



# **Ecologia Numérica**

## **Aula 5 - Beta-diversidade**

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# Diversidade Taxonômica



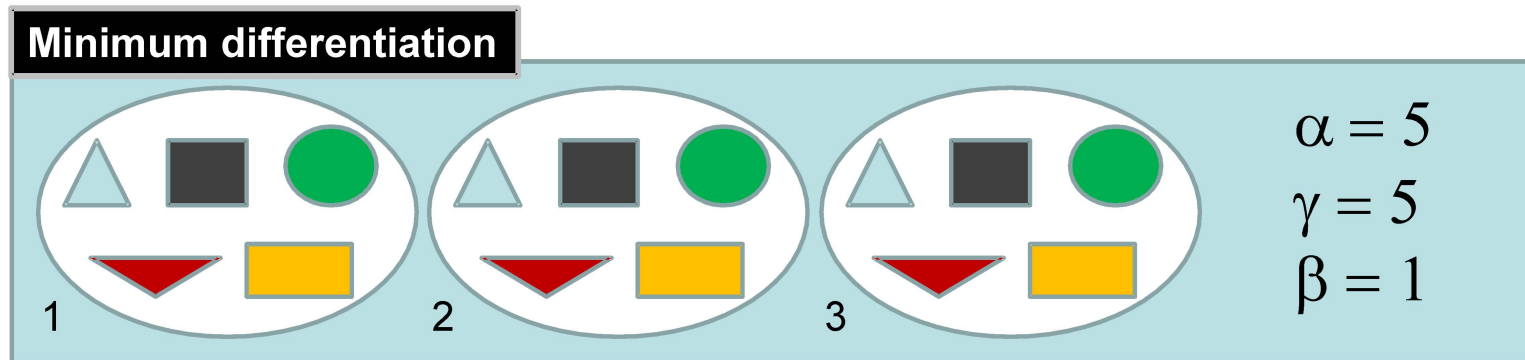
**Precisamos saber:**

**O que é Beta-diversidade?**

**O que ela pode informar sobre comunidades biológicas?**

**Como calcular beta-diversidade**

# Definindo beta-diversidade



Fonte: What is Beta-Diversity?

## A arte de medir a diferença entre comunidades biológicas

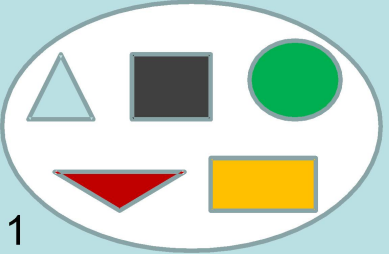
**"a magnitude da mudança na composição ou o grau de diferenciação, em  
relação a um gradiente ambiental"**

**R.H. Whittaker**

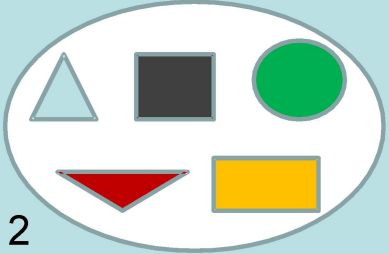
**Gama = Alfa média \* Beta**

$$\gamma = \alpha * \beta$$

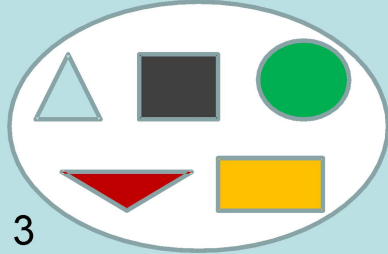
### Minimum differentiation



1



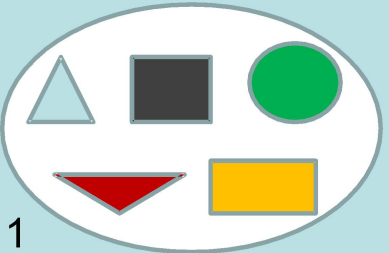
2



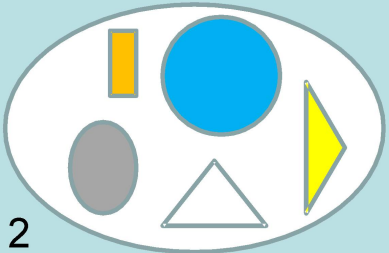
3

$\alpha = 5$   
 $\gamma = 5$   
 $\beta = 1$

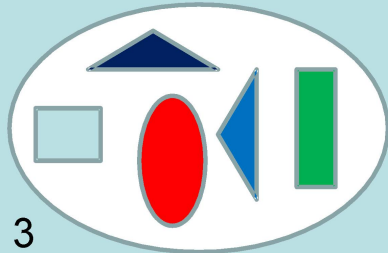
### Maximum differentiation



1



2



3

$\alpha = 5$   
 $\gamma = 15$   
 $\beta = N = 3$





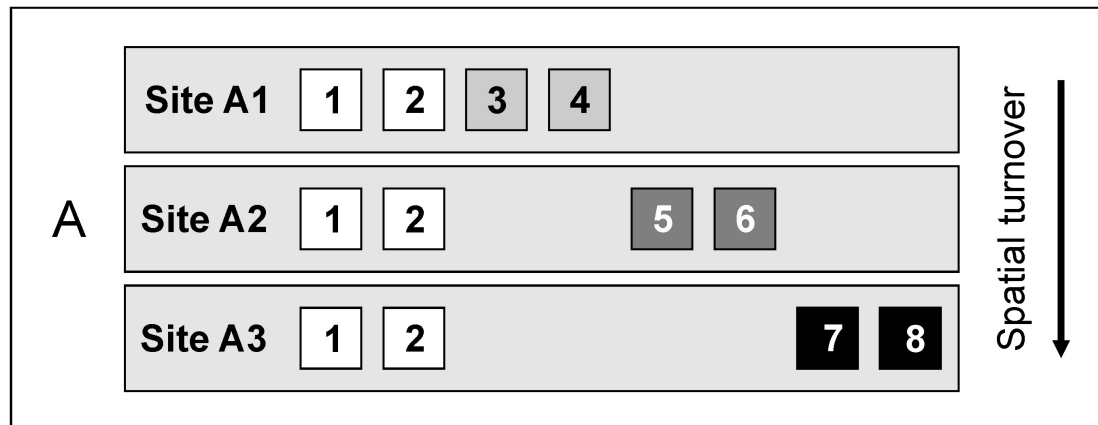
# Medidas de beta-diversidade

Índices "Standarizados" = Jaccard      Sorensen      plot

```
data("BCI")
vegdist(BCI, method = "jaccard")
```

##	1	2	3	4	5	6	7	8	9	10	11	12
## 2	0.4260250											
## 3	0.5186992	0.4463668										
## 4	0.5382263	0.4790323	0.4898911									
## 5	0.5428135	0.5560676	0.5288754	0.5424460								
## 6	0.5448393	0.5218150	0.5465116	0.5954198	0.5467512							
## 7	0.5205479	0.4527273	0.4896907	0.5471698	0.6087613	0.4751381						
## 8	0.5101695	0.4311594	0.4479167	0.4781199	0.5420561	0.5262238	0.4793537					
## 9	0.5950820	0.5448276	0.5393635	0.5490506	0.5938462	0.5844828	0.5372340	0.4473198				
## 10	0.5475819	0.5024470	0.4567700	0.4753846	0.5555556	0.5993740	0.5592949	0.4376068	0.4567474			
## 11	0.5511945	0.5150977	0.5331070	0.5479233	0.6146789	0.4972274	0.5226040	0.5377856	0.5937500	0.5460526		
## 12	0.6226734	0.5436364	0.5780446	0.5695581	0.6722561	0.5485075	0.4514851	0.5295203	0.5514019	0.5802676	0.4960784	
## 13	0.7189836	0.6750392	0.7081481	0.6671512	0.7323162	0.7091195	0.6180905	0.6319218	0.6633987	0.6920821	0.6721311	0.6234458
## 14	0.5427632	0.4922280	0.5467742	0.4815409	0.5625000	0.5785953	0.5500849	0.4646643	0.5035336	0.5145161	0.5706985	0.5769912
## 15	0.5956790	0.5173554	0.5247209	0.5190840	0.5631501	0.6428571	0.6387597	0.4940978	0.5555556	0.4807074	0.6125402	0.6536585
## 16	0.5151007	0.5144804	0.5342020	0.5461538	0.5640244	0.5511945	0.5008787	0.5793781	0.6108374	0.5692068	0.4791289	0.5557554
## 17	0.6206323	0.5633803	0.6186579	0.6065831	0.7122093	0.5939716	0.5456204	0.5679012	0.6308492	0.6242038	0.5410448	0.4629630
## 18	0.7300319	0.6768190	0.7264151	0.6825886	0.7507331	0.6868512	0.6152450	0.6609294	0.6943005	0.7269939	0.6737589	0.6182171
## 19	0.5628059	0.5162393	0.5800317	0.5611621	0.6503597	0.5822148	0.5511945	0.4868651	0.5305410	0.5320513	0.5520833	0.5093284
## 20	0.5528053	0.5230769	0.5636071	0.5220820	0.5783866	0.6122112	0.5986733	0.4965035	0.5601375	0.4825291	0.5540070	0.6502547
## 21	0.5733333	0.5540309	0.5951613	0.6389302	0.5953846	0.6218487	0.6243740	0.6086235	0.6628478	0.6012559	0.5370705	0.6397188

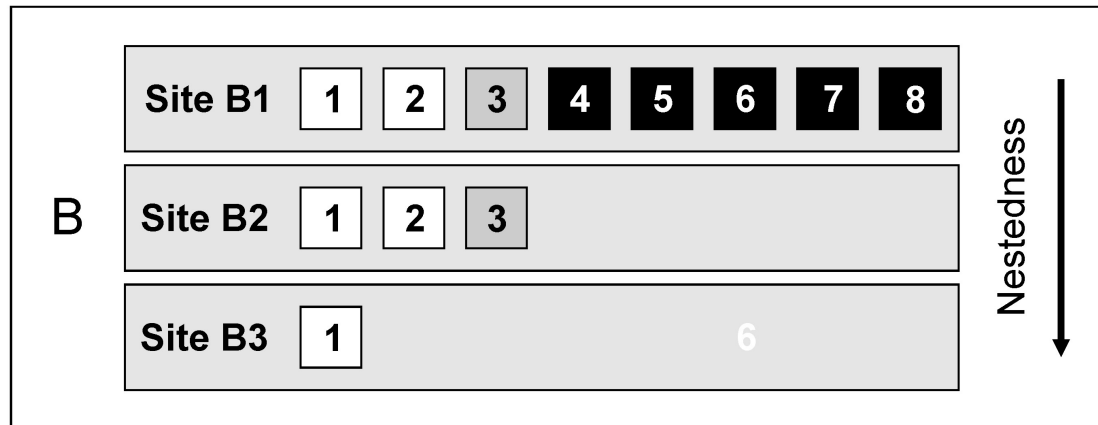
## Substituição de espécies



$$\beta = 8/4 = 2$$

$$\beta_{\text{sor}} = 0.5$$

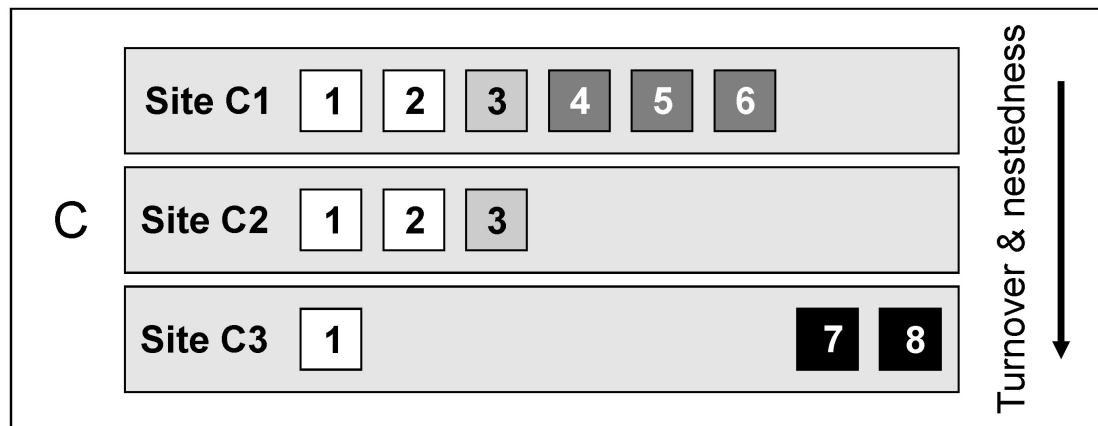
# Aninhamento



$$\beta = 8/4 = 2$$

$$\beta_{\text{sor}} = 0.5$$

## Combinação de ambos



$$\beta = 8/4 = 2$$

$$\beta_{\text{sor}} = 0.5$$

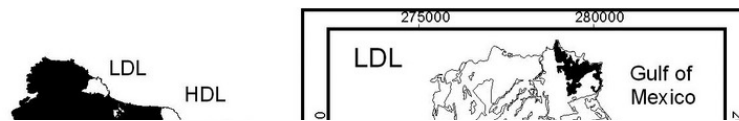
# Exemplos



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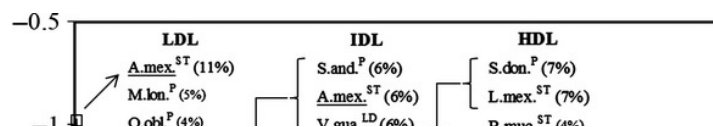


# Exemplos

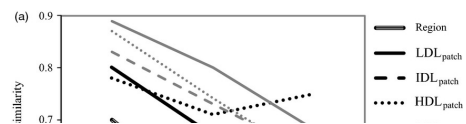




# Exemplos



# Exemplos



## Prática no R