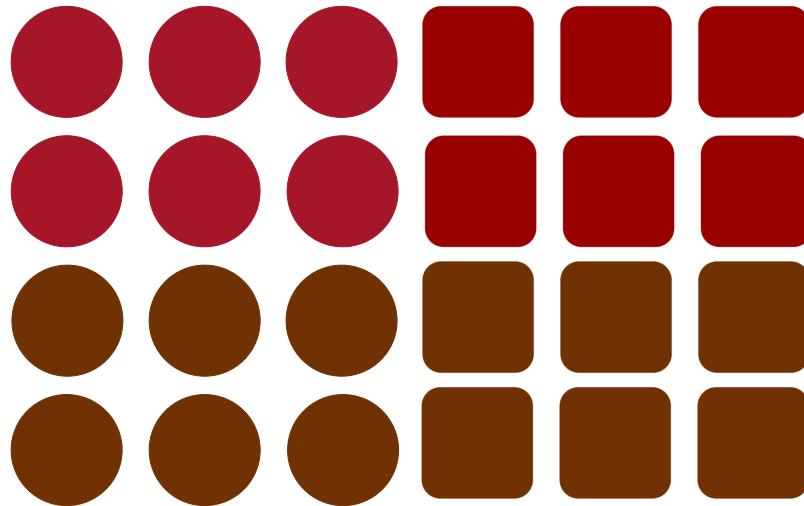
**eco-evolutivo**



Índice de distúrbio (mortes acumuladas / tamanho da comunidade)

banco

- x 48
- x 12
- x 48
- x 12

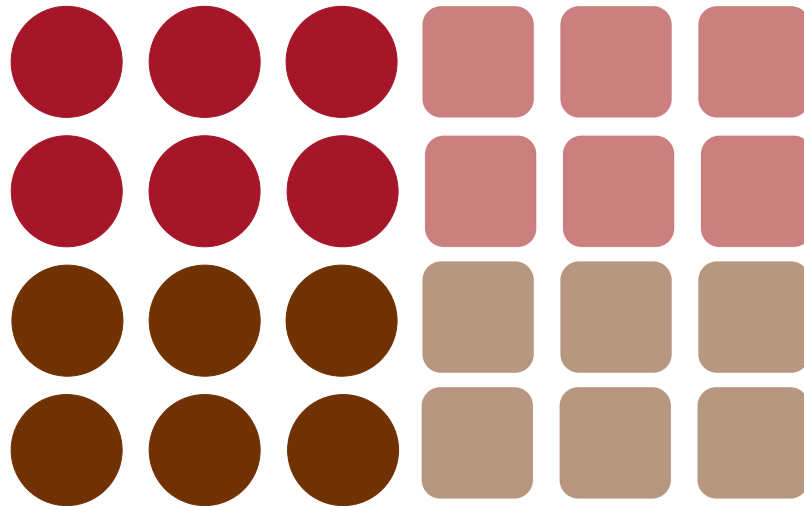


eco-evolutivo

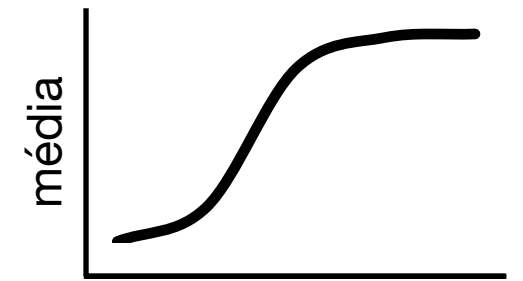


banco

- x 48
- x 12
- x 48
- x 12



eco-evolutivo

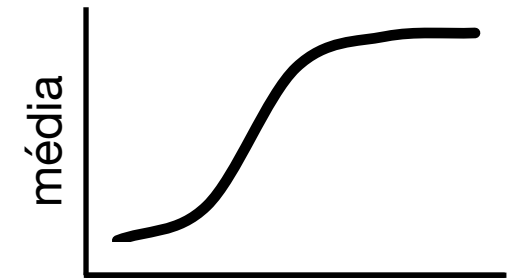
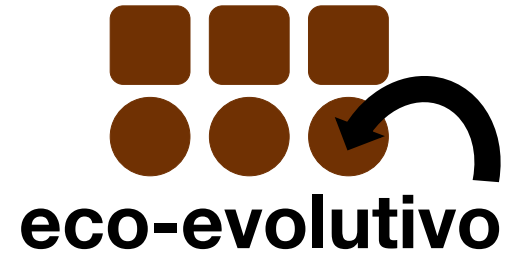
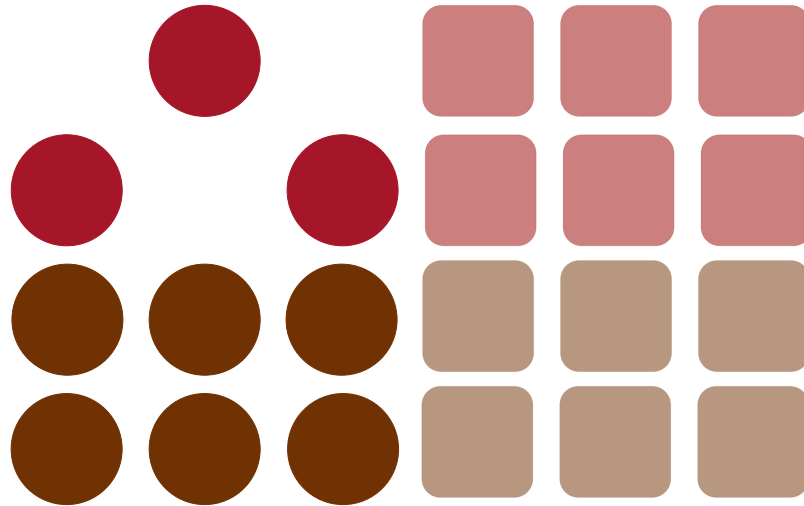


# seleção natural

resultados e discussão ● ● ●

banco

- x 48
- x 12
- x 48
- x 12



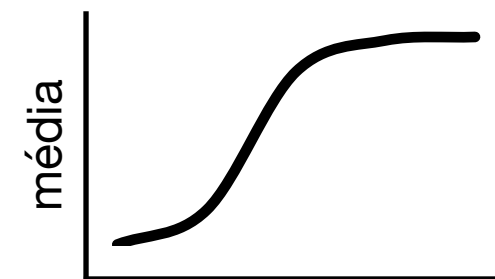
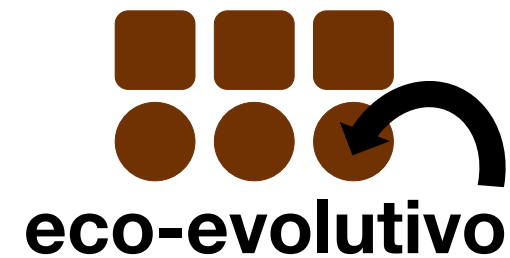
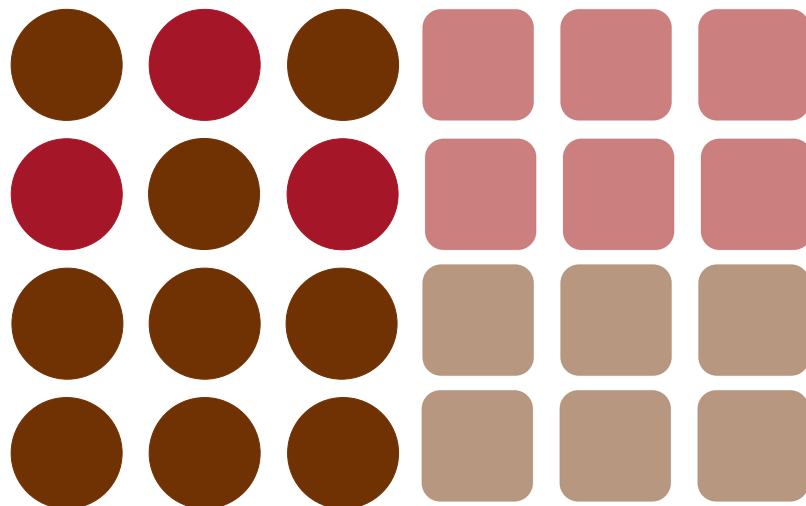


# seleção natural

resultados e discussão ● ● ●

banco

- x 72
- x 6
- x 48
- x 12



# seleção natural + exclusão competitiva de espécies

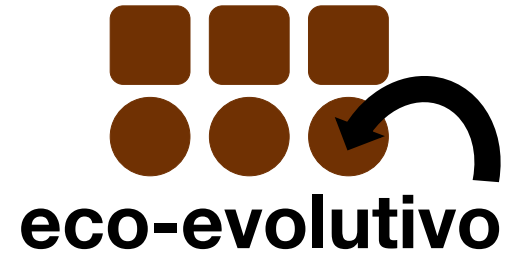
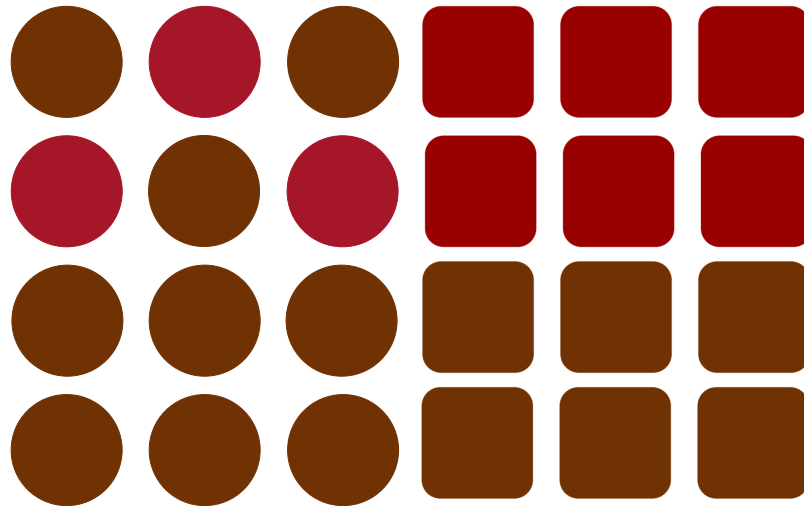
banco

● x 72

● x 6

■ x 48

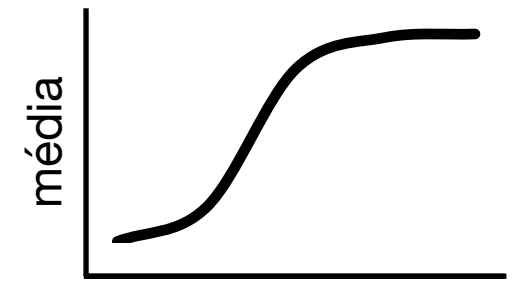
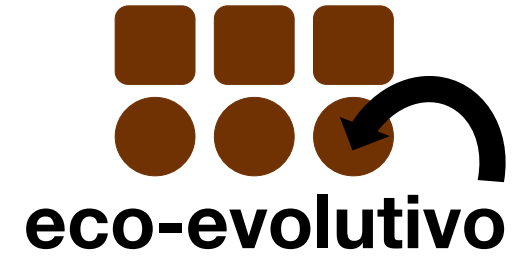
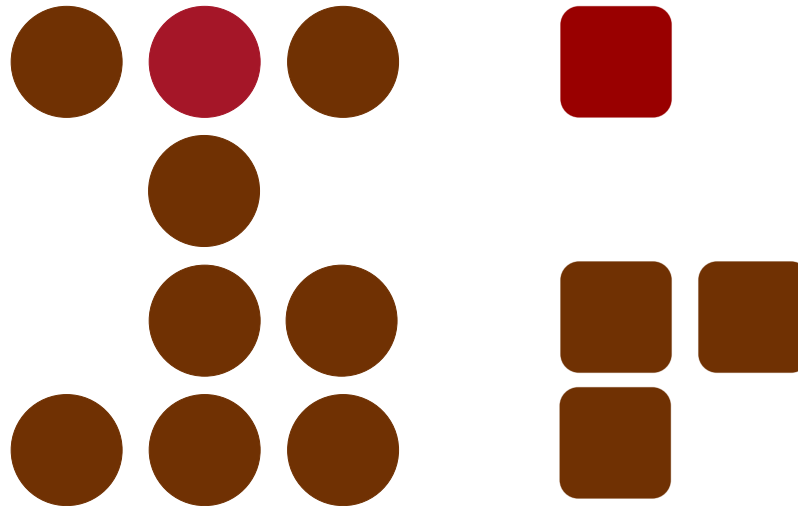
■ x 12



# seleção natural + exclusão competitiva de espécies

banco

- x 72
- x 6
- x 48
- x 12



# seleção natural + exclusão competitiva de espécies

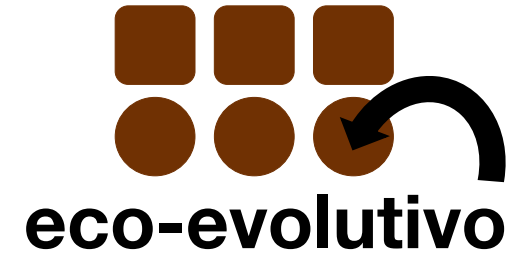
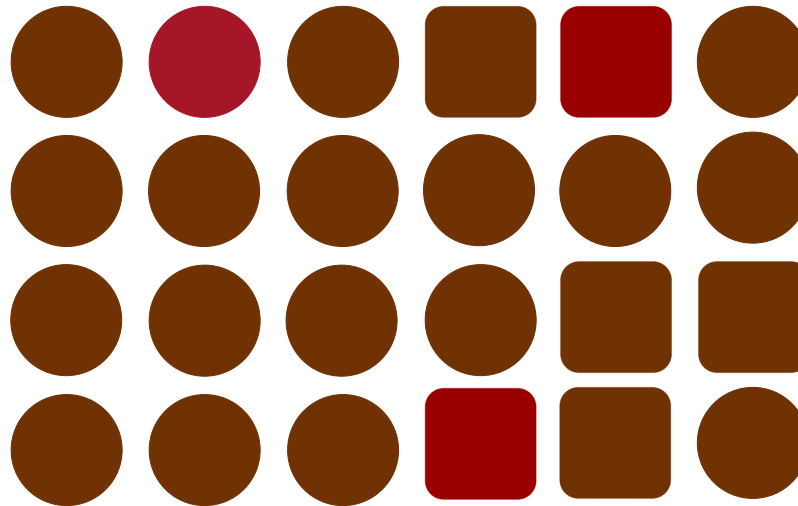
banco

● x 136

● x 2

■ x 32

■ x 4



# seleção natural + exclusão competitiva de espécies

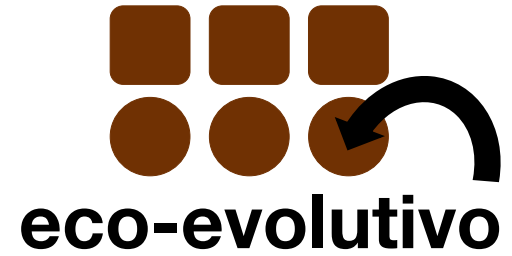
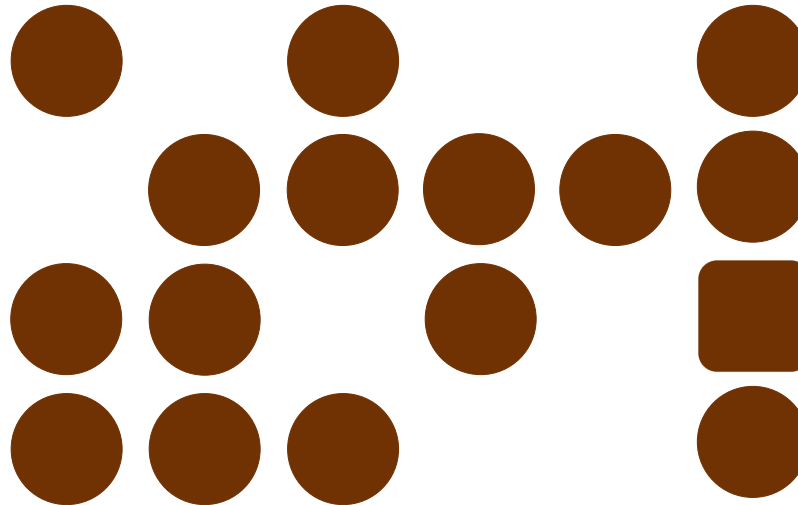
banco

● x 136

● x 2

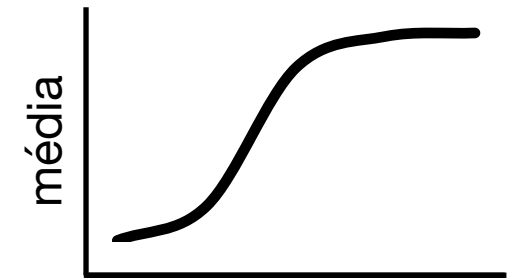
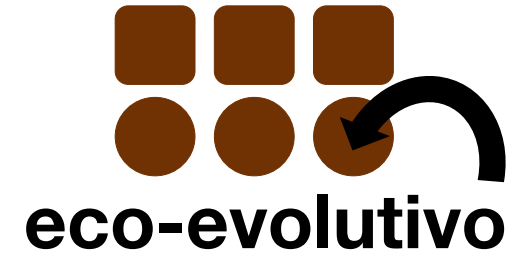
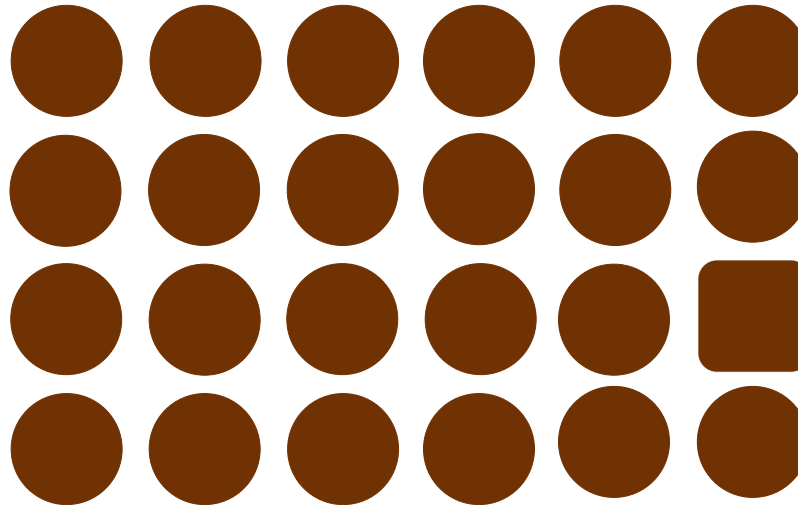
■ x 32

■ x 4



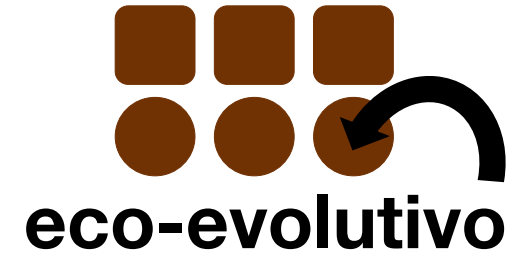
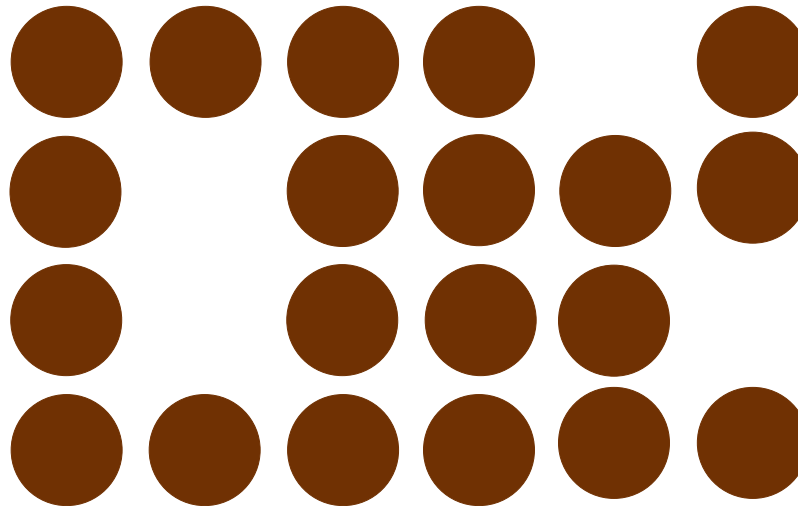
# seleção natural + exclusão competitiva de espécies

banco  
● x 184  
■ x 8



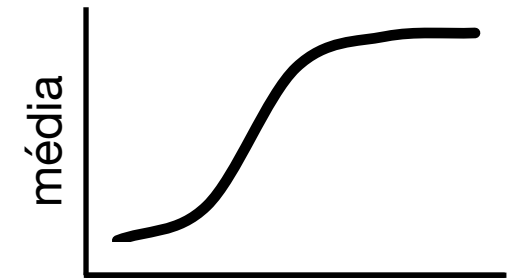
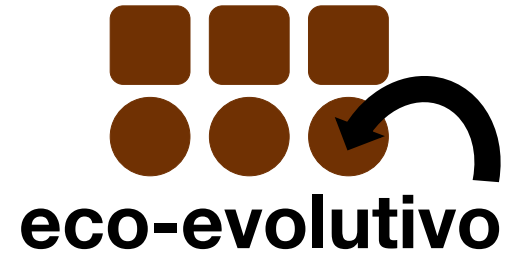
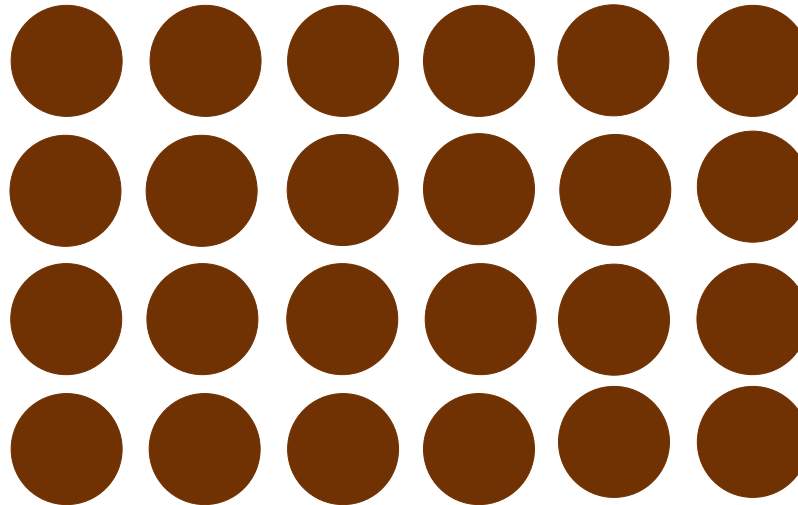
# seleção natural + exclusão competitiva de espécies

banco  
● x 184  
■ x 8



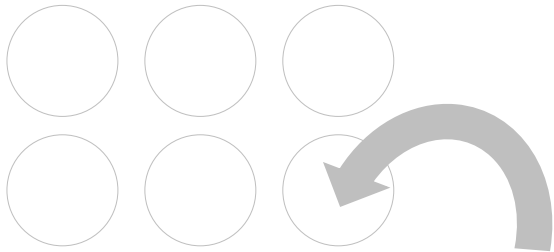
# seleção natural + exclusão competitiva de espécies

banco  
● x 192





## evolutivo

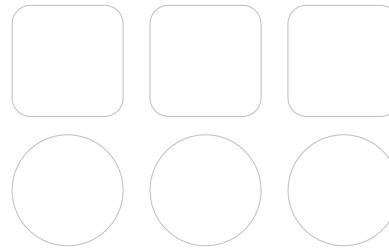


estratégia média

diversidade  
de estratégias

-

## ecológico

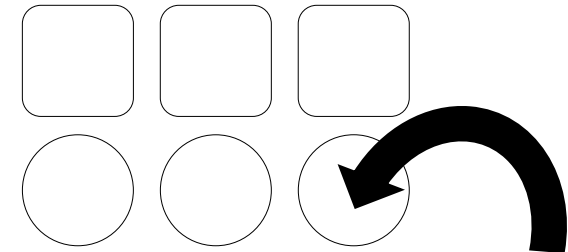


estratégia média

diversidade  
de estratégias

heterogeneidade  
interespecífica de  
estratégias

## eco-evolutivo

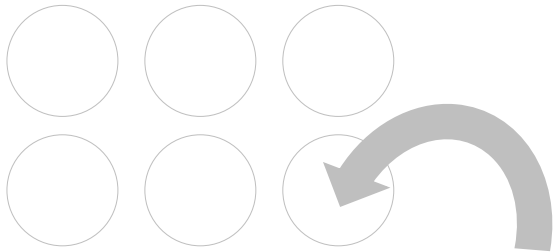


estratégia média

diversidade  
de estratégias

heterogeneidade  
interespecífica de  
estratégias

## evolutivo

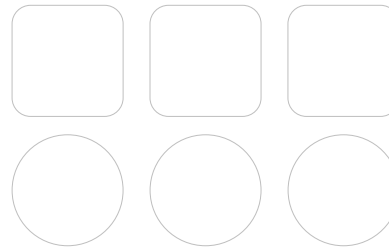


estratégia média

diversidade  
de estratégias

-

## ecológico

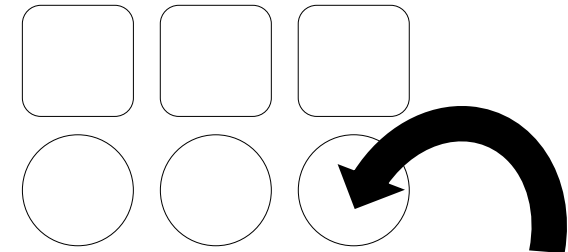


estratégia média

diversidade  
de estratégias

heterogeneidade  
interespecífica de  
estratégias

## eco-evolutivo



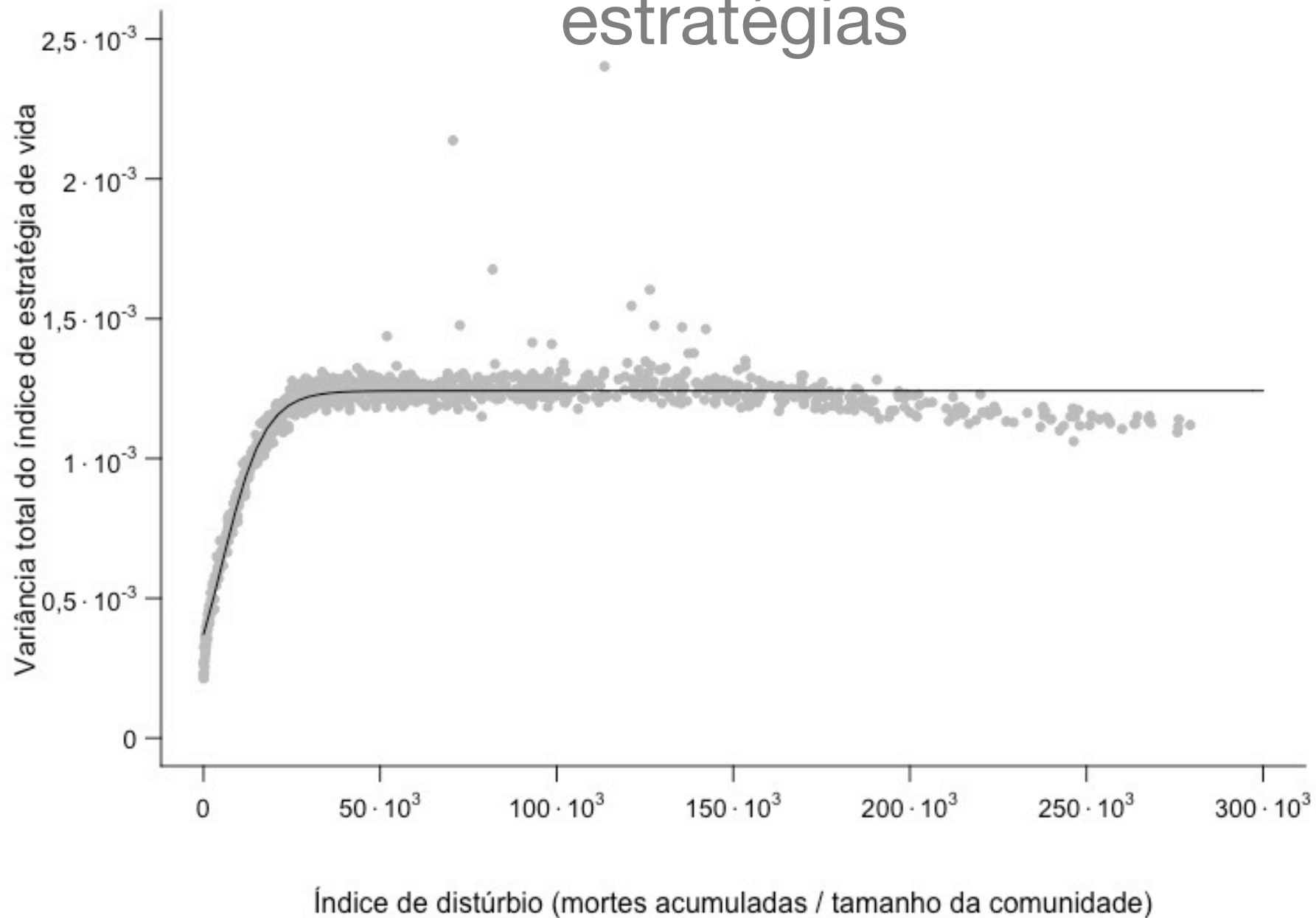
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diversidade  
de estratégias

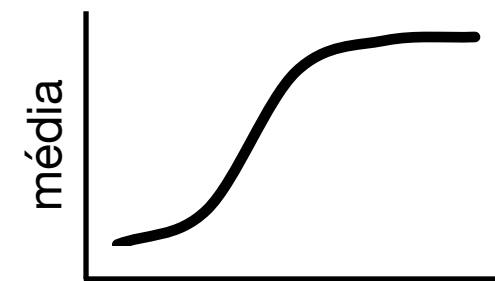
heterogeneidade  
interespecífica de  
estratégias

# diversidade de estratégias

resultados e discussão ● ● ●

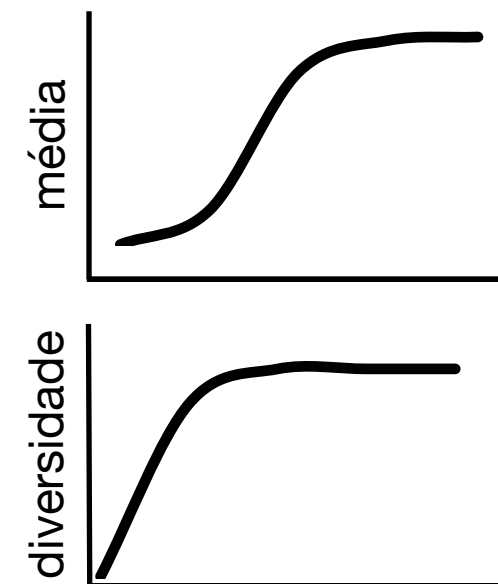
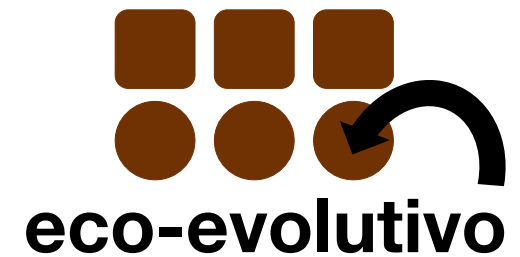
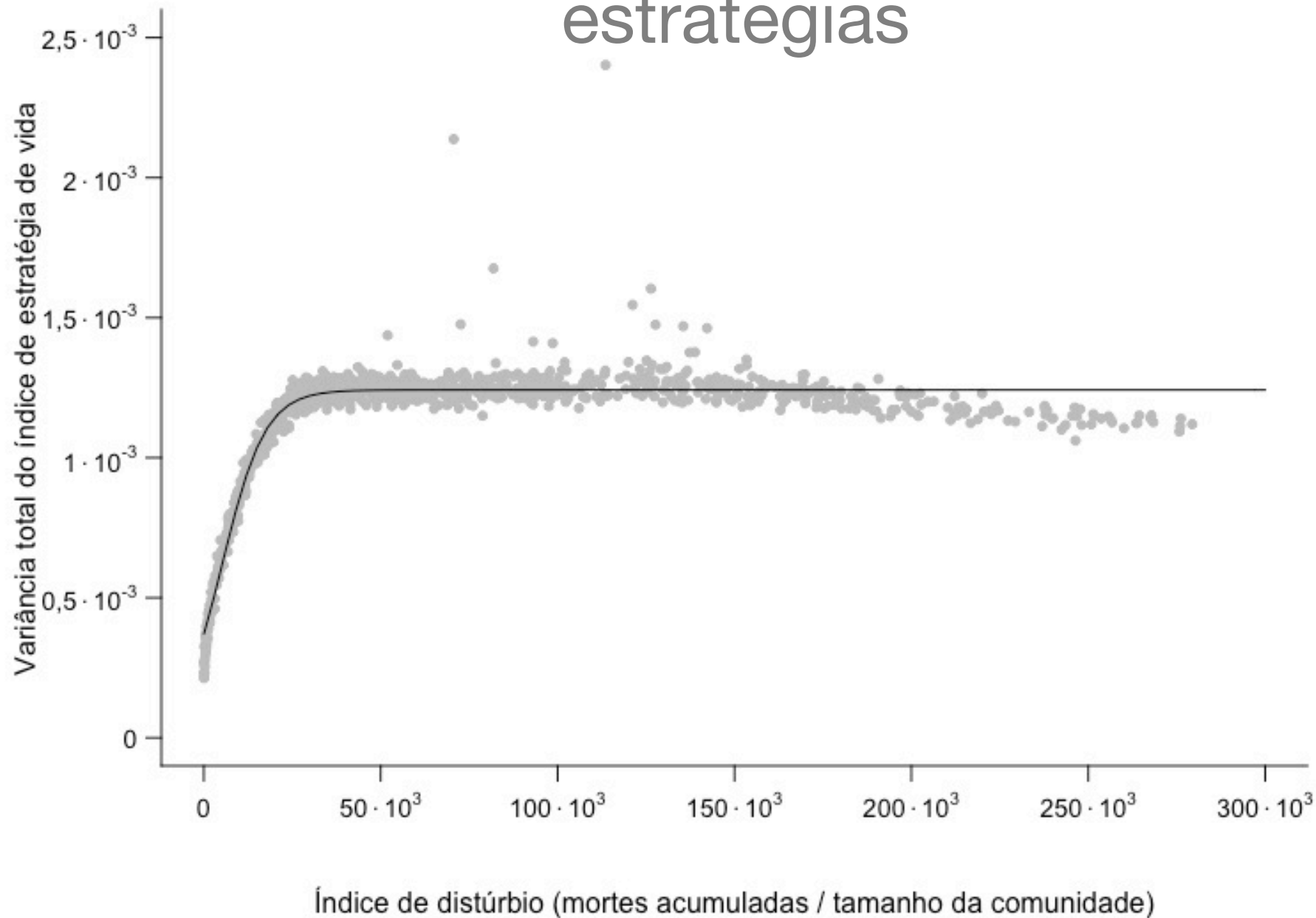


eco-evolutivo



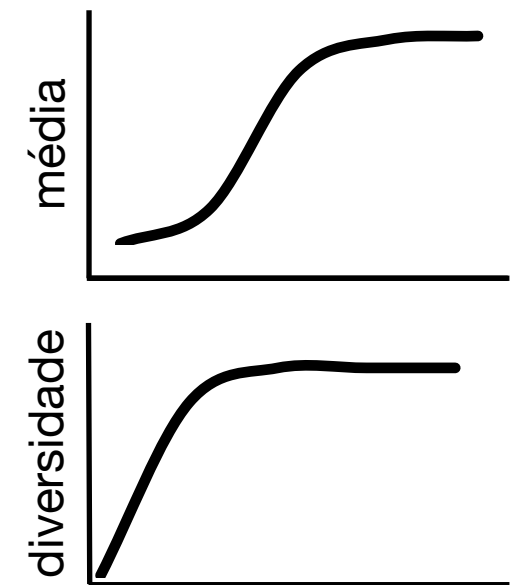
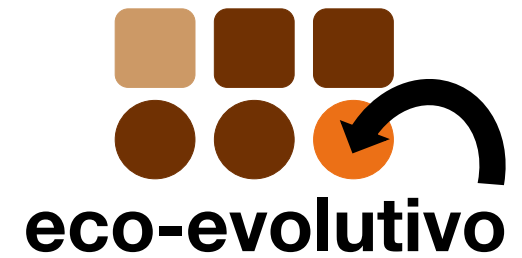
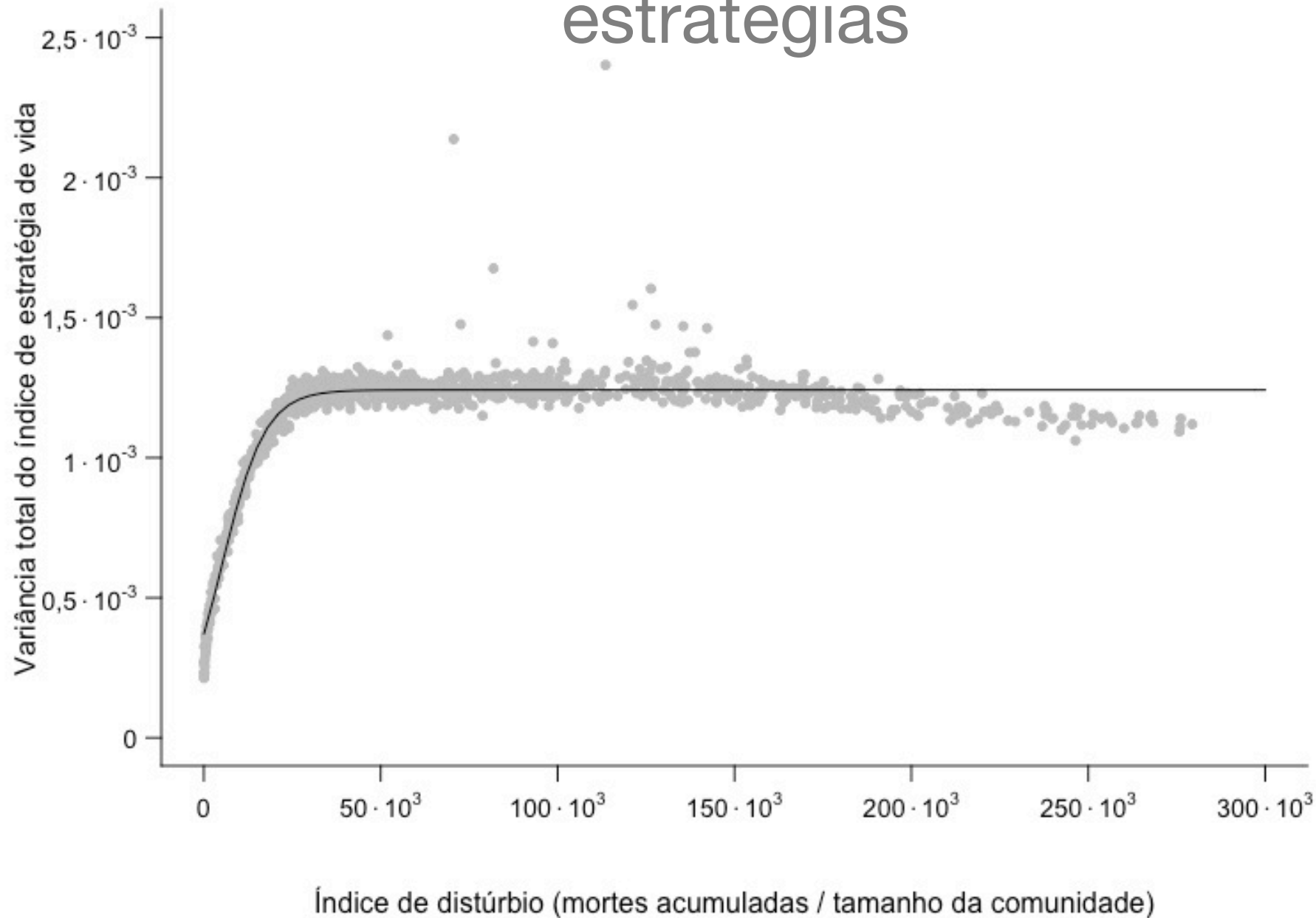
# diversidade de estratégias

resultados e discussão ● ● ●



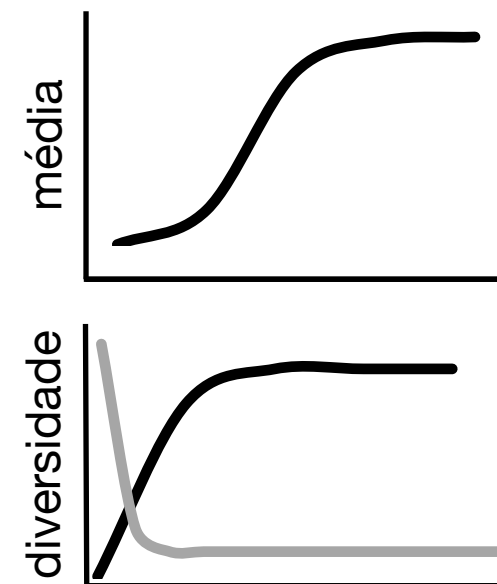
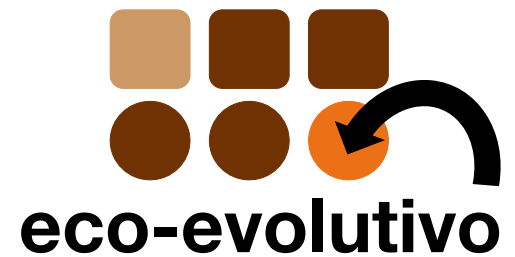
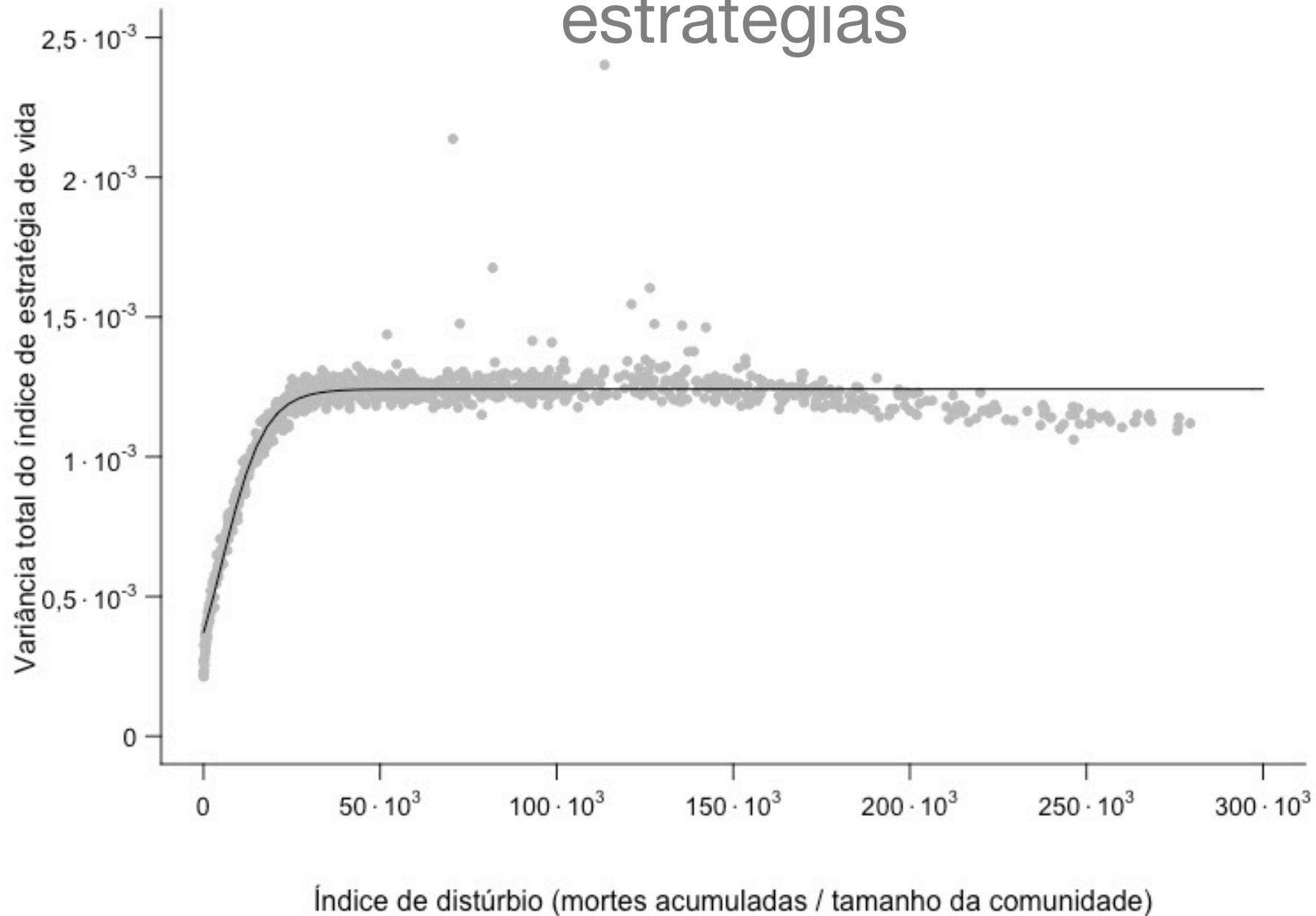
# diversidade de estratégias

resultados e discussão ● ● ●



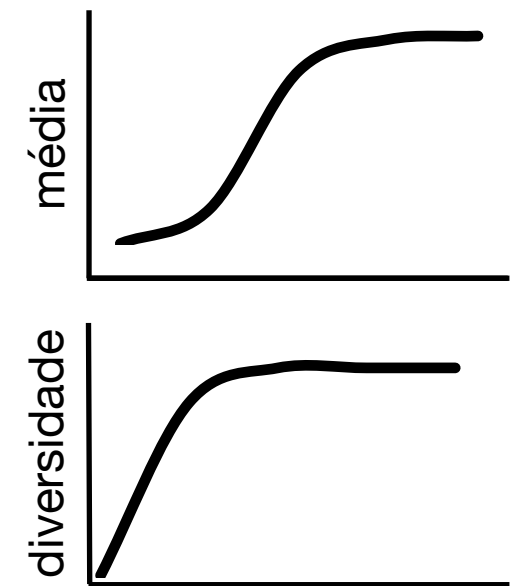
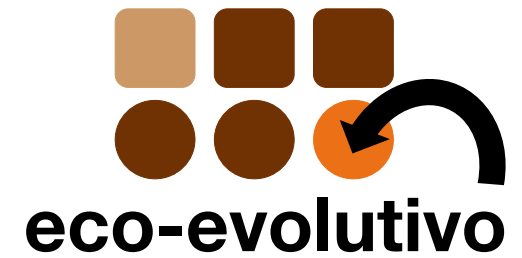
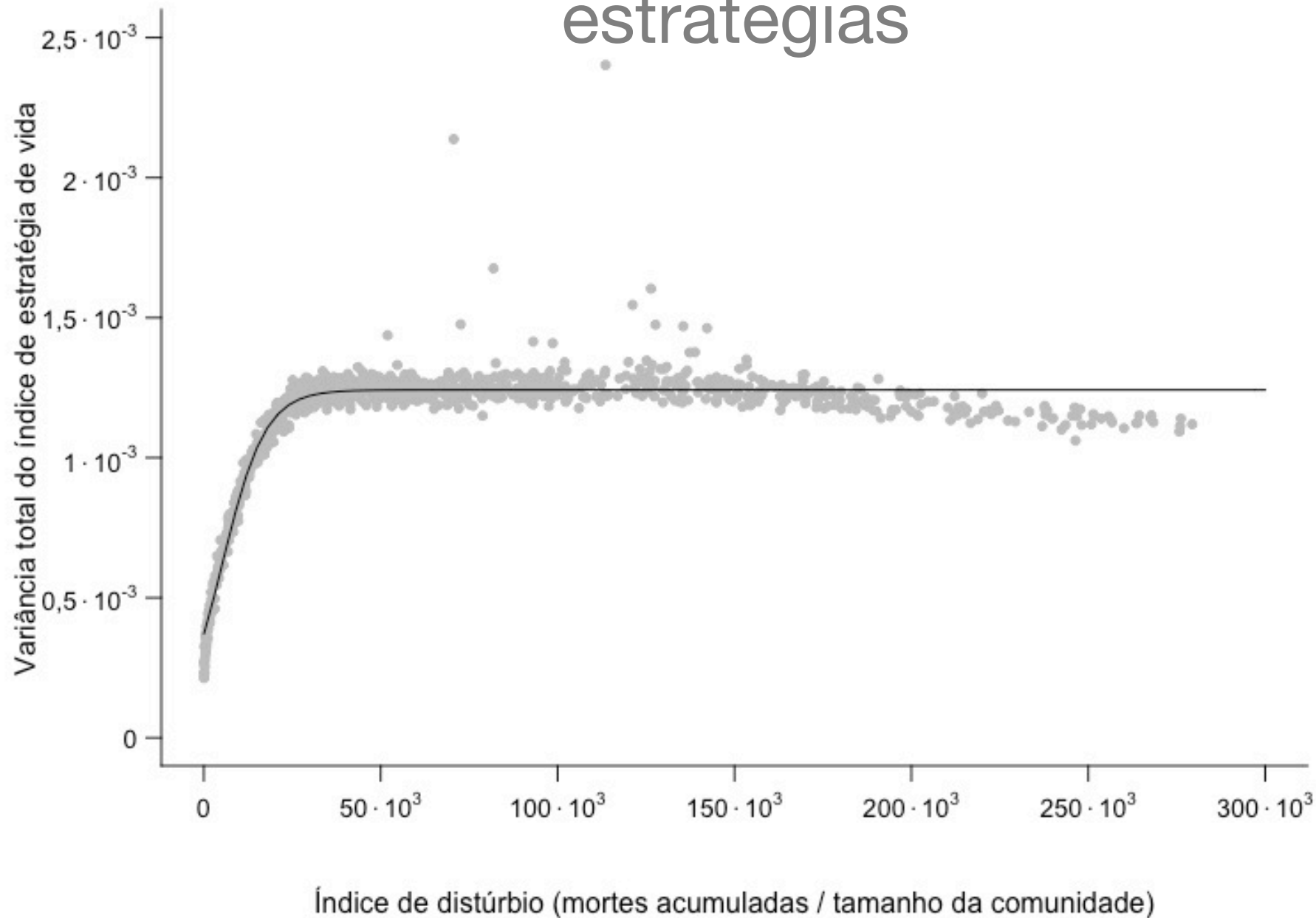
# diversidade de estratégias

resultados e discussão ● ● ●

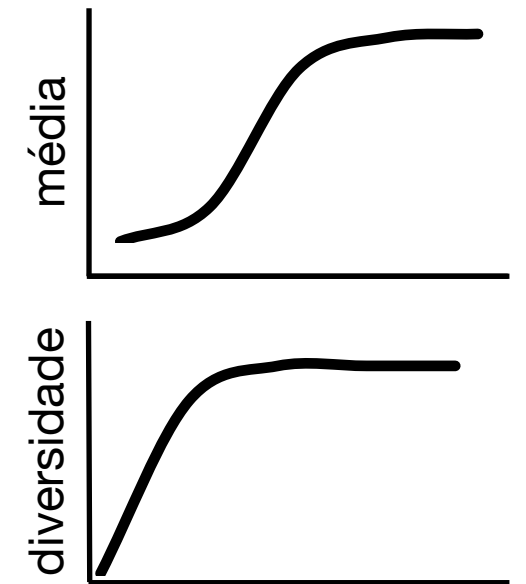
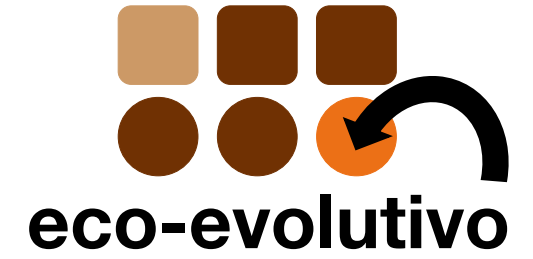
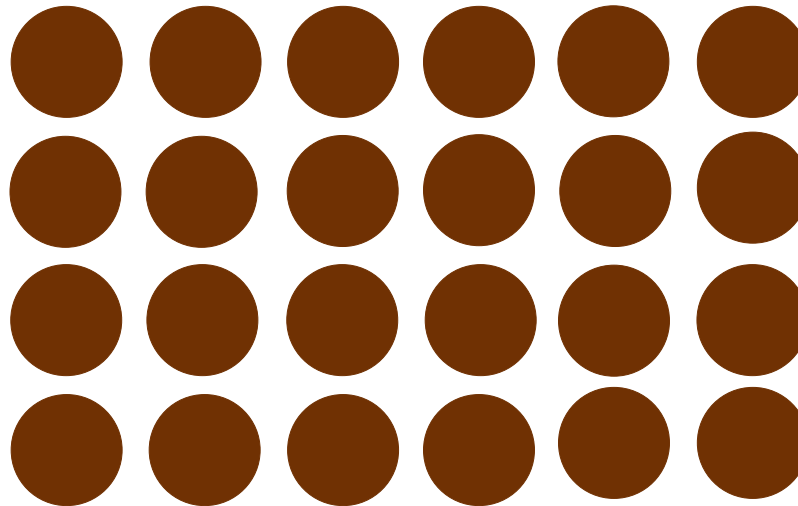


# diversidade de estratégias

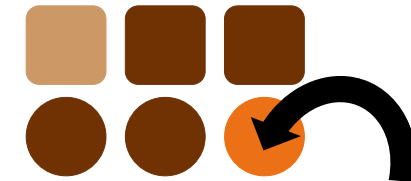
resultados e discussão ● ● ●



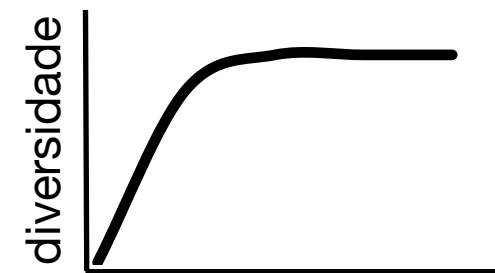
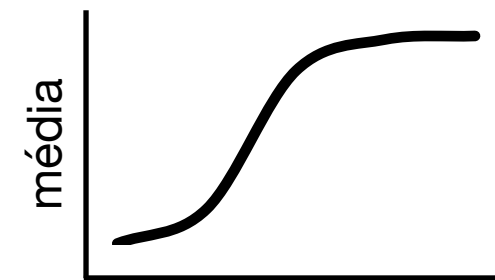
banco  
● x 192



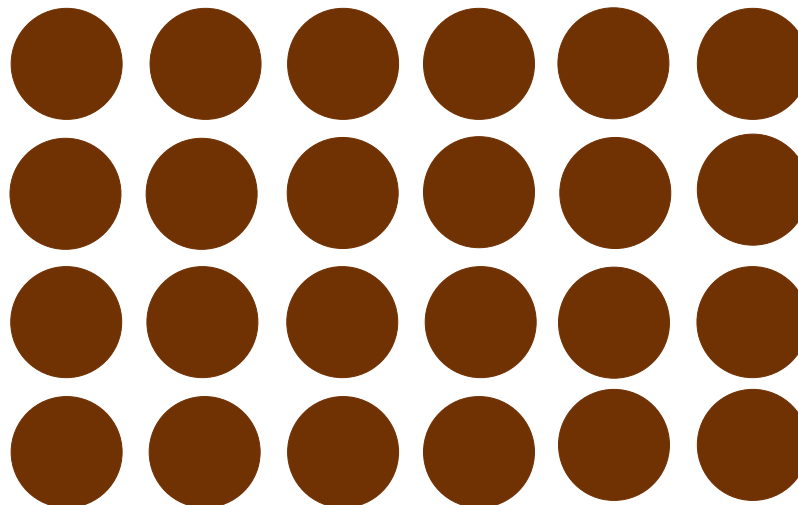
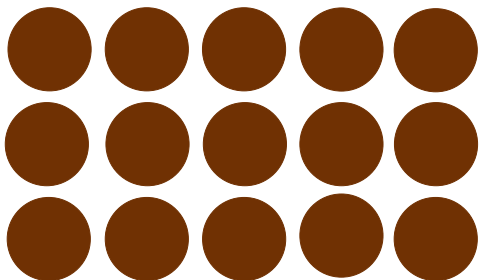




**eco-evolutivo**

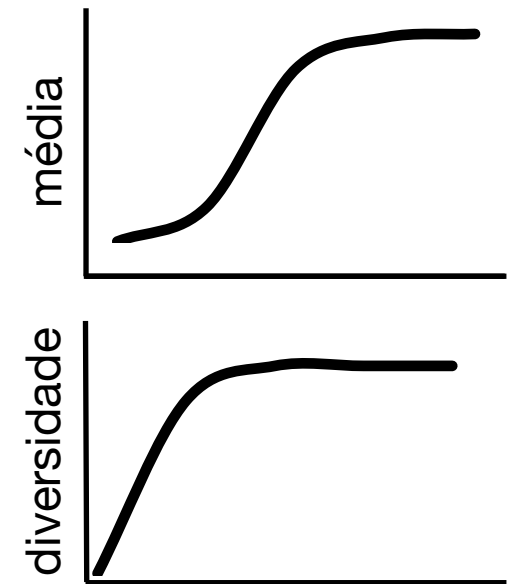
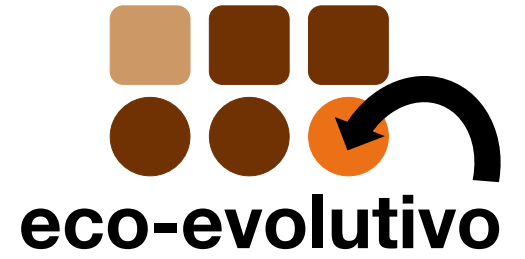
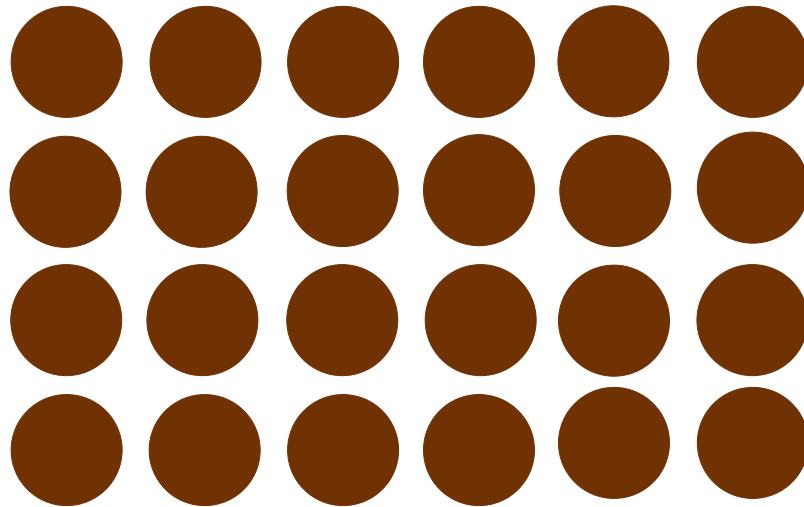
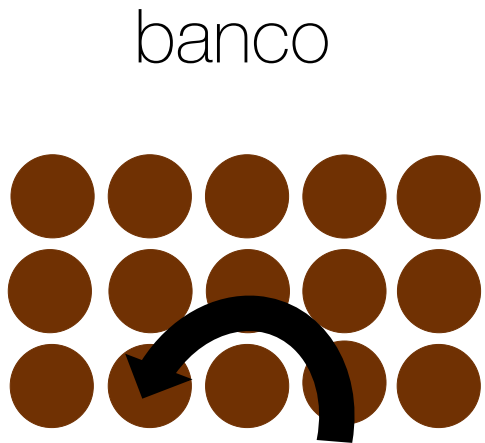


banco



# mutação

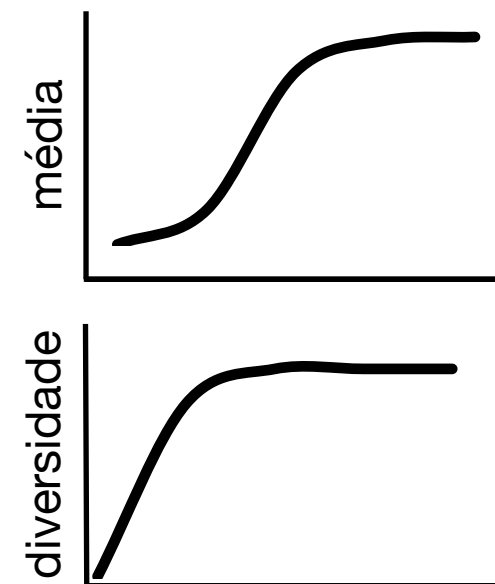
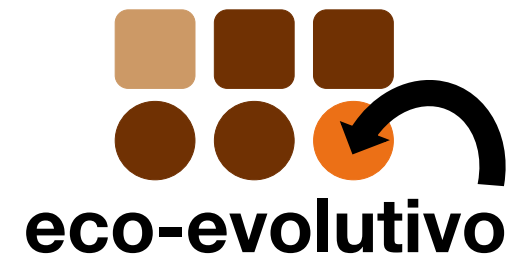
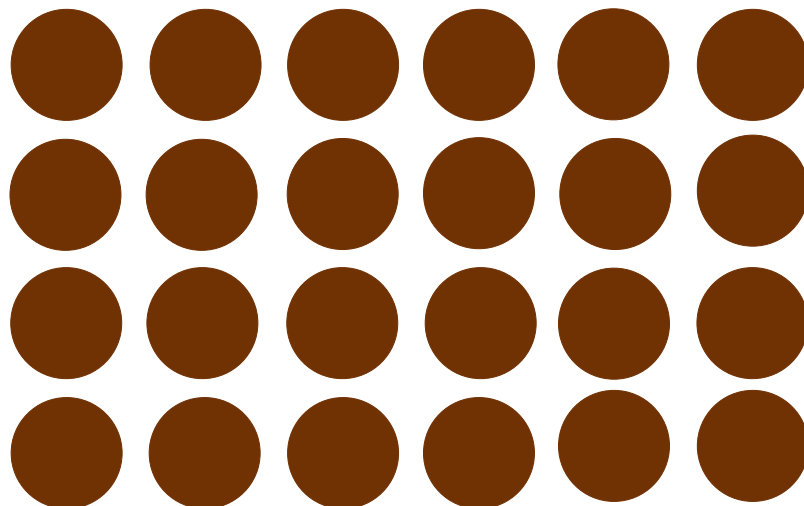
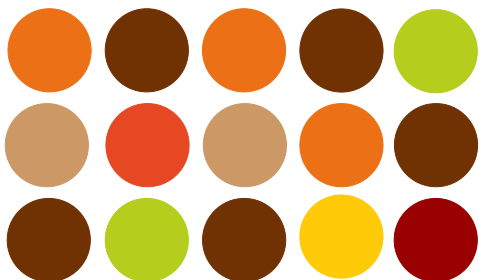
resultados e discussão ● ● ●



# mutação

resultados e discussão ● ● ●

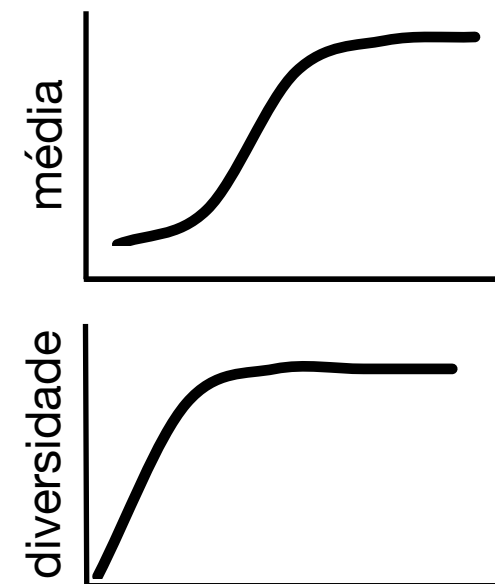
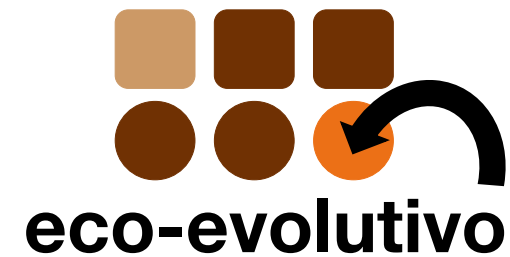
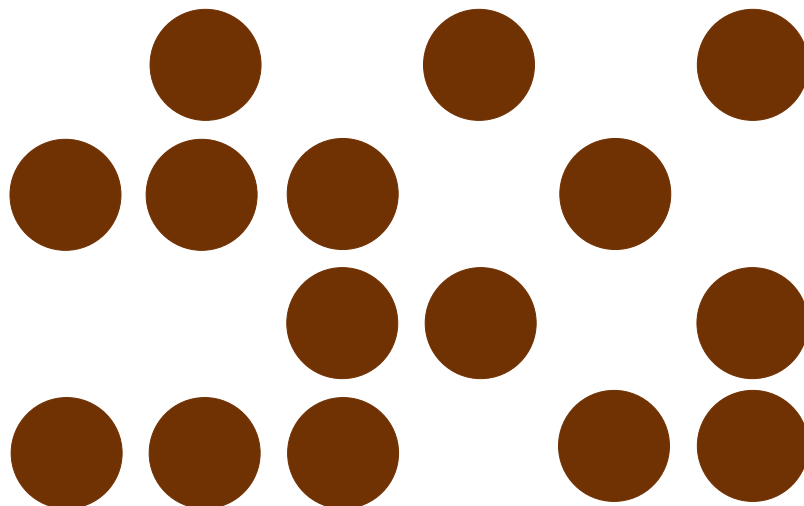
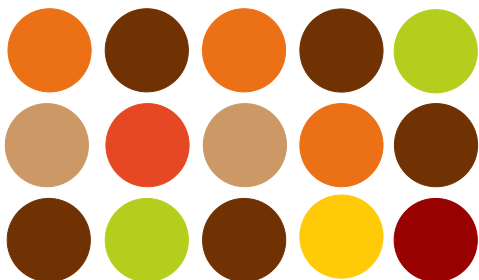
banco



# mutação

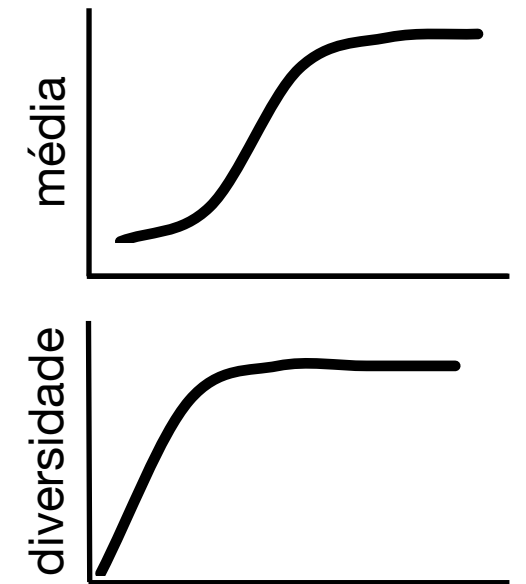
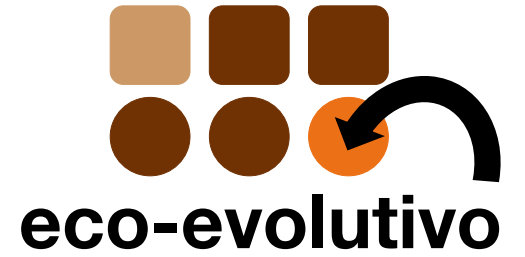
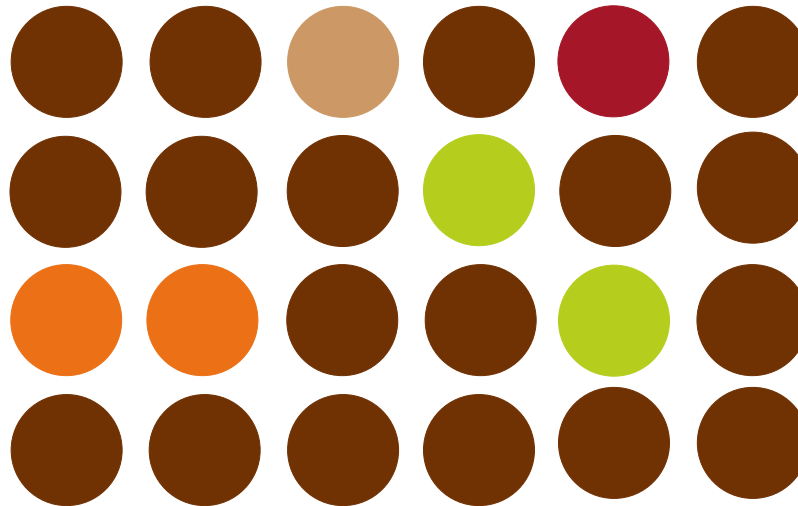
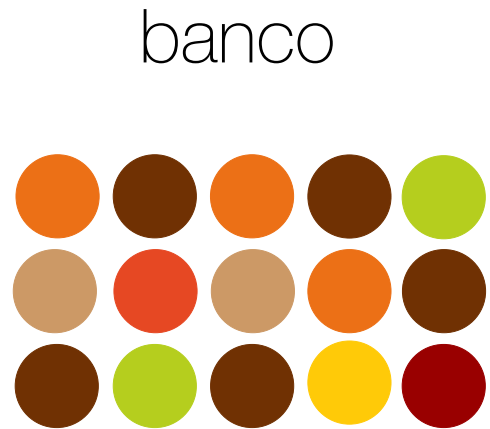
resultados e discussão ● ● ●

banco

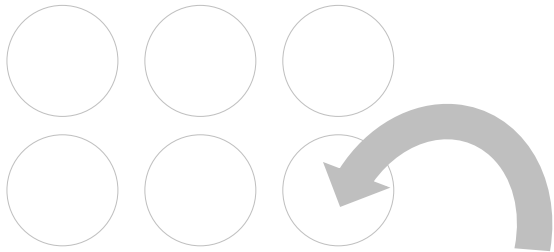


# mutação + amostragem

resultados e discussão ● ● ●



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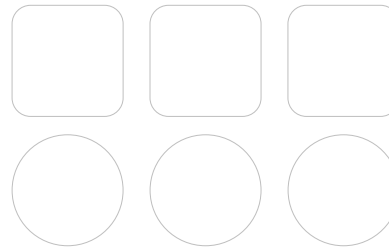


estratégia média

diversidade  
de estratégias

-

## ecológico

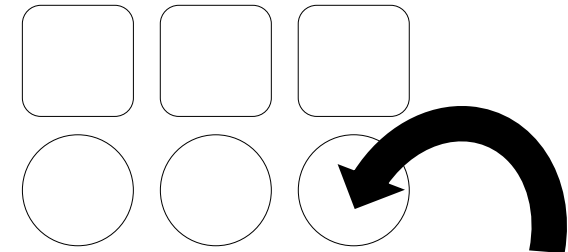


estratégia média

diversidade  
de estratégias

heterogeneidade  
interespecífica de  
estratégias

## eco-evolutivo

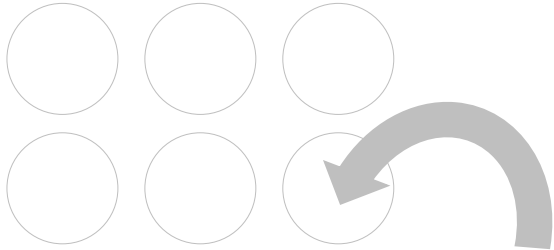


estratégia média

diversidade  
de estratégias

heterogeneidade  
interespecífica de  
estratégias

## evolutivo

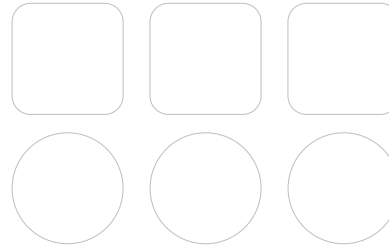


estratégia média

diversidade  
de estratégias

-

## ecológico

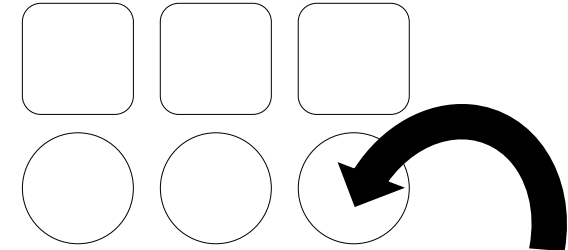


estratégia média

diversidade  
de estratégias

heterogeneidade  
interespecífica de  
estratégias

## eco-evolutivo

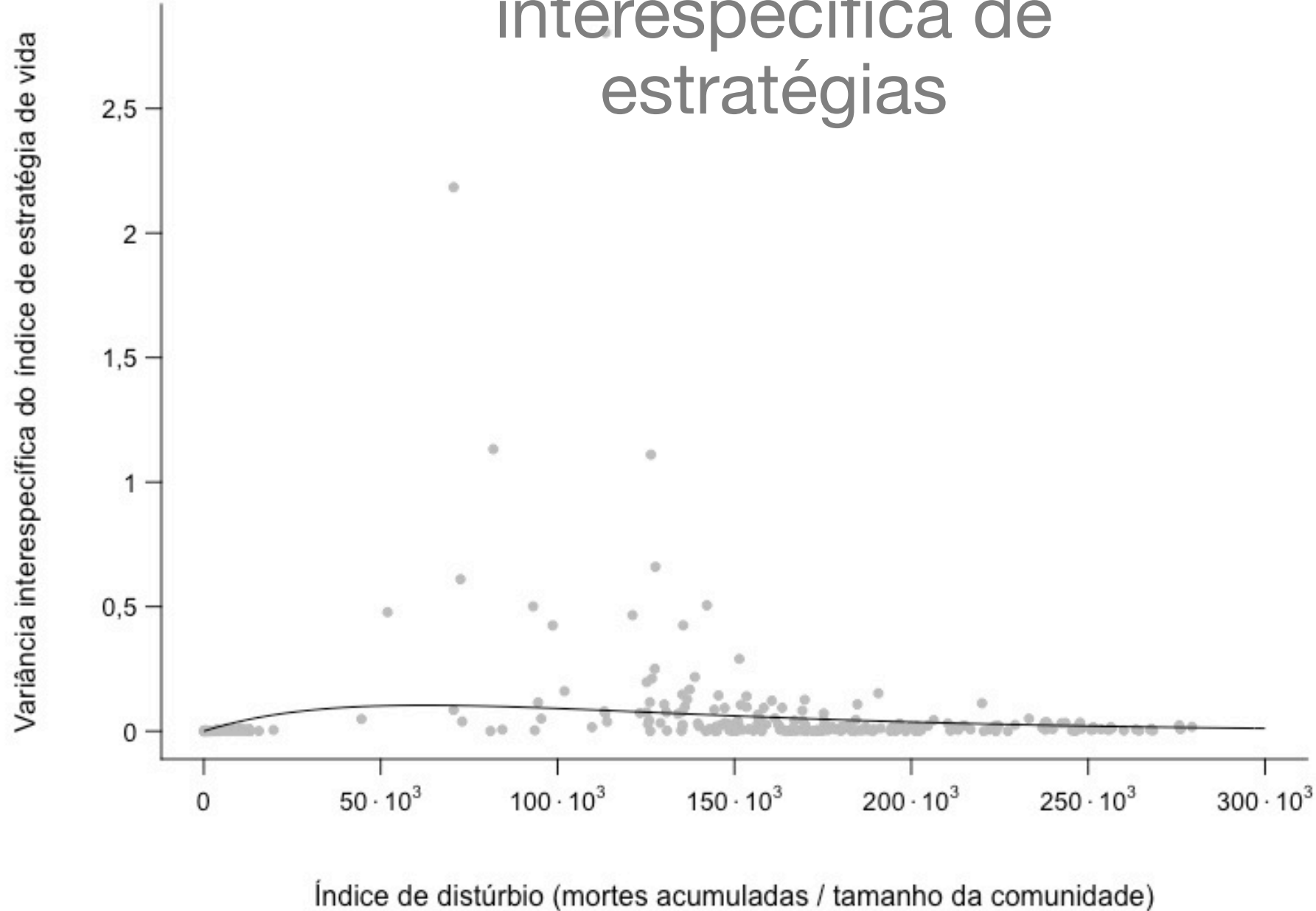


estratégia média

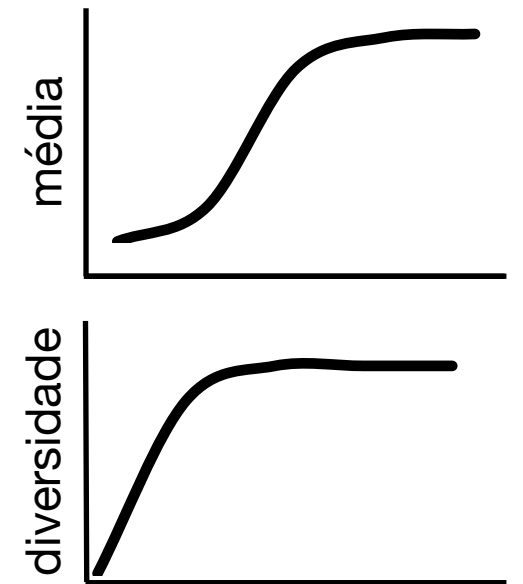
diversidade  
de estratégias

heterogeneidade  
interespecífica de  
estratégias

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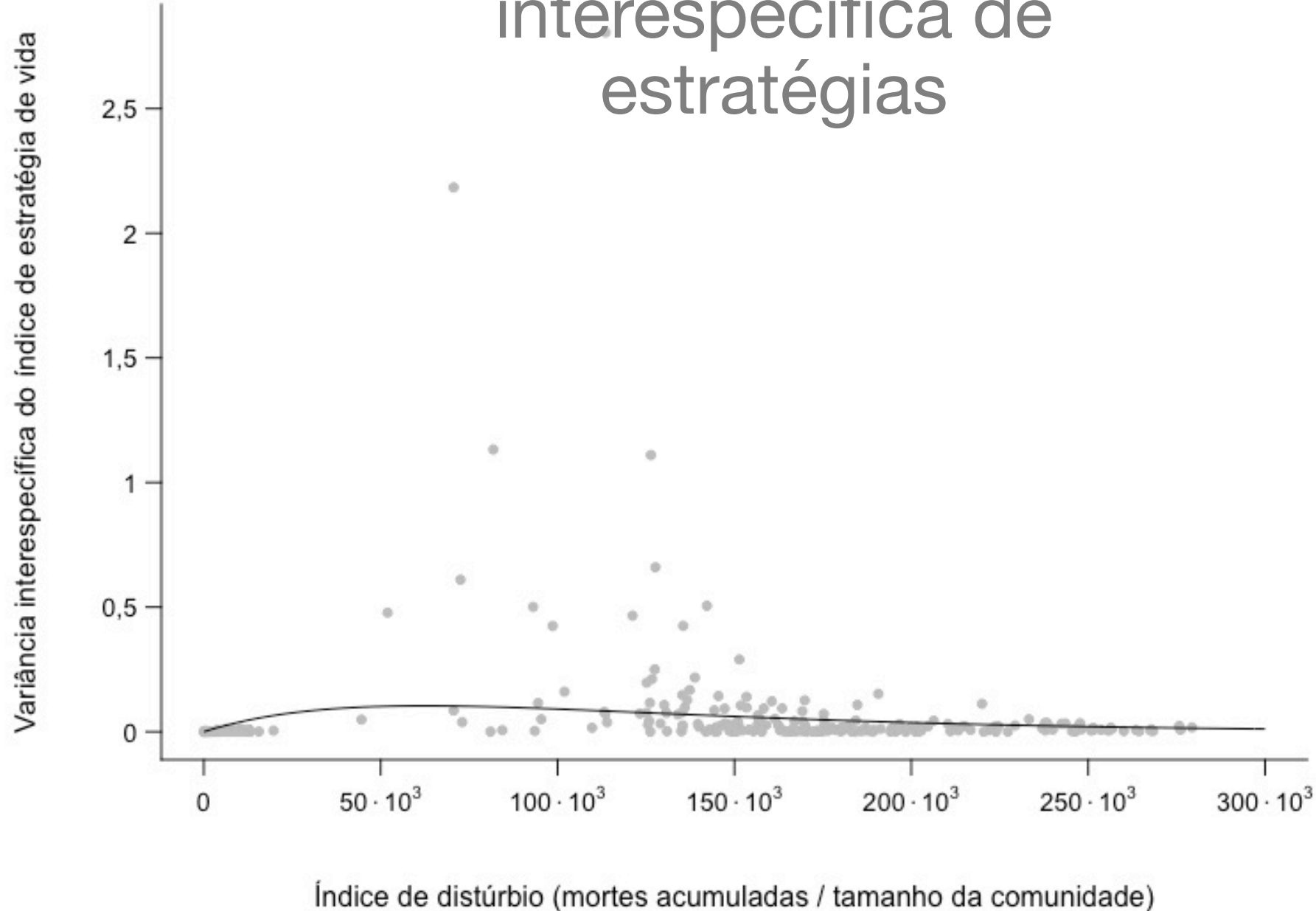


eco-evolutivo

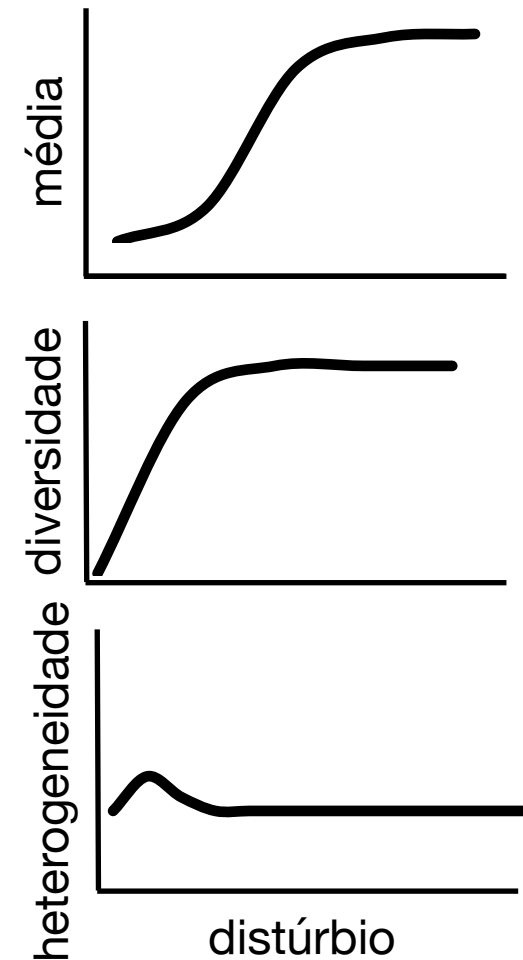




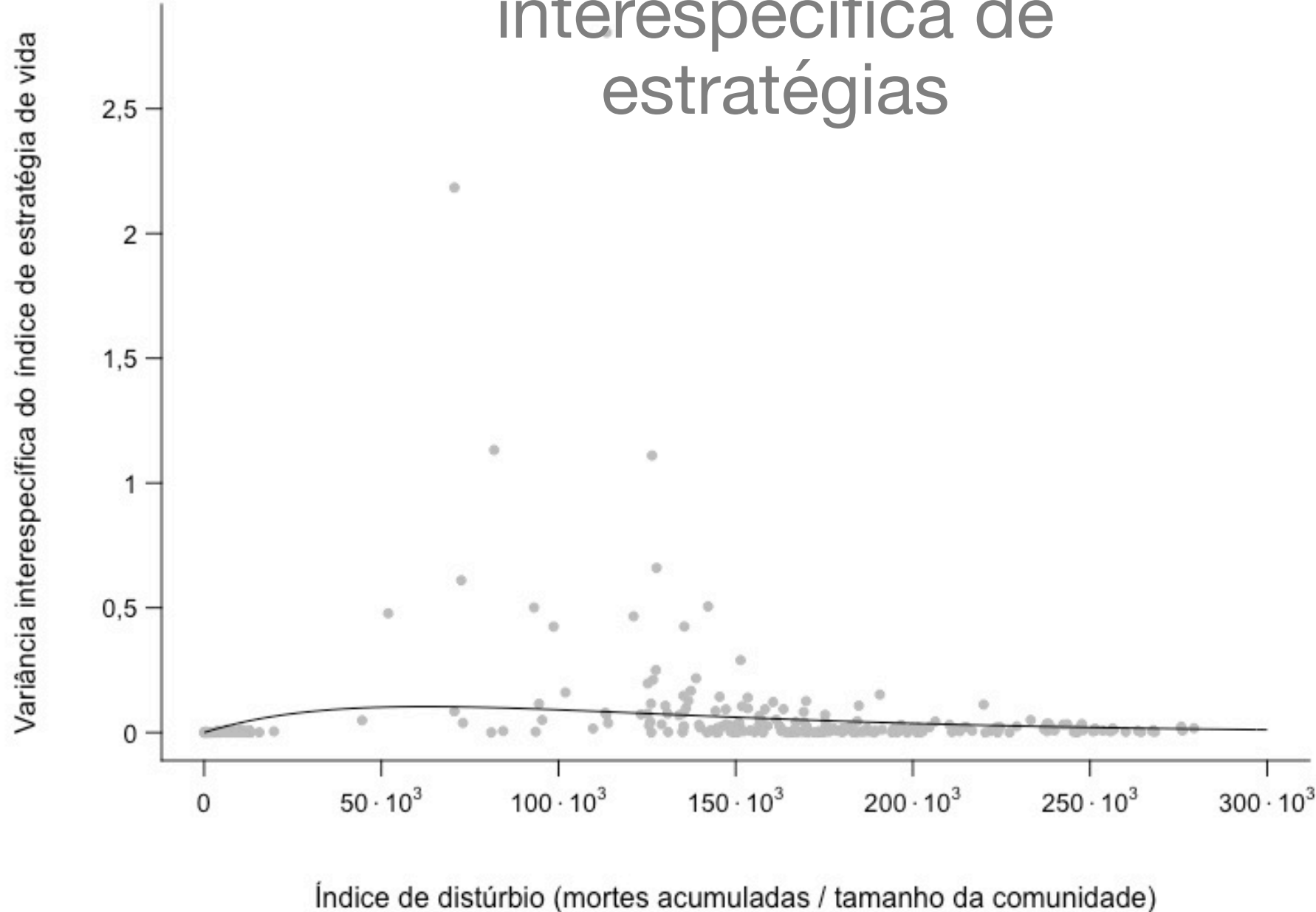
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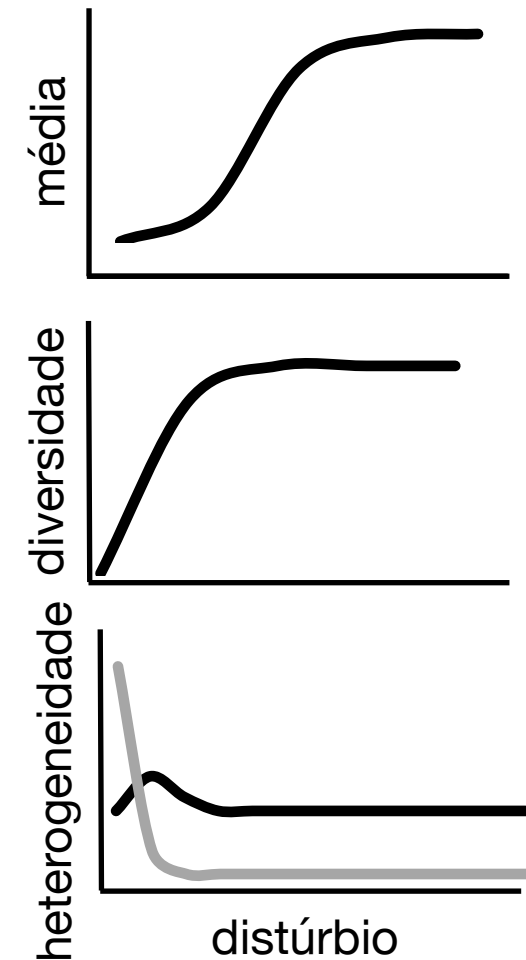
eco-evolutivo



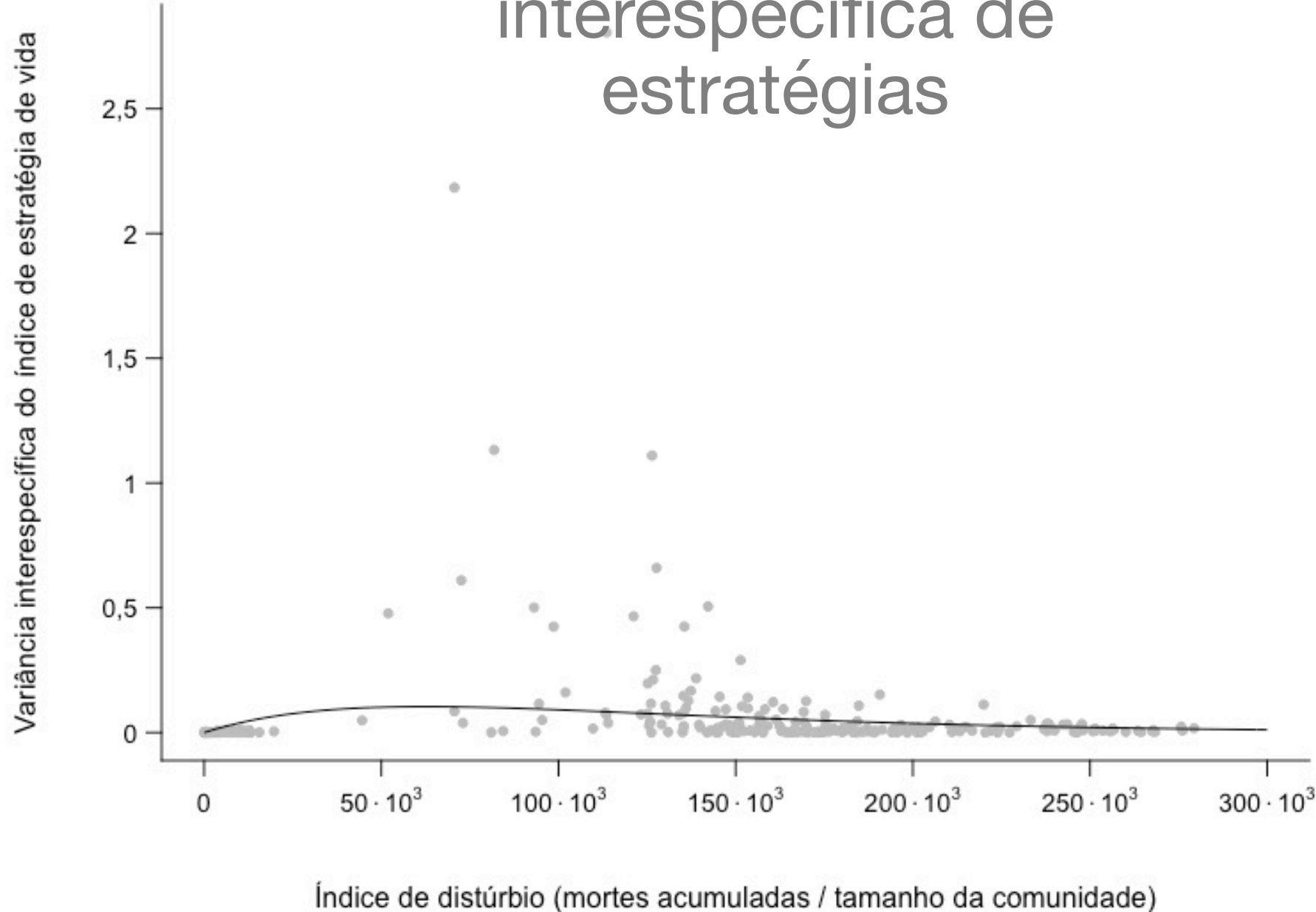
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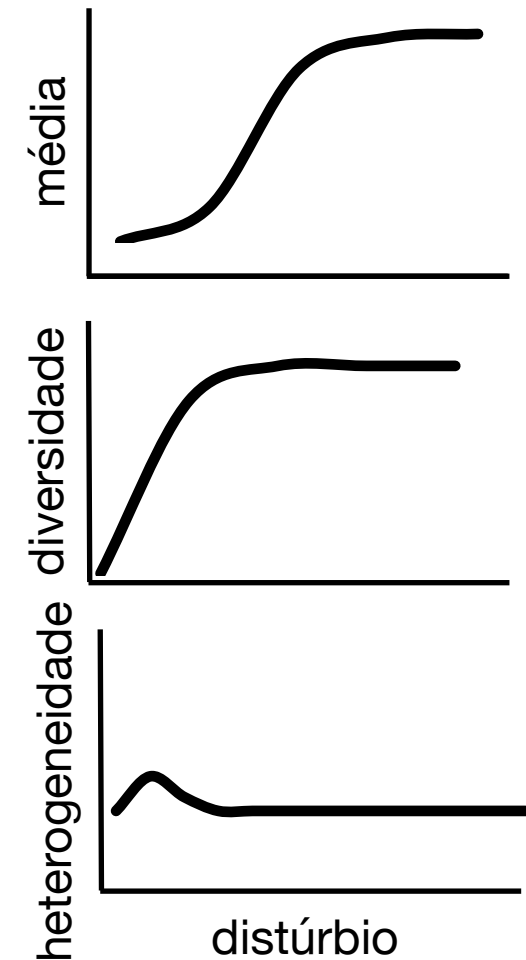
eco-evolutivo



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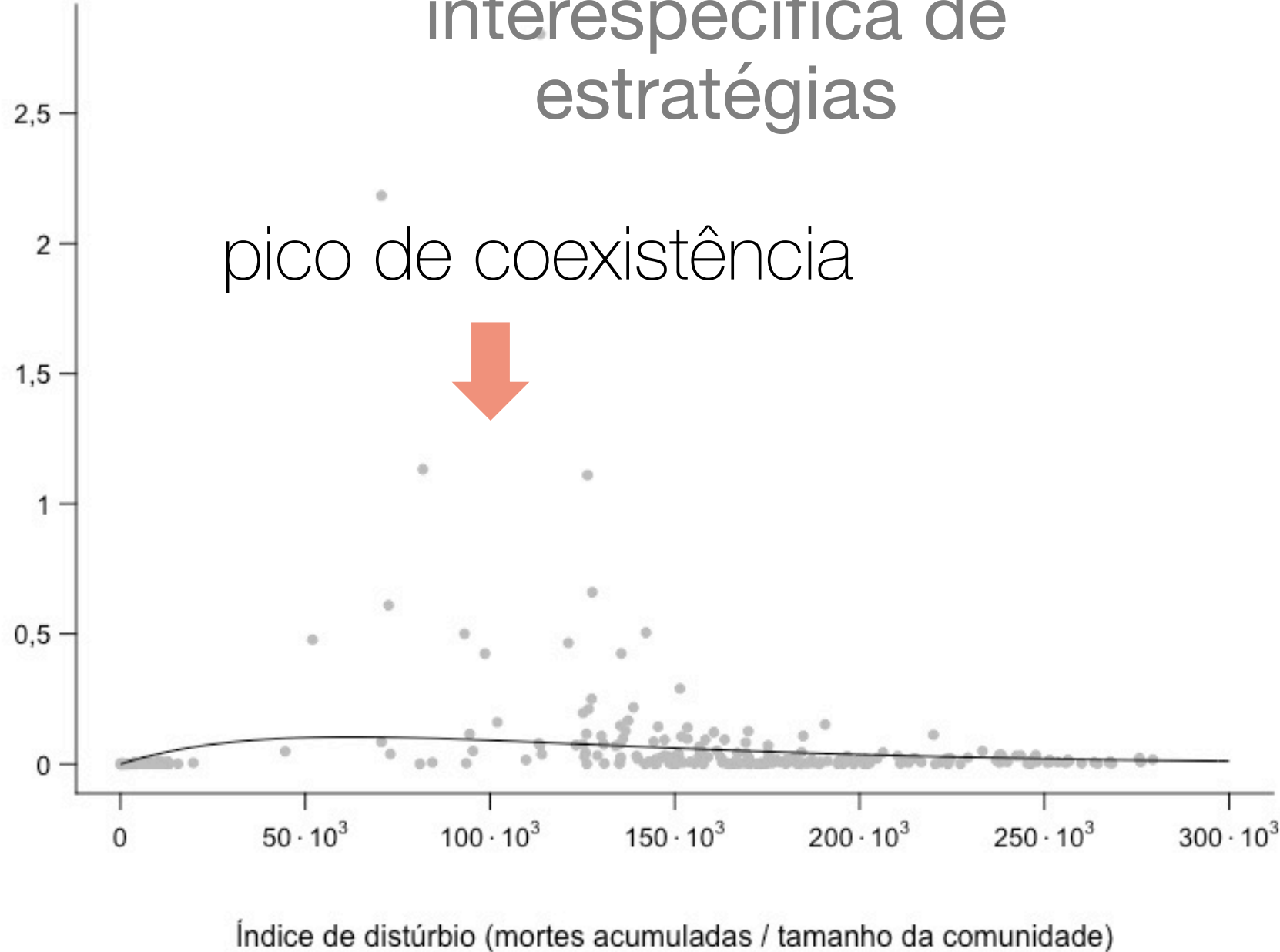


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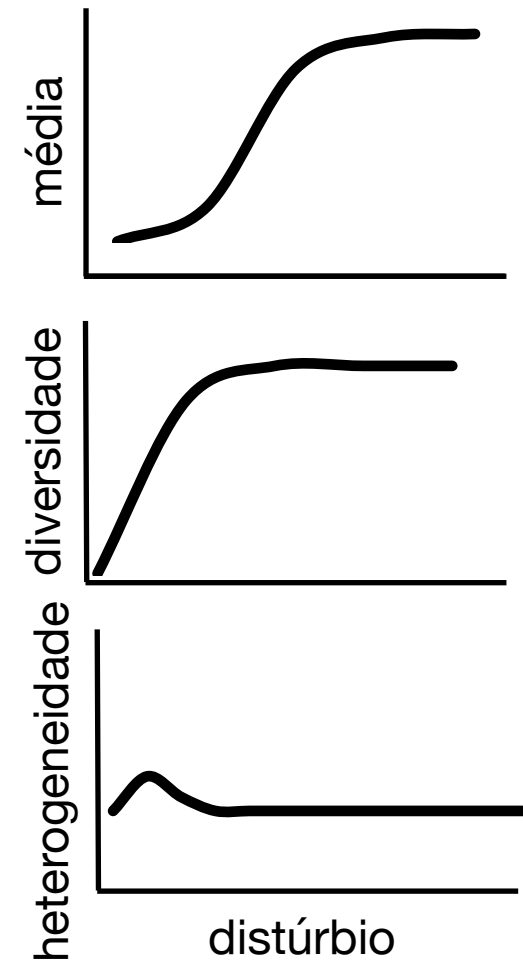


# heterogeneidade interespecífica de estratégias

Variação interespecífica do índice de estratégia de vida

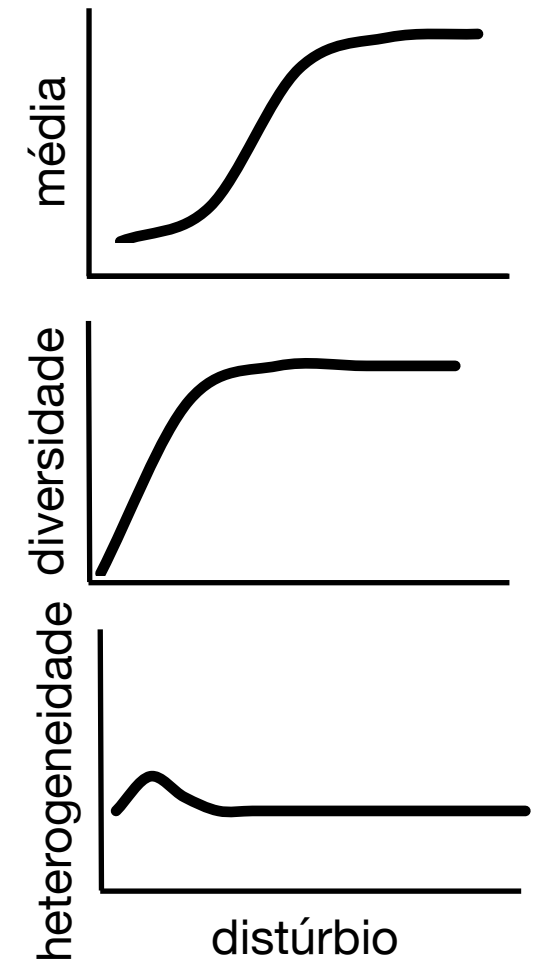
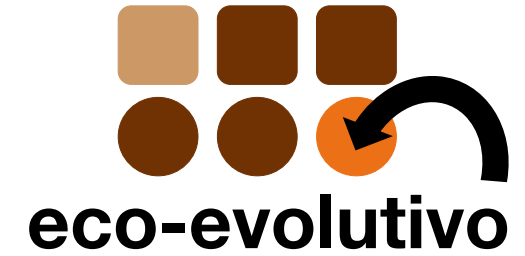


eco-evolutivo



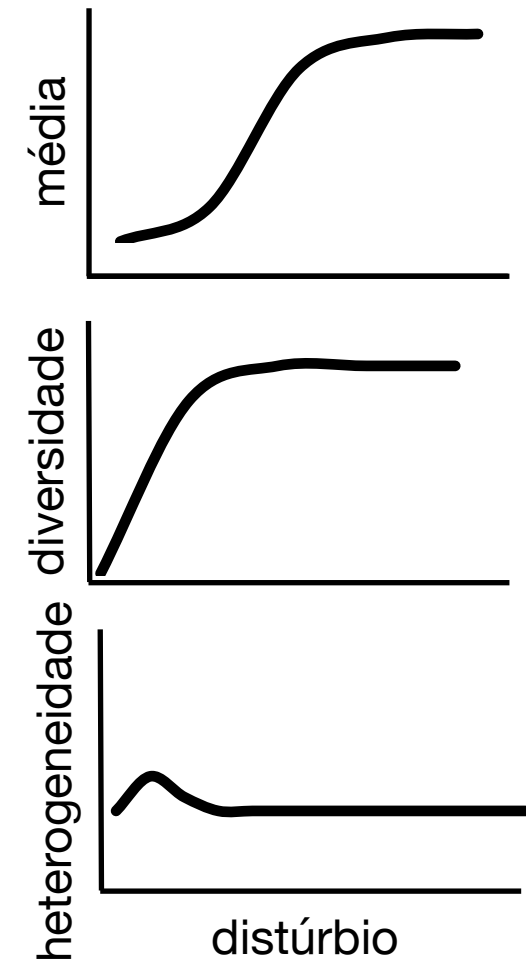
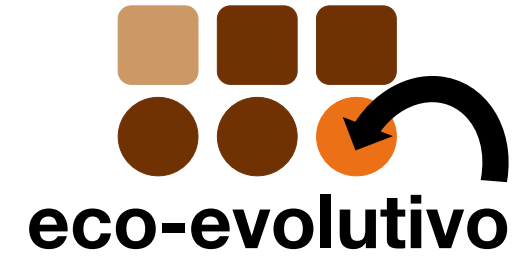
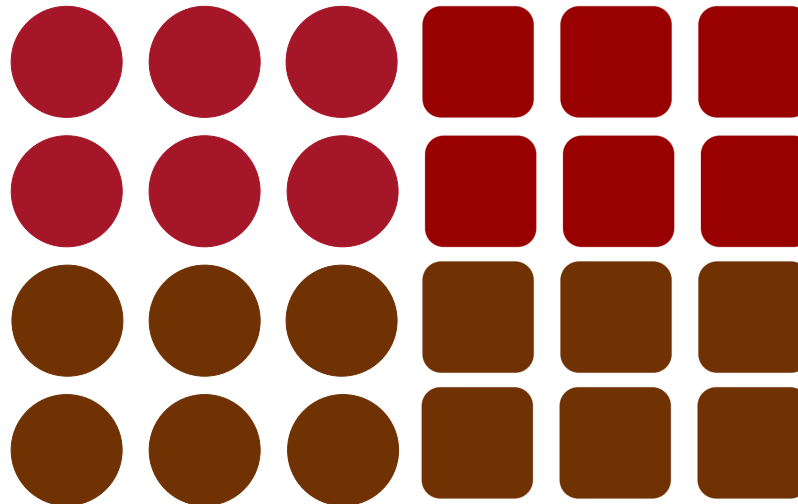
# coexistência de estratégias mediada pelo distúrbio

resultados e discussão ● ● ●



# coexistência de estratégias mediada pelo distúrbio

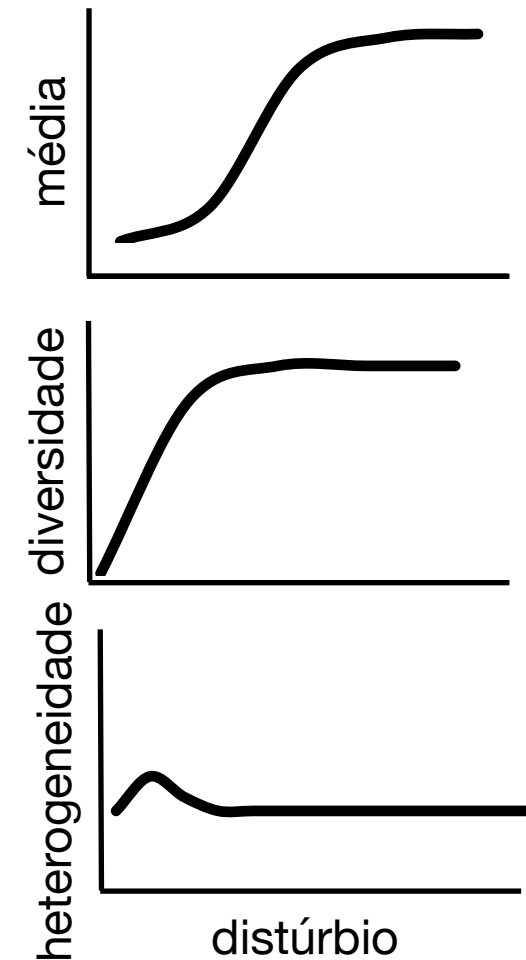
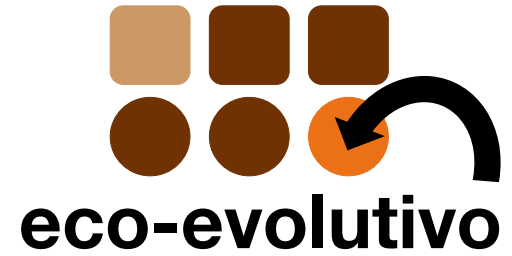
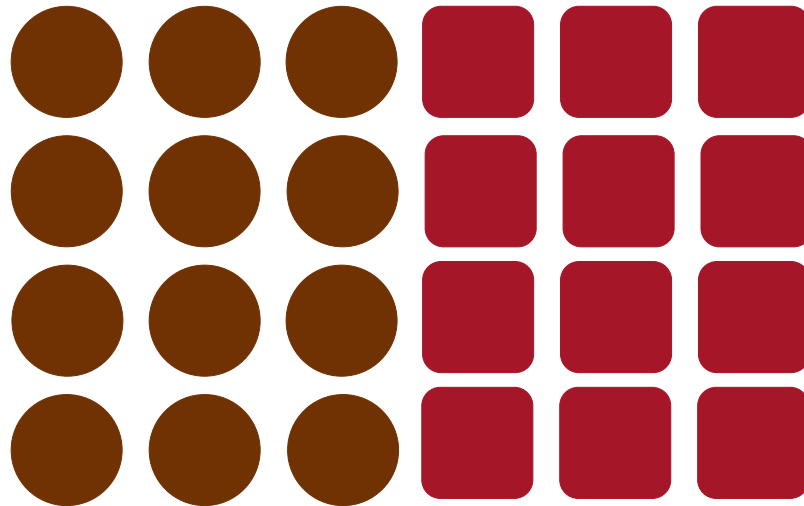
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● x 12  
■ x 48  
■ x 12



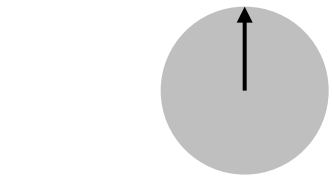
# coexistência de estratégias mediada pelo distúrbio

● x 96

■ x 24

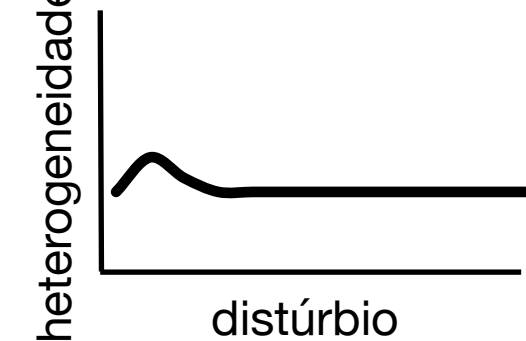
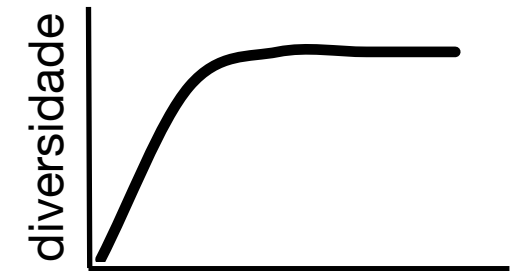
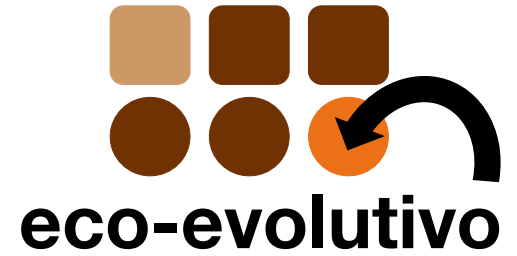
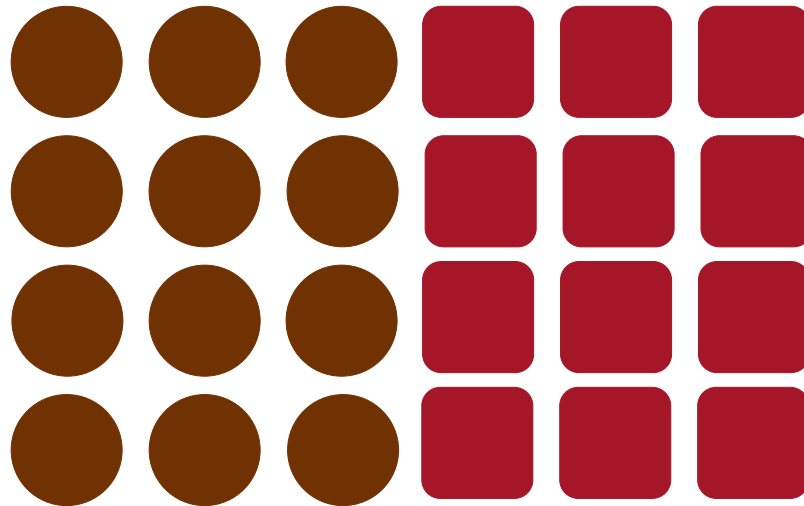


# coexistência de estratégias mediada pelo distúrbio



● x 96

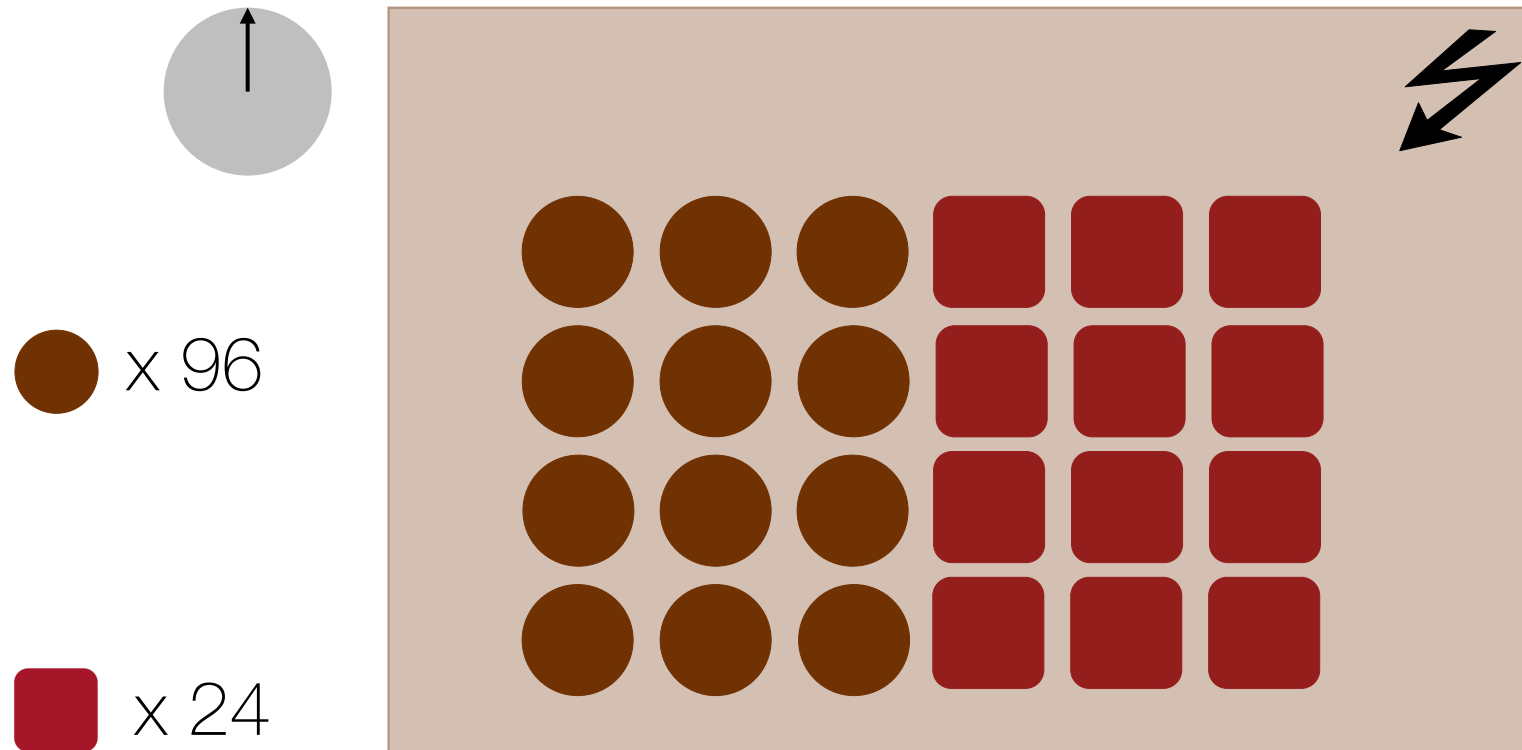
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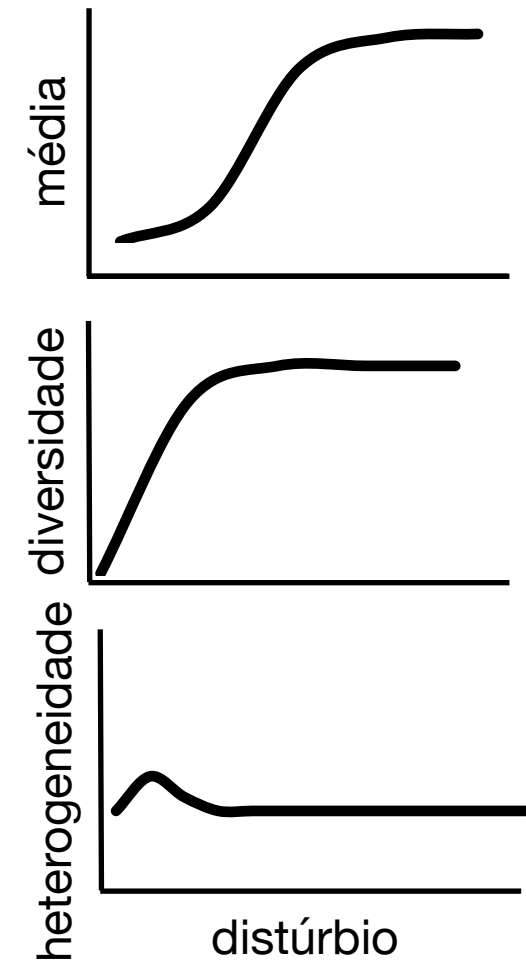


# coexistência de estratégias mediada pelo distúrbio

resultados e discussão ● ● ●

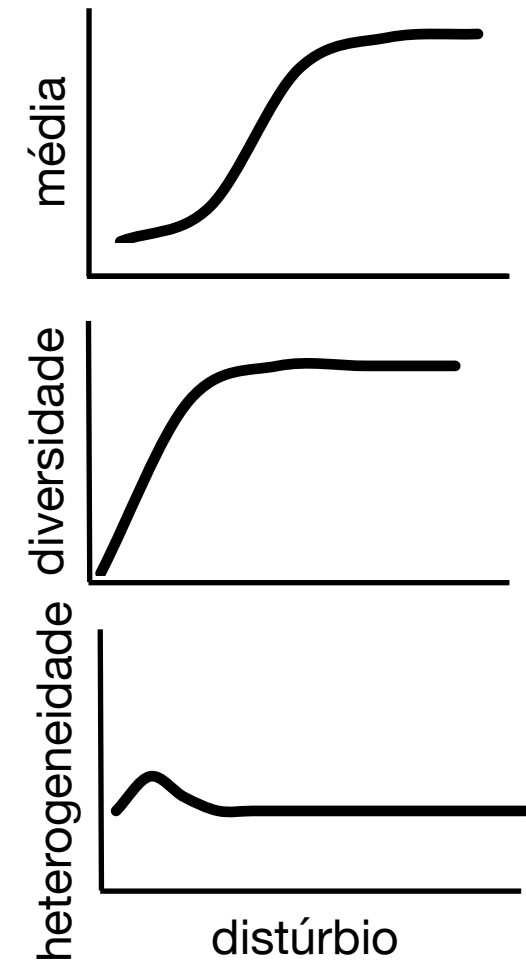
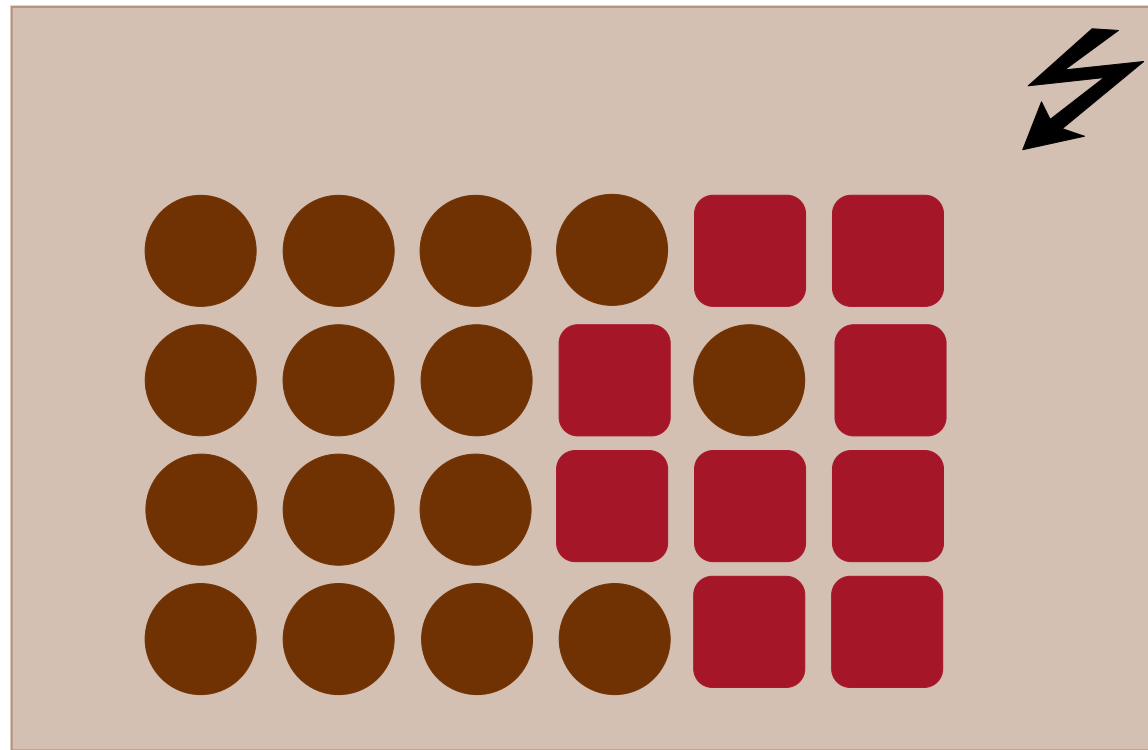
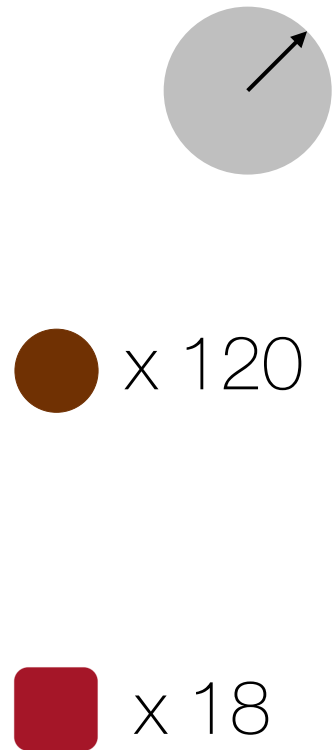
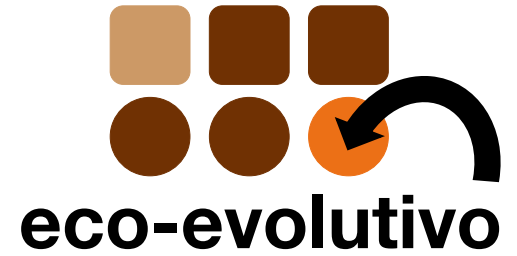


eco-evolutivo



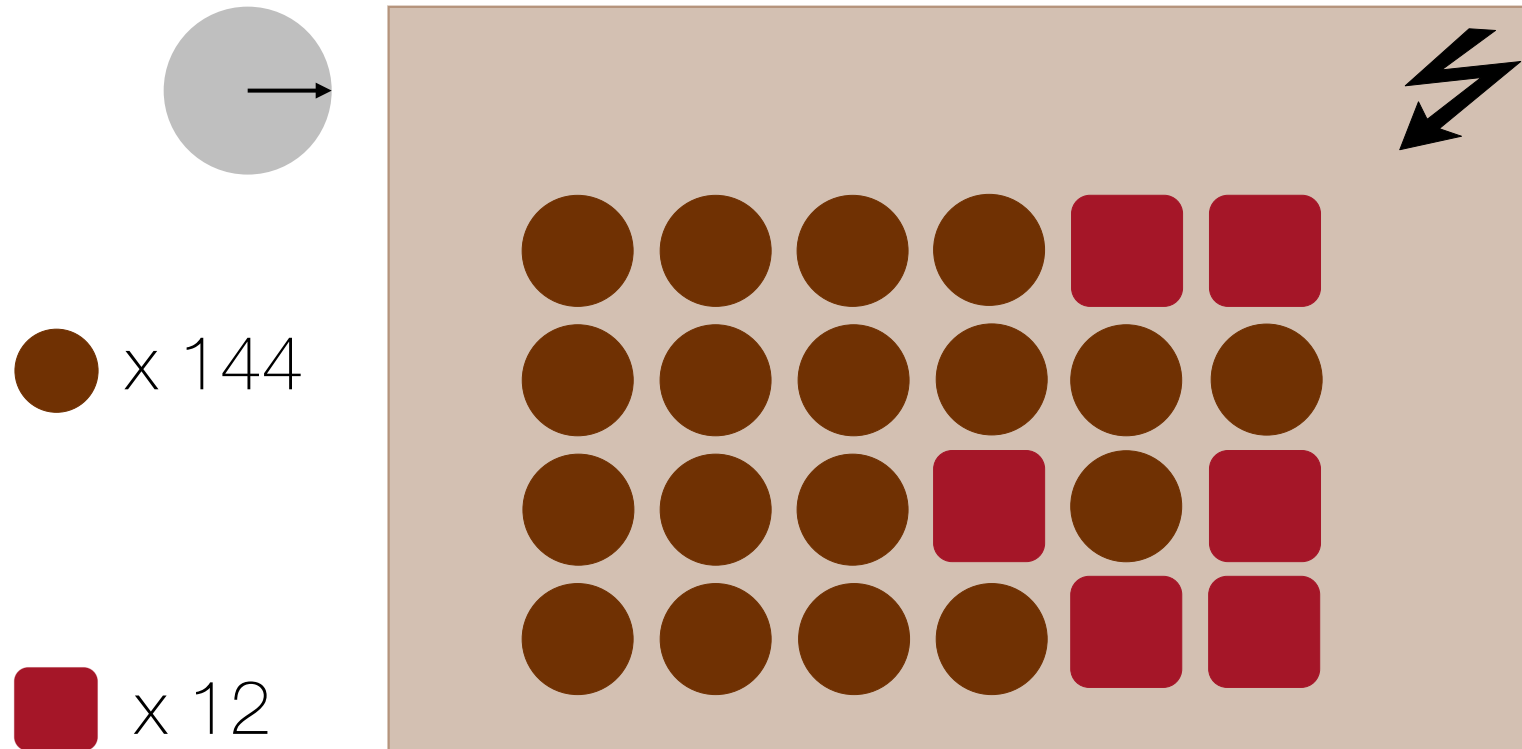
# coexistência de estratégias mediada pelo distúrbio

resultados e discussão ● ● ●

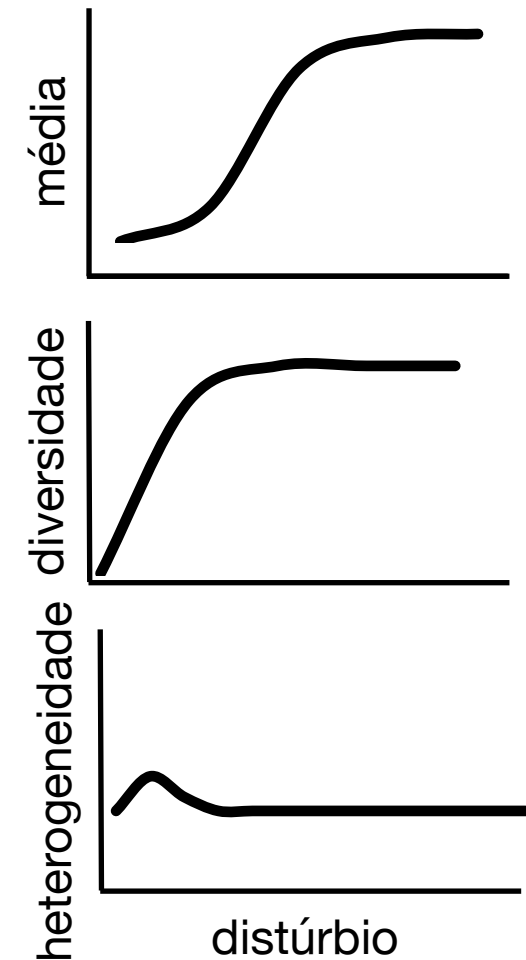


# coexistência de estratégias mediada pelo distúrbio

resultados e discussão ● ● ●

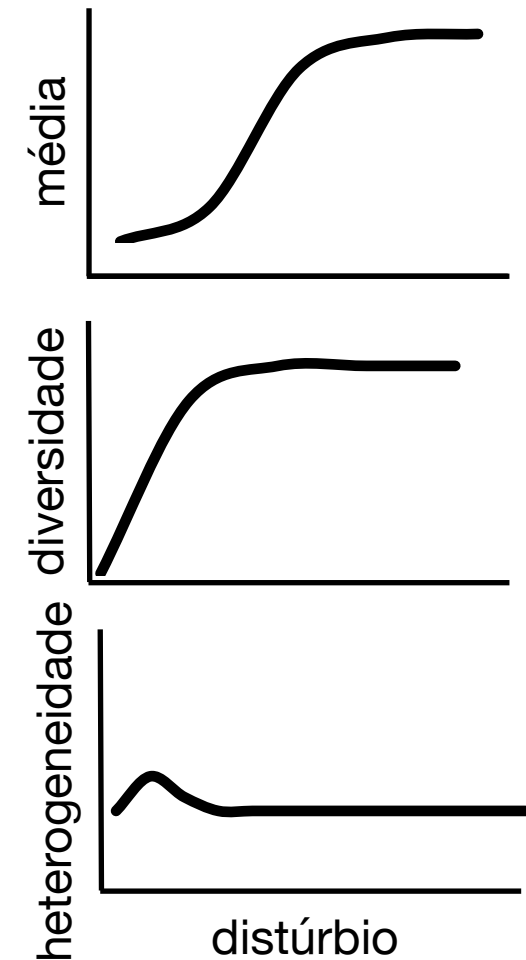
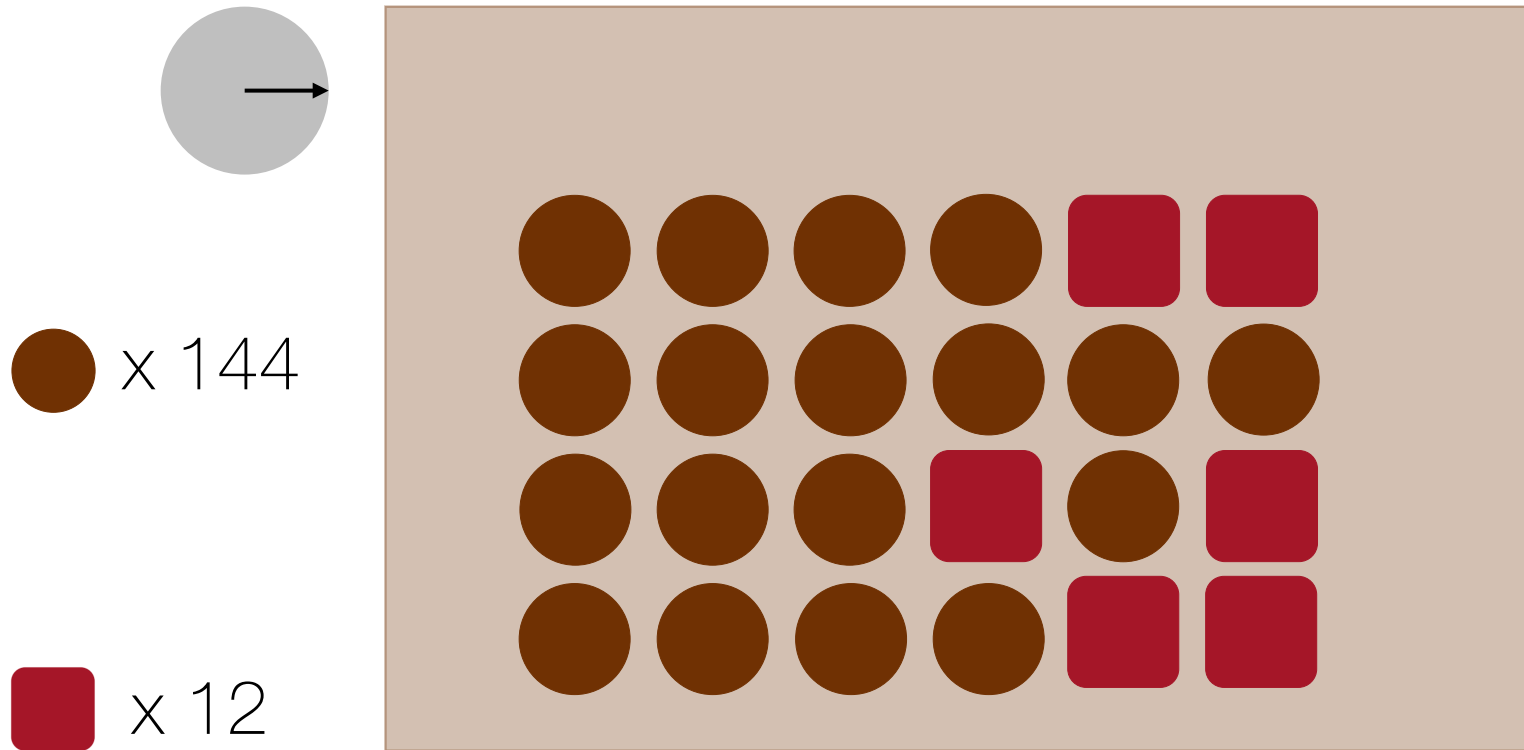
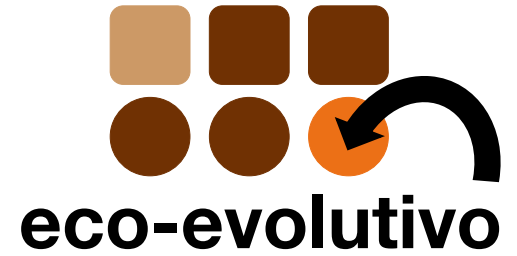


eco-evolutivo



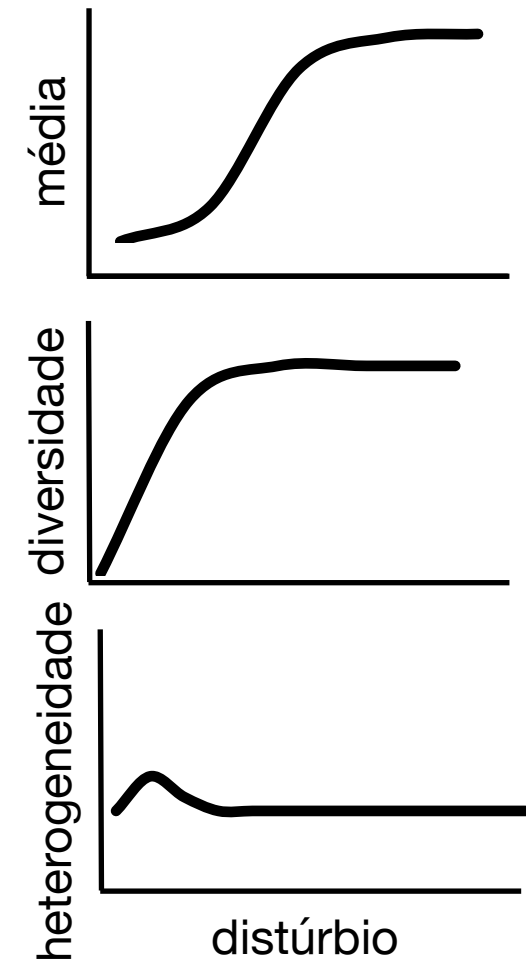
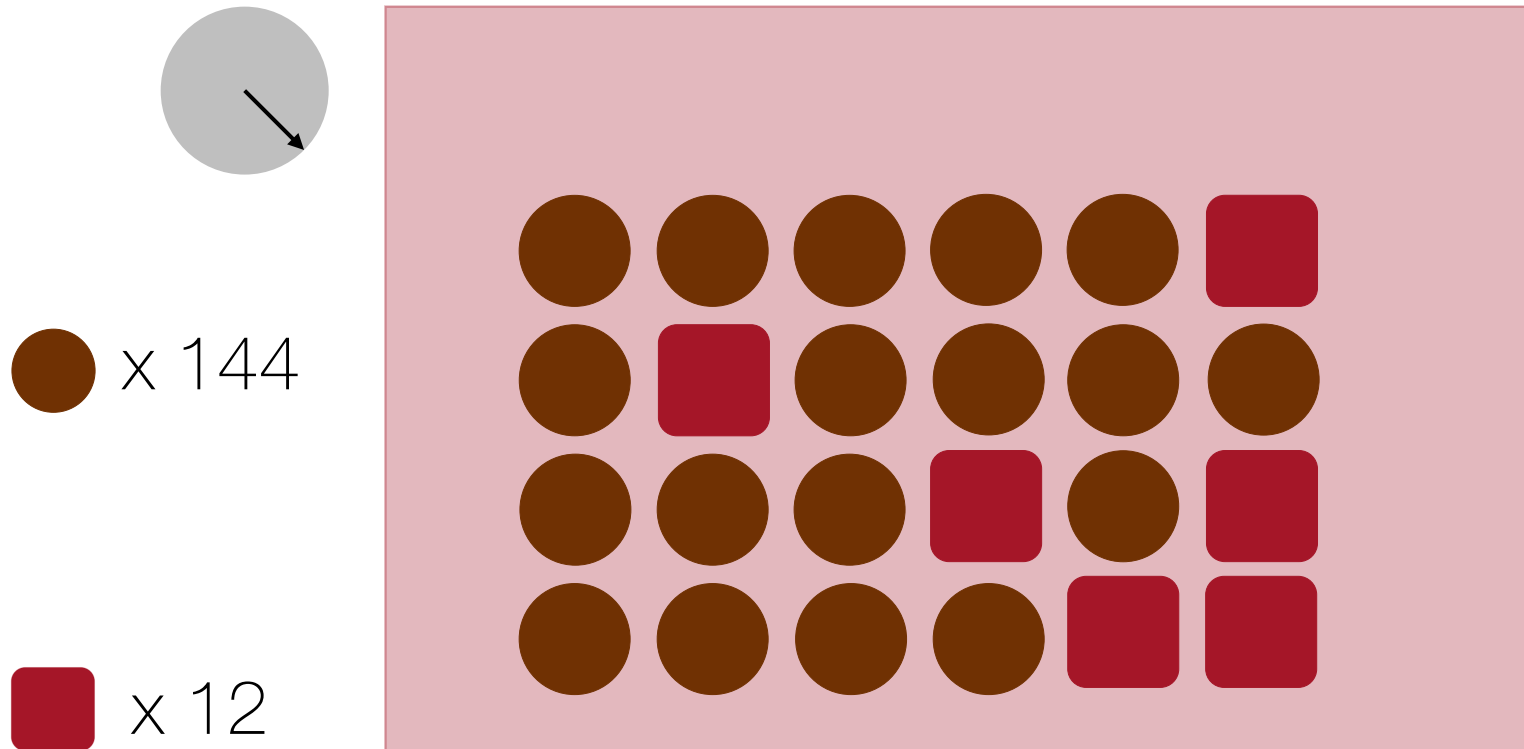
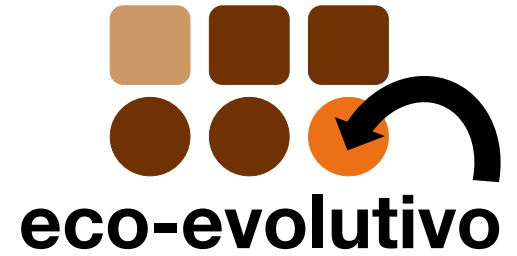
# coexistência de estratégias mediada pelo distúrbio

resultados e discussão ● ● ●



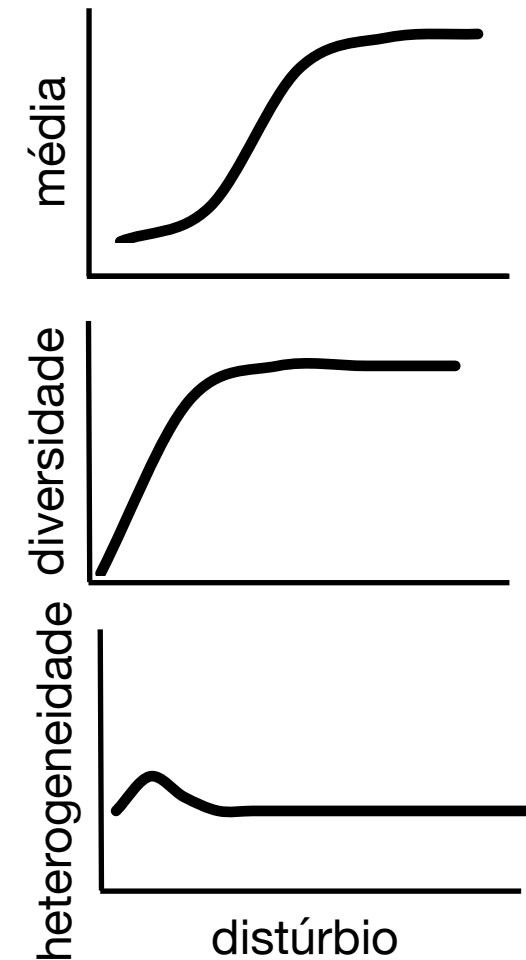
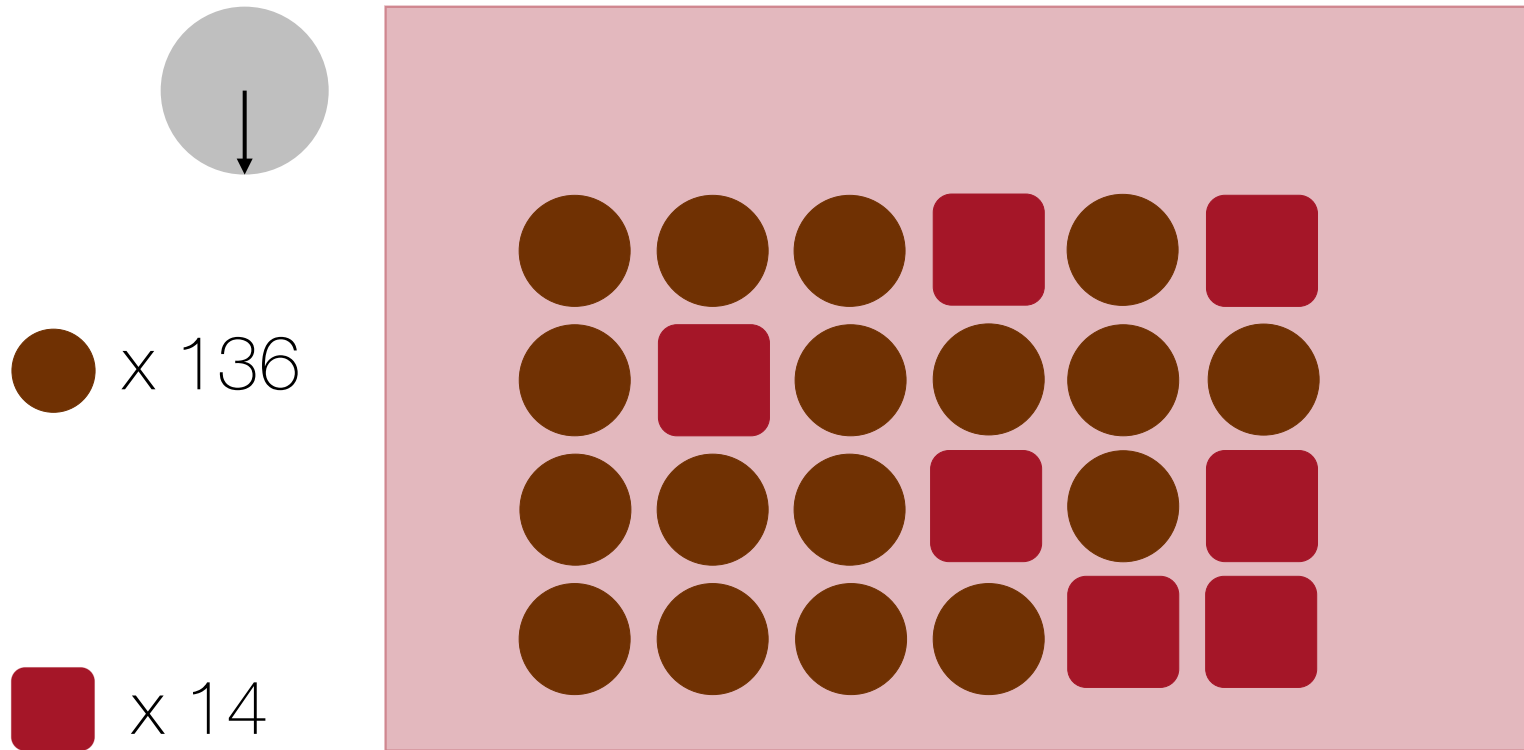
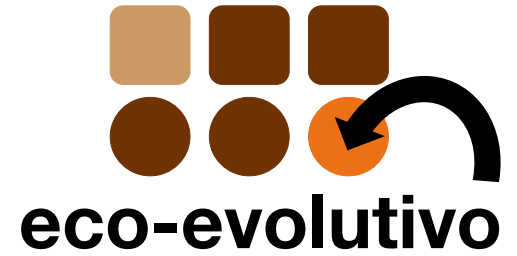
# coexistência de estratégias mediada pelo distúrbio

resultados e discussão ● ● ●



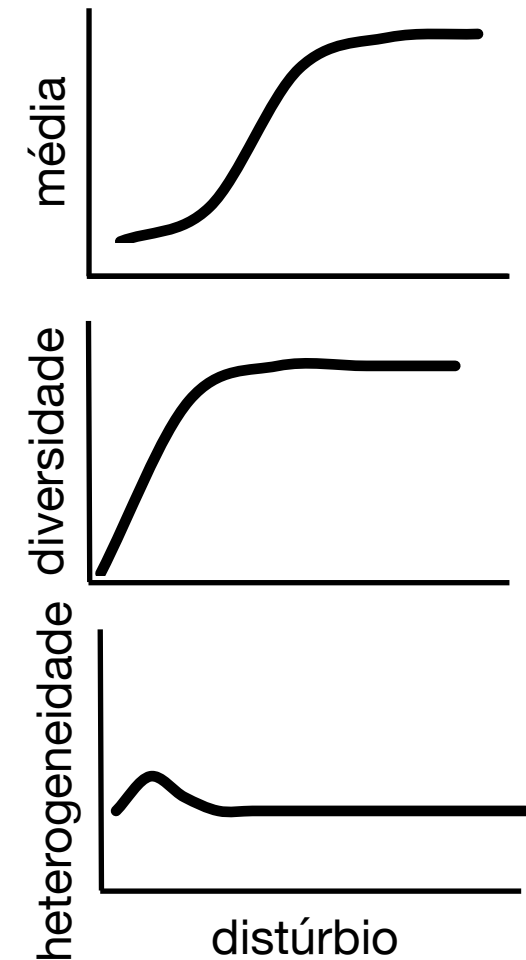
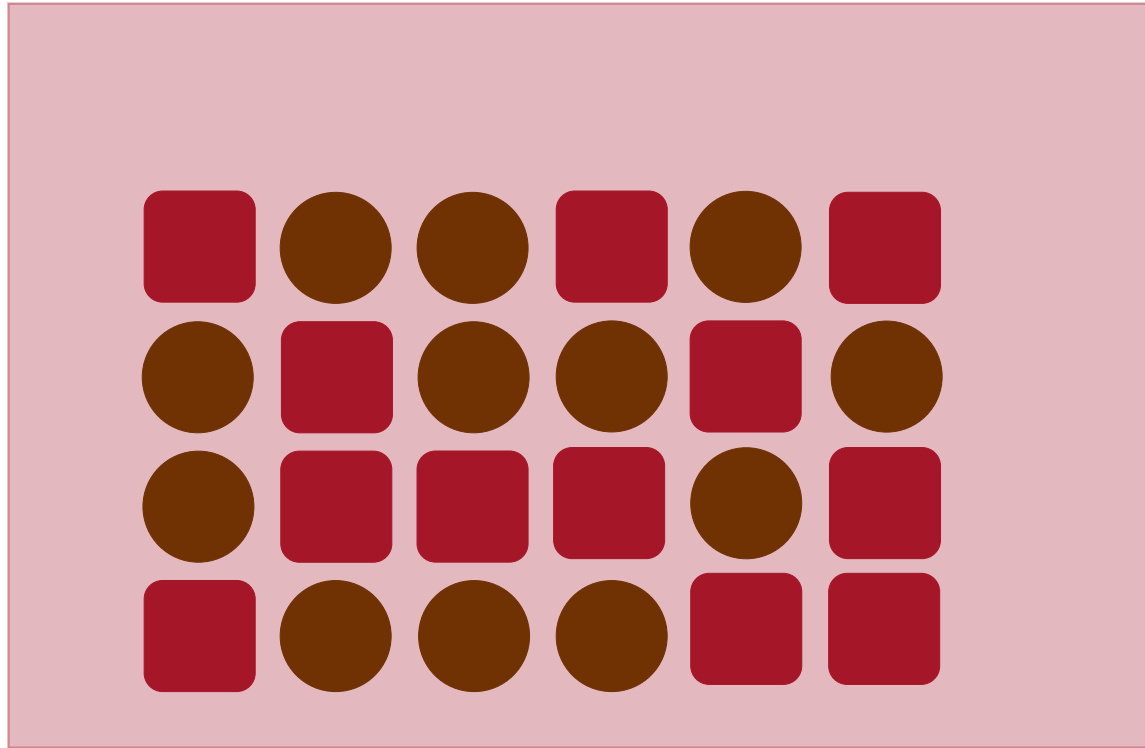
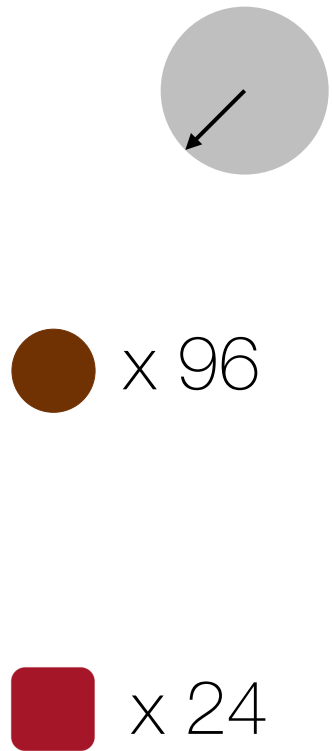
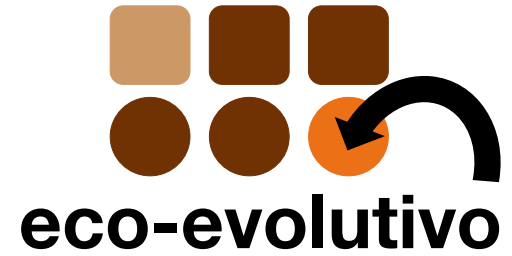
# coexistência de estratégias mediada pelo distúrbio

resultados e discussão ● ● ●



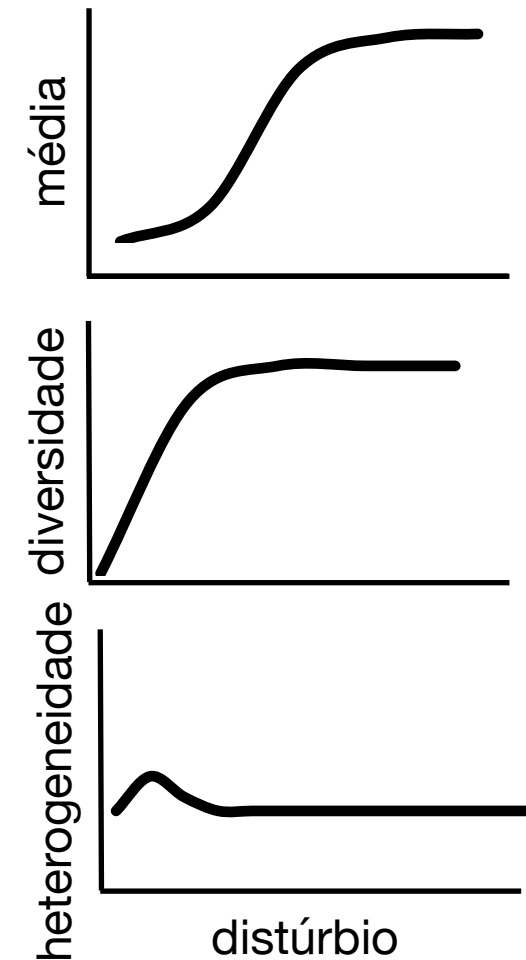
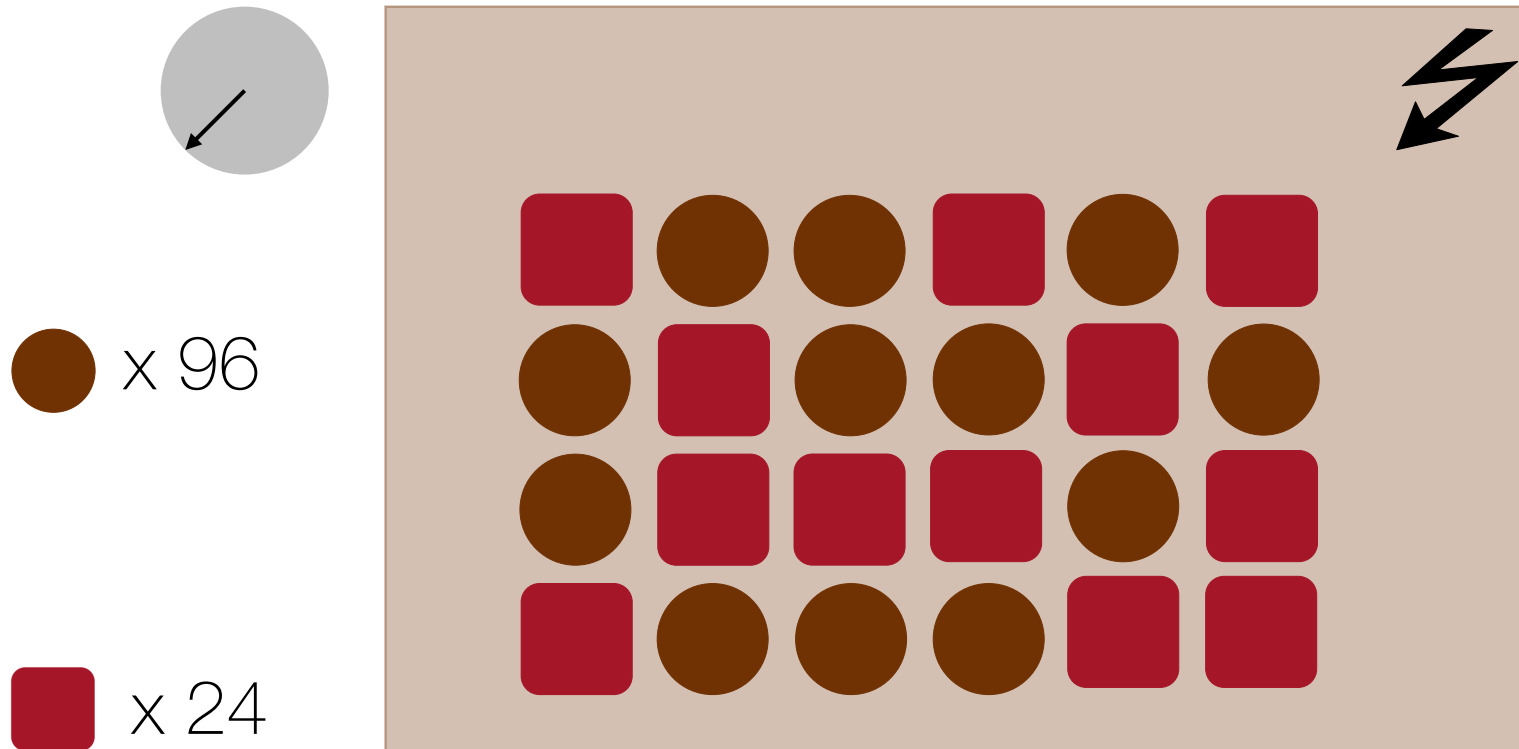
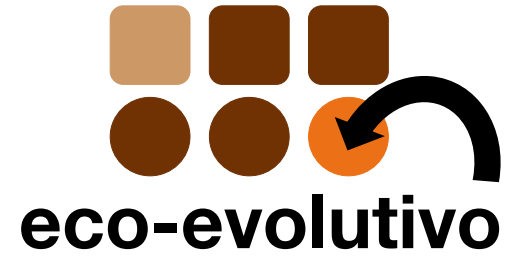
# coexistência de estratégias mediada pelo distúrbio

resultados e discussão ● ● ●



# coexistência de estratégias mediada pelo distúrbio

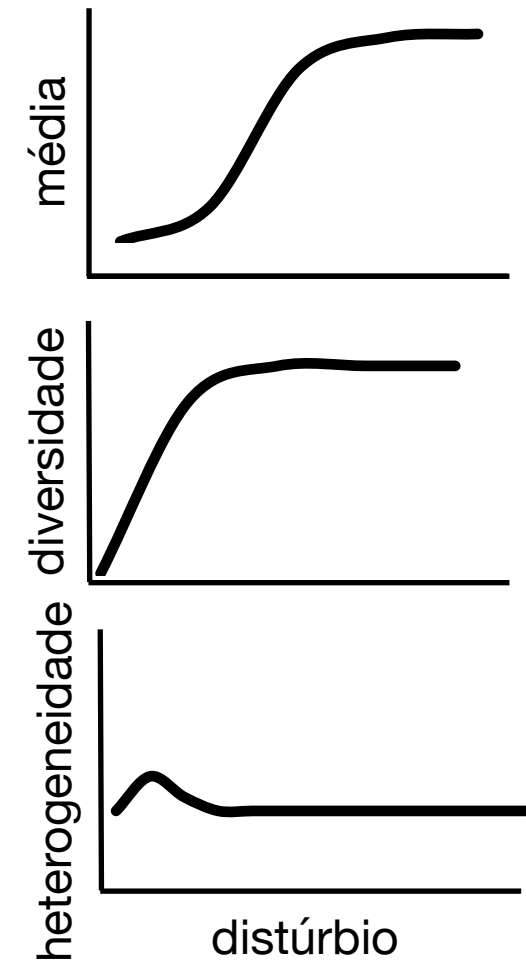
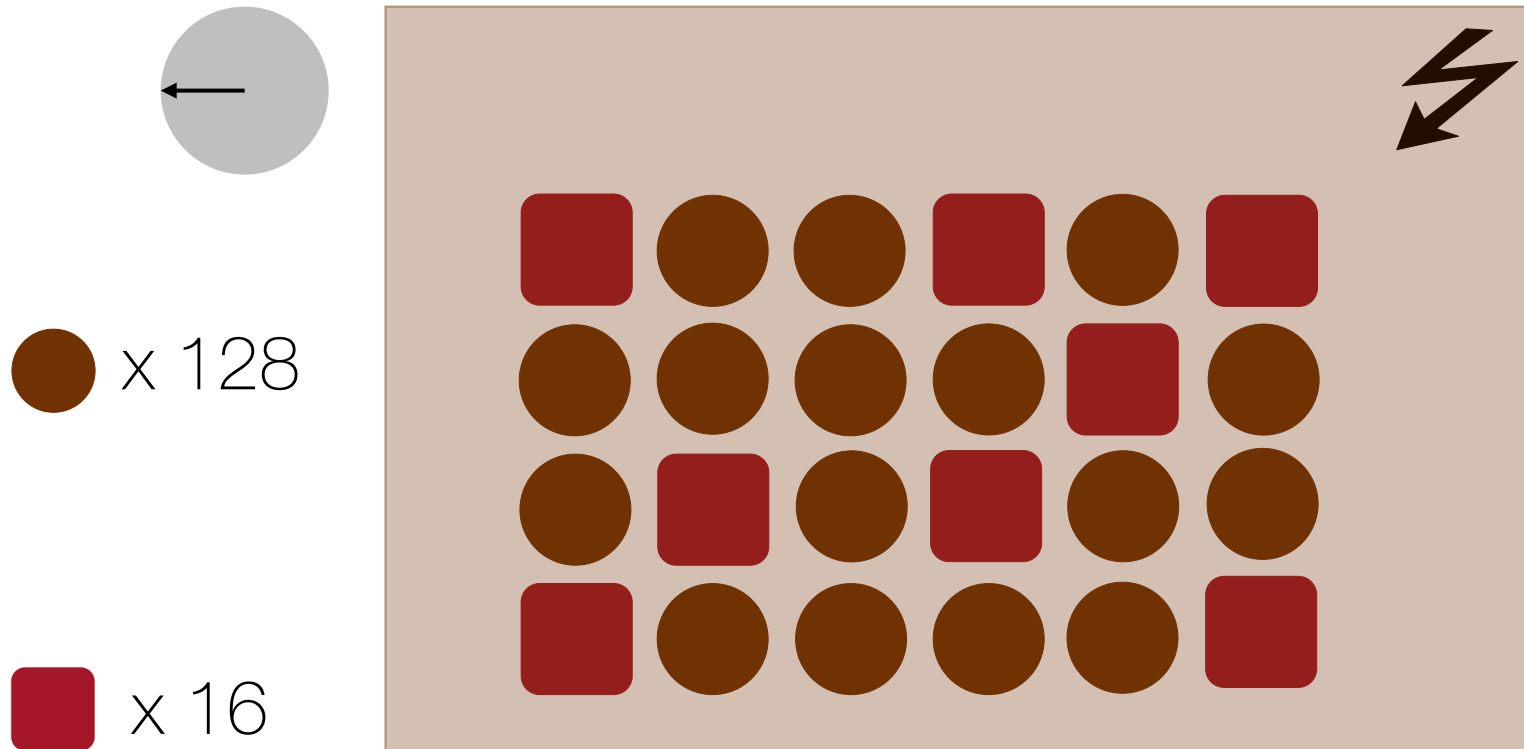
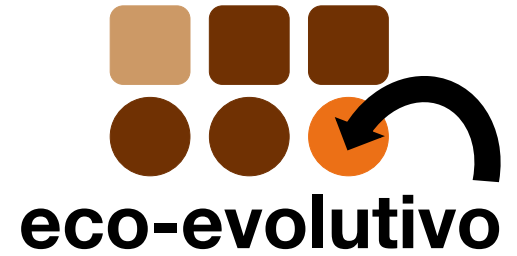
resultados e discussão ● ● ●





# coexistência de estratégias mediada pelo distúrbio

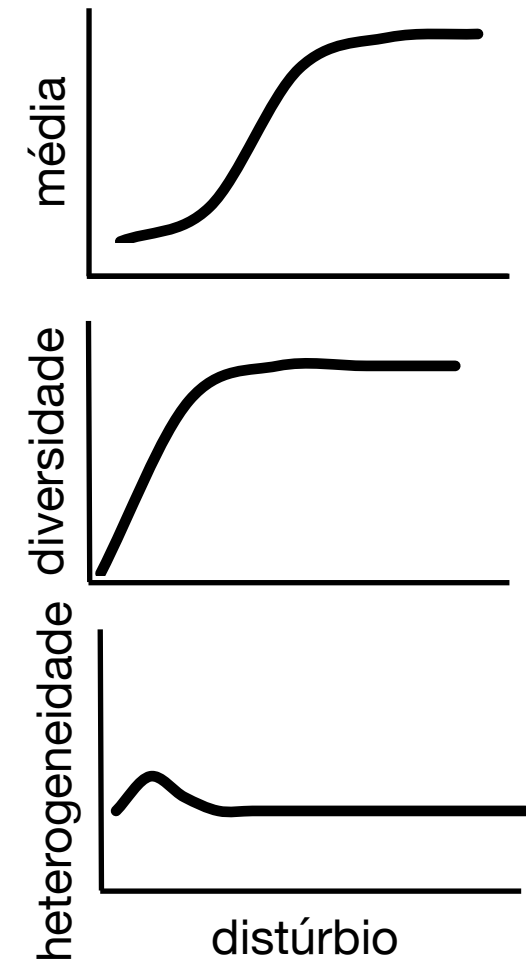
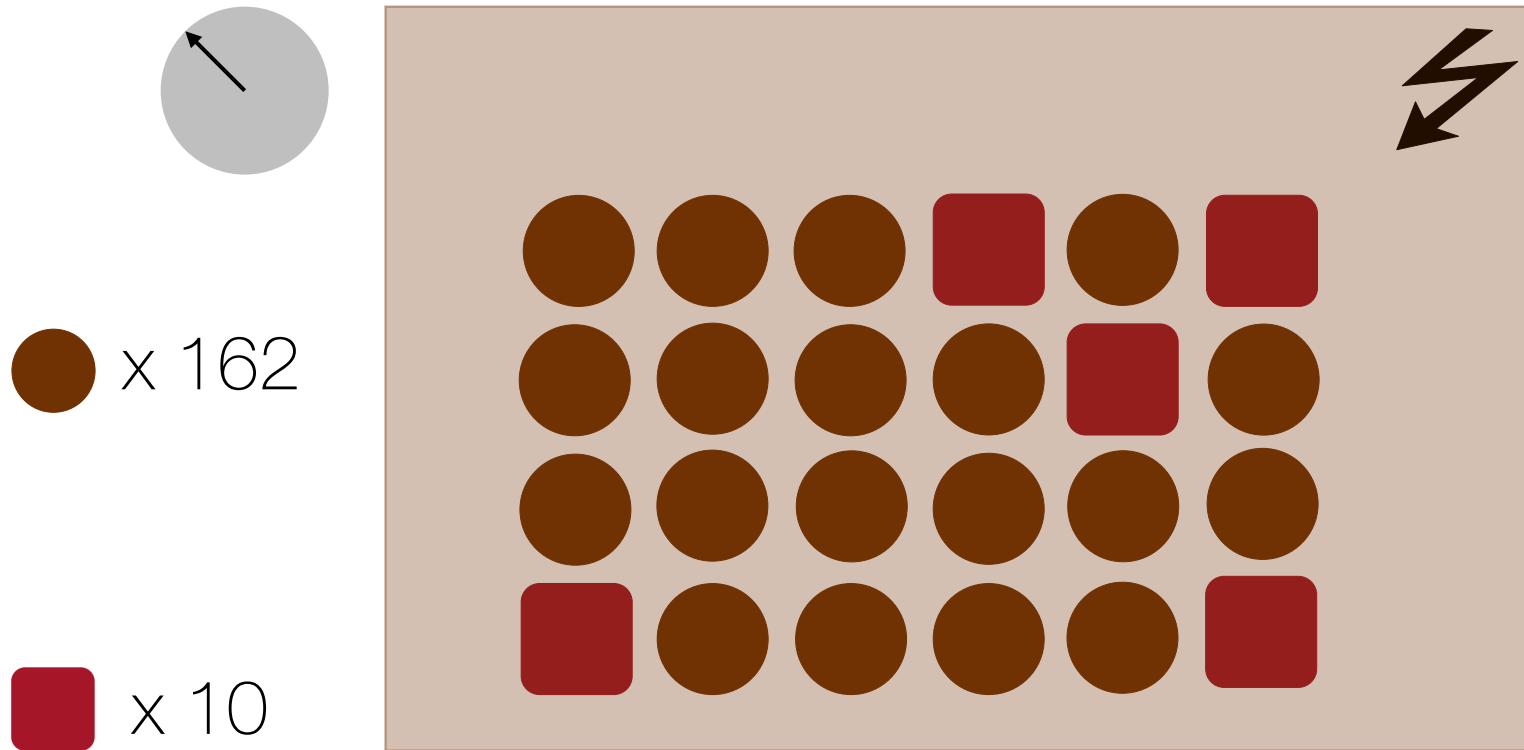
resultados e discussão ● ● ●



# coexistência de estratégias mediada pelo distúrbio

resultados e discussão ● ● ●

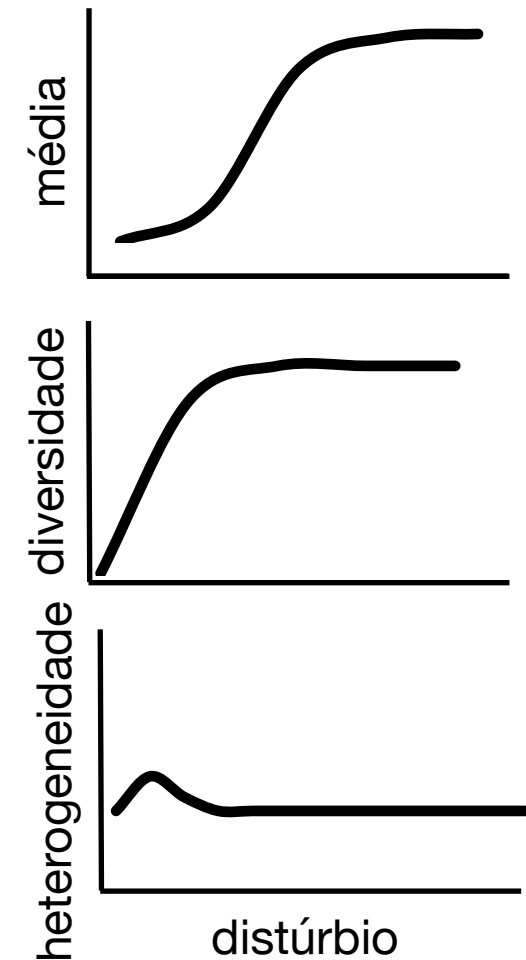
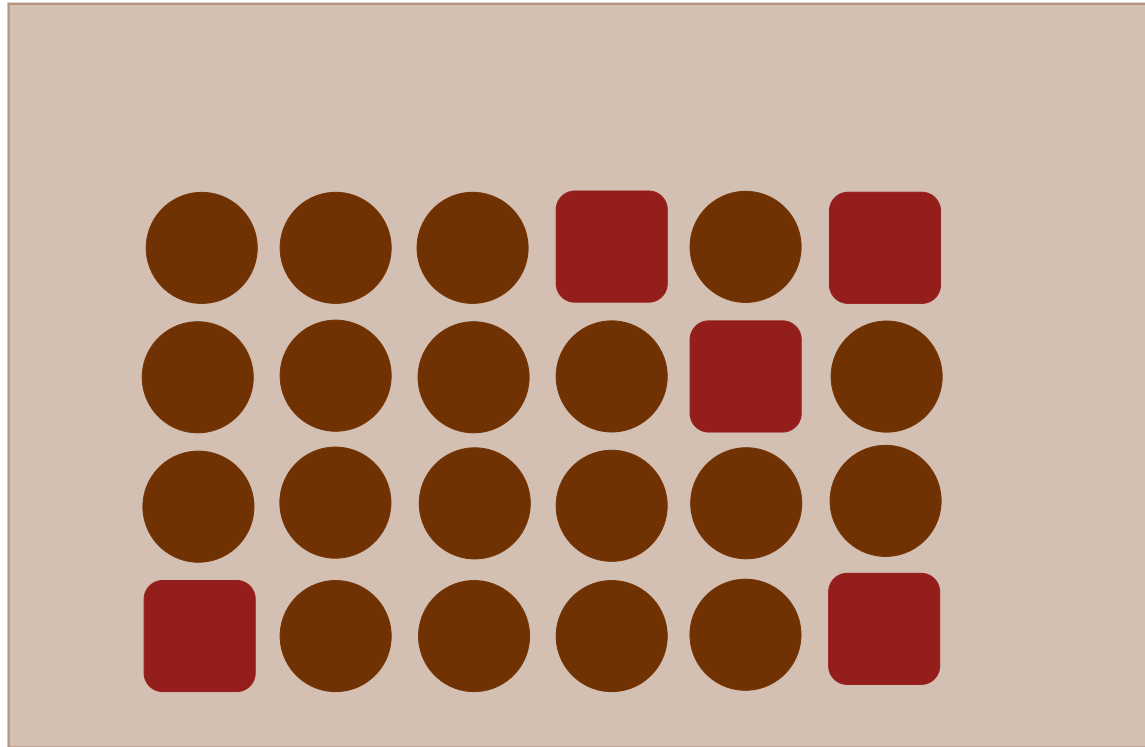
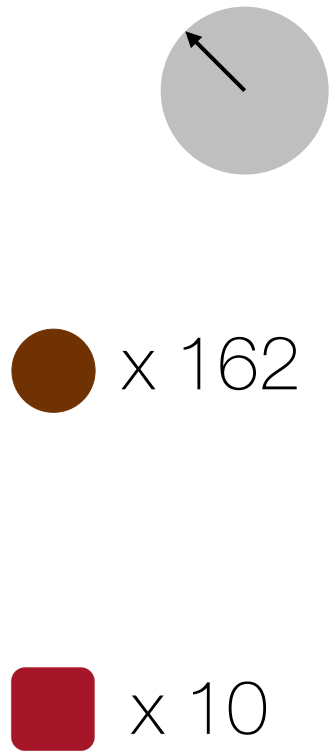
eco-evolutivo



# coexistência de estratégias mediada pelo distúrbio

resultados e discussão ● ● ●

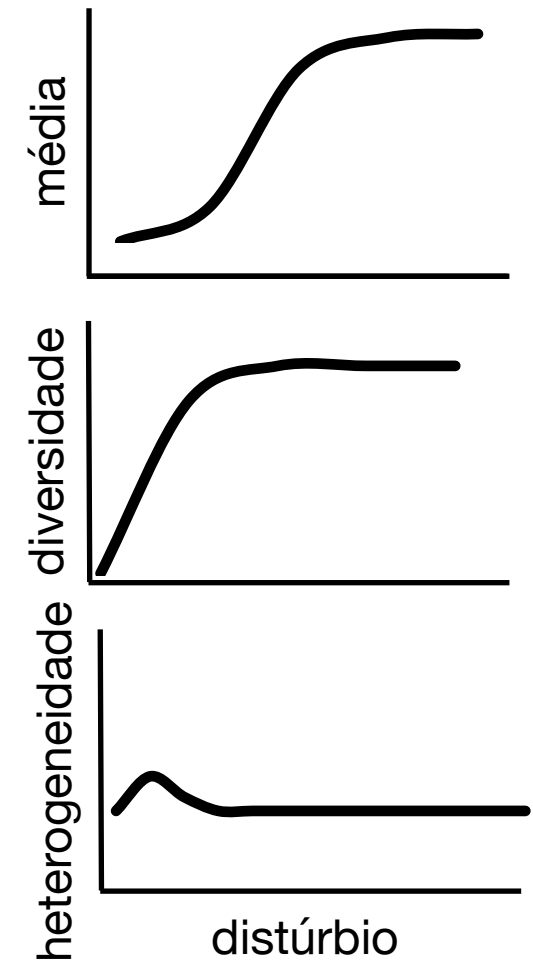
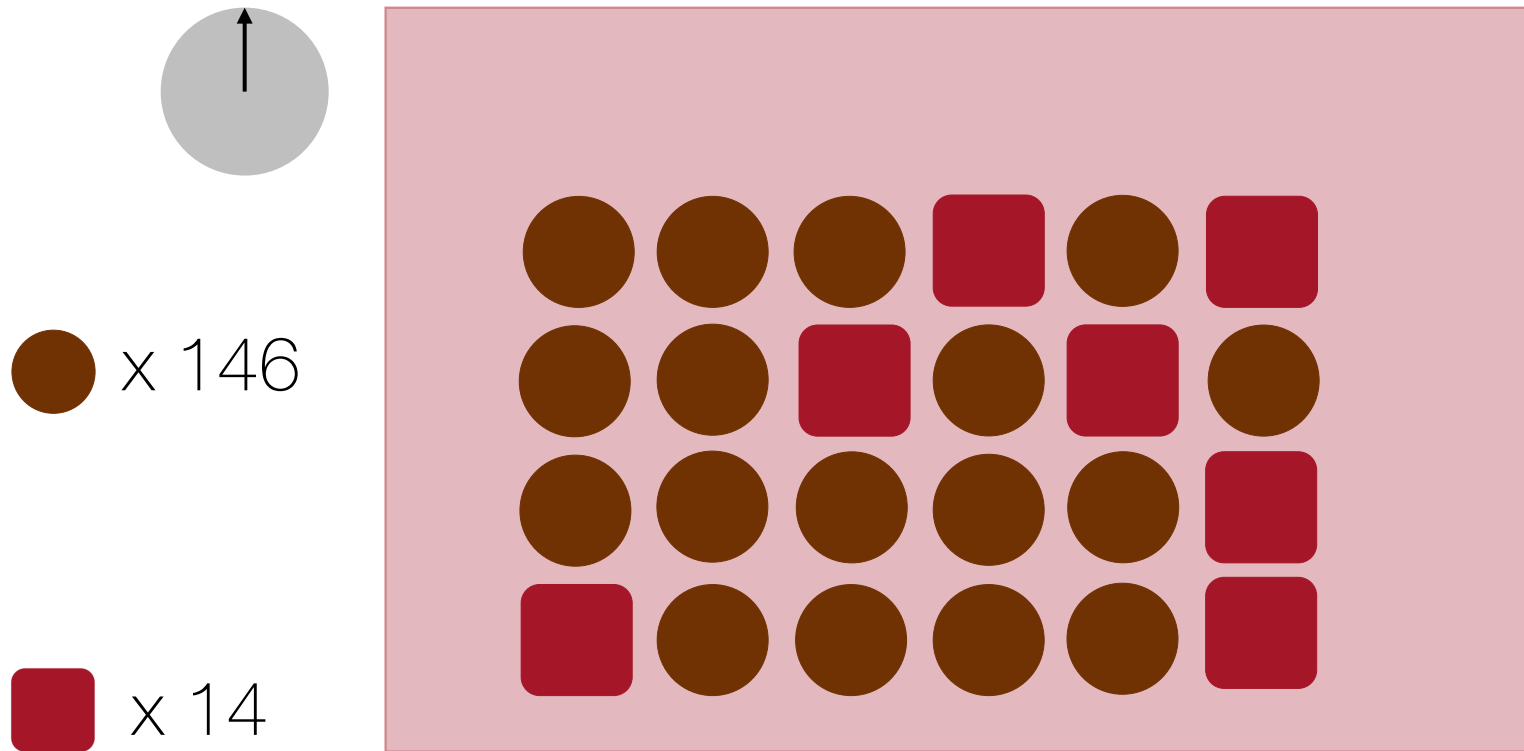
eco-evolutivo



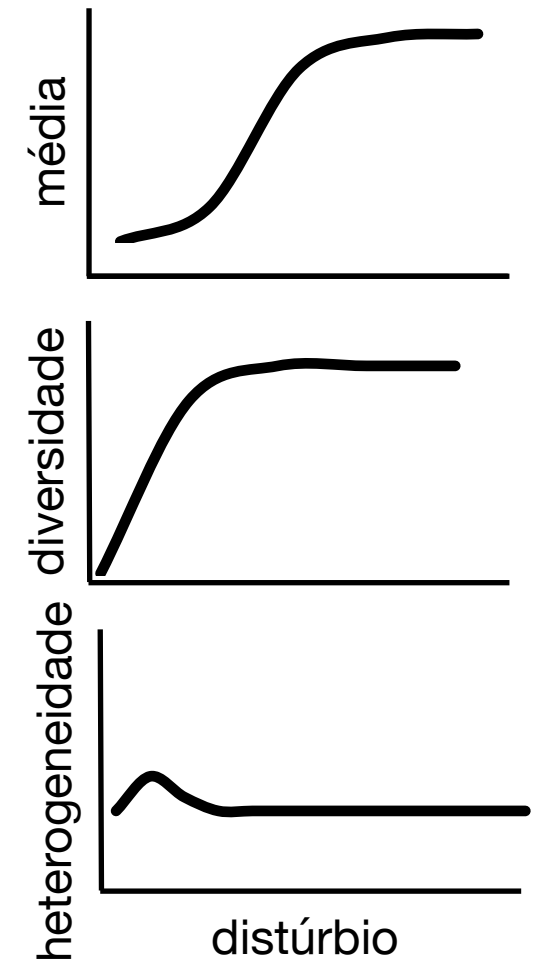
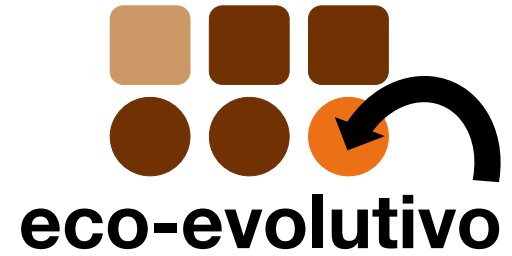
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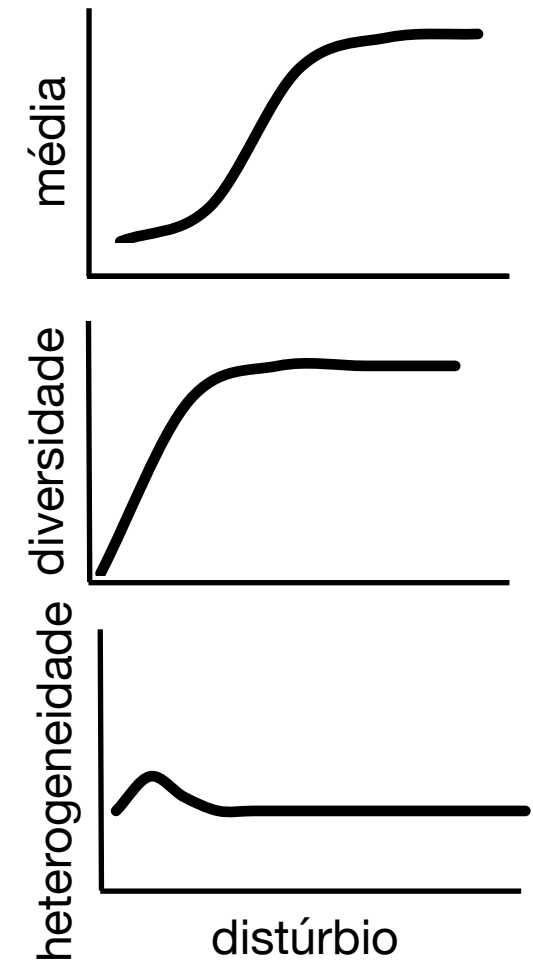
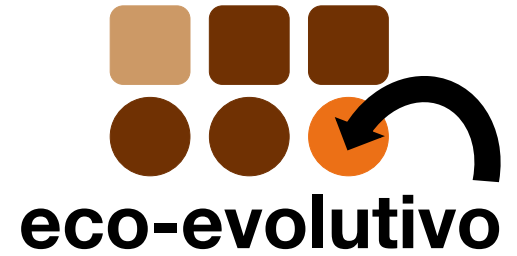


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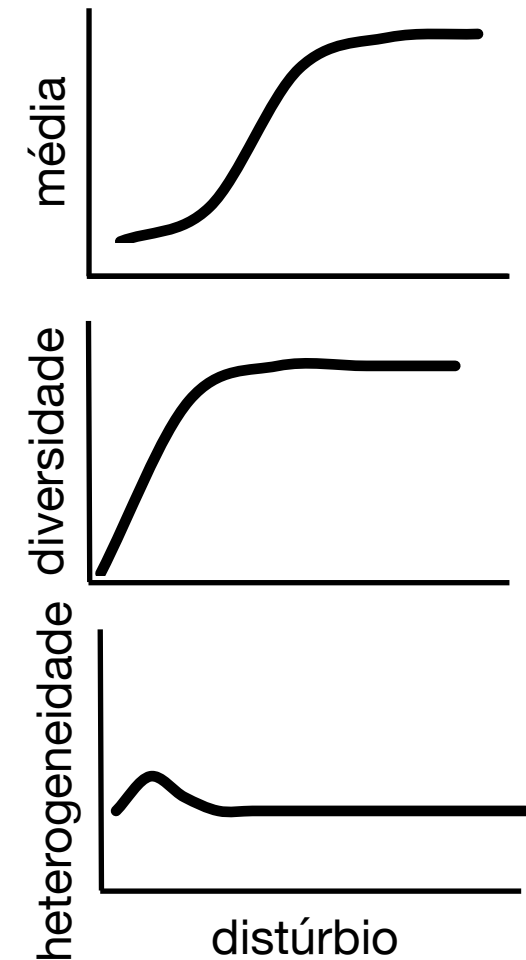
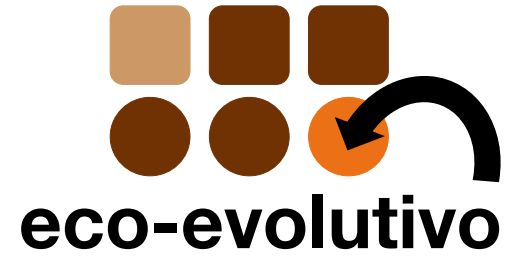
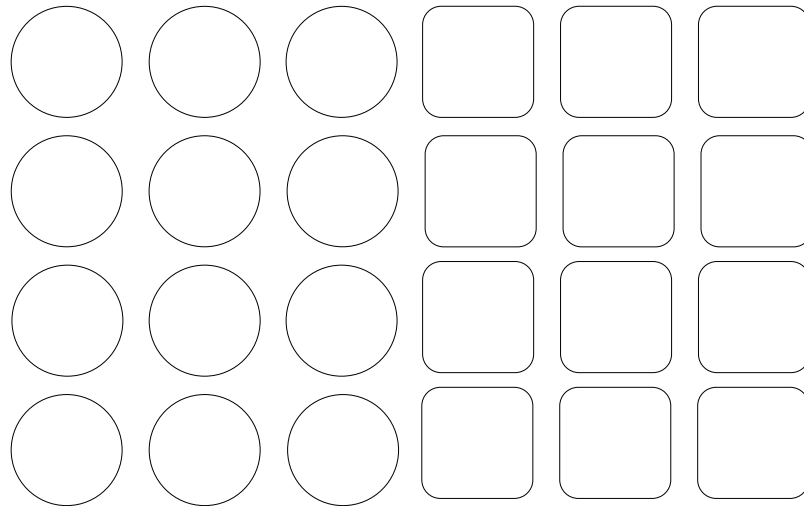
# coexistência de estratégias mediada pelo distúrbio

cenário eco-evolutivo



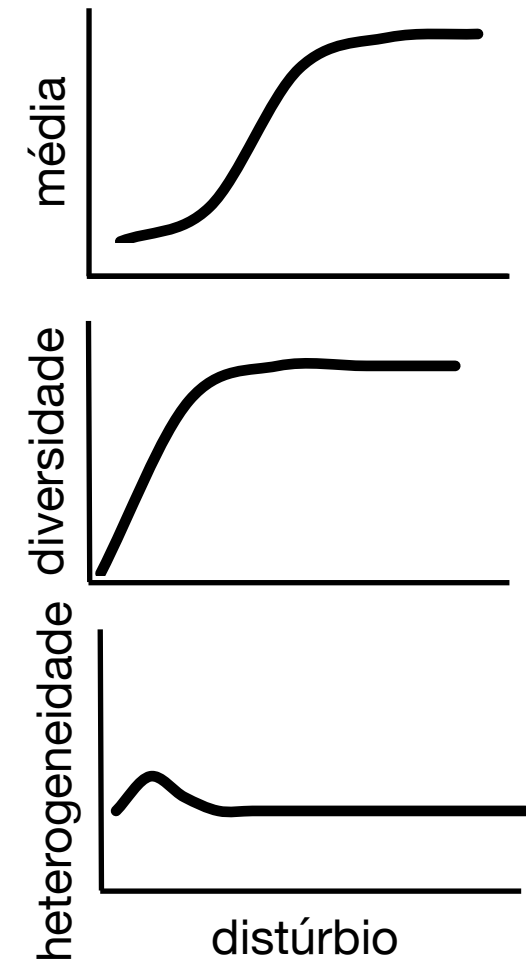
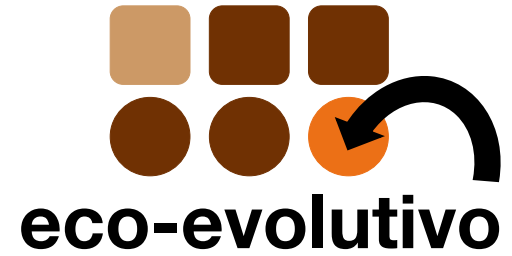
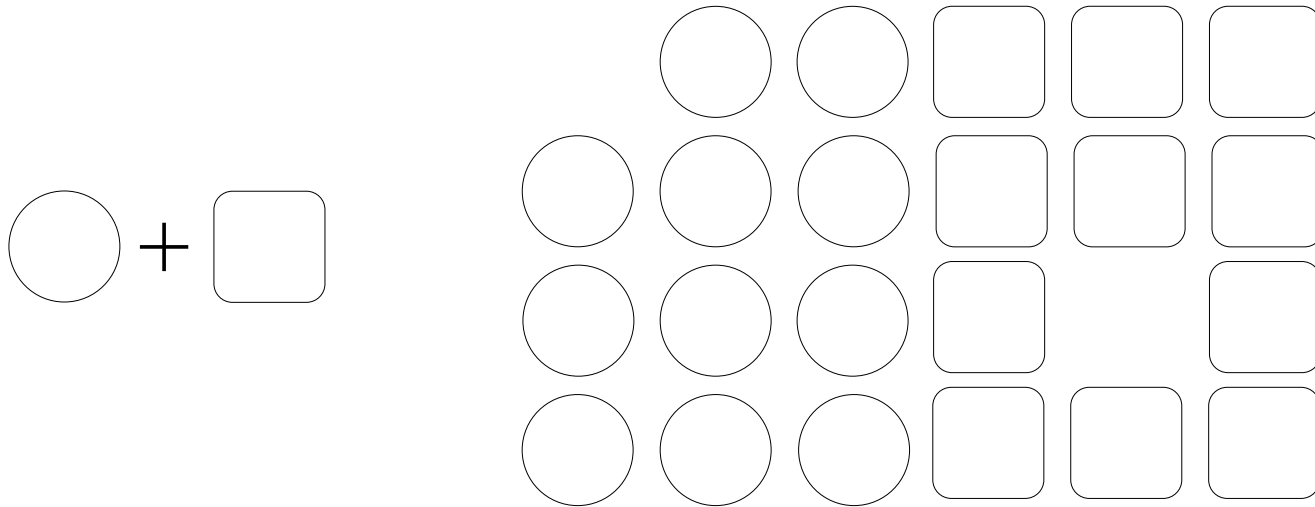
# coexistência de estratégias mediada pelo distúrbio

cenário eco-evolutivo = isolamento reprodutivo



# coexistência de estratégias mediada pelo distúrbio

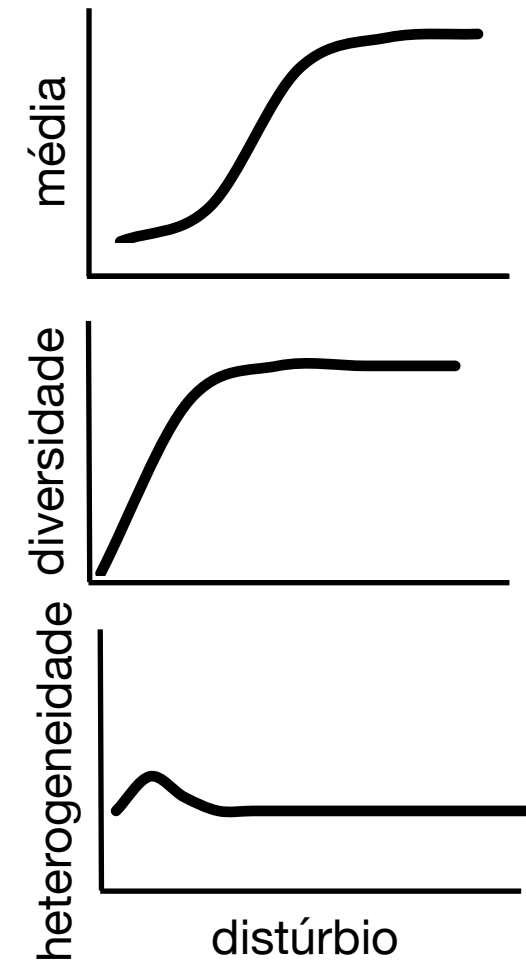
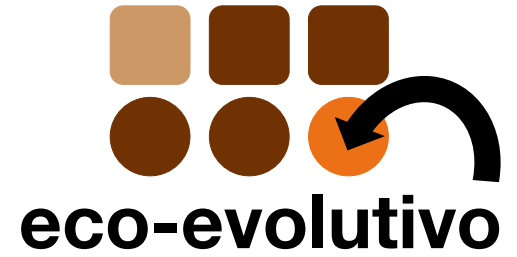
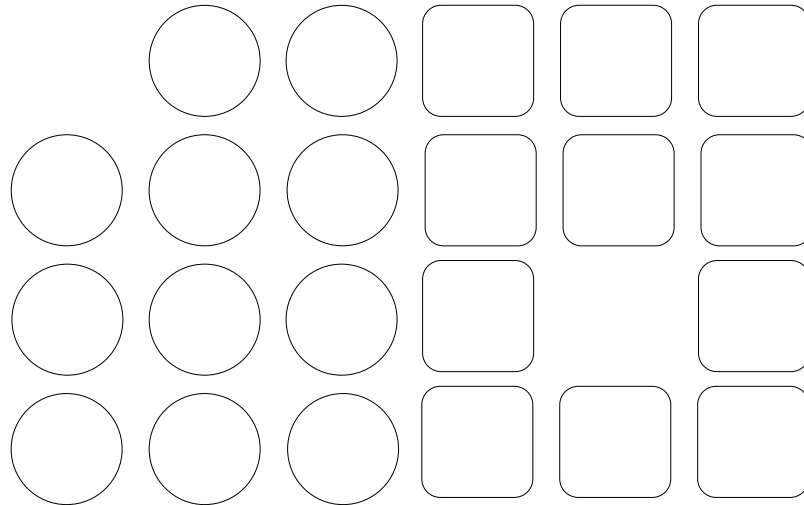
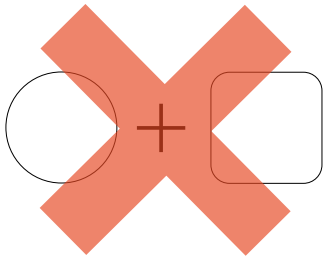
cenário eco-evolutivo = isolamento reprodutivo





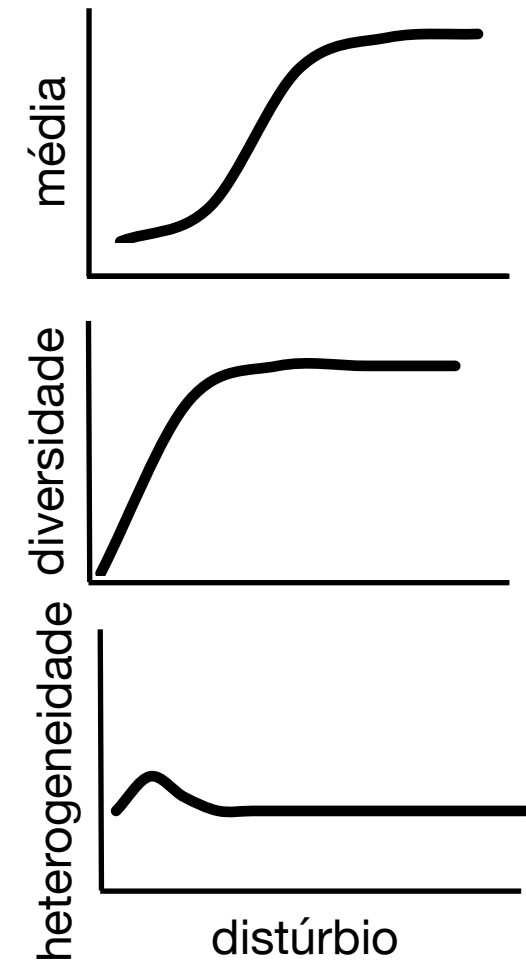
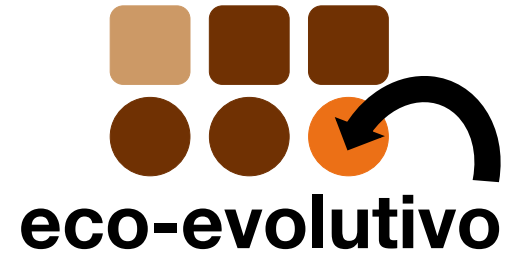
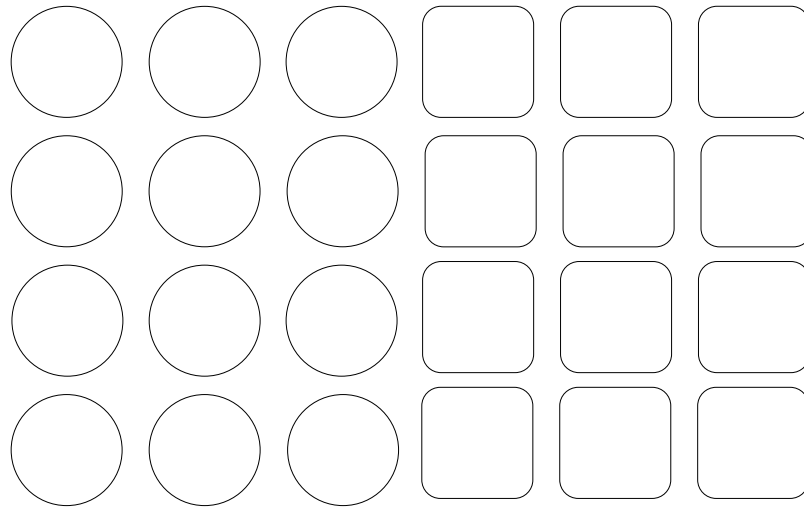
# coexistência de estratégias mediada pelo distúrbio

cenário eco-evolutivo = isolamento reprodutivo



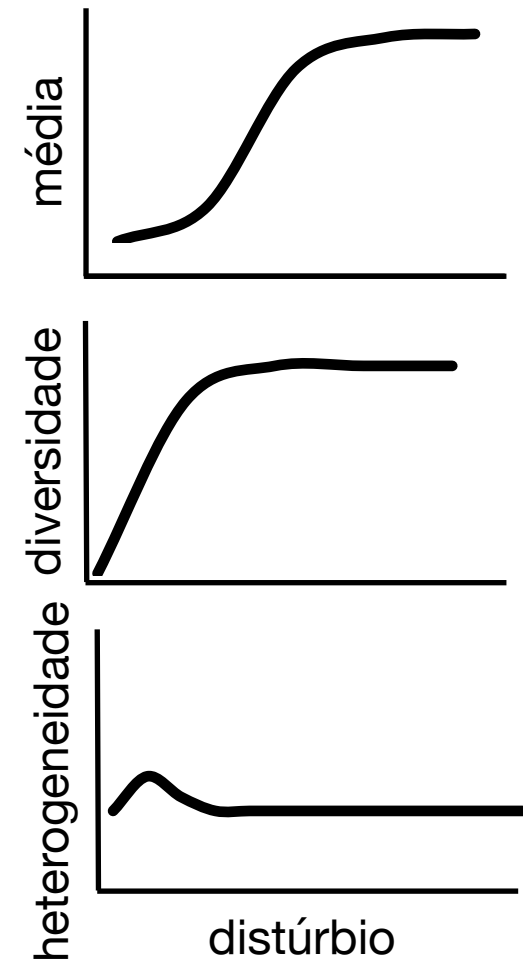
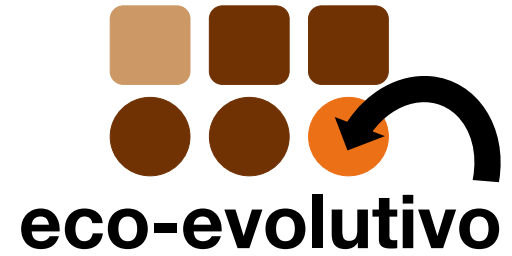
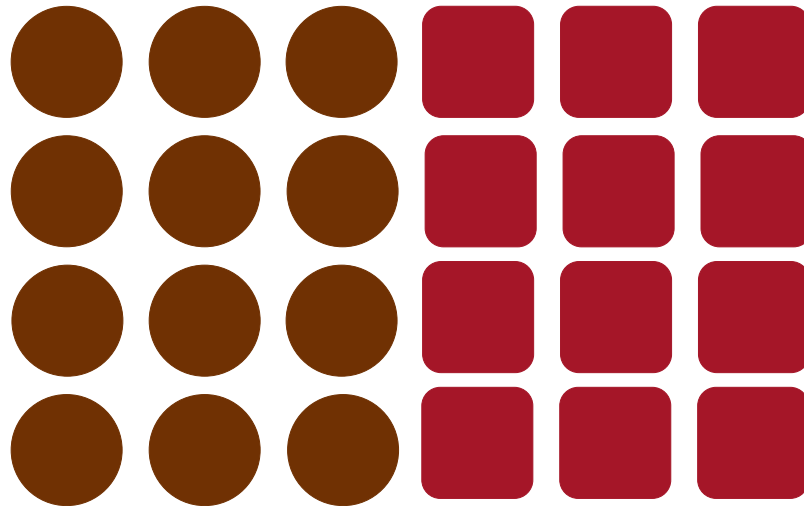
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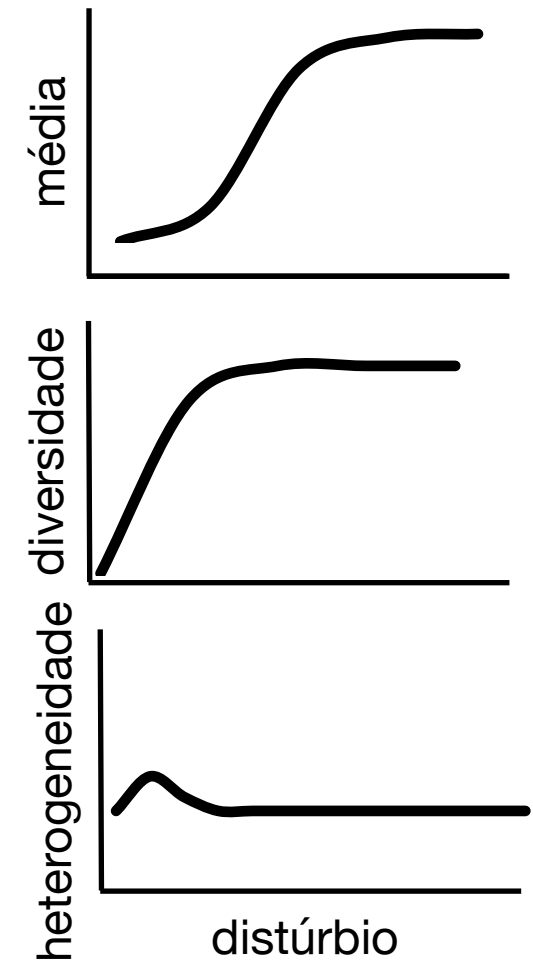
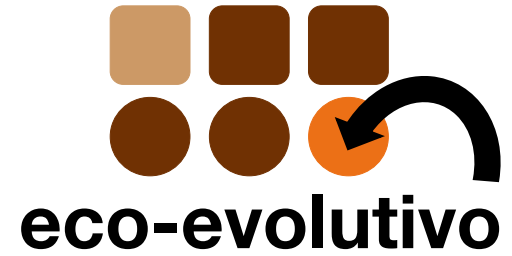
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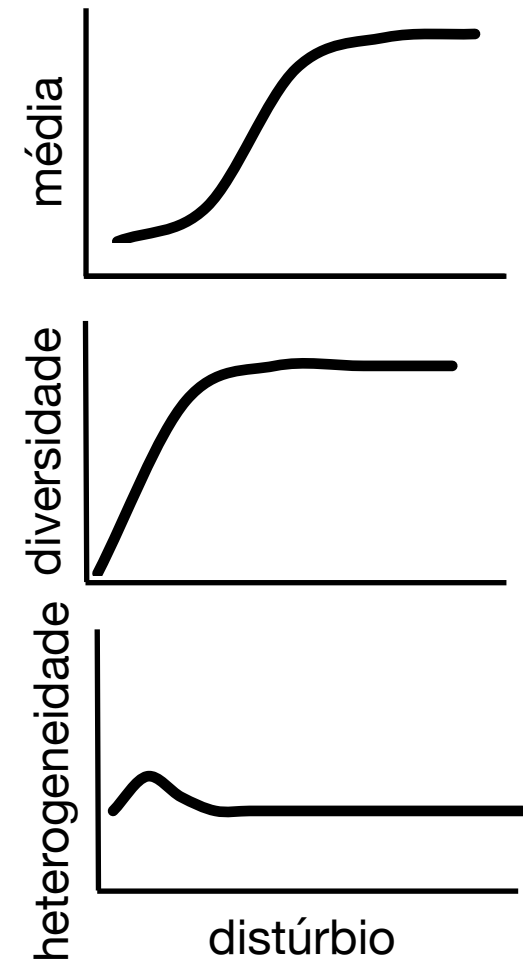
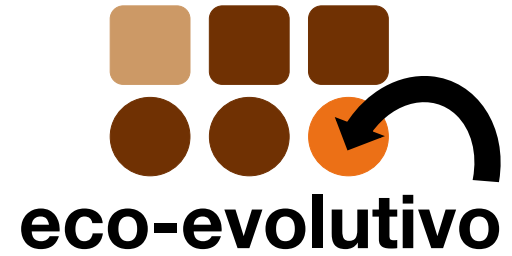
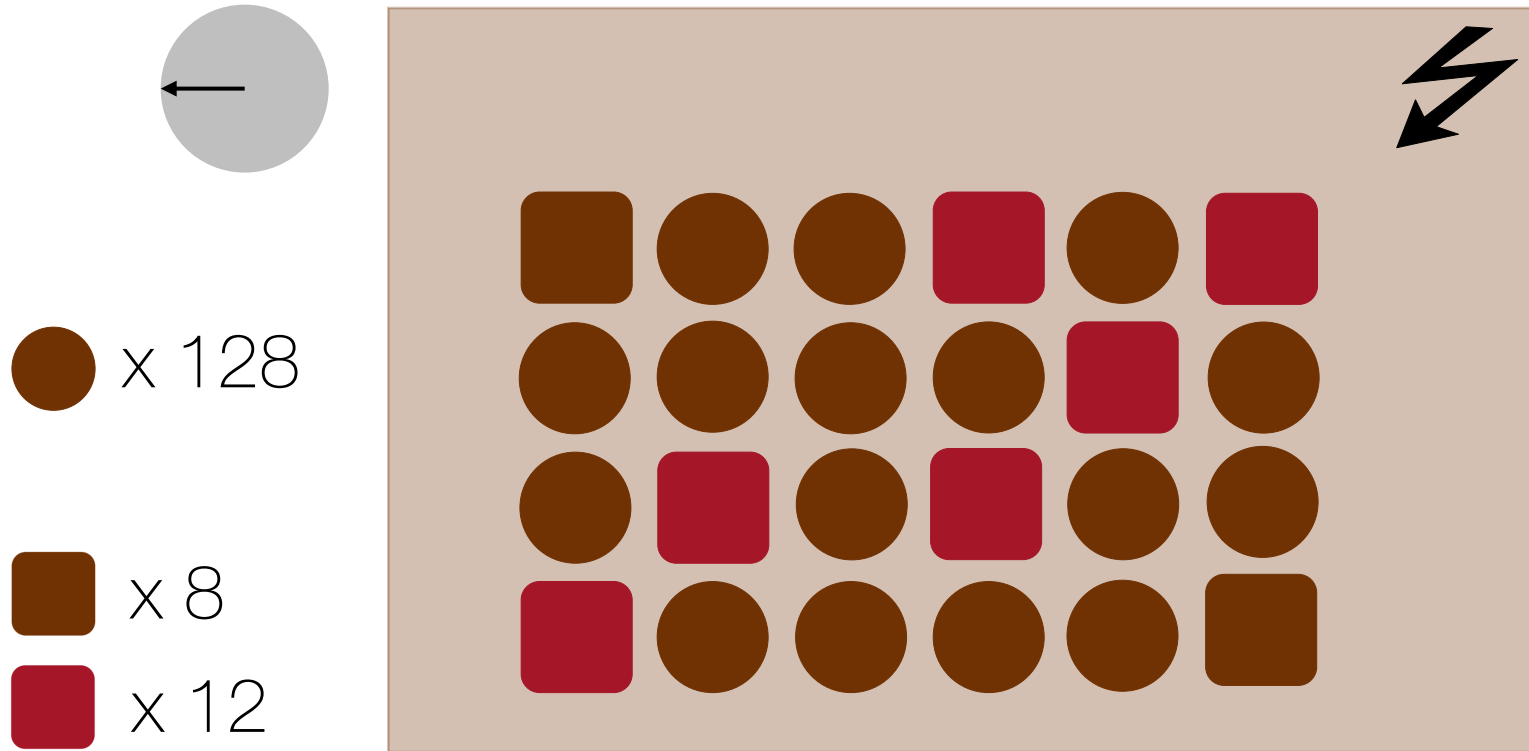
# coexistência de estratégias mediada pelo distúrbio

cenário eco-evolutivo = mutação



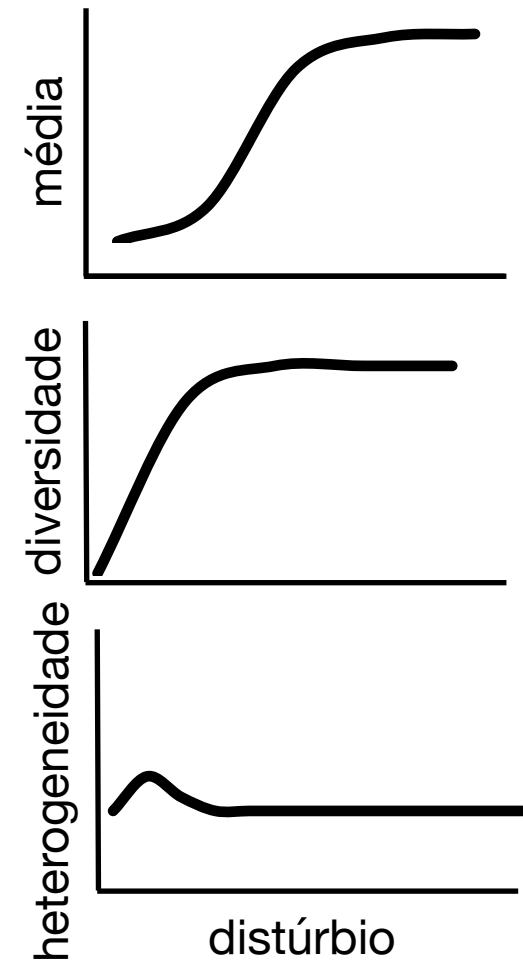
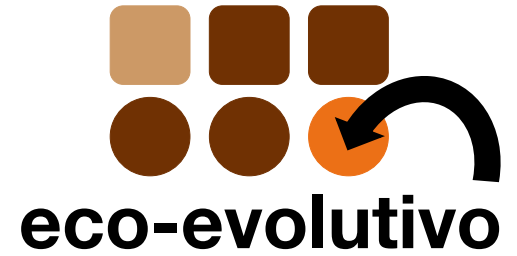
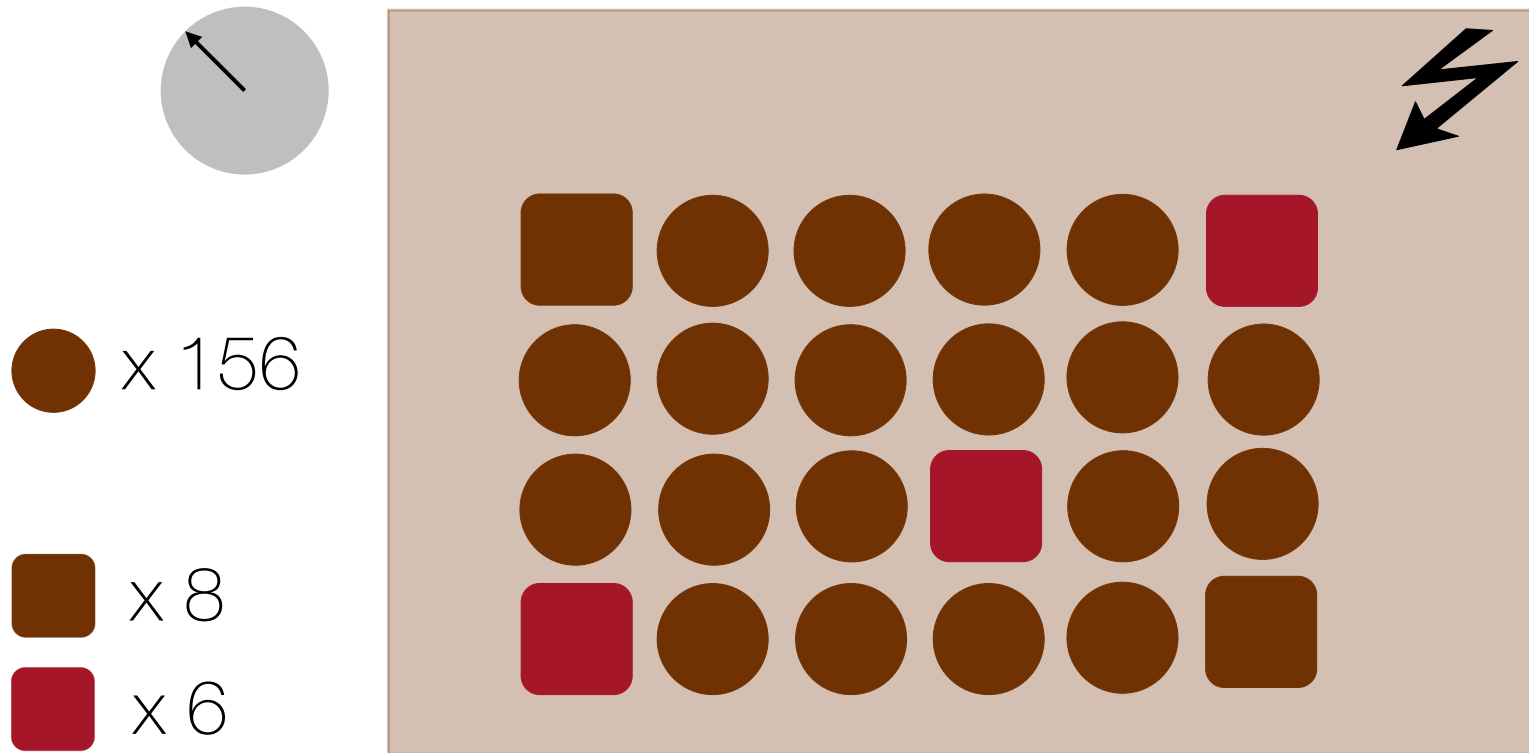
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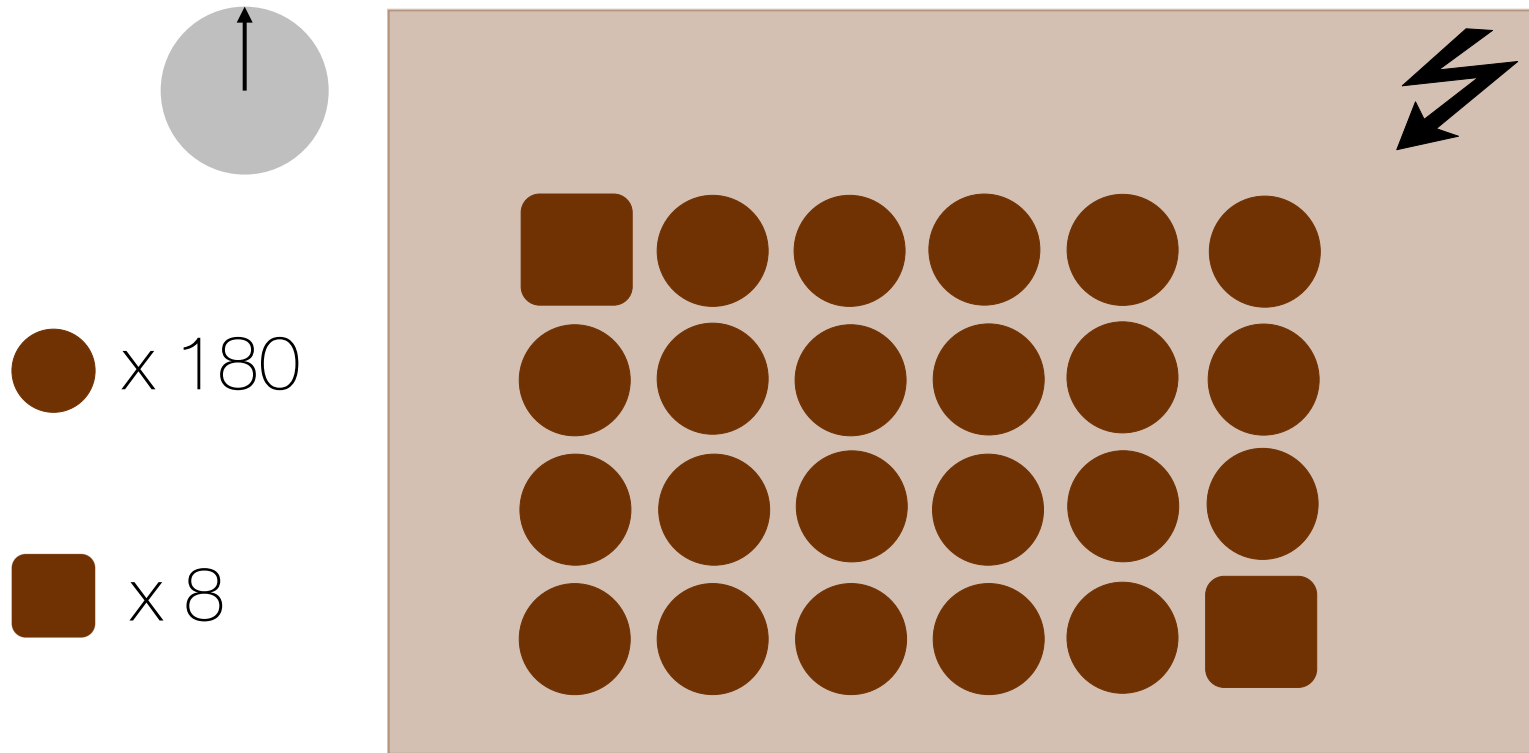
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cenário eco-evolutivo = mutação

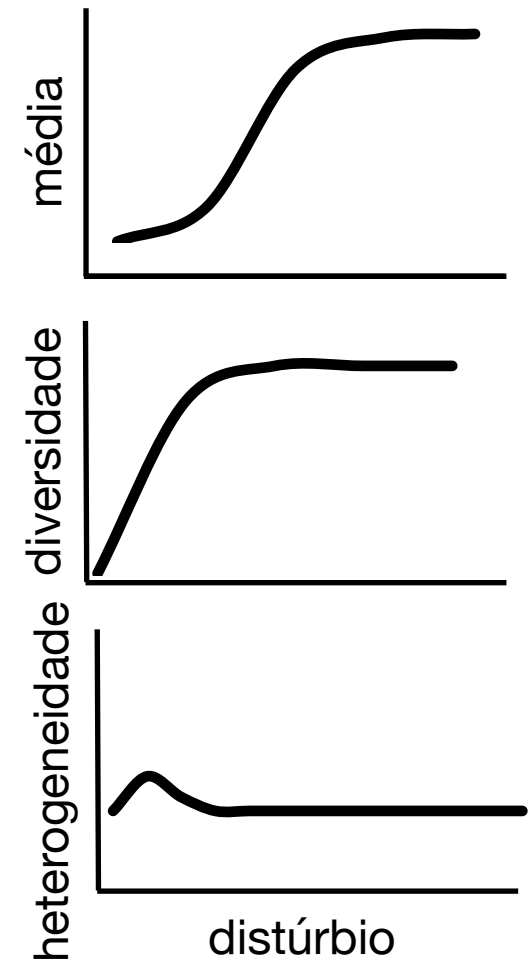


# coexistência de estratégias mediada pelo distúrbio

cenário eco-evolutivo = mutação

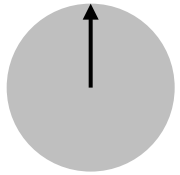


eco-evolutivo



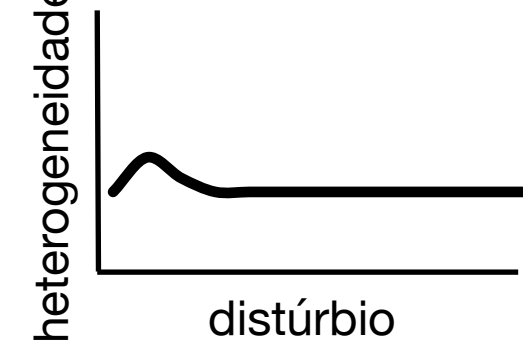
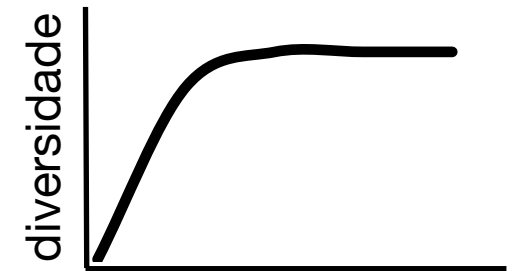
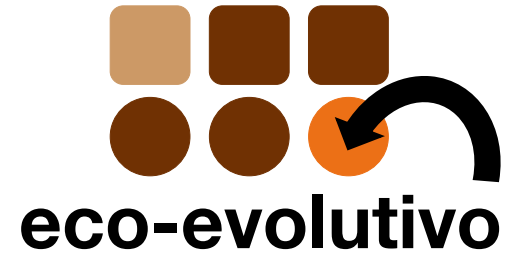
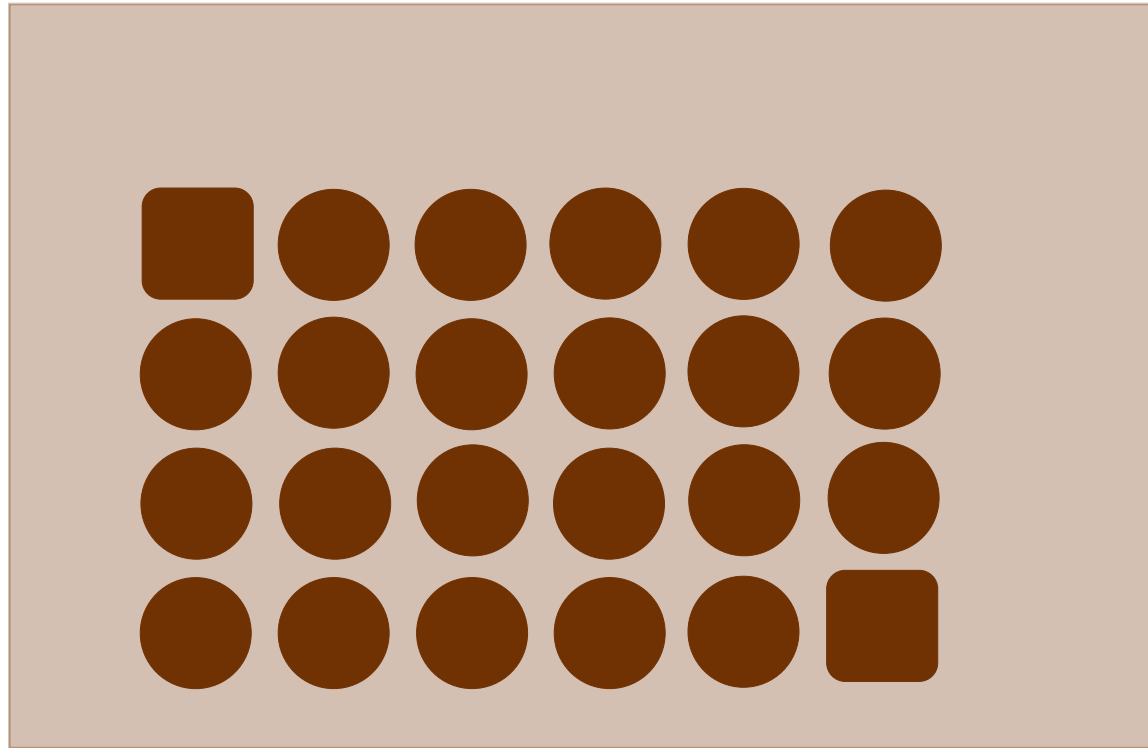
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cenário eco-evolutivo = mutação



● x 180

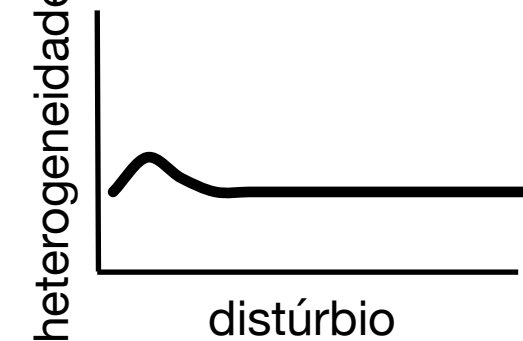
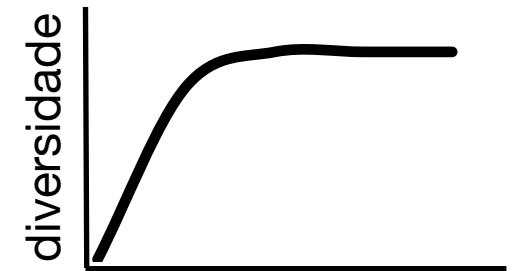
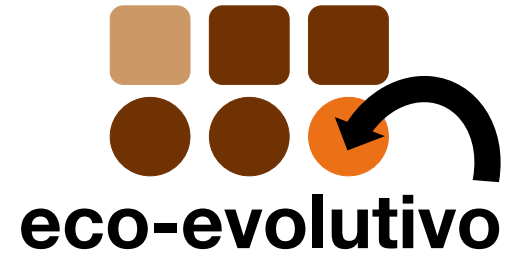
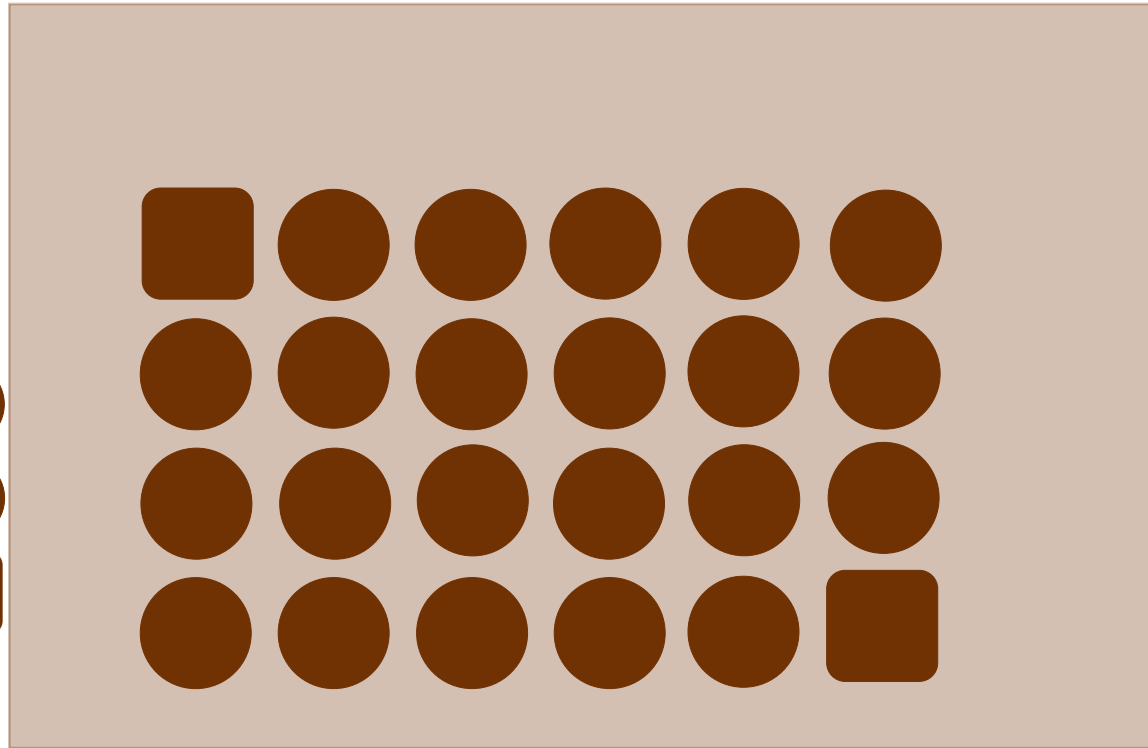
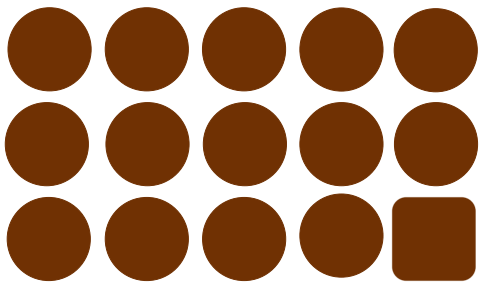
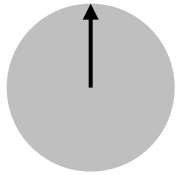
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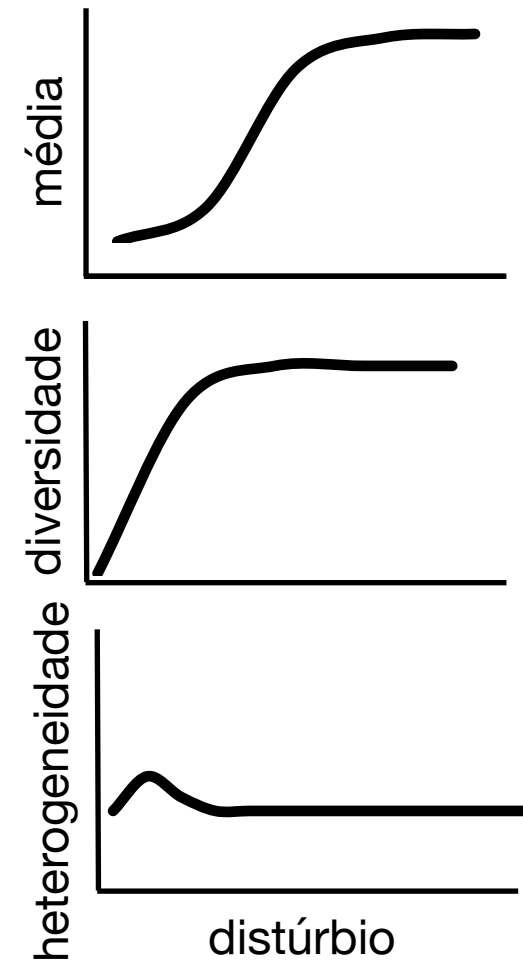
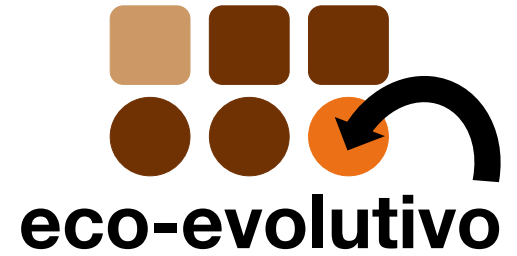
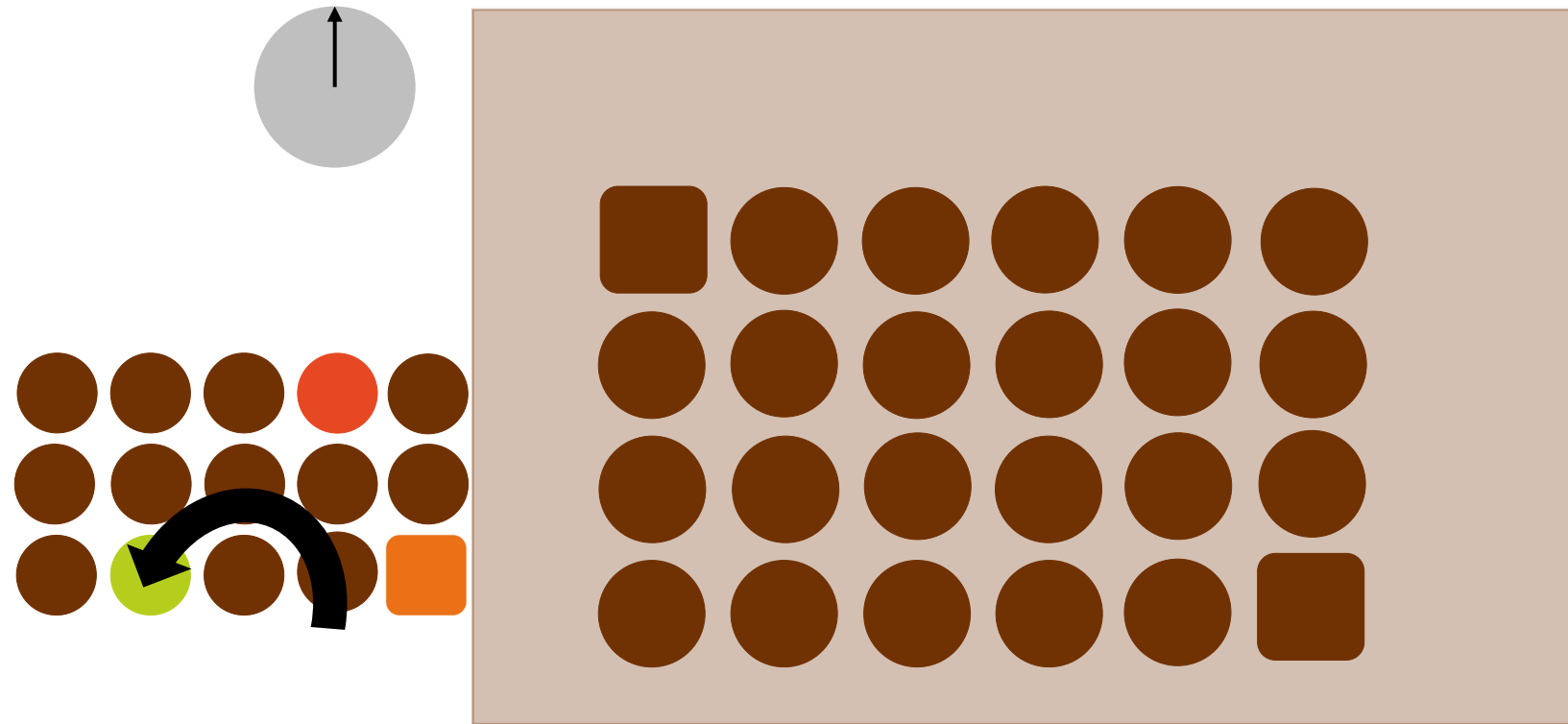
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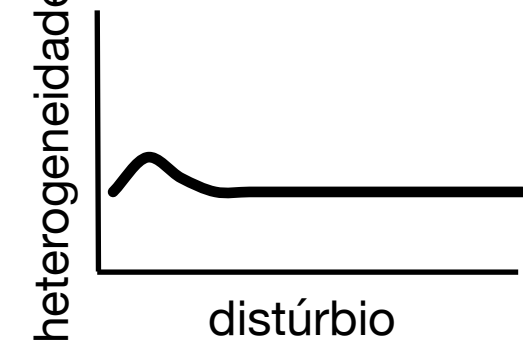
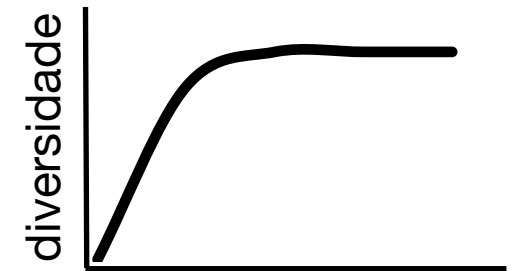
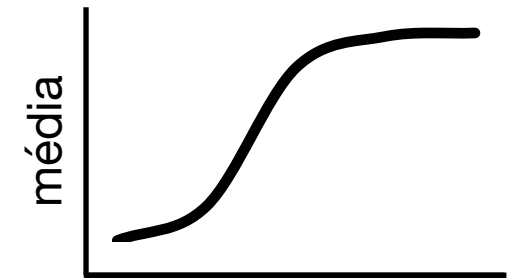
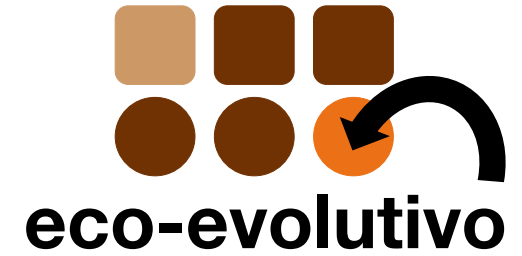
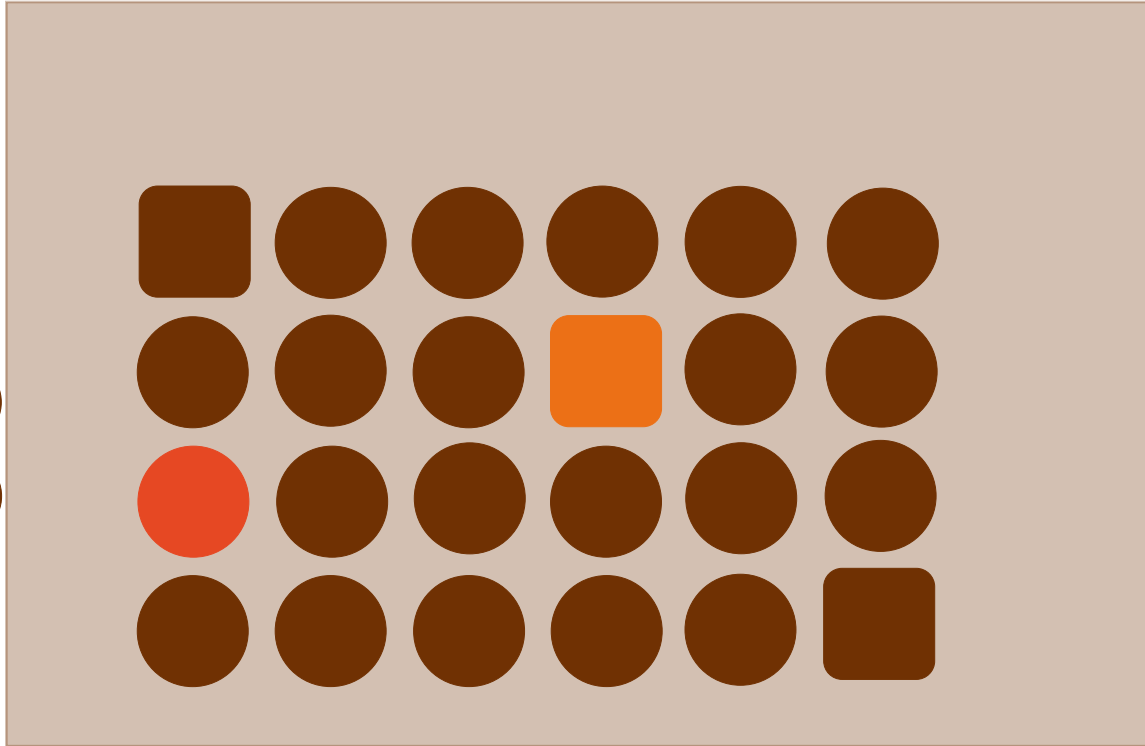
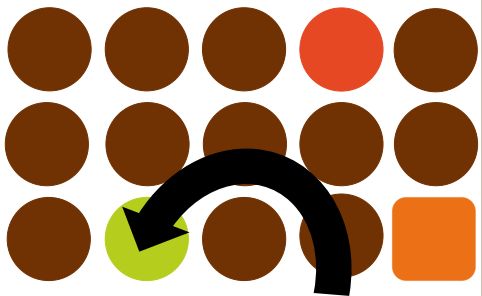
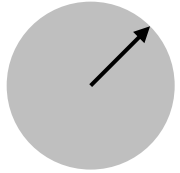
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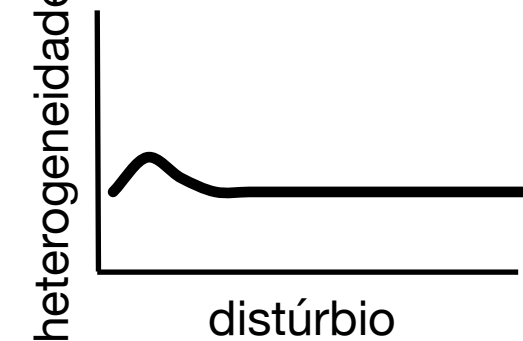
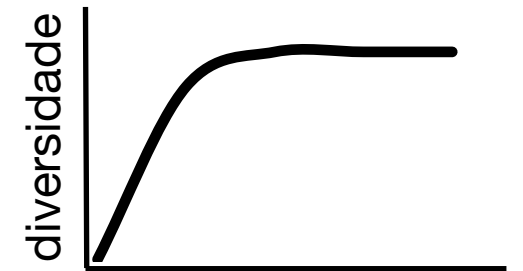
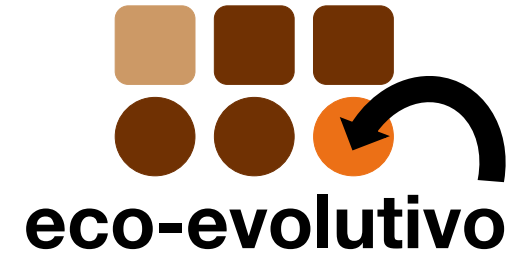
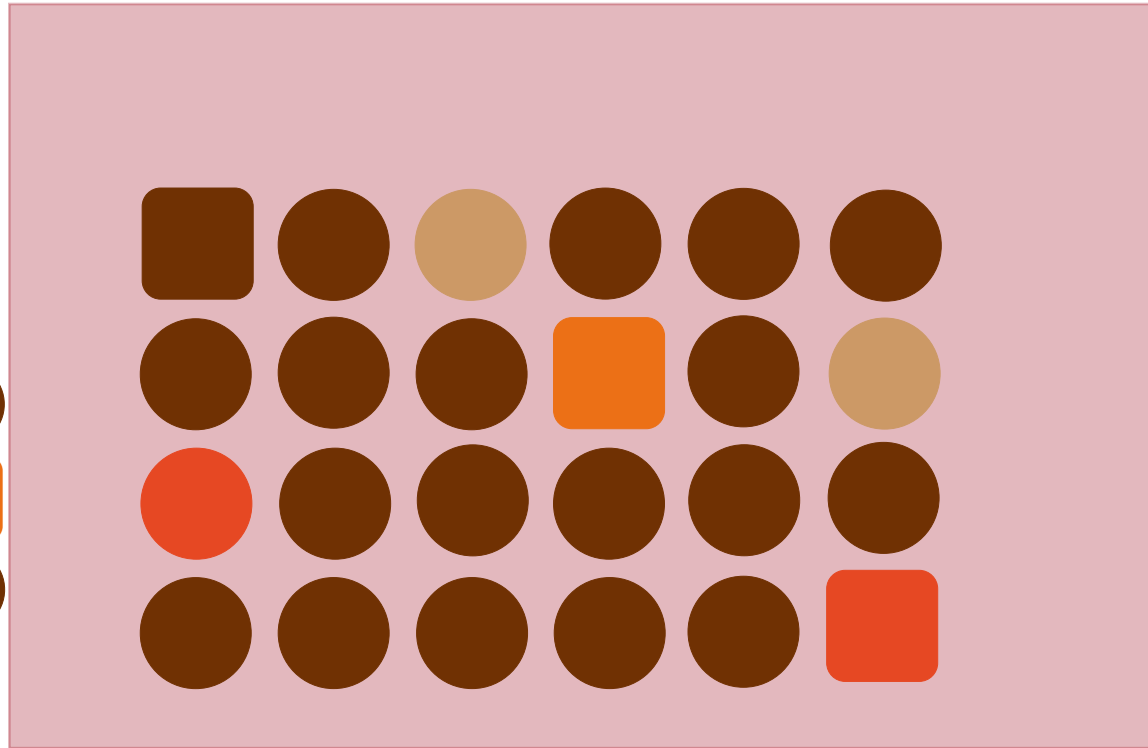
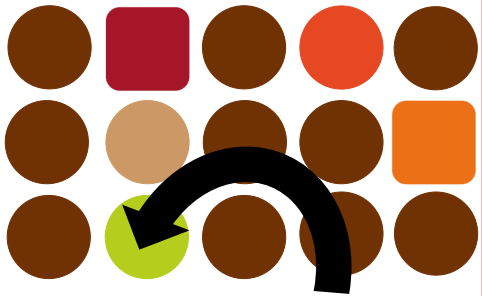
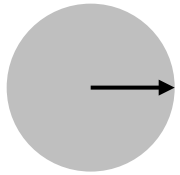
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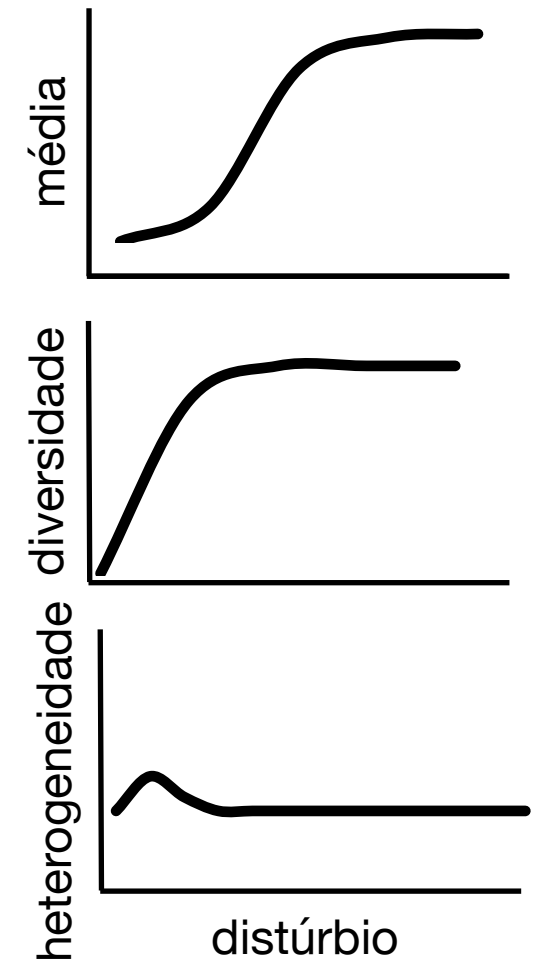
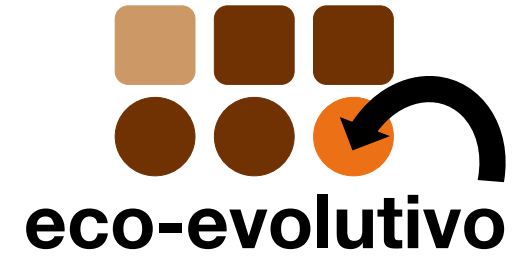
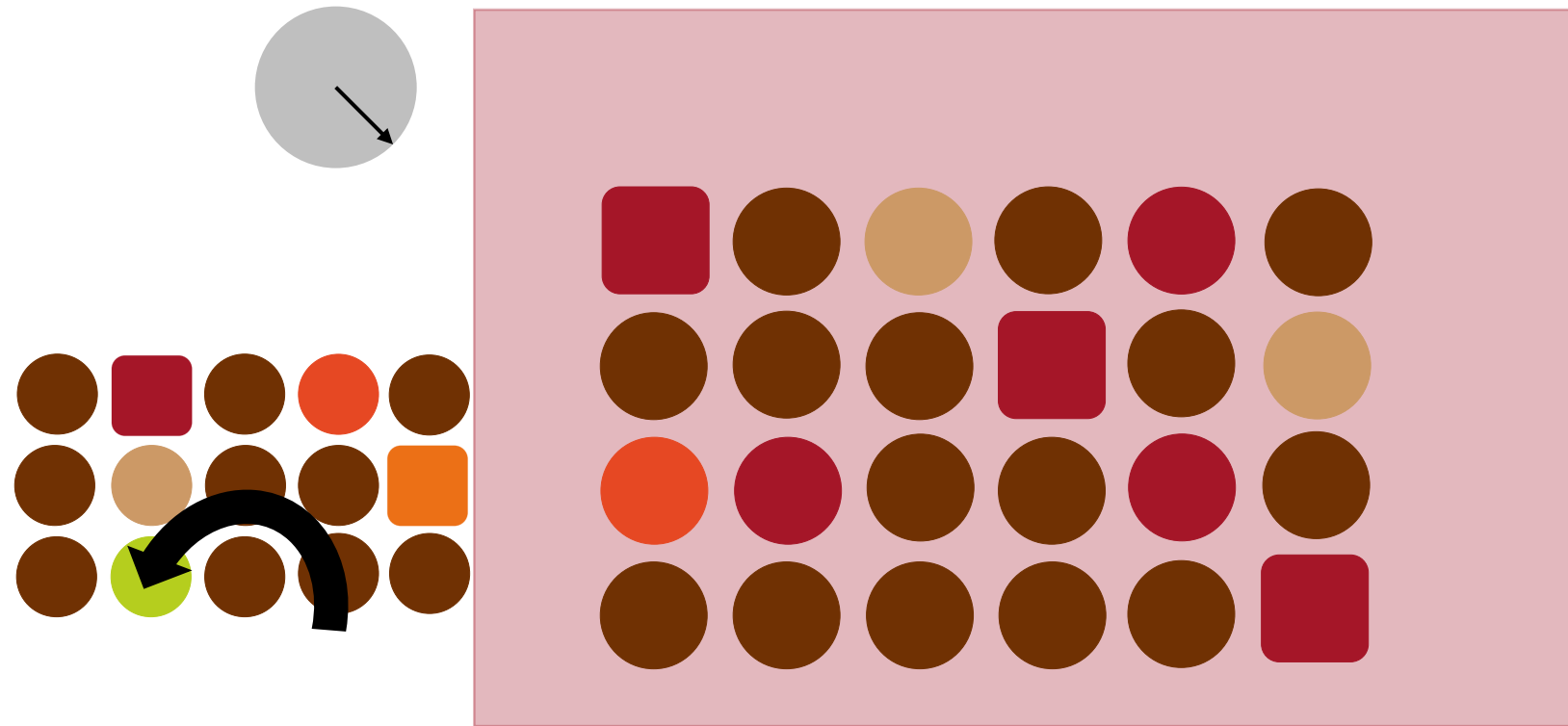
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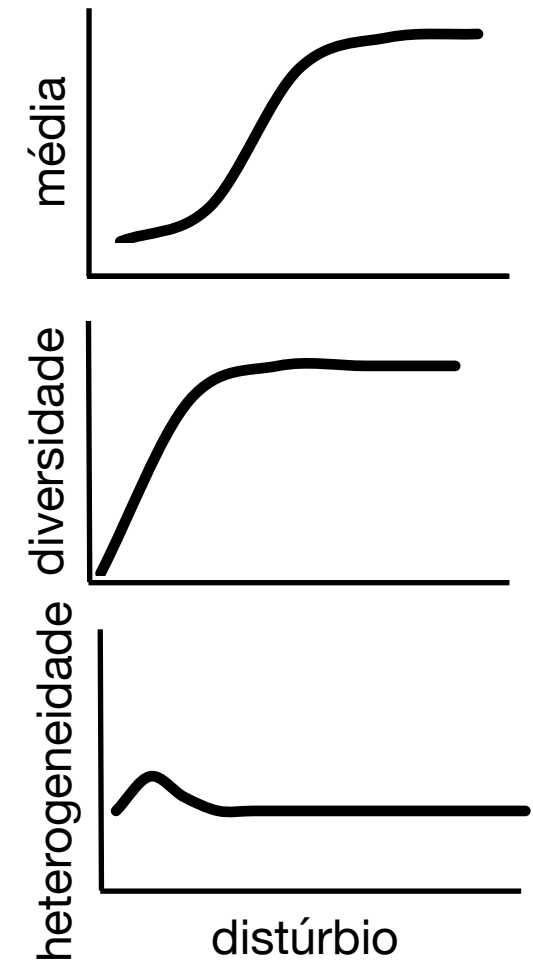
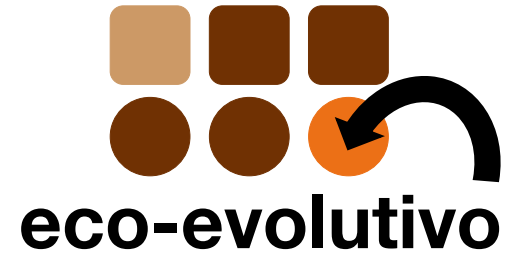
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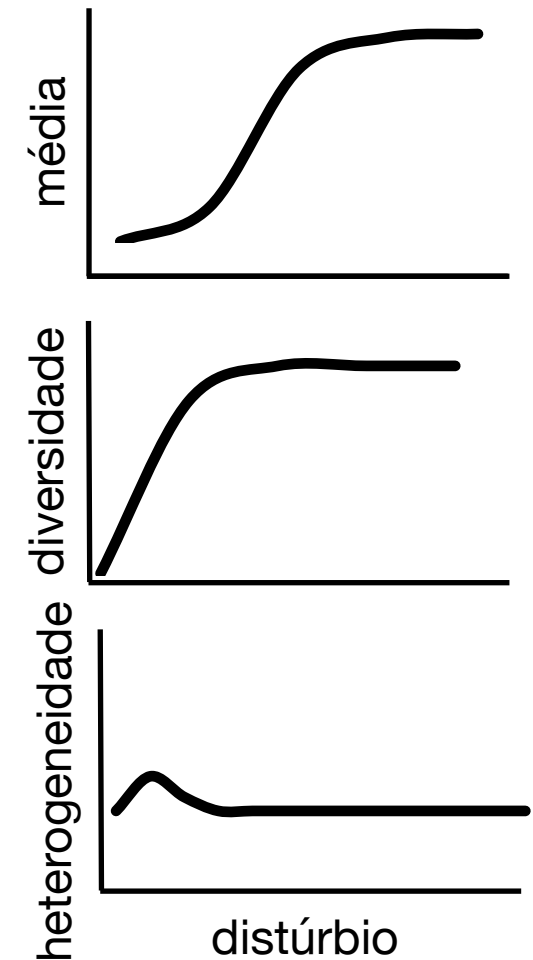
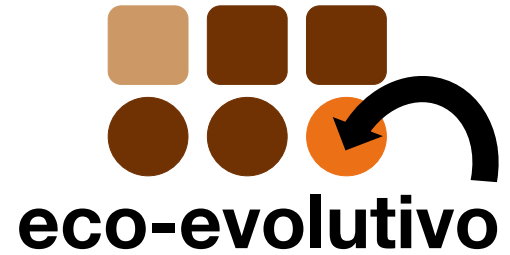
*storage effect:*



# coexistência de estratégias mediada pelo distúrbio

*storage effect:*

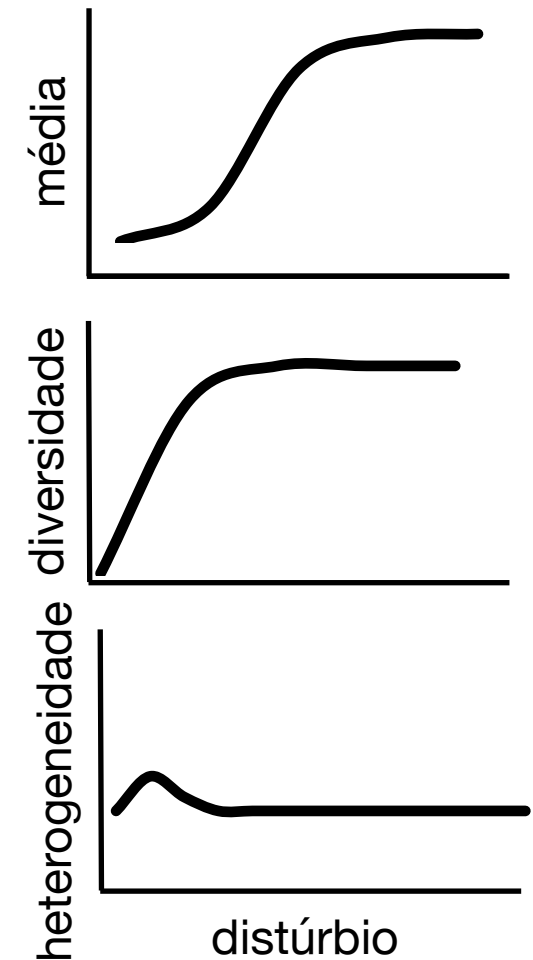
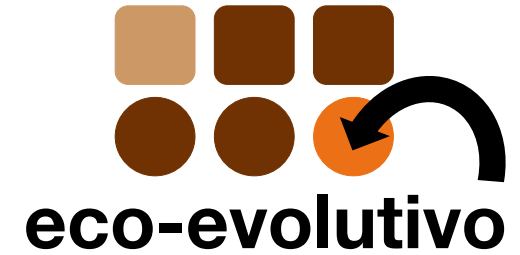
- diferença na resposta ao ambiente  
(isolamento reprodutivo das espécies)



# coexistência de estratégias mediada pelo distúrbio

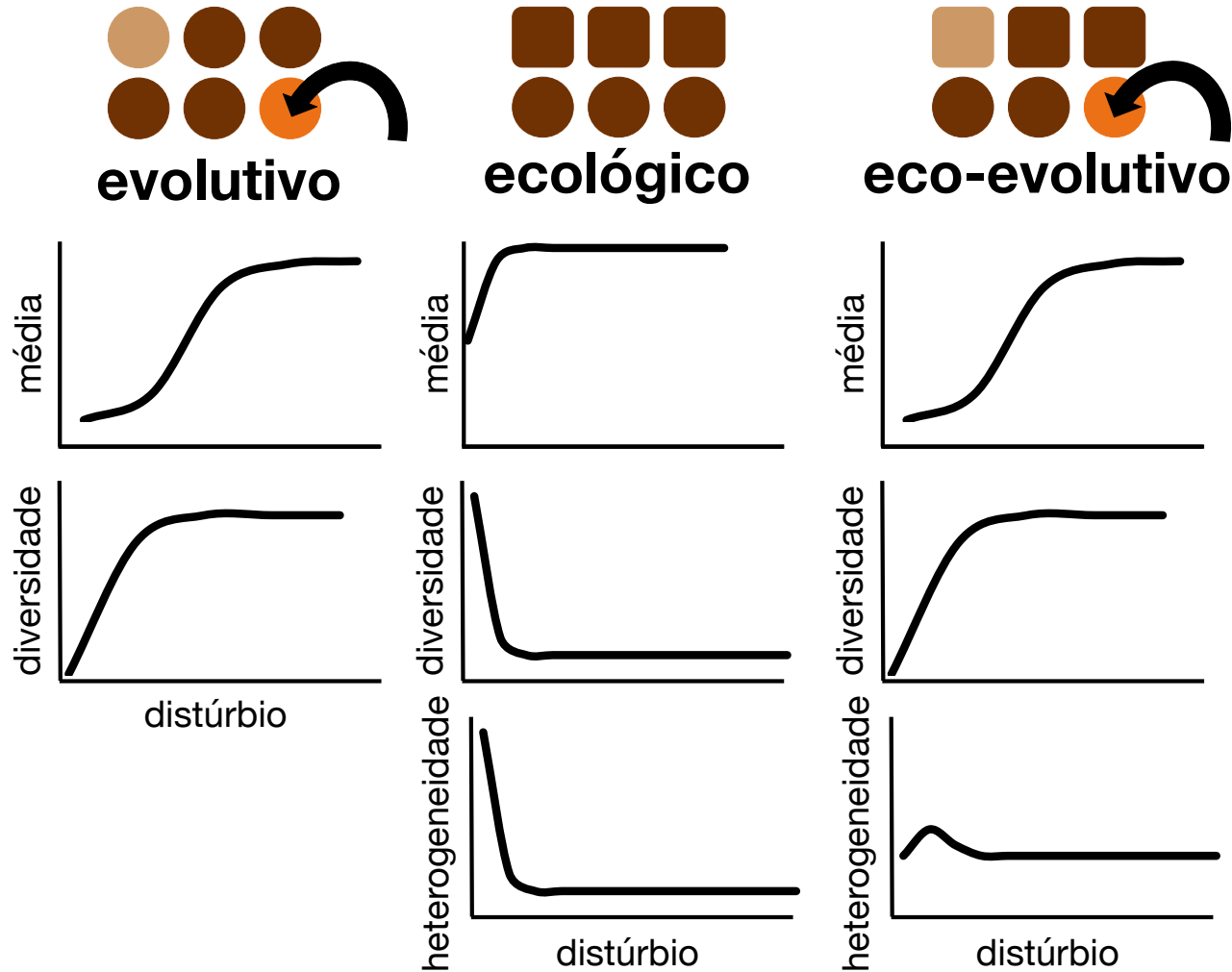
*storage effect:*

- diferença na resposta ao ambiente (isolamento reprodutivo das espécies)
- crescimento populacional tamponado (mutação)

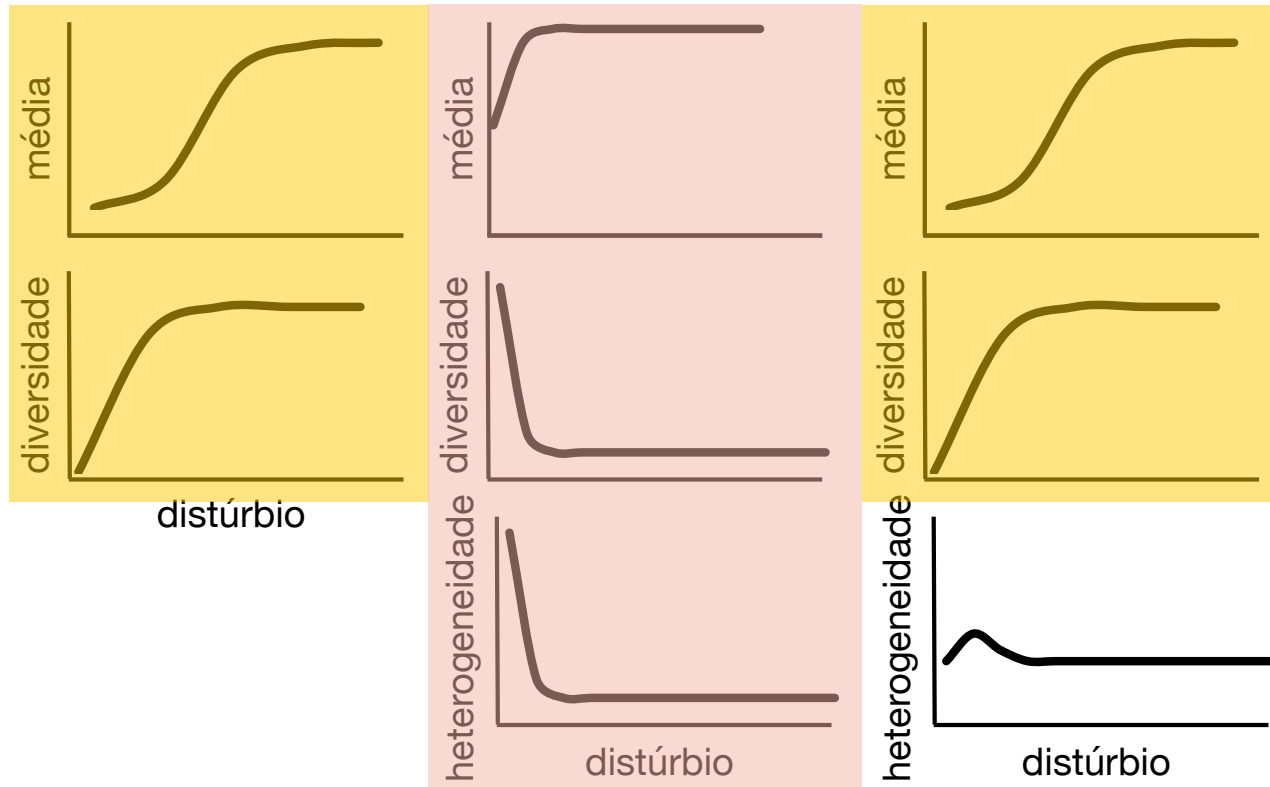
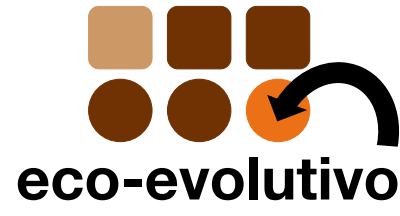




## cenários

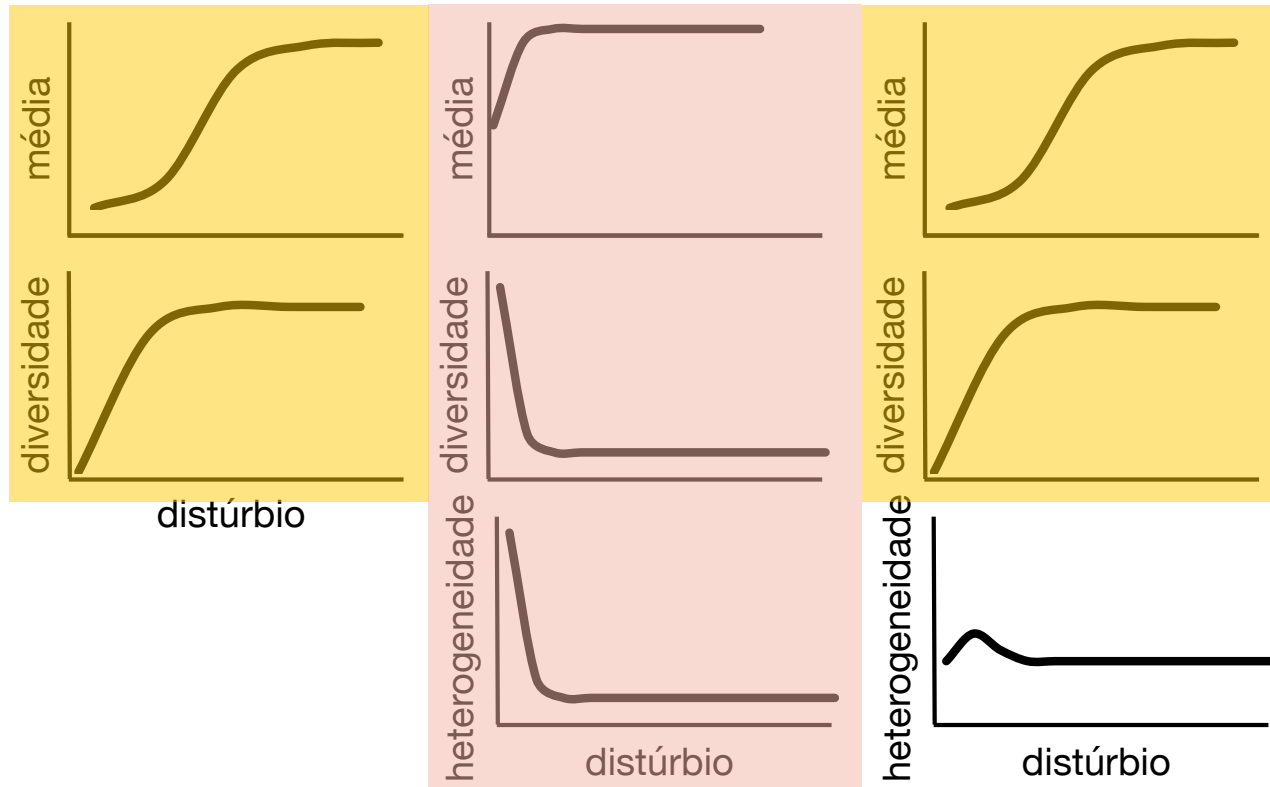
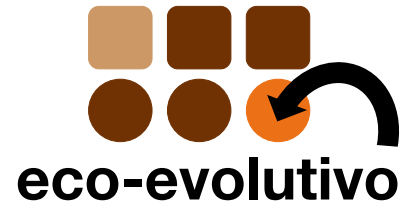


## cenários

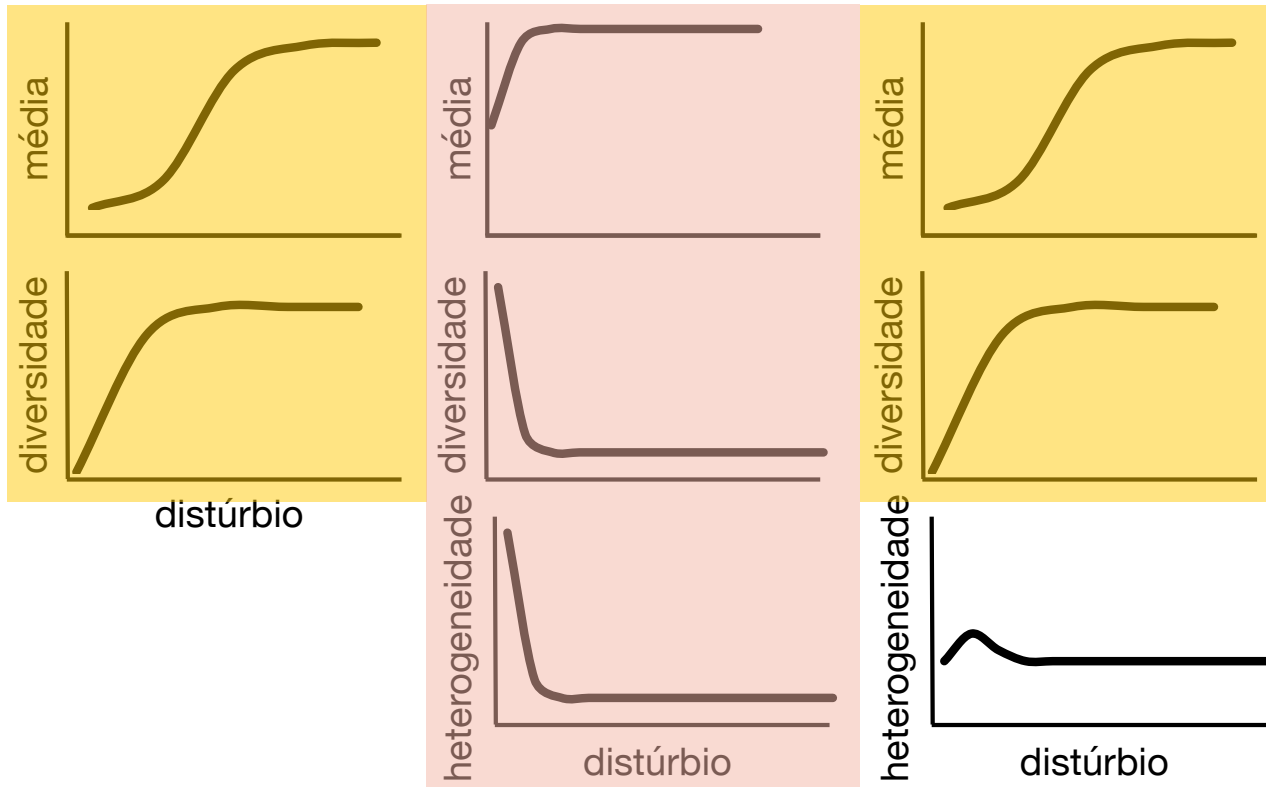
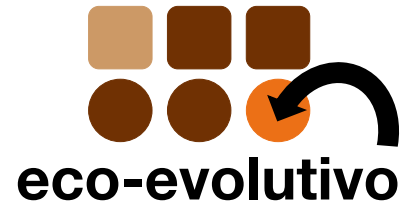


## cenários

## mutação



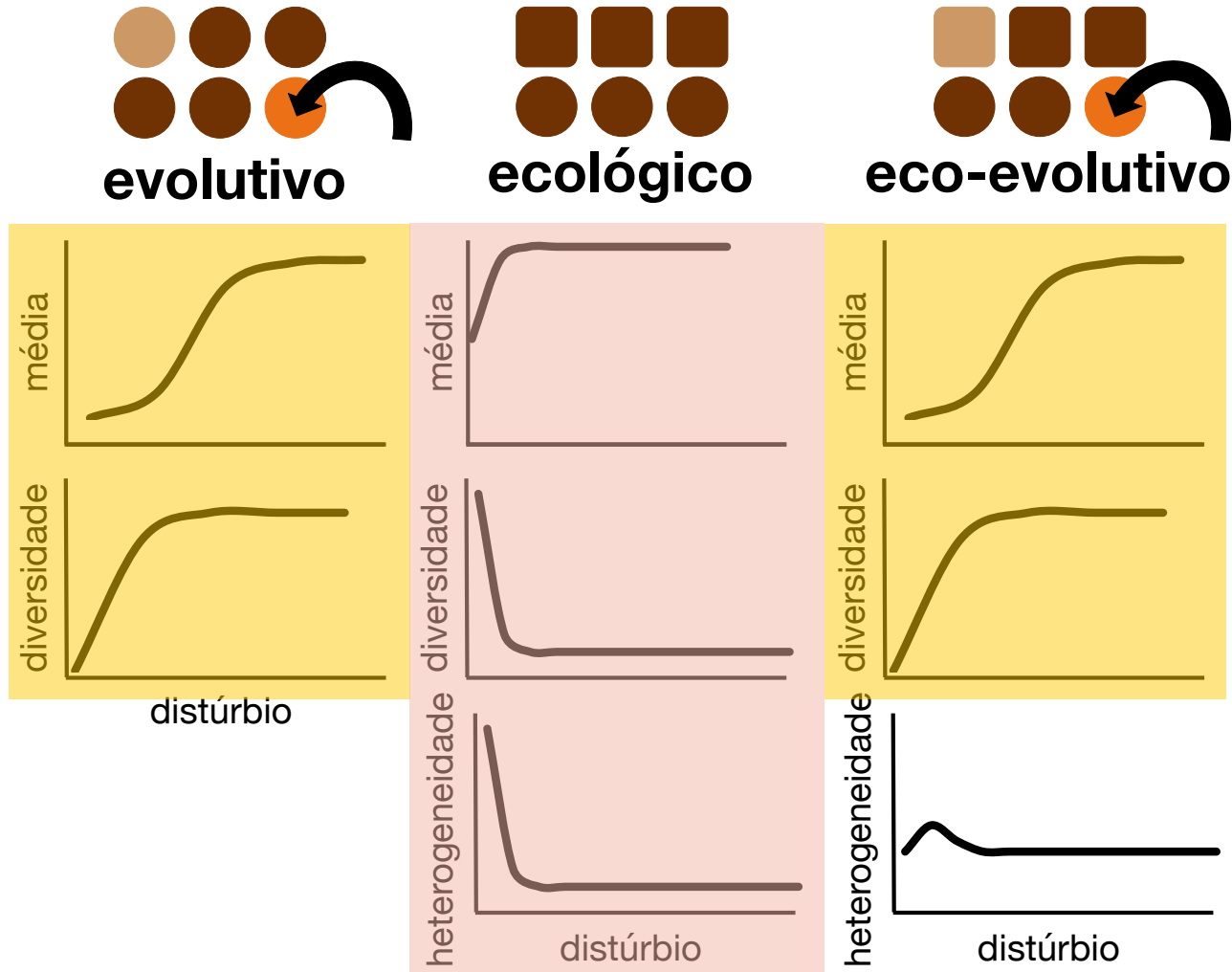
## cenários



## mutação

- é o único processo de entrada de variação (vs. exclusão competitiva e seleção e vs. deriva)

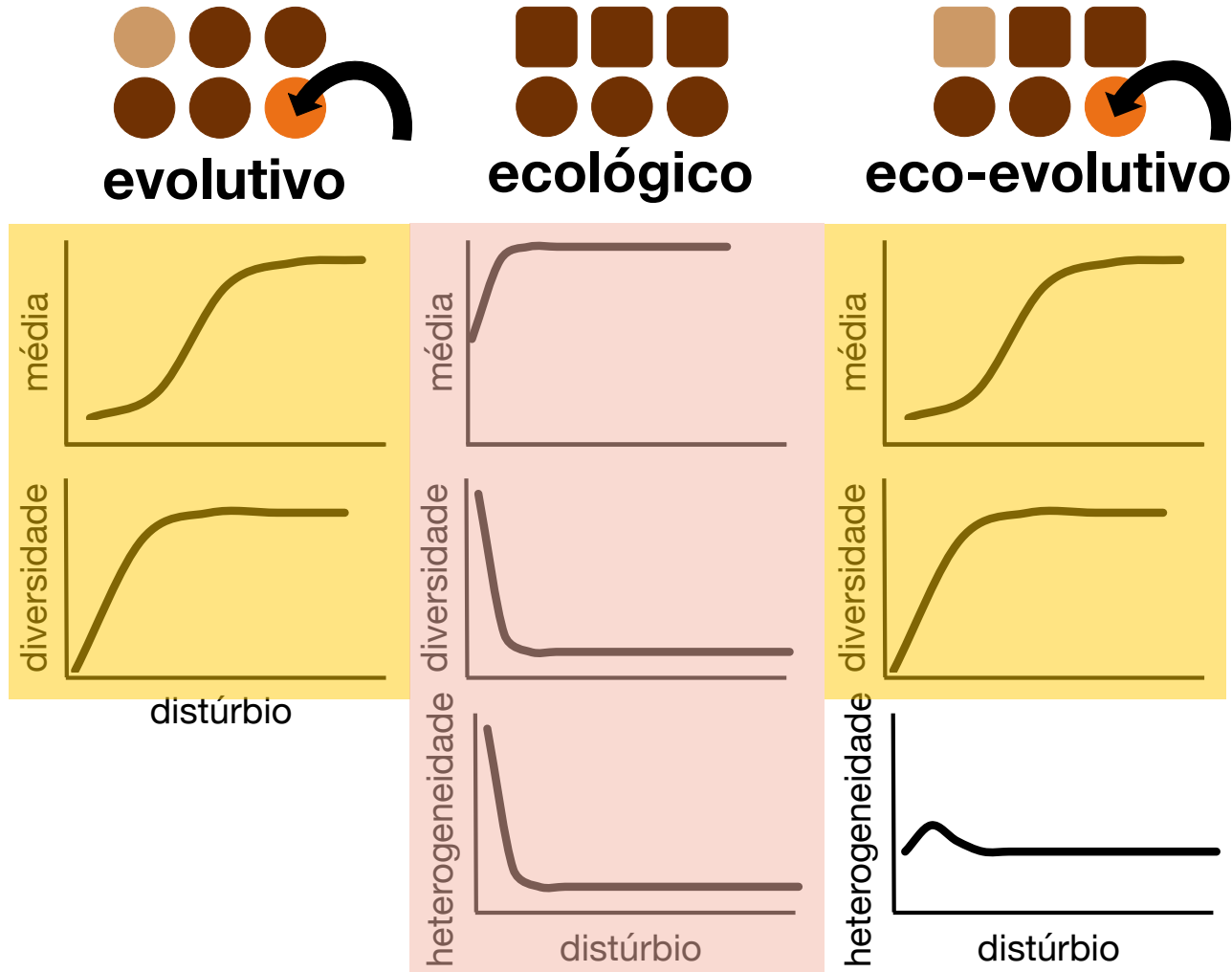
## cenários



## mutação

- é o único processo de entrada de variação (vs. exclusão competitiva e seleção e vs. deriva)
- cria novas estratégias e pode resgatar estratégias extintas ou quase extintas

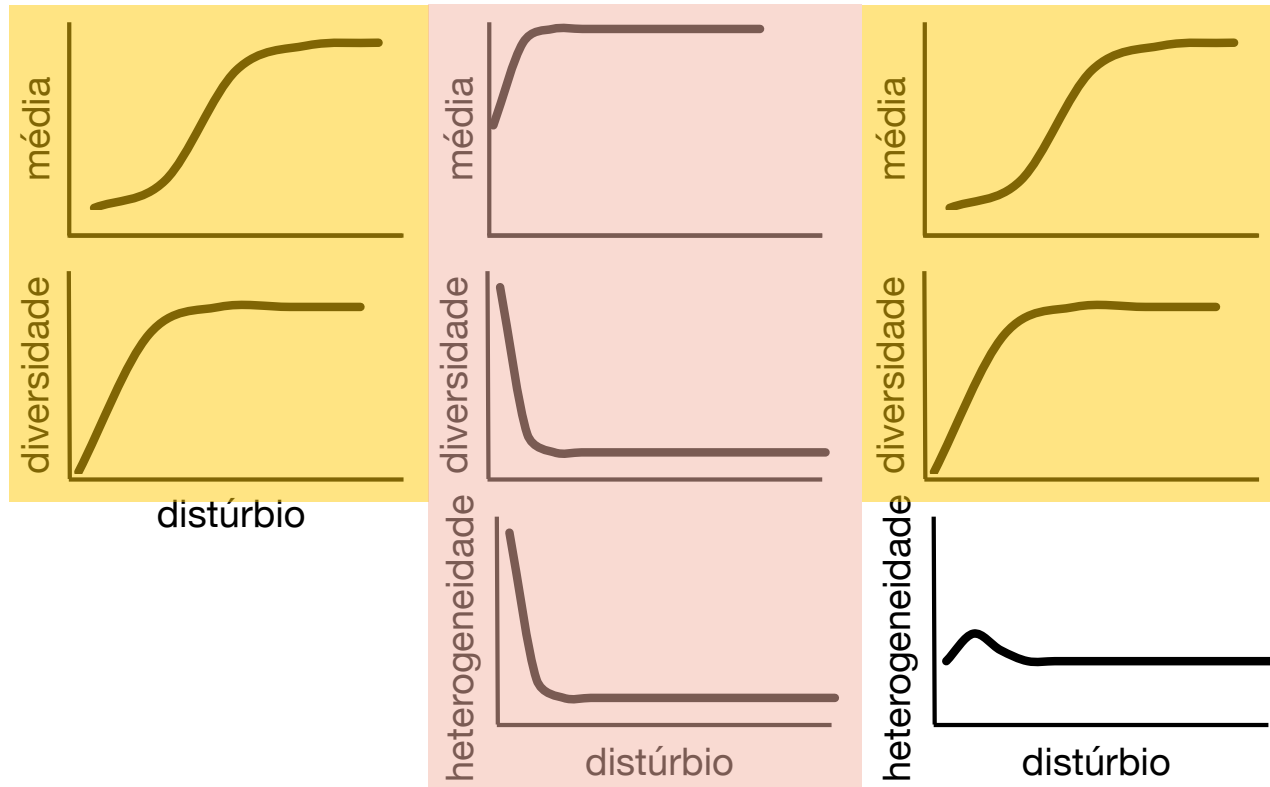
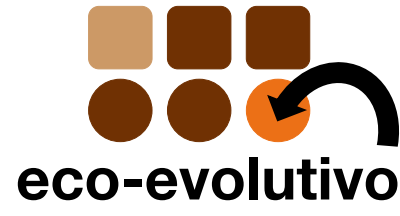
## cenários



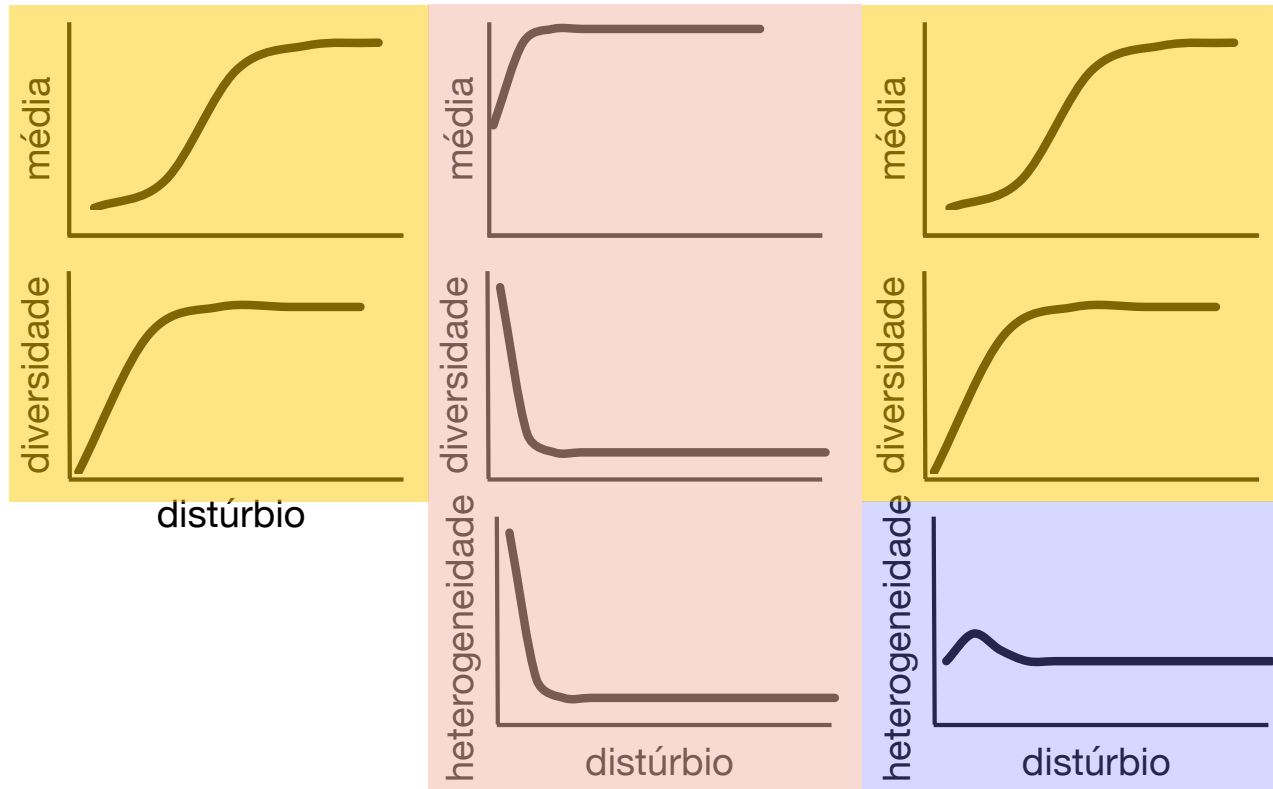
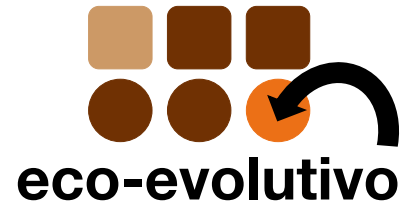
## mutação

- é o único processo de entrada de variação (vs. exclusão competitiva e seleção e vs. deriva)
- cria novas estratégias e pode resgatar estratégias extintas ou quase extintas
- permite resposta contínua às pressões variadas ao longo do tempo

## cenários



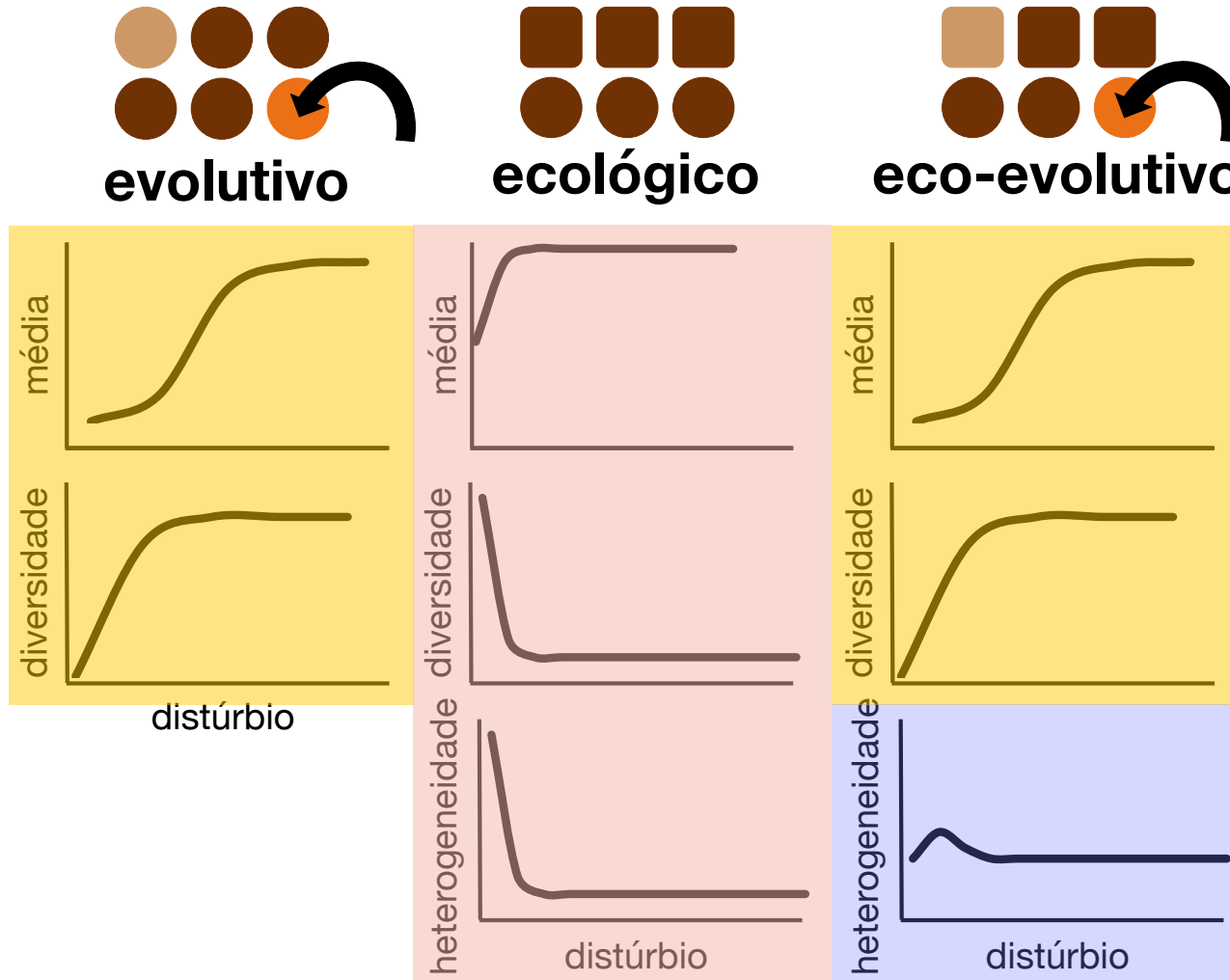
## cenários



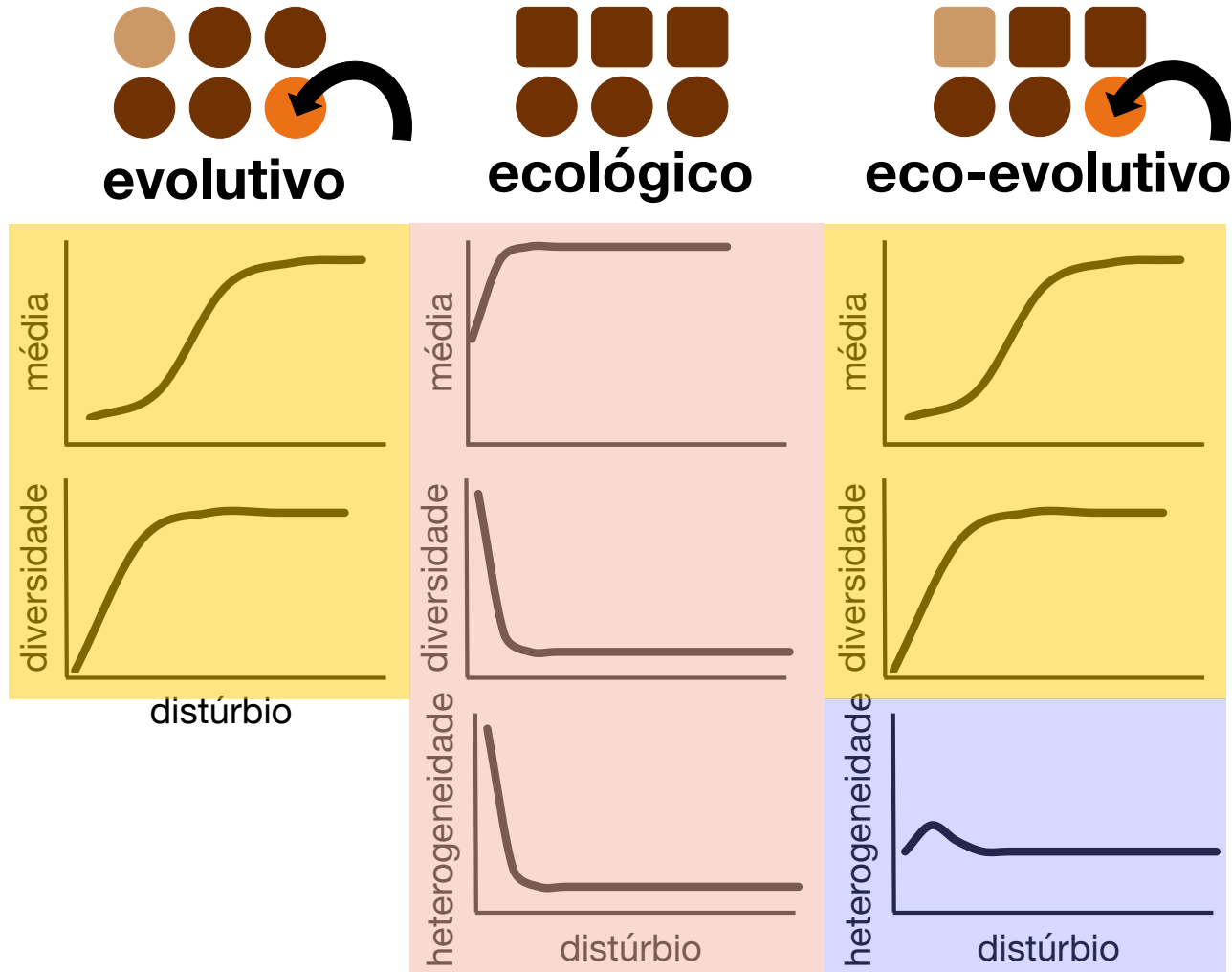


## cenários

## interação eco-evo



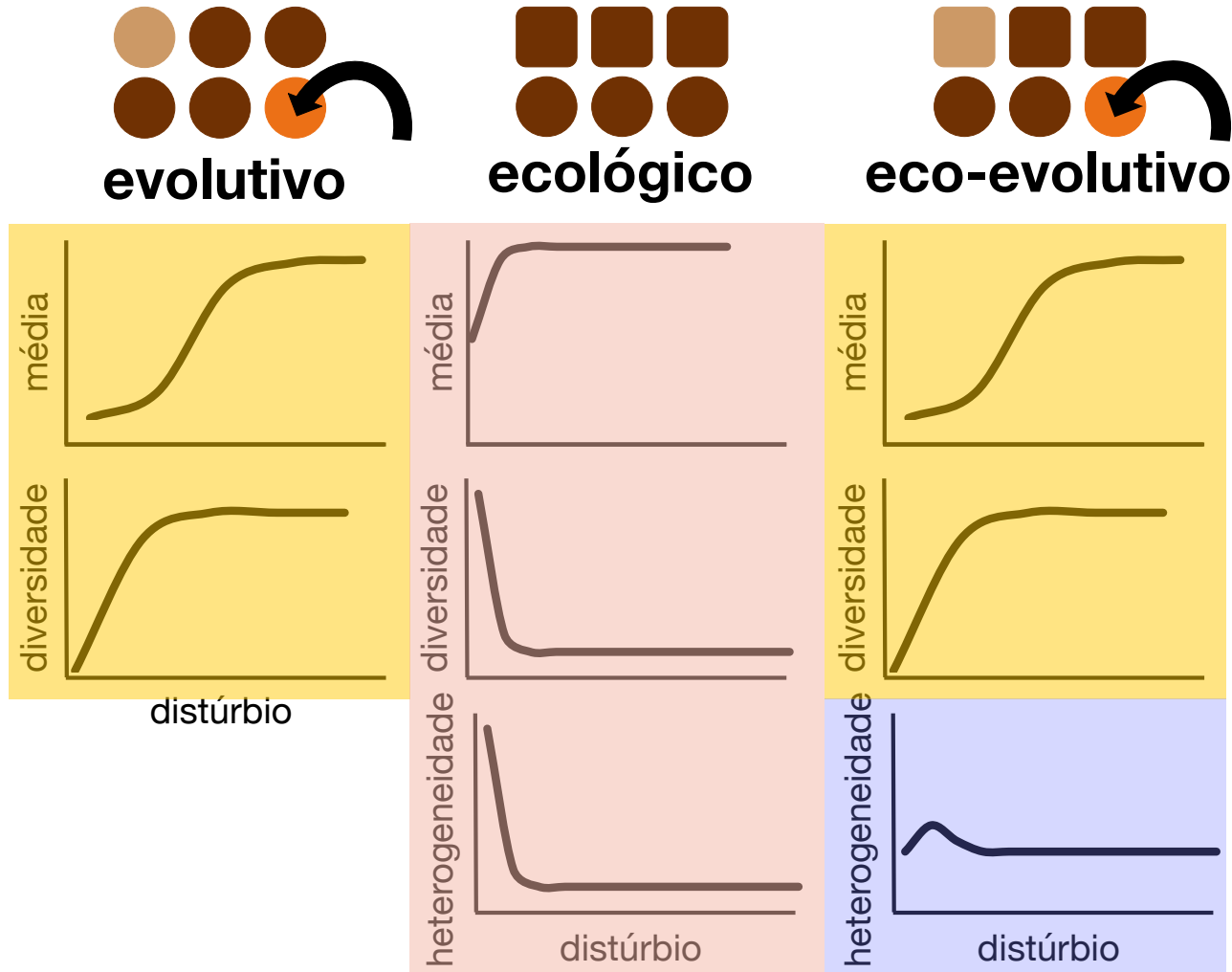
## cenários



## interação eco-evo

- entrada de variação por mutação
- competição entre linhagens isoladas (espécies diferentes)

## cenários



## interação eco-evo

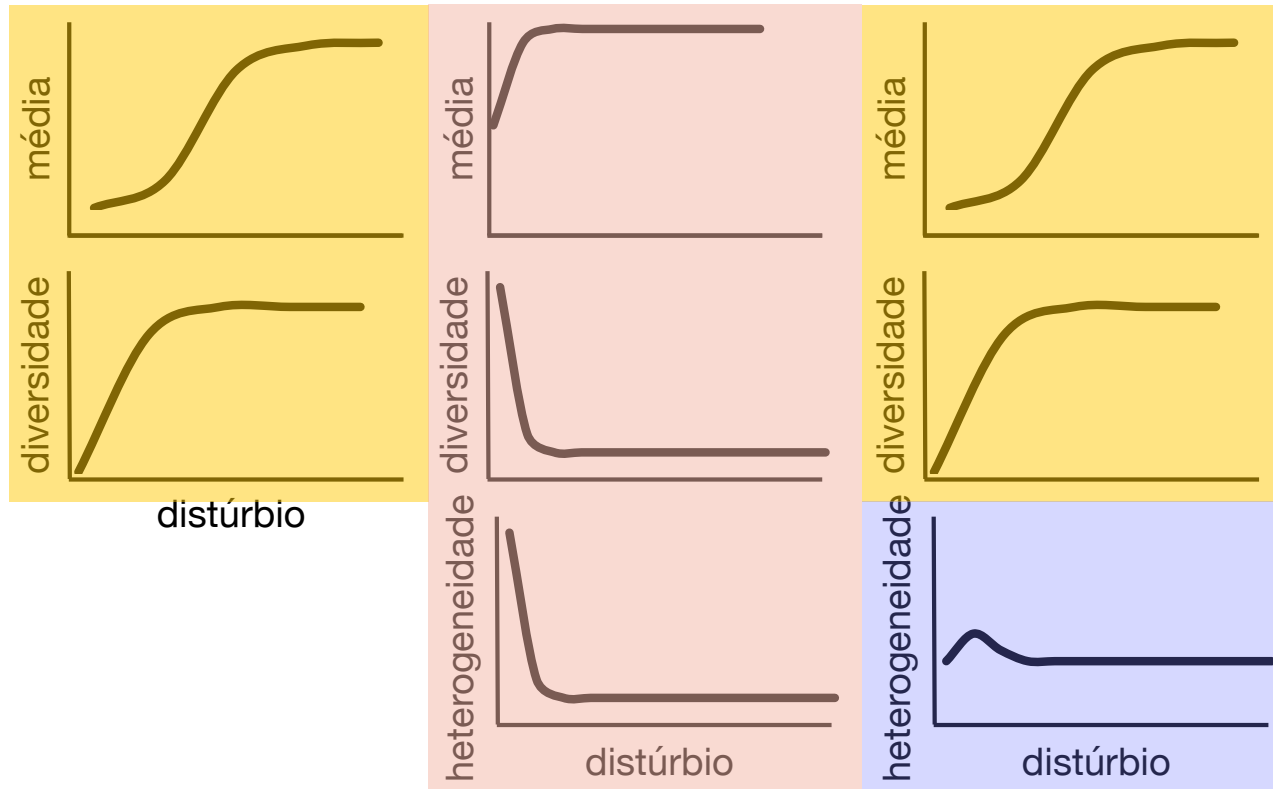
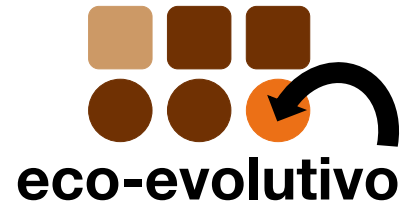
- entrada de variação por mutação
- competição entre linhagens isoladas (espécies diferentes)
- coexistência de estratégias distintas mediadas por distúrbio

ainda assim...

## Ecologia

- desconsidera adaptação
- possíveis consequências:
  - gerar previsões erradas
  - relacionar padrões a processos equivocados

## cenários



ainda assim...

discussão ● ● ●

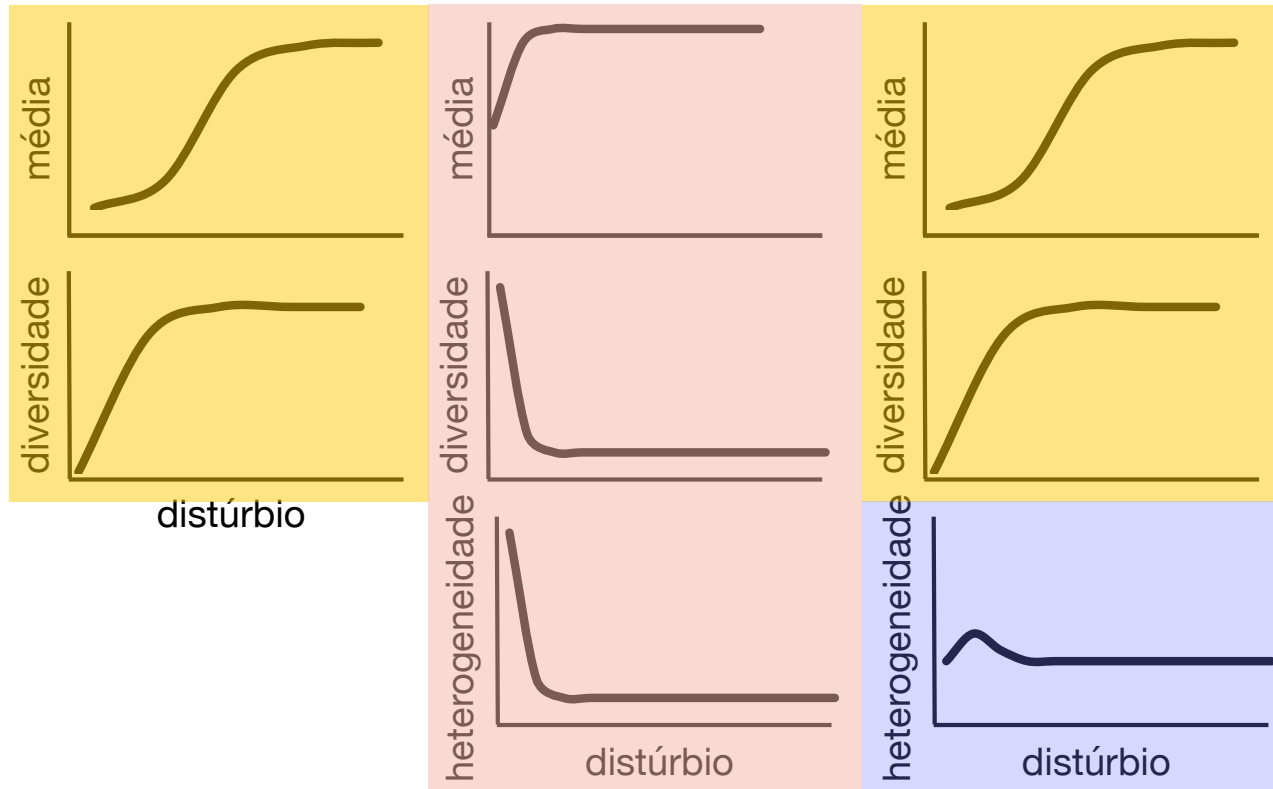
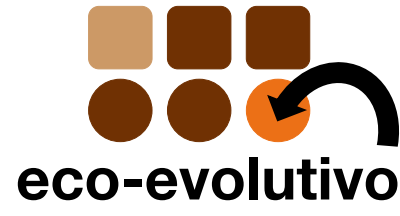
## Ecologia

- desconsidera adaptação
- possíveis consequências:
  - gerar previsões erradas
  - relacionar padrões a processos equivocados

## Biologia Evolutiva

- desconsidera contexto multiespecífico
- possíveis consequências:
  - não acessar padrões que emergem em escalas maiores
  - limitar-se a escalas que não explicam a maior parte da diversidade

## cenários



# conclusões

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# conclusões

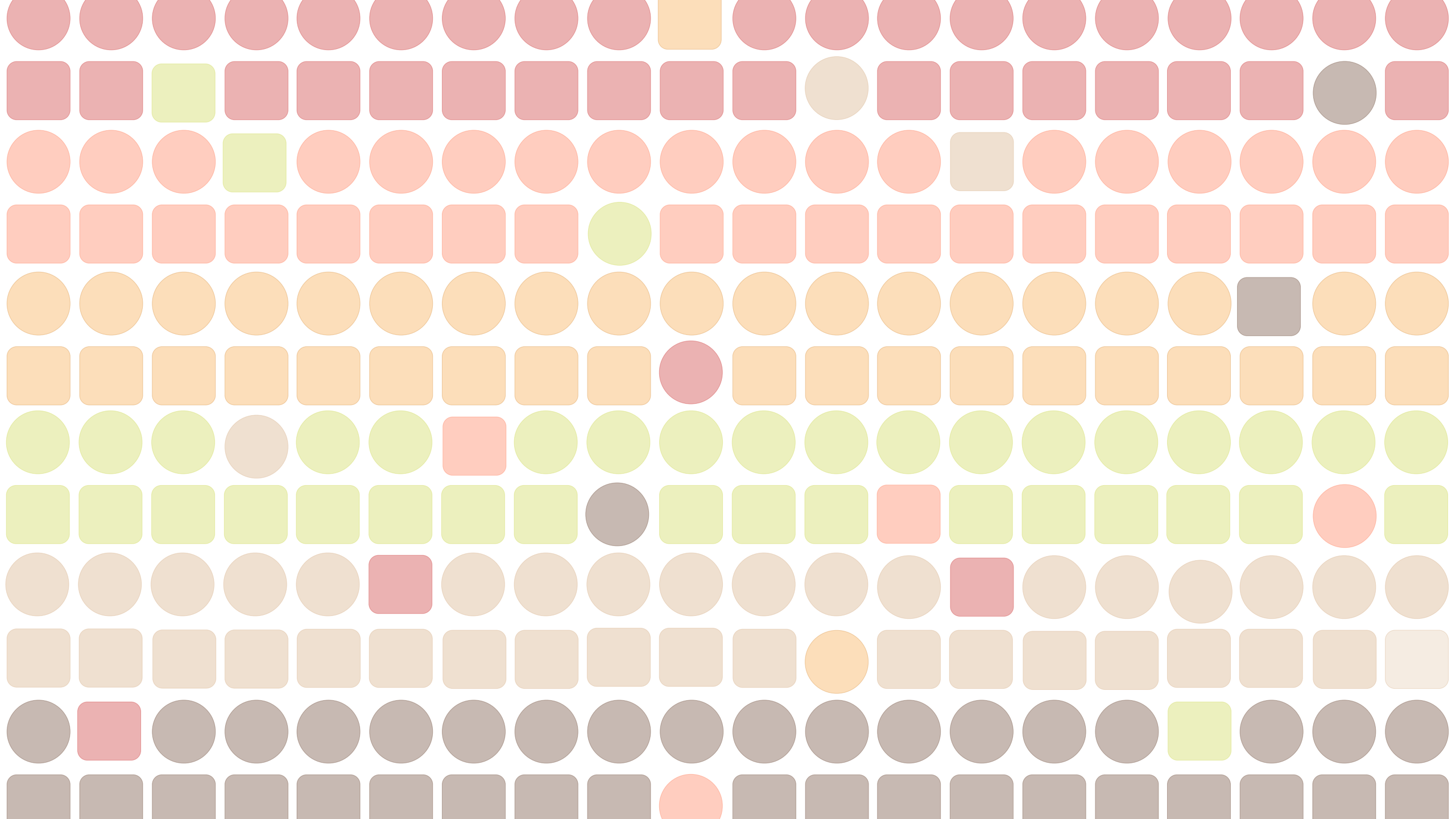
- efeito do distúrbio nas estratégias de vida é diferente comparando dinâmicas ecológicas e evolutivas
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# conclusões

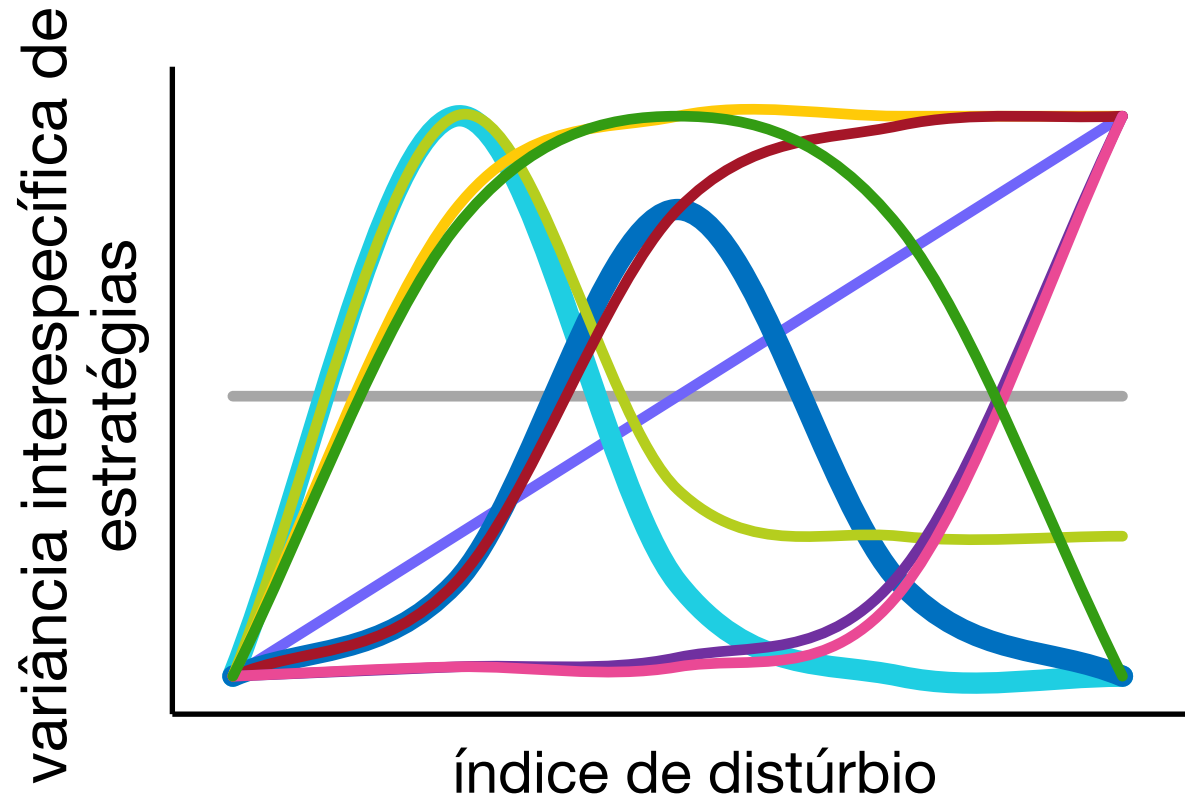
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# conclusões

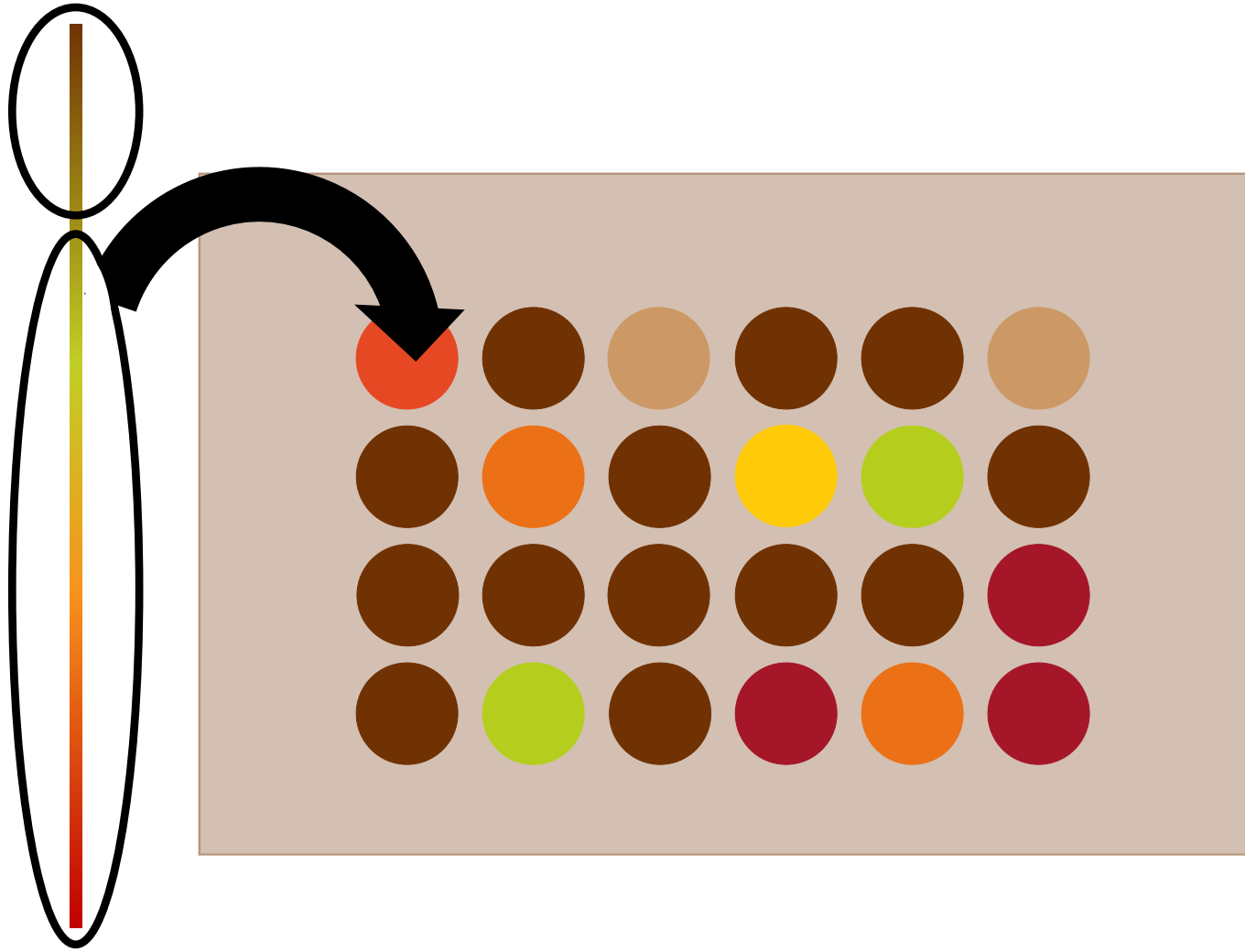
- efeito do distúrbio nas estratégias de vida é diferente comparando dinâmicas ecológicas e evolutivas
- há padrões que emergem apenas em dinâmicas eco-evolutivas
- o distúrbio deve ser estudado em dinâmicas eco-evolutivas, na interface entre Biologia Evolutiva e Ecologia



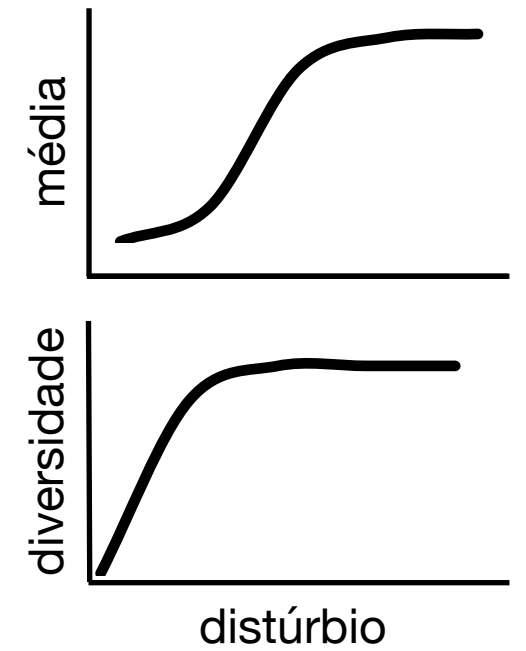
variância  
(heterogeneidade interespecífica de estratégias) ~ distúrbio



# produtividade



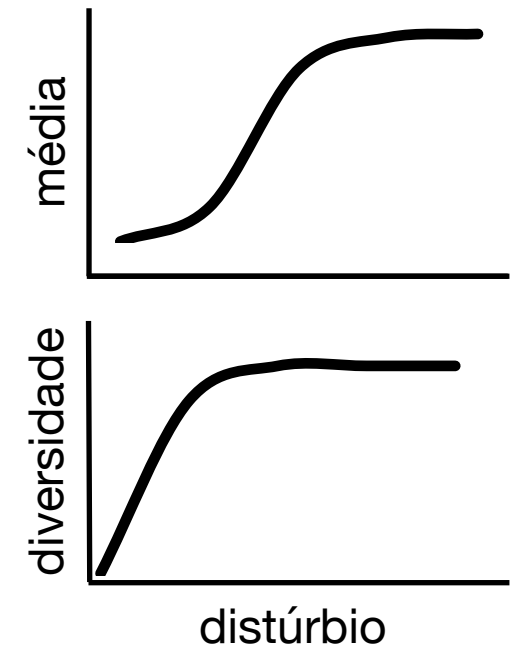
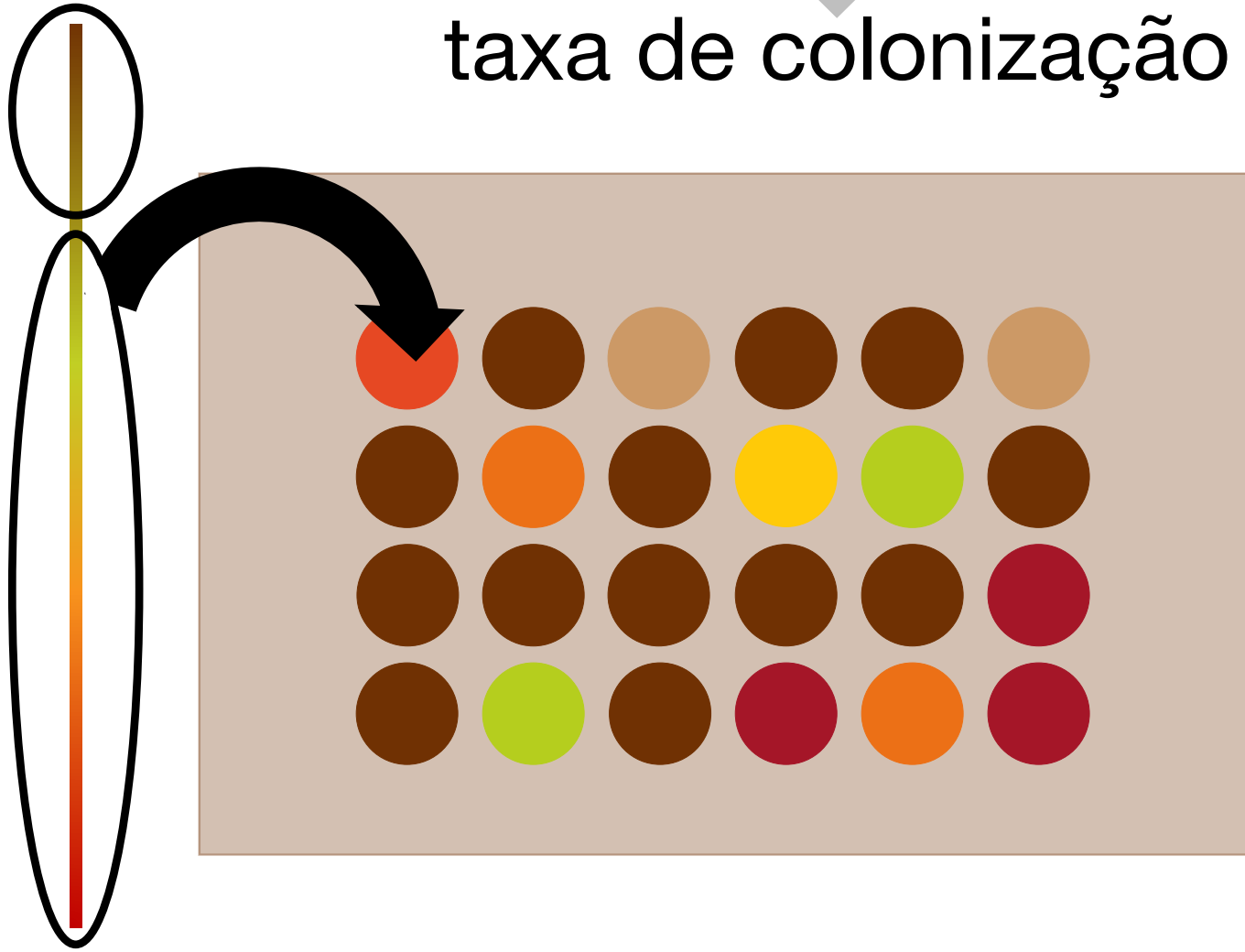
resultados e discussão ● ● ●



produtividade



taxa de colonização



## Queda na diversidade:

- O aumento do distúrbio, ainda que possa prejudicar o melhor competidor anterior, cria uma nova condição, em que outra estratégia passa a ser melhor competidora
- Quanto maior o distúrbio, mais **rápida** é a perda de espécies por deriva ecológica e por exclusão competitiva

