Teórica 9:
Estructura comunitaria en el espacio y en el tiempo: biodiversidad

Repaso teórica 8: Parasitismo

- Tipos de parásitos.
- Modelos de compartimientos de enfermedades infecciosas.
- Ejemplos de dinámica hospedador-parásito.
- Efectos de los parásitos sobre los hopedadores.
- Evolución de interacciones hospedador-parásito.

Teórica 9: Esquema conceptual

- Definición de comunidad
- Medición de la biodiversidad
- Explicaciones de la estructura de las comunidades
- Gradientes geográficos en la diversidad
- Cambio comunitario: Sucesión

Niveles de organización biológica

Paisajes*
Ecosistemas*
Comunidades*
Especies*
Poblaciones*
Organismos individuales(*)
Sistemas de órganos
Órganos
Tejidos
Células
Organelas
Moléculas

Complejidad creciente

Conocimiento científico decreciente

La comunidad es...

- El conjunto de especies que viven en un lugar determinado (Krebs 2009).
- Un ensamble de plantas, animales, bacterias y hongos que viven un ambiente e interactúan entre sí, formando un sistema vivo distintivo con composición, estructura, relaciones ambientales, desarrollo y funciones propios (Whittaker 1975).

Preguntas básicas de la ecología de comunidades

- ¿Por qué algunas especies son comunes y otras raras?
- ¿Por qué algunos sitios tienen muchas especies y otros pocas?
- ¿Funcionan de manera diferente las comunidades con muchas y con pocas especies?
- ¿Qué determina la coexistencia de las especies en las comunidades?

Atributos comunitarios

- Riqueza: el número de especies en la comunidad
- Abundancia relativa
- Composición: la identidad de las especies
- Estructura trófica (o, en general, estructura de la "red" de interacciones)
- Arquitectura y formas de crecimiento
- Rasgos y atributos funcionales de las especies

Riqueza

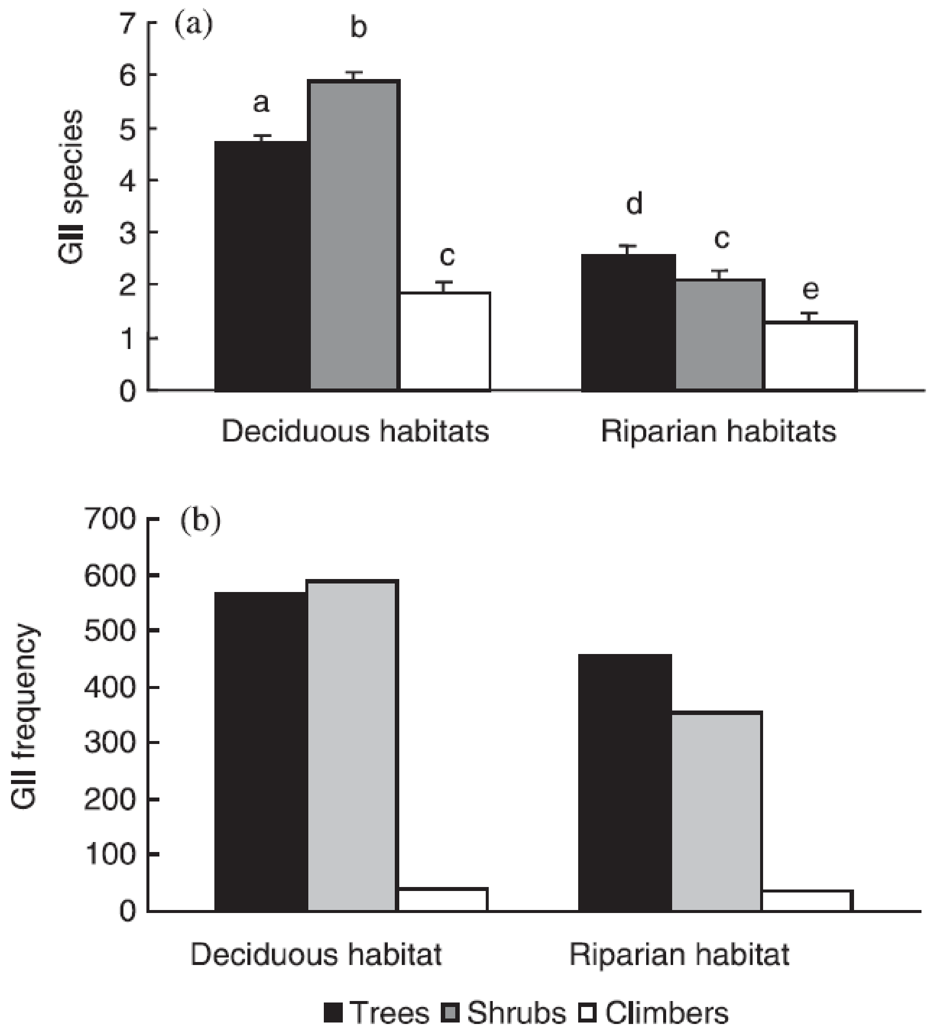
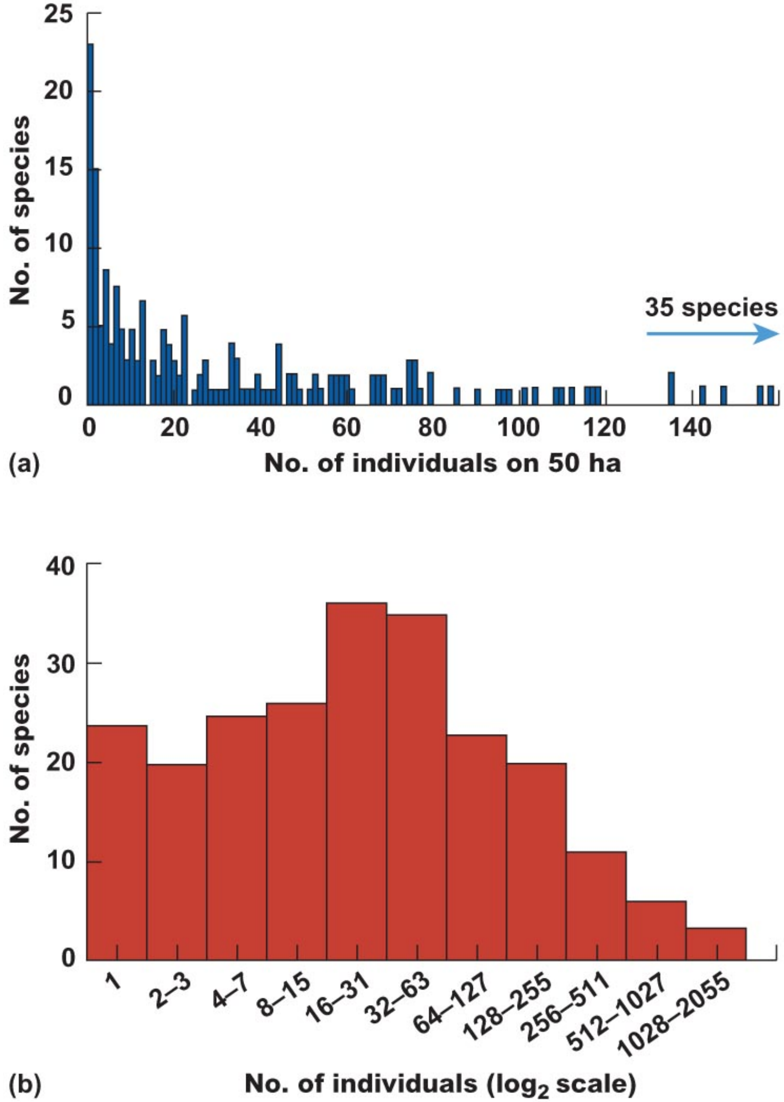
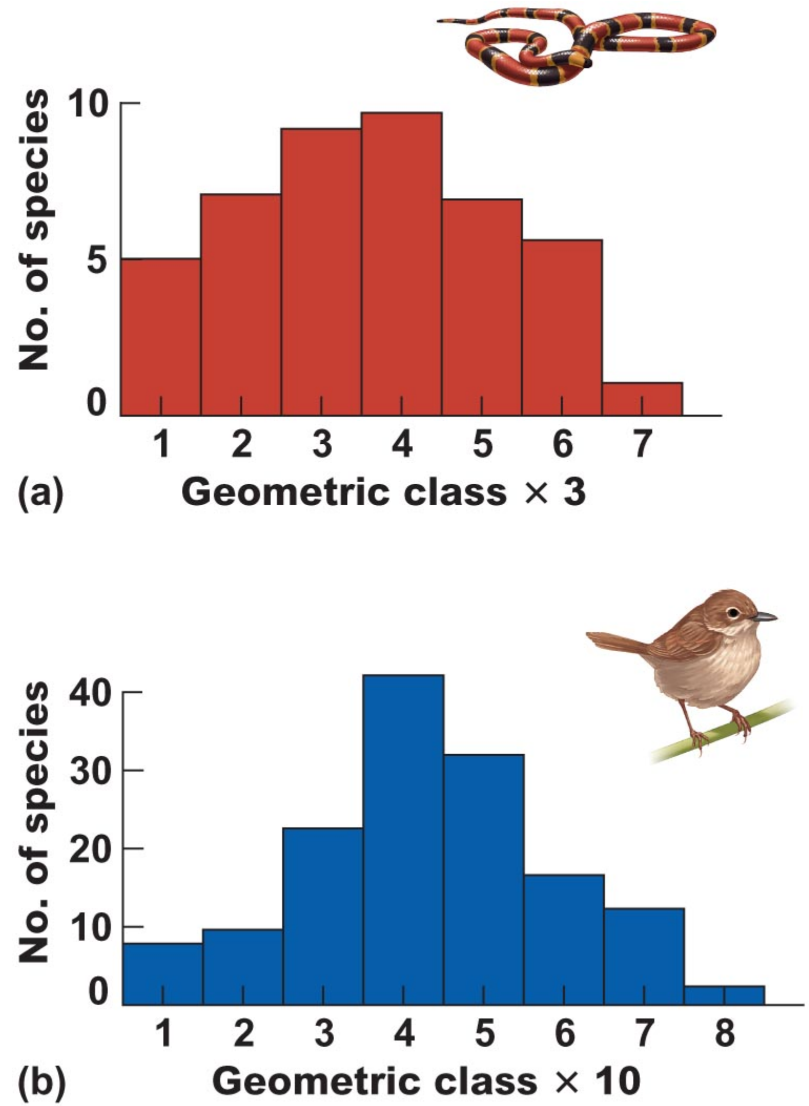


Fig. 2 (a) Effect on GII of different life-forms in deciduous and riparian habitats species richness. Non-transformed data are shown. Values with the same letter did not differ significantly after an LSMeans multiple comparison test ($P > 0.001$). (b) Frequency. PROC CATMOD procedure (SAS 2000) was applied for modelling categorical data: life-form ($\chi^2 = 18.8$, d.f. = 2, $P < 0.0001$), habitat ($\chi^2 = 8.0$, d.f. = 1, $P < 0.0047$), life-form × habitat ($\chi^2 = 23.6$, d.f. = 2, $P < 0.0001$).

Fuente: Cuevas-Reyes et al. (2004) Journal of Ecology 92: 707-716

Abundancia relativa / Equidad





Composición

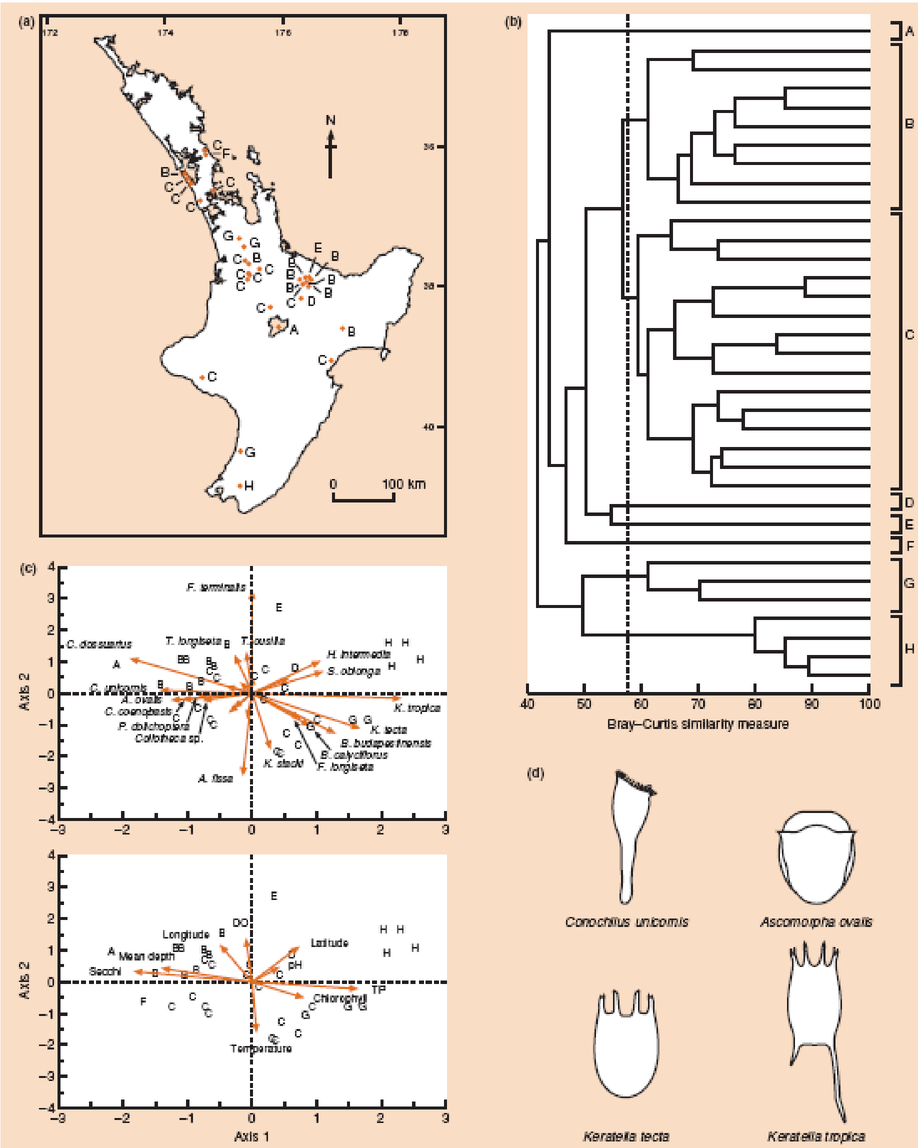


Figure 16.7 (*opposite*) (a) Thirty-one lakes in the North Island of New Zealand where rotifer communities (78 species in total) were sampled and described. (b) Results of cluster analysis (classification) on species composition data from the 31 lakes (based on the Bray–Curtis similarity measure); lake communities that are most similar cluster together and eight clusters are identified (A–H). (c) Results of canonical correspondence analysis (ordination). The positions in ordination space are shown for lake sites (shown as letters A–H corresponding to their classification), individual rotifer species (orange arrows in top panel) and environmental factors (orange arrows in lower panel). (d) Silhouettes of four of the rotifer species. (After Duggan *et al.*, 2002.)

Estructura de las interacciones

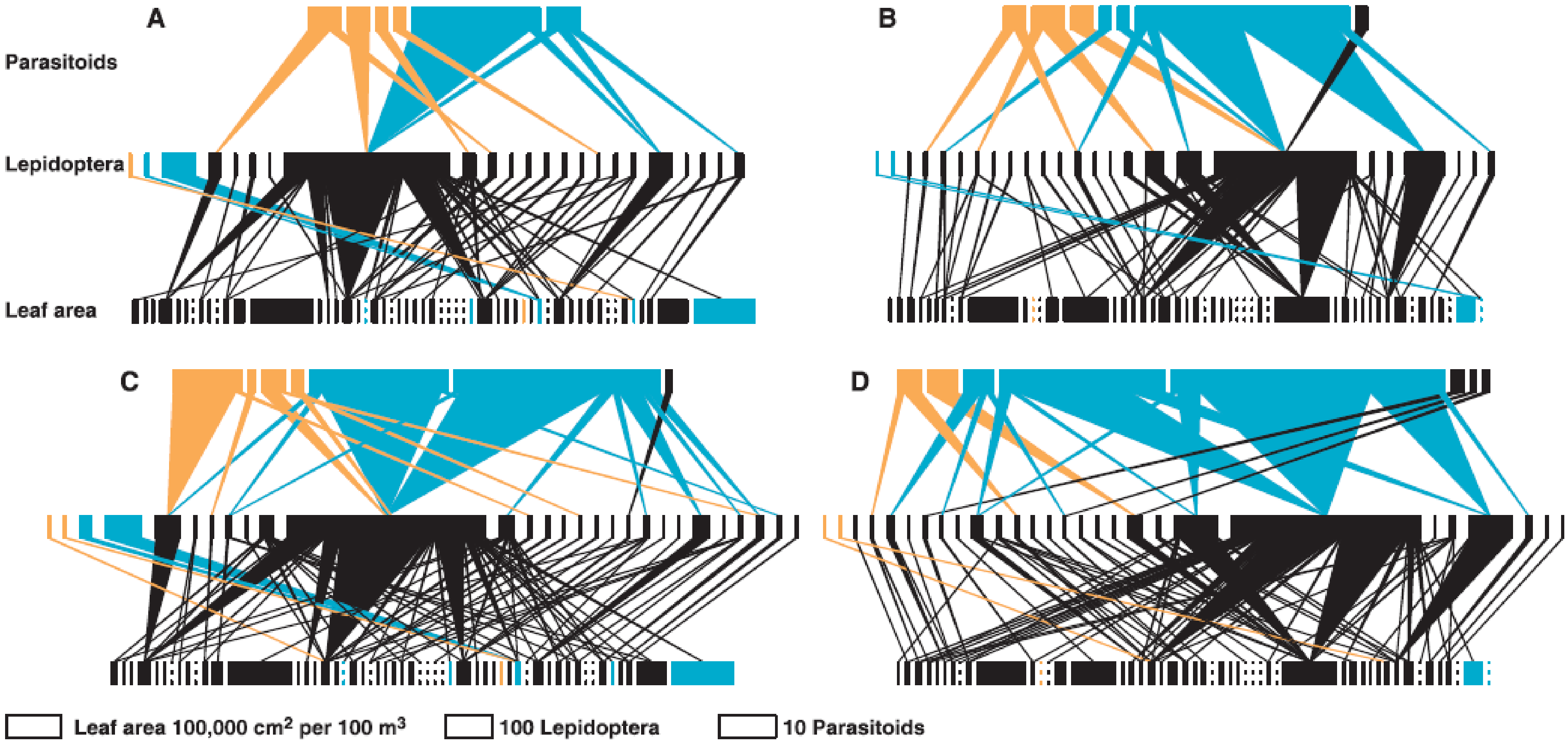


Fig. 1. Quantitative food webs for two plots over 2 years in the Alakai Swamp. Plant species are on the bottom, moths in the middle, and parasitoids on top. Each bar represents a species, and its width represents its relative abundance among all individuals collected. Relative plant abundance was measured using leaf area per 100 m^3 and was assessed by counting leaves of all plant species along four arbitrary transects in each plot and by measuring average leaf area for all species. The scale bar for leaf area represents 100,000 cm^2 per 100 m^3 of forest; the bar for Lepidoptera represents 100 individuals; and the bar for parasitoids represents 10 individuals. The width of the lines connecting trophic levels represents the relative numbers of the upper species attacking the lower species. Plants represented by dotted lines were in the plots but did not occur on these transects. Native species are black, accidental immigrants are yellow, and intentionally introduced species are blue. In the case of insects, intentionally introduced species are biological control agents; in the case of plants, intentionally introduced species are ornamentals and trees that were originally planted for erosion control. (**A**) Plot 1, 1999. (**B**) Plot 2, 1999. (**C**) Plot 1, 2000. (**D**) Plot 2, 2000. All webs are drawn at the same scale. See supplemental material (*20*) for figure detail and species names.

Fuente: Henneman & Memmott (2001) Science 293: 1314-1316

Atributos funcionales

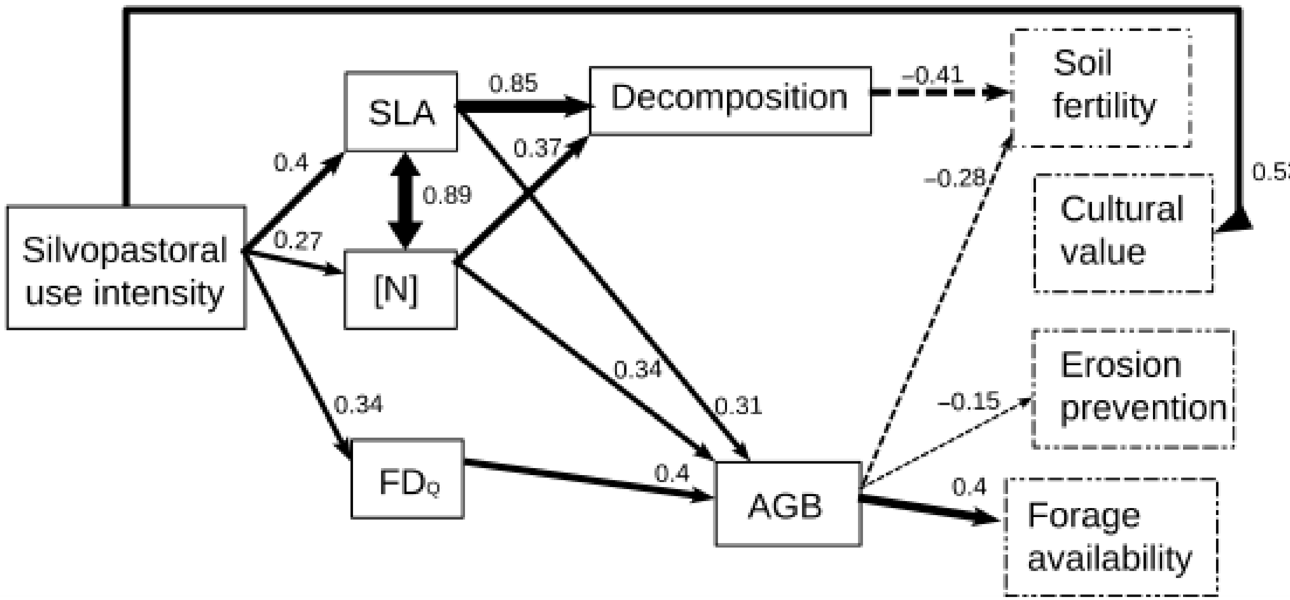


FIGURE 2 Best-fitting structural equation model examining direct and indirect relationships among land-use intensification, biodiversity, ecosystem processes and ecosystem services. SLA, community-weighted mean index of specific leaf area; [N], community-weighted mean index of leaf nitrogen content; FD_Q, functional diversity index; AGB, above-ground green biomass. The width of the arrows reflects the strength of dependency between two variables, dashed arrows reflects negative relationship, solid arrows reflects positive relationships and standardized path coefficients are shown on the path. Only significant (p < .05) paths values higher than .15 are presented. Table 2 shows the parameters of all models in a comparative way

Fuente: Chillo, Vázquez, Bennett & Amoroso (2018) Functional Ecol 32: 1390-1399

Atributos comunitarios

Abundance

	Site 1	Site 2	Site 3	Site 4
Species 1	4	0	315	0
Species 2	300	250	0	223
Species 3	56	120	74	101
Species 4	23	18	0	0

Trait 1	Trait 2	Trait 3	Trait 4
0.2	320	0.5	20
0.6	298	0.1	16
0.9	412	0.1	26
1.3	300	0.2	21

Site characteristic 1	10	1	7	16
Site characteristic 2	0.01	0.4	0.2	0.5
Site characteristic 3	90	92	95	97
Site characteristic 4	12	0.1	0	5

Figure 2.3. The three data tables needed to calculate various second-order community properties, either incorporating species characteristics (traits) or site characteristics (e.g., environmental variables). Traits are assumed to be fixed at the species level (i.e., not variable within species among sites).

Fuente: Vellend (2016) The theory of ecological communities. Princeton Univ. Press

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Medición de la biodiversidad

Especie	Comunidad 1	Comunidad 2
A	99	50
B	1	50

Atributos a tener en cuenta:

- Riqueza
- Abundancia relativa/Equidad
- Composición

Estimación de la riqueza

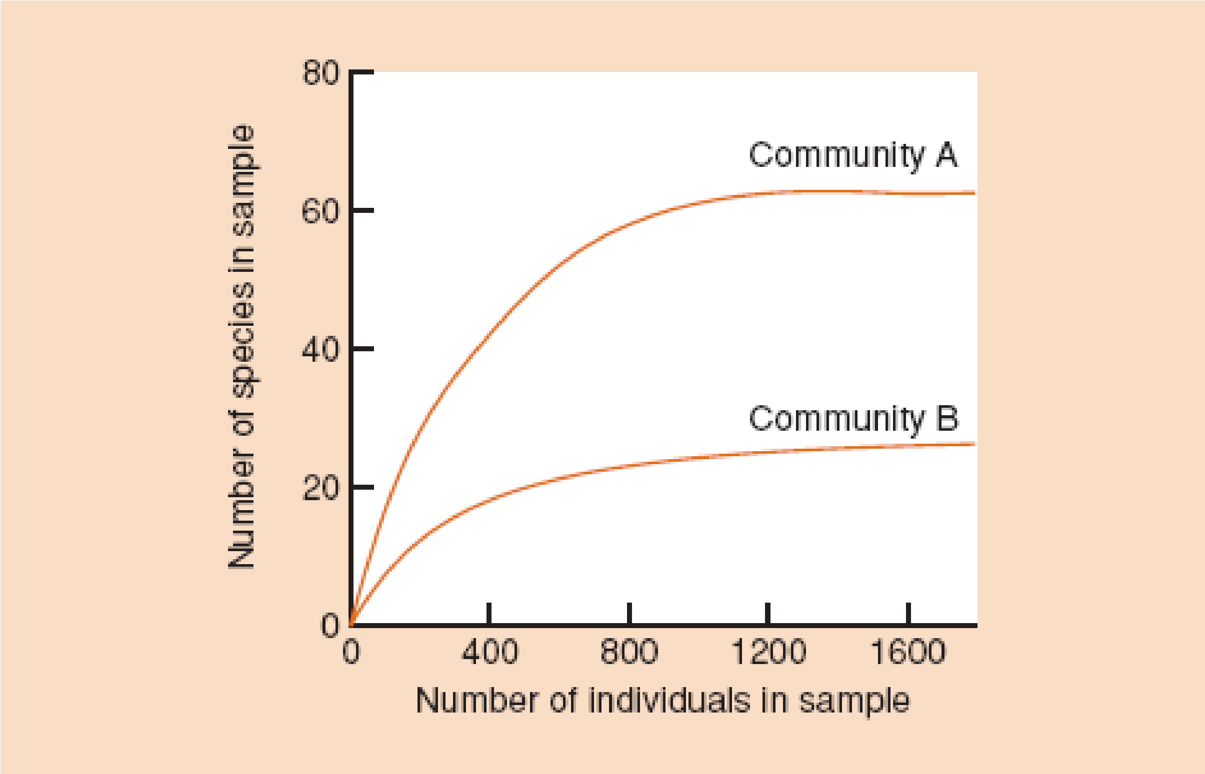


Figure 16.3 The relationship between species richness and the number of individual organisms from two contrasting hypothetical communities. Community A has a total species richness considerably in excess of community B.

Estimación de la riqueza: Curvas de acumulación y rarefacción

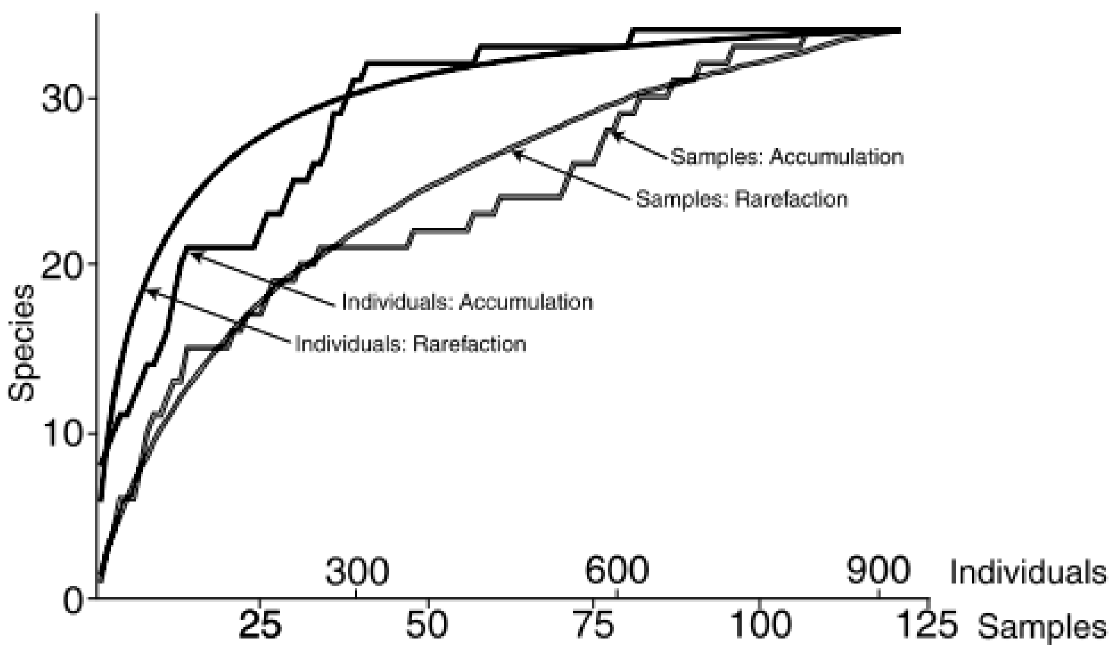


Figure 1 Sample- and individual-based rarefaction and accumulation curves. Accumulation curves (jagged curves) represent a single ordering of individuals (solid-line, jagged curve) or samples (open-line, jagged curve), as they are successively pooled. Rarefaction curves (smooth curves) represent the means of repeated re-sampling of all pooled individuals (solid-line, smooth curve) or all pooled samples (open-line, smooth curve). The smoothed rarefaction curves thus represent the statistical expectation for the corresponding accumulation curves. The sample-based curves lie below the individual-based curves because of the spatial aggregation of species. All four curves are based on the benchmark seedbank dataset of Butler & Chazdon (1998), analysed by Colwell & Coddington (1994) and available online with *EstimateS* (Colwell 2000a). The individual-based accumulation curve shows one particular random ordering of all individuals pooled. The individual-based rarefaction curve was computed by *EstimateS* using the Coleman method (Coleman 1981). The sample-based accumulation curve shows one particular random ordering of all samples in the dataset. The sample-based rarefaction curve was computed by repeated re-sampling, using *EstimateS*. For both sample-based curves, the patchiness parameter in *EstimateS* set to 0.8, to emphasize the effect of spatial aggregation.

Fuente: Gotelli & Colwell (2001) Ecology Letters 4: 379-391

Estimación de la riqueza: Curvas de acumulación y rarefacción

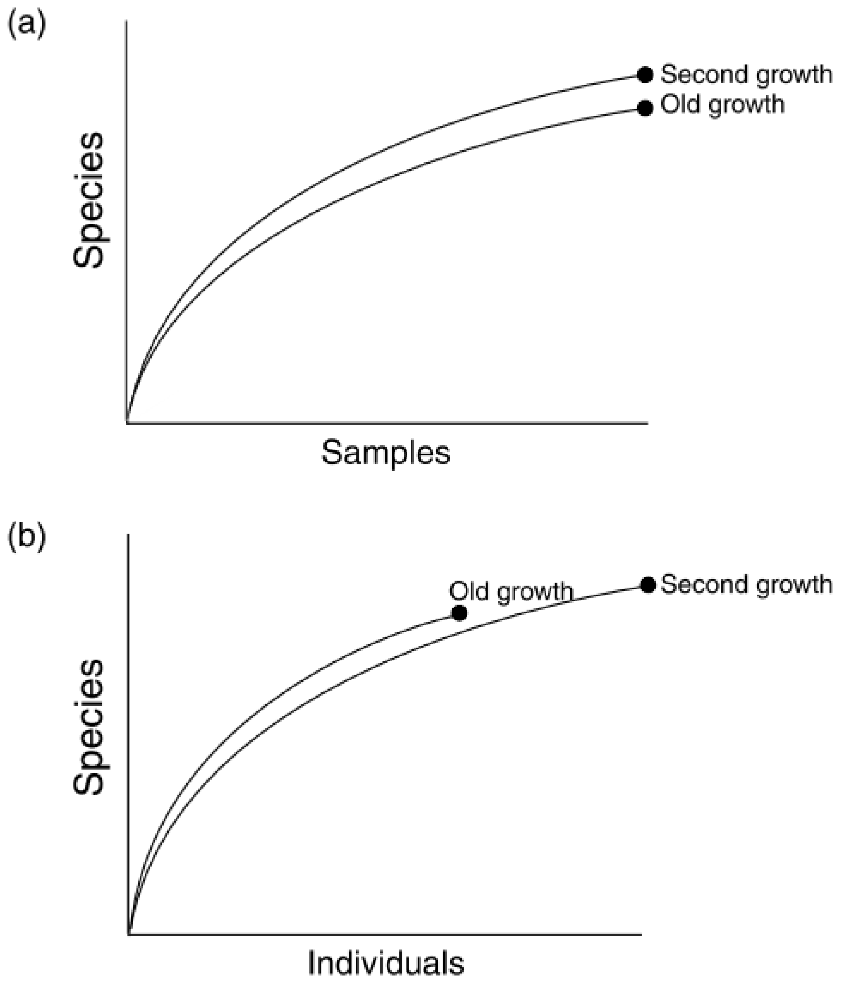


Figure 2 The effect on species richness of re-scaling the *x*-axis of sample-based rarefaction curves (randomized species accumulation curves) from samples to individuals, when individual densities vary. In this hypothetical example, species richness appears to be higher for a second-growth forest stand than for an old growth stand (a, based on corresponding numbers of accumulated samples. However, stem density is higher in the second-growth stand (with smaller trees) than for the old-growth stands (with larger trees). When the *x*-axis is re-scaled to individuals, the result is reversed (b).

Fuente: Gotelli & Colwell (2001) Ecology Letters 4: 379-391

Estimación de la riqueza: Ejemplo de rarefacción

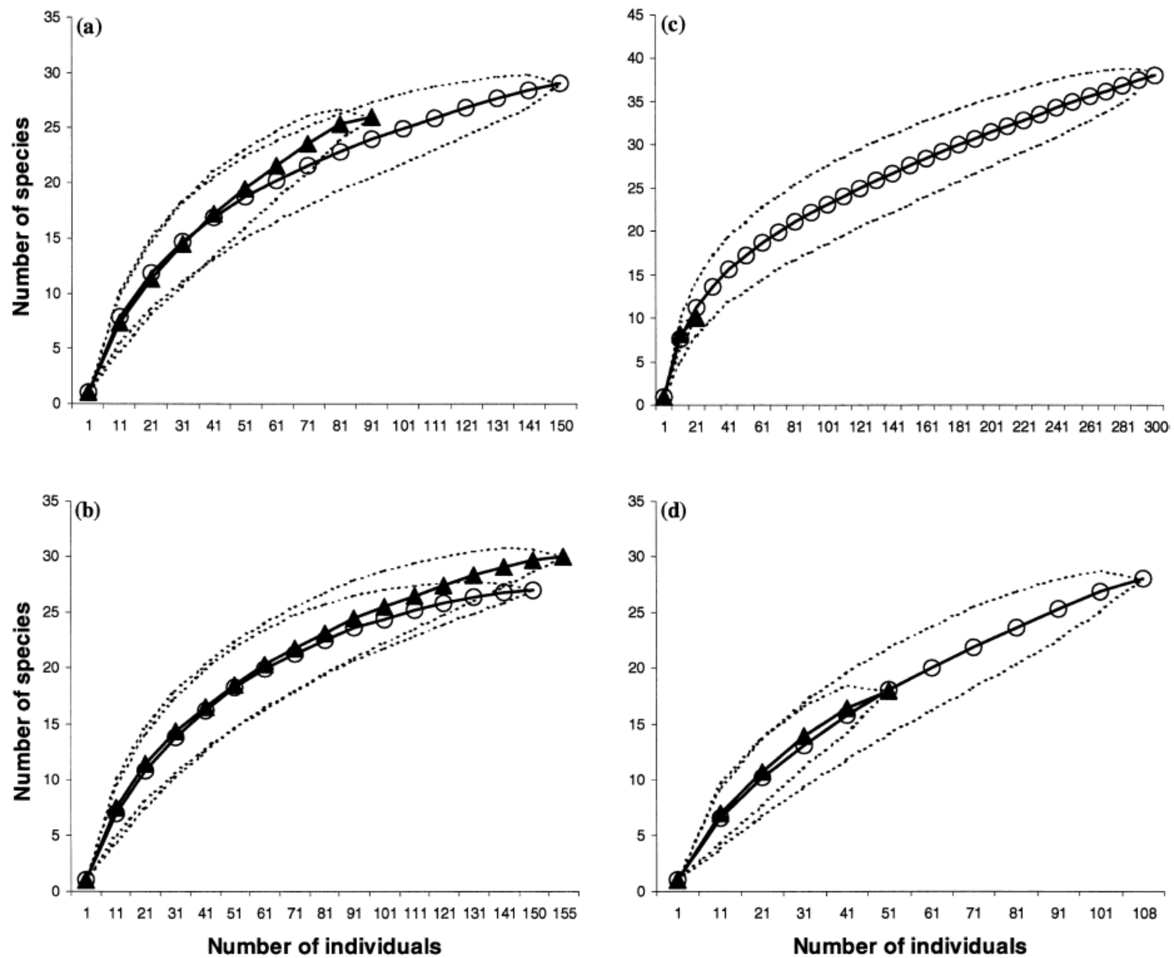
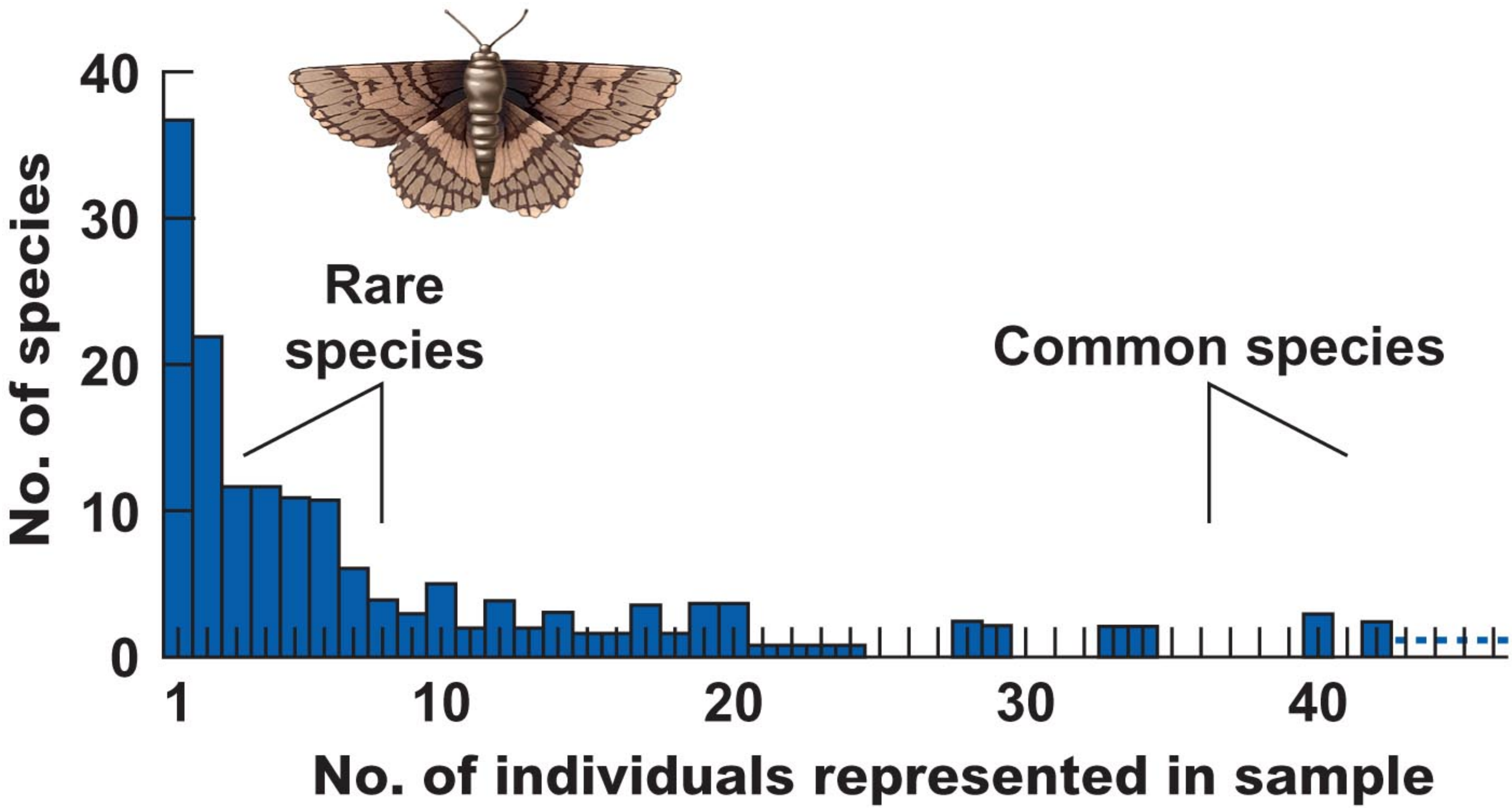


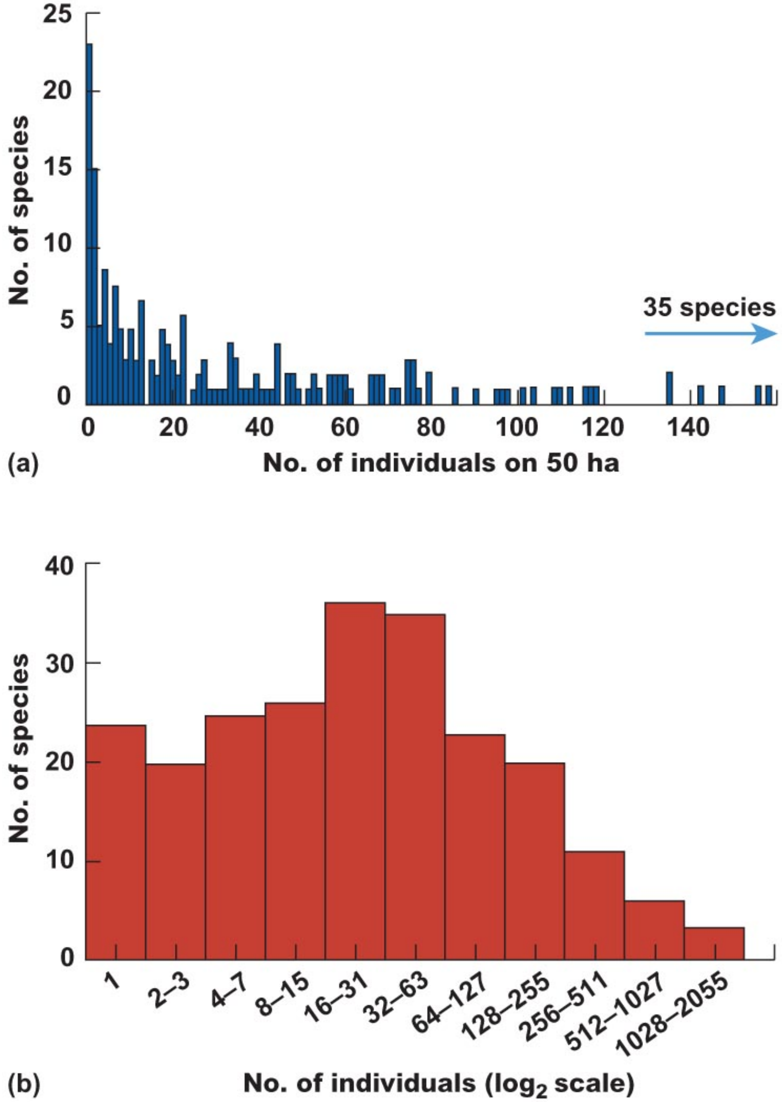
Figure 1. Rarefaction curves for the species richness of insects recorded visiting flowers of *Alstroemeria aurea* by Vázquez and Simberloff (2002). The rarefaction calculations were performed using EcoSim software (Gotelli and Entsminger 2000). The continuous lines indicate expected values of rarefaction curves; dashed lines above and below the expected values are 95% confidence limits calculated over 1000 iterations of the simulation. ▲: grazed sites; ○: ungrazed sites. Actual species richness corresponds to the upper-right end of the lines. Rarefaction curves given separately for each of four pairs of sites. Paired sites are: (a) Llao Llao (UG), Cerro López (G); (b) Safariland (UG), Arroyo Goye (G); (c) Mascardi (UG and G); (d) Quetrihué (UG and G) (UG, ungrazed site; G, grazed site).

Fuente: Vázquez DP (2002) Biological Invasions 4: 175-191

Diversidad: riqueza y abundancia relativa



Diversidad:
riqueza y abundancia relativa



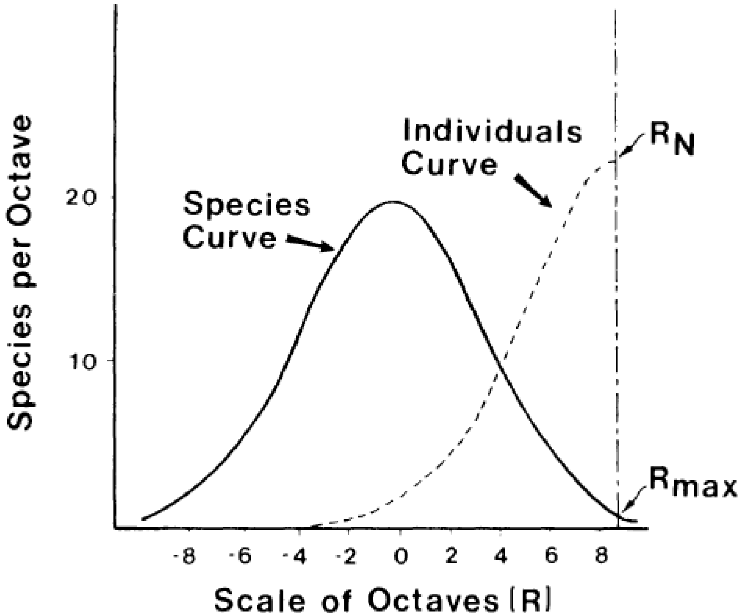


FIG. 1.—The canonical lognormal distribution for an ensemble of 178 species (after Preston 1962). By convention, the *x*-axis is scaled as logarithmic (base 2) abundance classes or "octaves" of individuals/species, adjusted to have a mean of zero. The species curve denotes the number of species in each octave and the individual's curve shows the number of individuals in each abundance class. This particular distribution is canonical because the mode of the individual's curve, R_N, coincides with the upper truncation point of the species curve, R_{max} (i.e., $\gamma = R_N/R_{max} = 1$). Setting $\gamma = 1$ couples species count and variance in a specific way (see fig. 2).

Fuente: Sugihara (1980) American Naturalist 116: 770-787

Estimación de la diversidad: Indices de diversidad

	Indice de Simpson	Indice de Shannon
Diversidad	$D = \frac{1}{\sum_{i=1}^{S} P_i^2}$	$H = -\sum_{i=1}^{S} P_i \ln P_i$
Equitatividad	$E = \frac{D}{D_{max}} = \frac{1}{\sum_{i=1}^{S} P_i^2} \times \frac{1}{S}$	$J = \frac{H}{H_{max}} = \frac{-\sum_{i=1}^{S} P_i \ln P_i}{\ln S}$

¡Cuidado! Así como la riqueza, los índices son muy sensibles al esfuerzo de muestreo.

Estimación de la diversidad: Indices de diversidad

Especie	Comunidad 1	Comunidad 2
A	99	50
B	1	50

$$D = \frac{1}{\sum_{i=1}^{S} P_i^2}$$

$1/(0.99^2 + 0.01^2) = 1,02$ $1/(0.5^2 + 0.5^2) = 2$

$$E = \frac{D}{D_{\max}} = \frac{1}{\sum_{i=1}^{S} P_i^2} \times \frac{1}{S}$$

1,02/2 = 0,51 2/2 = 1

Estimación de la diversidad:

Indices de diversidad

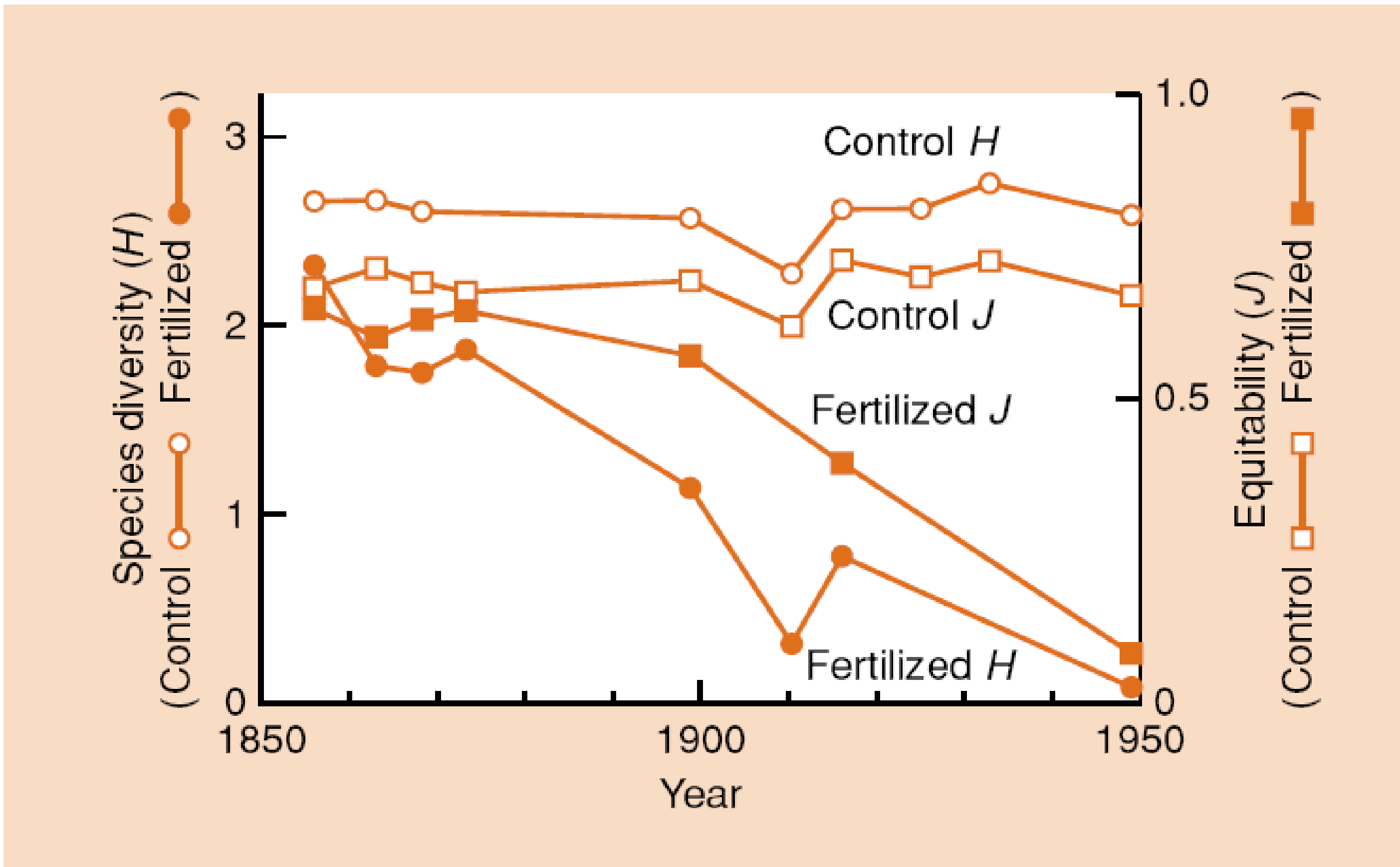


Figure 16.4 Species diversity (*H*) and equitability (*J*) of a control plot and a fertilized plot in the Rothamsteard 'Parkgrass' experiment. (After Tilman, 1982.)

Teórica 9: Esquema conceptual

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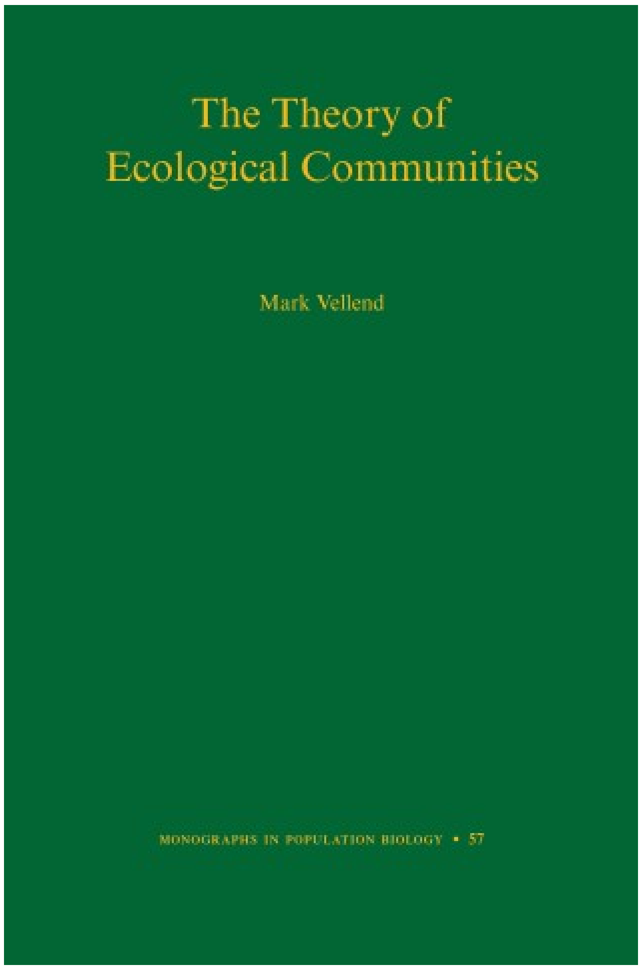
Explicaciones de la estructura comunitaria: cuatro procesos principales

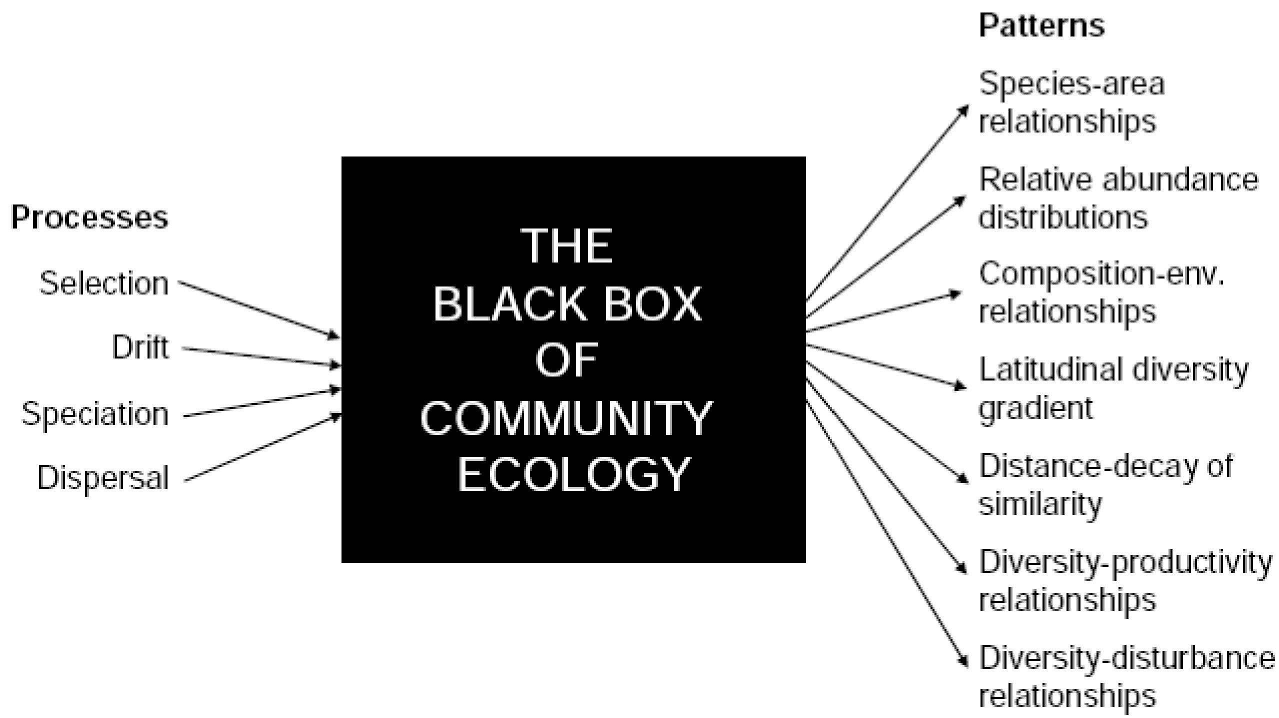
Los cuatro procesos comunitarios:

- **Selección:** diferencia en la aptitud entre individuos de distintas especies
- **Deriva:** cambios aleatorios en composición de especies
- **Especiación:** creación de nuevas especies
- **Dispersión:** movimiento de organismos en el espacio

Fuente: Vellend (2010) Quart. Rev. Biol. 85:183-206

Explicaciones de la estructura comunitaria: cuatro procesos principales





Fuentes: Vellend (2010) Quart. Rev. Biol. 85:183-206

Vellend (2016) The theory of ecological communities. Princeton Univ. Press

Explicaciones de la estructura comunitaria: cuatro procesos principales

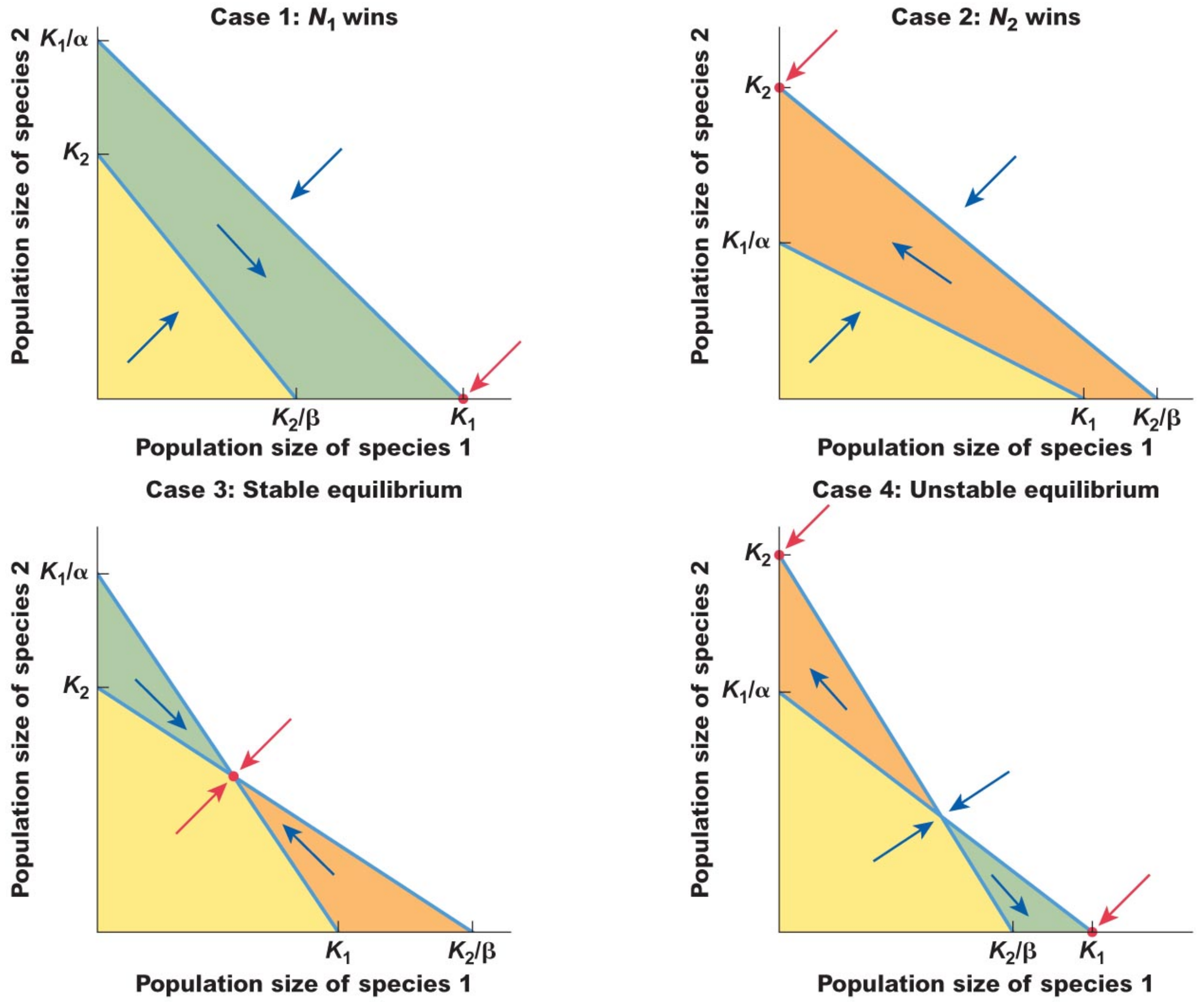
TABLE 2

Twelve combinations of selection, drift, speciation, and dispersal, and the ways in which existing ecological theories relate to these combinations

Combination	Selection	Drift	Speciation	Dispersal	Theories and models	Representative references
1	×				Niche models of all kinds (e.g., resource competition, predator-prey, food webs)	Tilman (1982); Chase & Leibold (2003)
2		×			Neutral theory I (demographic stochasticity)	Hubbell (2001)
3	×	×			Niche-neutral models (any niche model with demographic stochasticity)	Tilman (2004); Adler et al. (2007)
4	×		×		Historical/regional ecology I (species pool theory, diversity on gradients, speciation-selection balance)	MacArthur (1969); Ricklefs (1987)
5		×	×		Neutral model II (non-spatial)	Hubbell (2001)
6	×			×	Metacommunities - deterministic (spatial mass effects, spatial food webs)	Holyoak et al. (2005)
7		×		×	Neutral model III (island biogeography)	MacArthur & Wilson (1967); Hubbell (2001)
8	×	×	×		Historical/regional ecology II	Ricklefs (1987)
9	×		×	×	Historical/regional ecology III	Ricklefs (1987)
10		×	×	×	Neutral model IV (spatial)	Hubbell (2001)
11	×	×		×	Metacommunities - stochastic (colonization-competition tradeoffs, stochastic versions of six)	Holyoak et al. (2005)
12	×	×	×	×	The theory of ecological communities	This paper

Fuente: Vellend (2010) Quart. Rev. Biol. 85:183-206

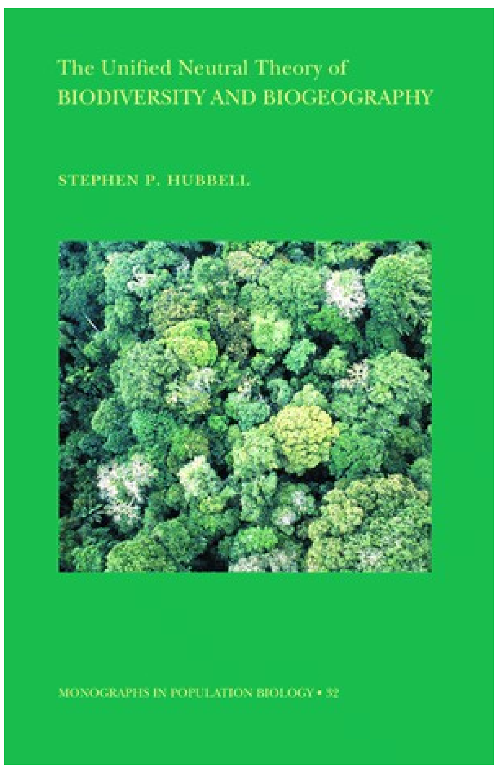
Explicaciones de la estructura comunitaria: selección (diferencias de nicho)



Explicaciones de la estructura comunitaria: teoría neutral (deriva, dispersión, especiación)

Graham Bell

Stephen Hubbell



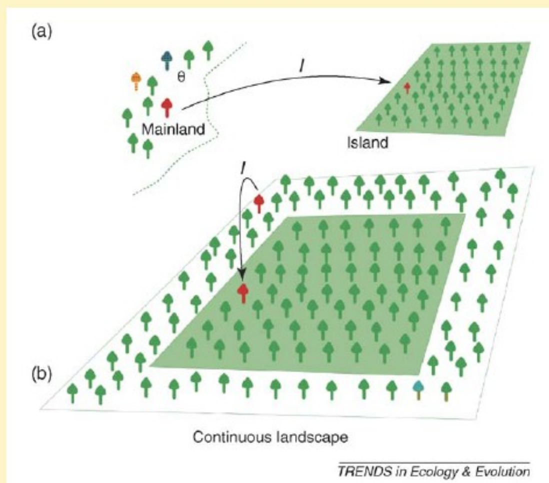


Figure I. Hubbell's mainland–island model and its relation to a sample from a continuous landscape. When we sample a locality, represented here by a rectangular area shaded in green in **(b)**, within a continuous region (or metacommunity), and obtain estimates of the fundamental biodiversity and dispersal numbers, we are calculating the effective neutral mainland-island model **(a)**, that best approximates the empirical distribution of species abundances observed. The fundamental numbers of the theory do not depend on sample size. The fundamental biodiversity number (θ) is a measure of the effective regional (or metacommunity) diversity, while the fundamental dispersal number (*I*) is a measure of the effective degree of isolation of the local community.

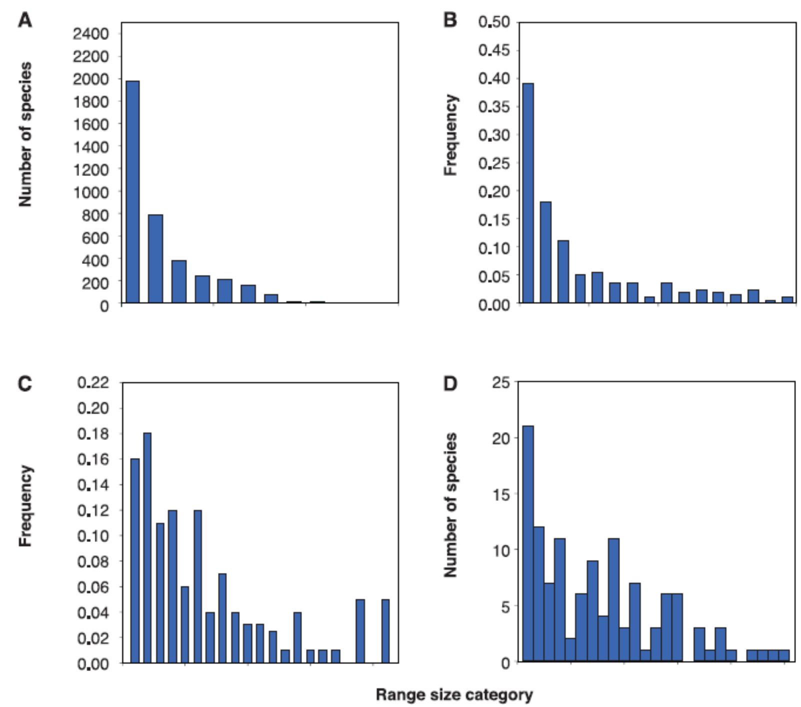
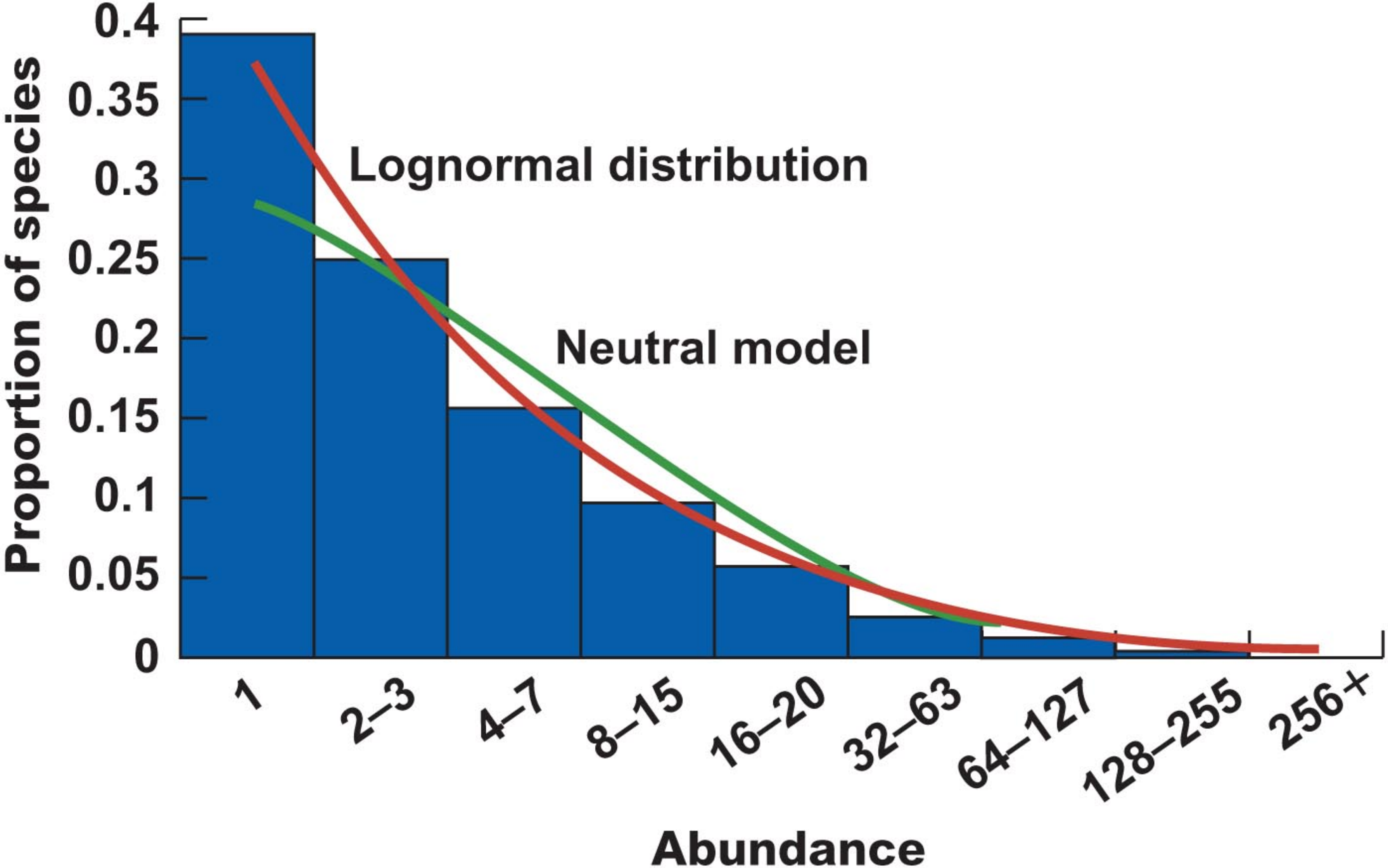


Fig. 1. The distribution of range among species. **(A)** The distribution of range among New World birds. Units of range are equal-area grid squares at intervals of 10° longitude, weighted by the proportion of land. Redrawn from Blackburn and Gaston (*18*). **(B)** The distribution of range among passerine birds in Australia. Units of range are 100-km × 100-km grid squares. Redrawn from Schoener (*19*). **(C)** The distribution of range size among North American birds. Units of range are 10^6 km^2. Redrawn from figure 6.1 of Brown (*1*). **(D)** The distribution of range in a neutral community. The community comprised 125 species whose ranges (number of sites occupied) in the central 1600 sites of a 50 × 50 matrix are shown for 25 equal range-size classes for local dispersal rate $u = 0.1$.

Fuentes: Alonso et al. (2006) TREE 21: 451-457; Bell (2001) Science 293: 2413-2418

Explicaciones de la estructura comunitaria: neutralidad vs. nicho



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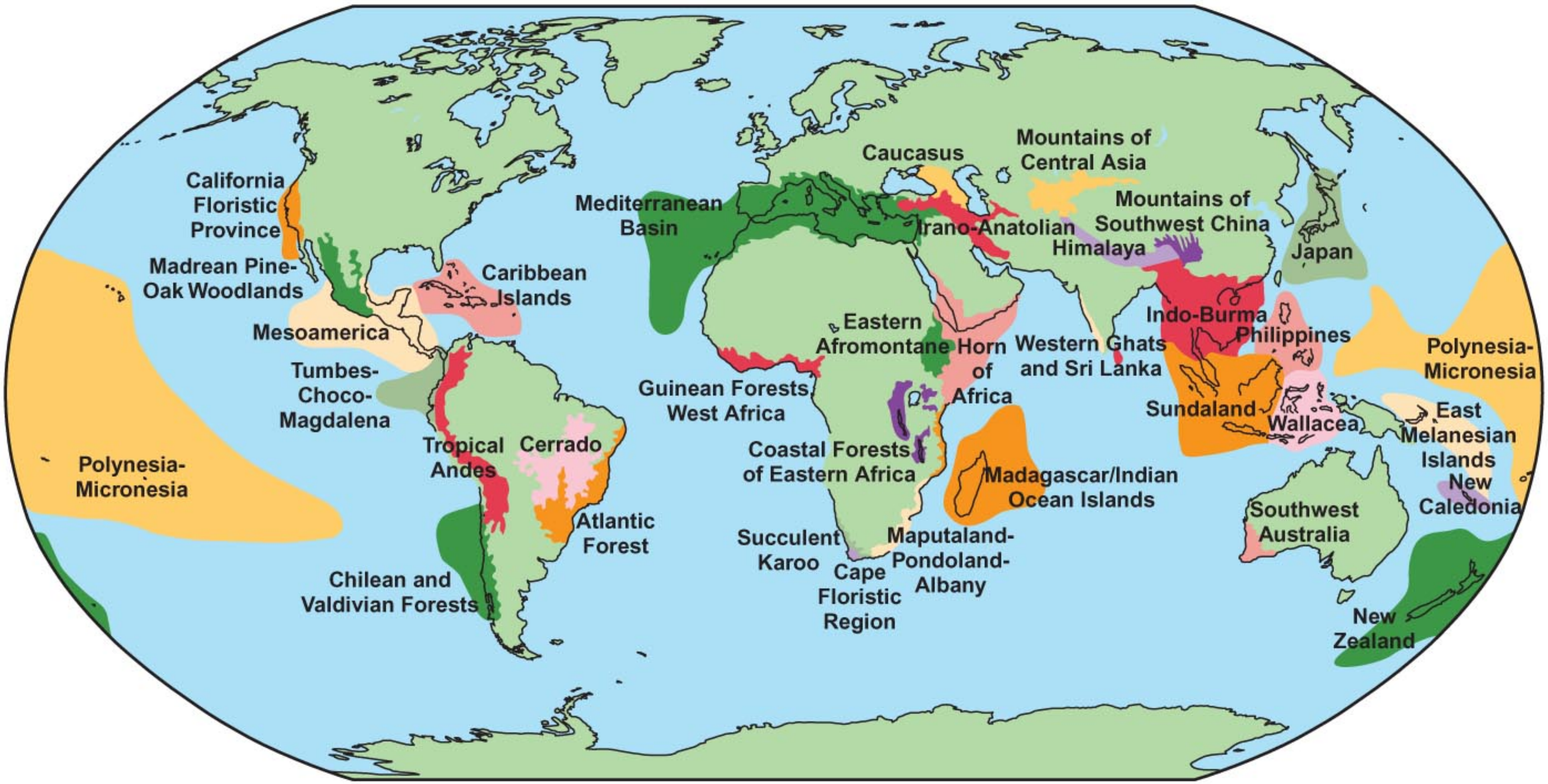
Centros de biodiversidad ("hotspots")



Gradientes geográficos de diversidad

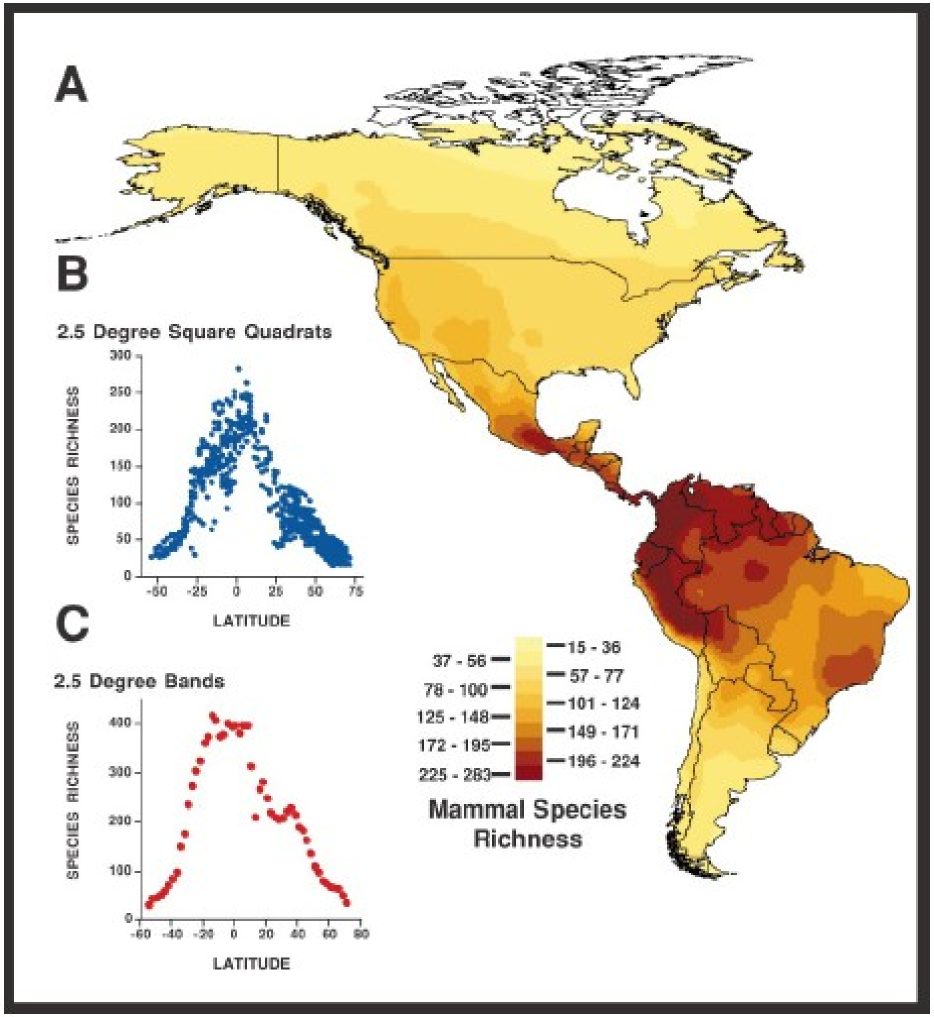


Figure 4 Spatial gradient of mammalian species richness in the continental New World for cells defined by 2.5° parallels and meridians. (*A*). Interpolated richness values in the map were created using the tension spline function in the Spatial Analyst extension to ArcGIS 8.2. Graphic representation of the latitudinal gradient in species richness for those same data (negative values for latitude indicate southern parallels), based on 2.5° cells (*B*) and 2.5° latitudinal bands (*C*). Data from Kaufman & Willig (1998).

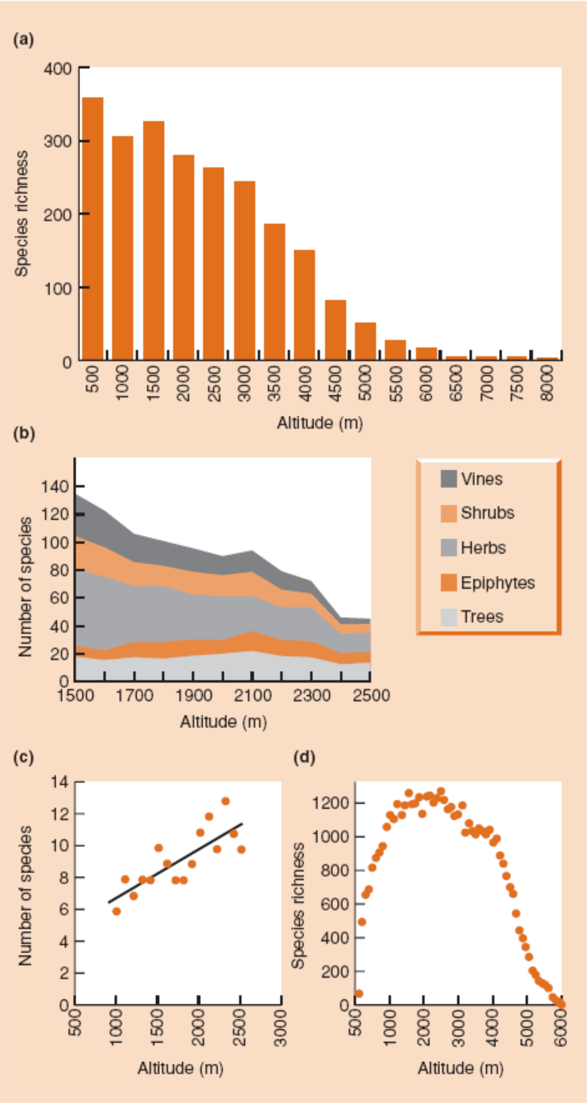
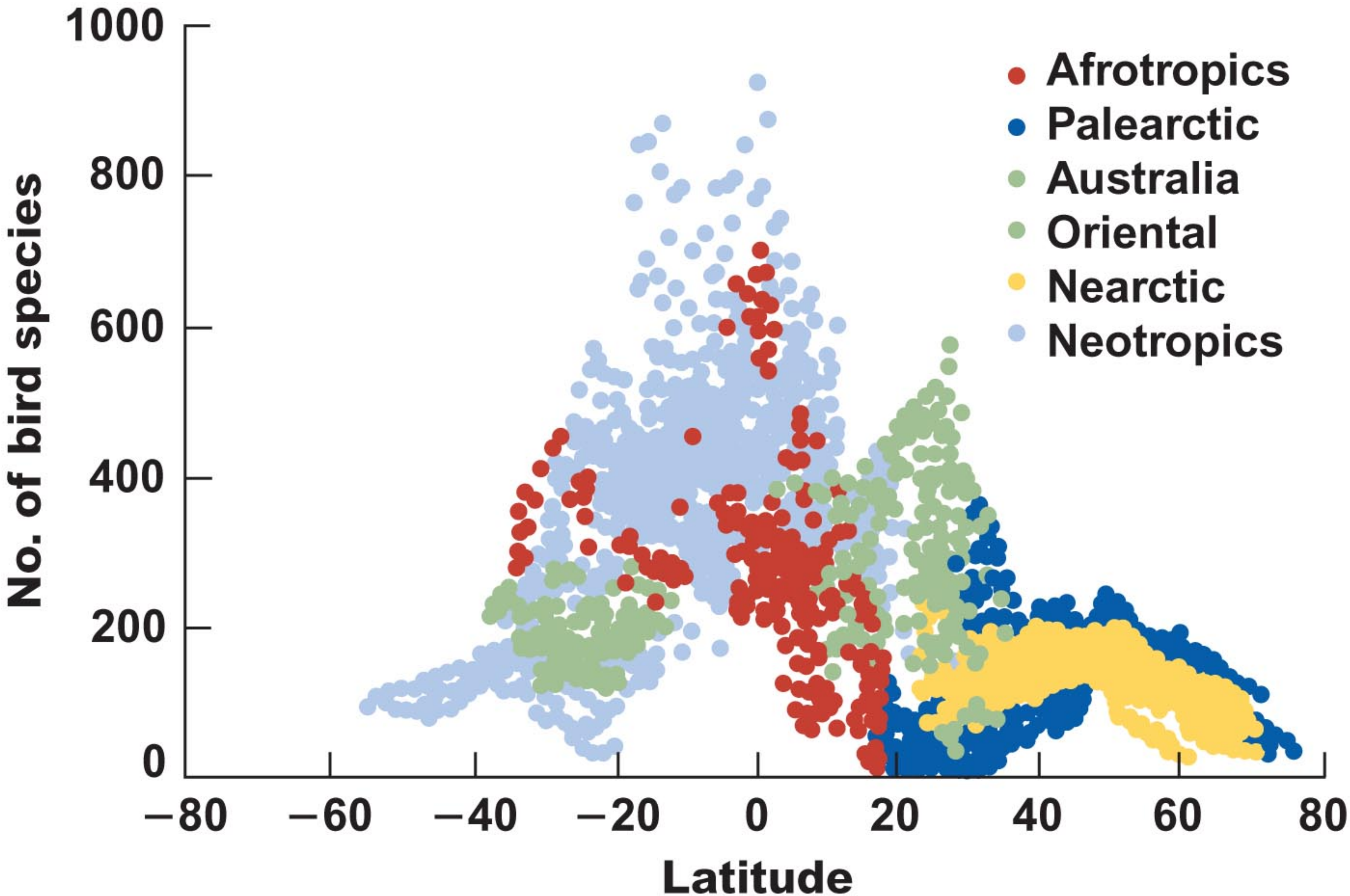


Figure 21.22 Relationships between species richness and altitude for: (a) breeding birds in the Nepalese Himalayas (after Hunter & Yonzon, 1992); (b) plants in the Sierra Manantlán, Mexico (after Vázquez & Givnish, 1998); (c) ants in Lee Canyon in the Spring Mountains of Nevada, USA (after Sanders *et al.*, 2003); and (d) flowering plants in the Nepalese Himalayas (after Grytnes & Vetaas, 2002).

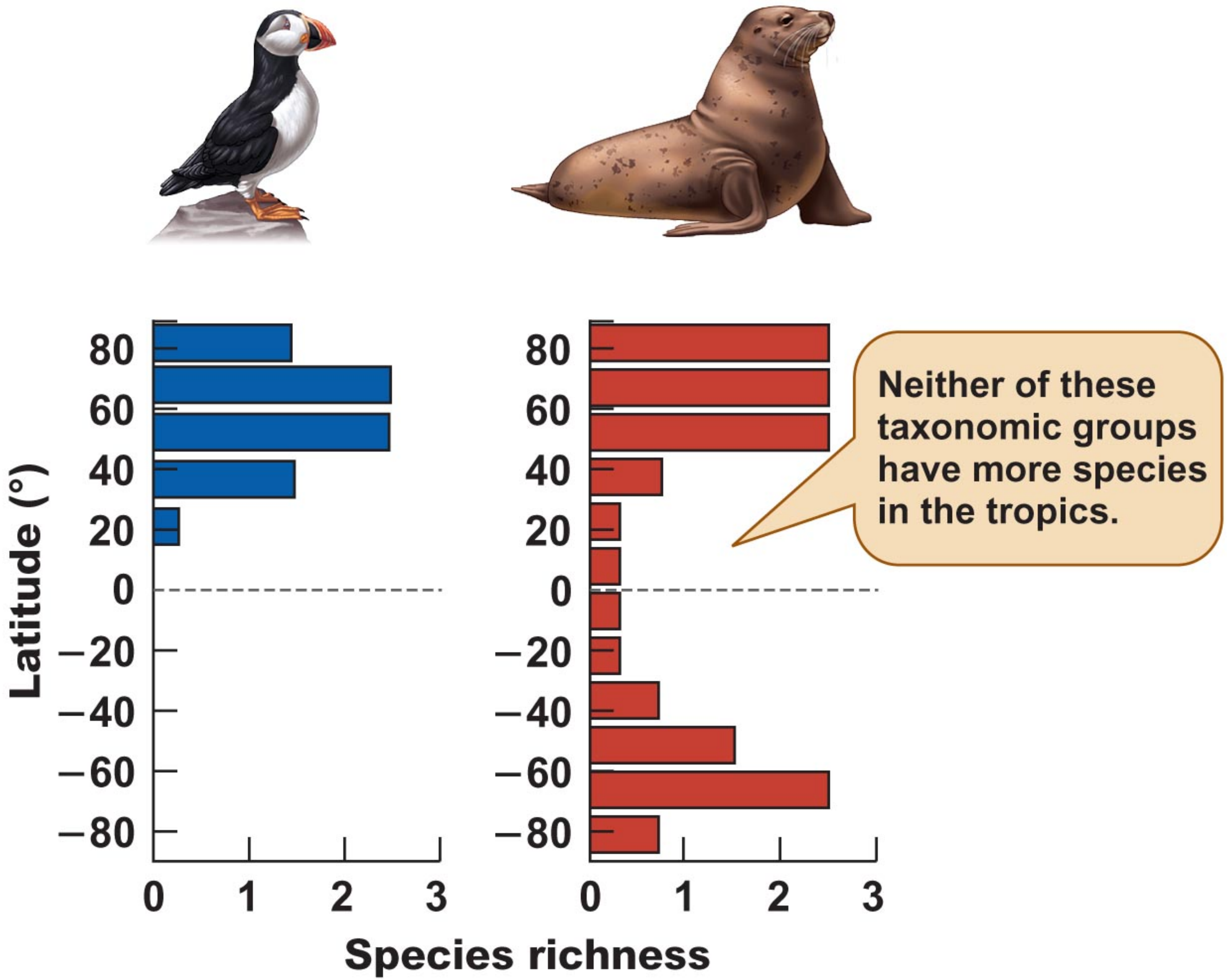
Fuente: Willig et al. (2003) AREES 34: 273-309

Gradiente latitudinal de diversidad



Gradiente latitudinal de diversidad

Gradiente latitudinal de diversidad



Gradiente altitudinal de diversidad

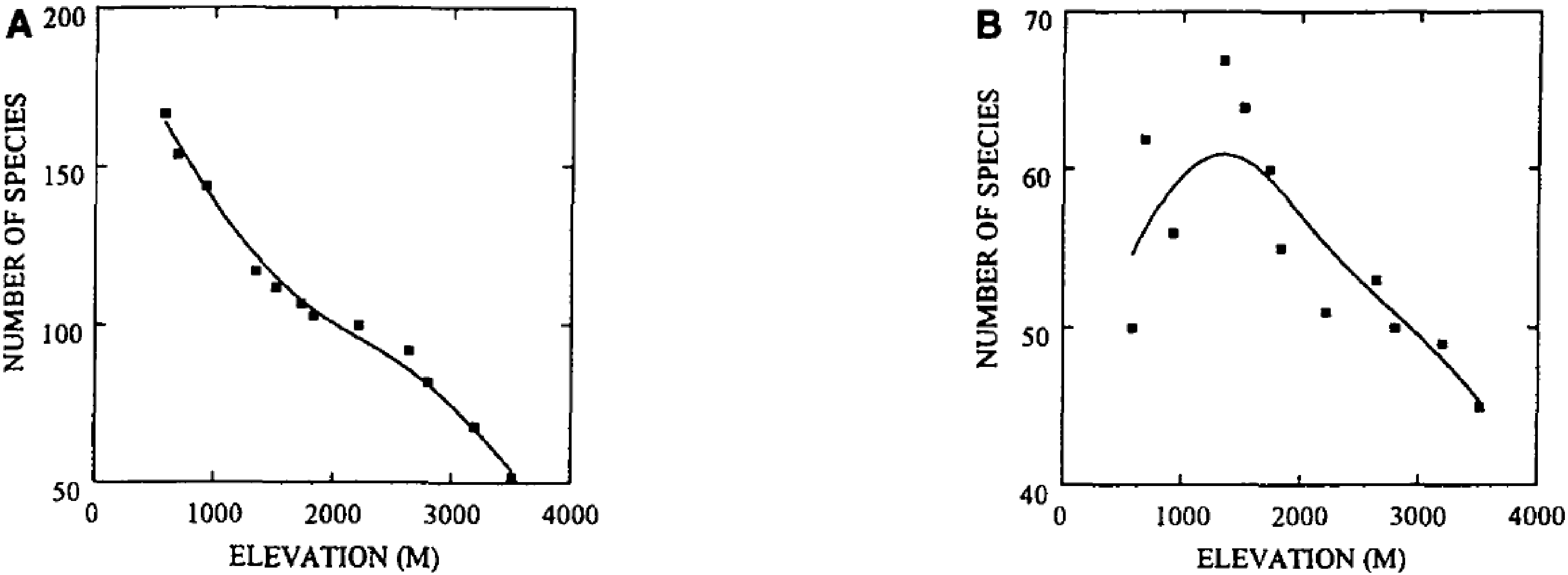


Fig 1 Species richness of syntopic birds versus elevation on an Amazonian slope of the Andes in Peru Figure 1A is based on data not standardized for area and sampling effort, whereas Fig 1B is based on standardized samples of 300 mist-netted birds (data from Terborgh 1977) I have fitted the lines by distance-weighted least-squares smoothing

Fuente: Rahbek (1995) Ecography 18: 200-205

Explicaciones del gradiente latitudinal de diversidad

TABLE 1 Hypotheses proposed to account for the latitudinal gradient of diversity*

†**Abiotic-biotic**[1]	§**Geographic area**[RI]	§**Rapoport rescue**[4]
§**Ambient energy**[R]	§**Geometric constraints**[3]	Rapoport's rule[RI]
Environmental predictability[RI]	Interspecific interactions[B]	†**Scale hierarchy**[5]
Environmental stability[P, RI]	Competition[P, RC]	**Spatial heterogeneity**[P, B]
Harshness[B, RC]	‡Host diversity[RC]	Biotic spatial heterogeneity[RC]
Seasonality[RI]	Mutualism[RC]	Epiphyte load[RC]
†**Energetic-equivalents**[2]	Niche width[B, RC]	Number of habitats[RI]
Evolutionary rates	Predation[P, RC]	Patchiness[RC]
Extinction rate[B]	**Population dynamics**	Physical heterogeneity[RI]
Origination rate[B]	Epidemics[RC]	‡Solar angle[RI]
§**Evolutionary speed**[R]	Population growth rate[RC]	**Time**[P, B]
Temperature-dependent	Population size[RC]	Abiotic rarefaction[RI]
chemical reactions[R]	§**Productivity**[P, B, RI]	Ecological time[R]
	‡Aridity[RI]	Evolutionary time[R]

*Augmented from Rohde (1992) and modified from D.M. Kaufman & J.H. Brown (in review). Originating authors follow for those hypotheses not included in Rohde; for others, see Rohde (1992).

†Recent hypotheses not yet evaluated thoroughly in the literature; published sources are indicated by numeric superscript: ([1]Kaufman 1995, 1998; [2]Allen et al. 2002; [3]Colwell & Hurtt 1994, Lyons & Willig 1997; and [5]Whittaker et al. 2001).

§Hypotheses discussed in detail in text ([4]Taylor & Gaines 1999).

‡Hypotheses too specific to provide a general mechanism.

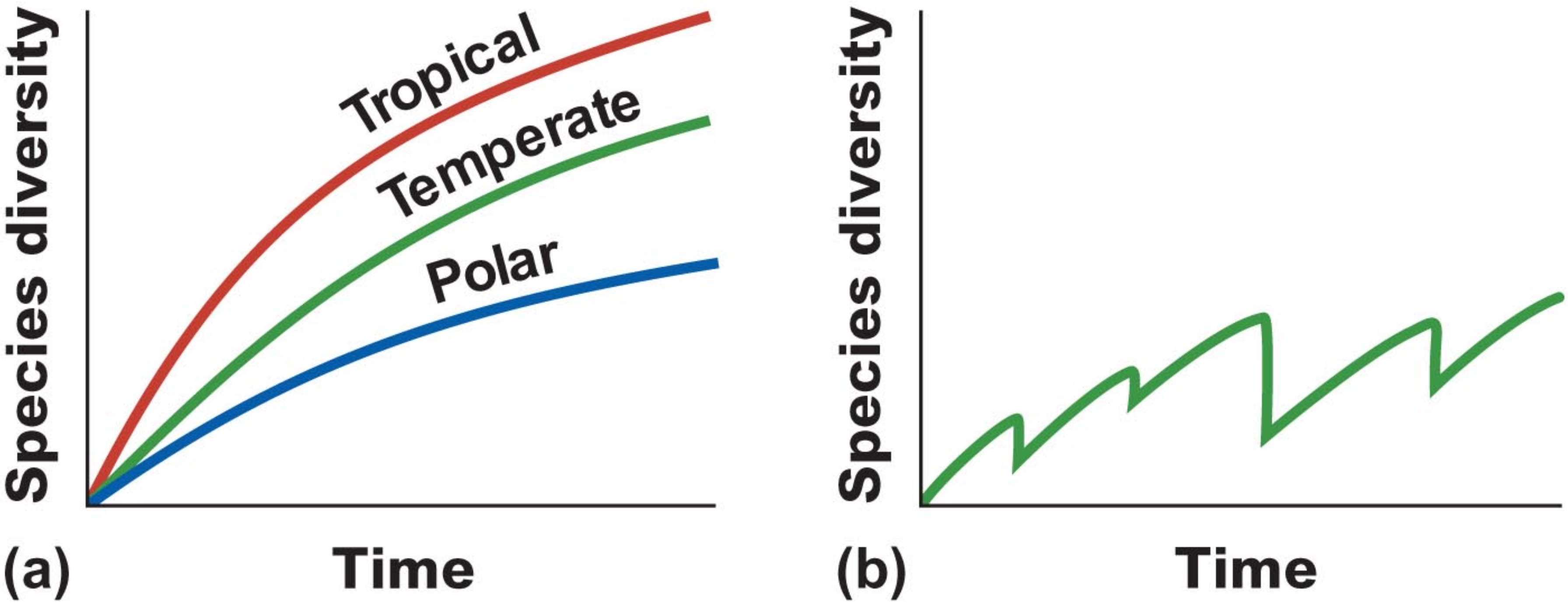
[P]Hypotheses included by Pianka (1966).

[B]Hypotheses included by Brown (1988, Brown & Gibson 1983).

[R]Hypotheses included by Rohde (1992; with [C] denoting "circular" hypotheses and [I] for "insufficiently supported" hypotheses).

Fuente: Willig et al. (2003) Ann. Rev. Ecol., Evol. & Syst. 34: 273-309

Explicaciones de los gradientes: Velocidad evolutiva



Explicaciones de los gradientes: Velocidad evolutiva

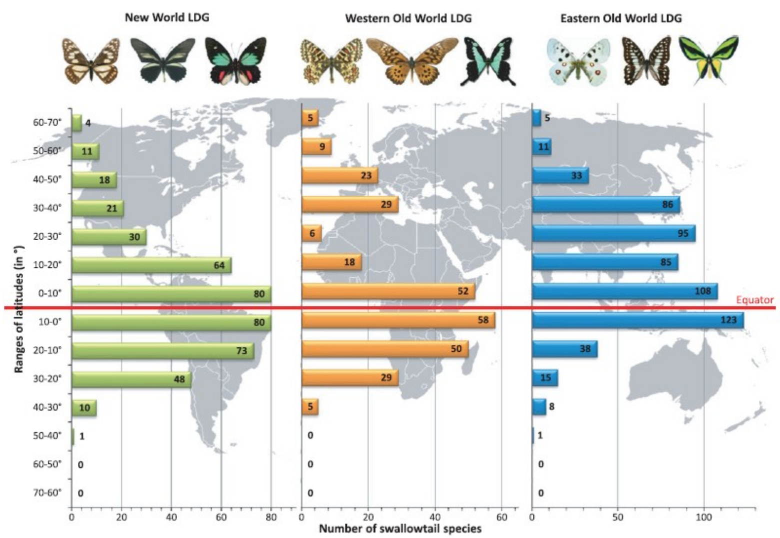
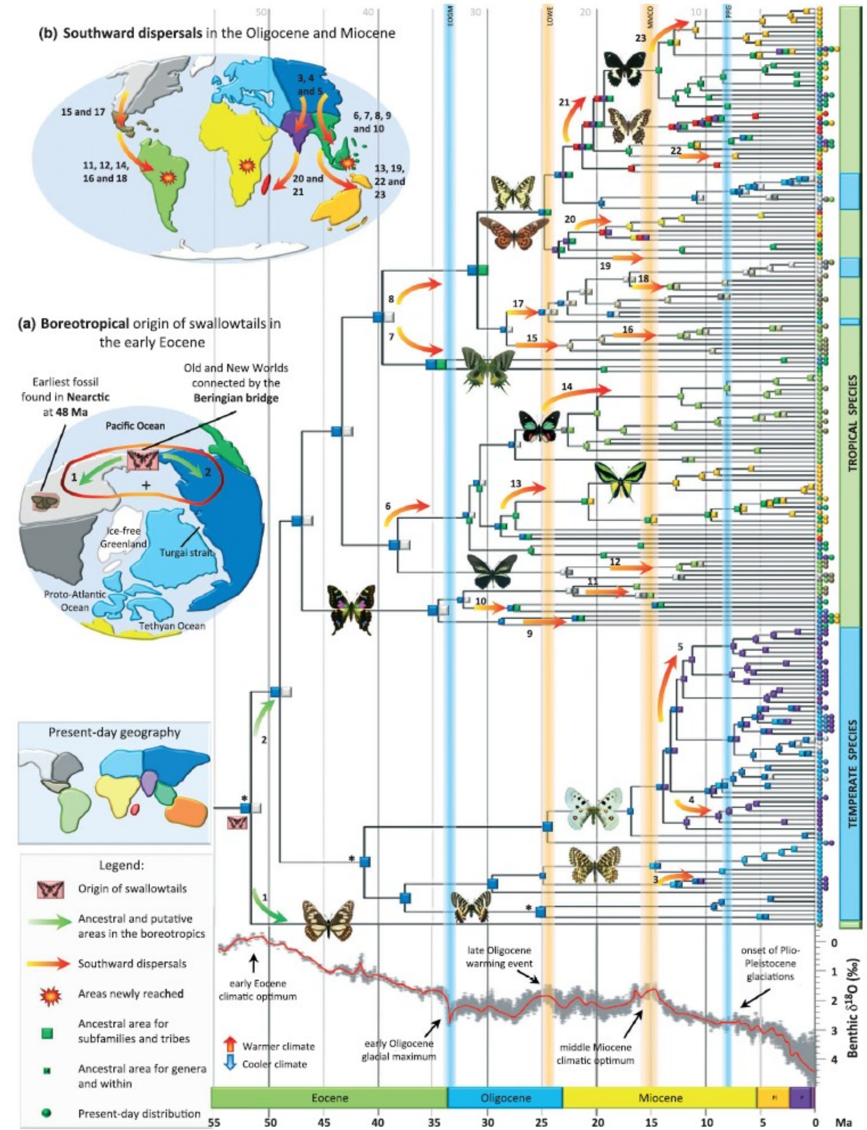
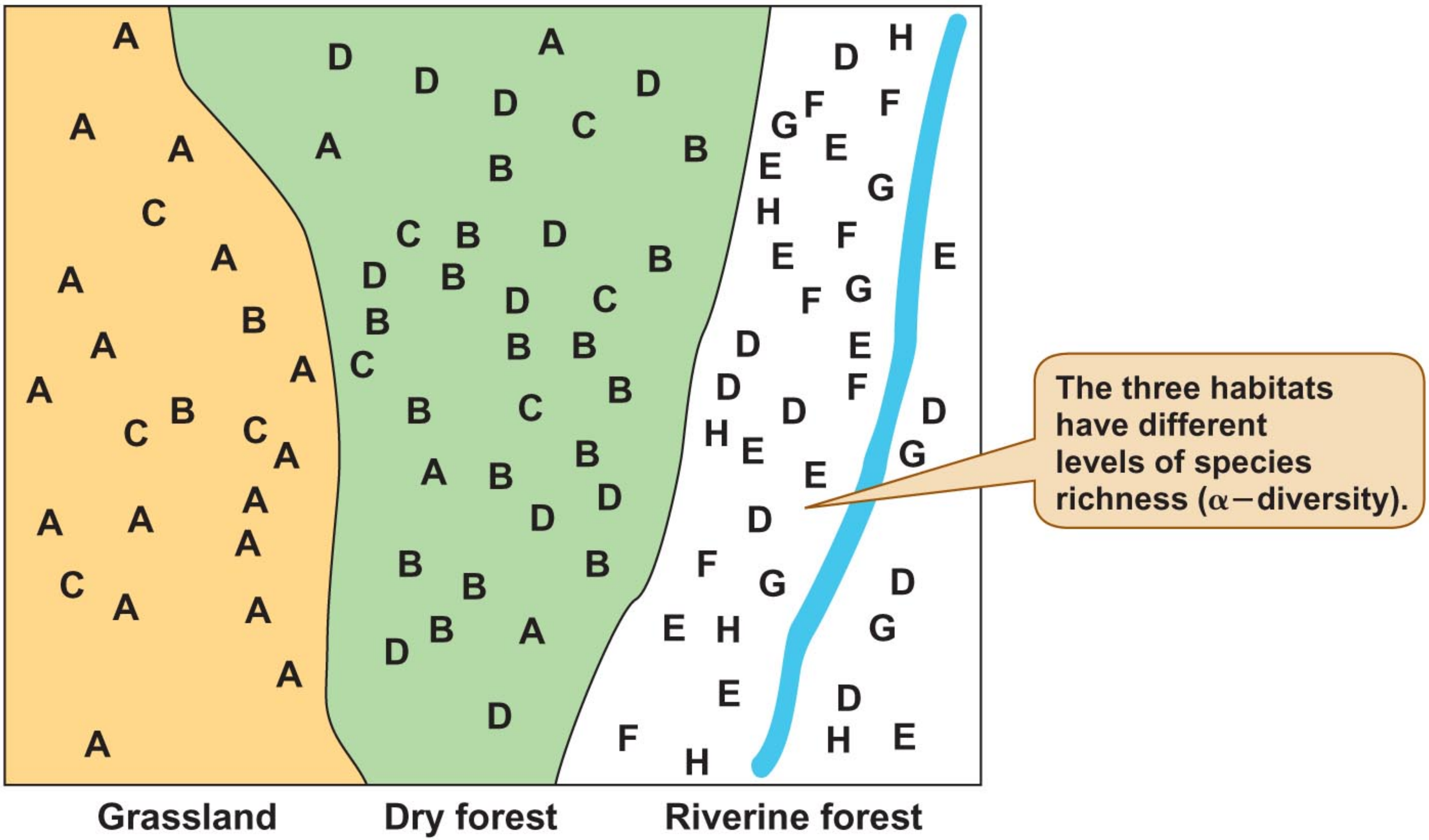


Figure 1 Latitudinal diversity gradients for swallowtail butterflies in three different parts of the world. Species richness increases from the poles toward the equator (red line) and applies to all tropical regions. One easily explained exception occurs in the western Old World, where a dip in species richness coincides with North African desert. Well-known species from each region are figured above. Data are compiled from various sources (e.g. Collins & Morris 1985).

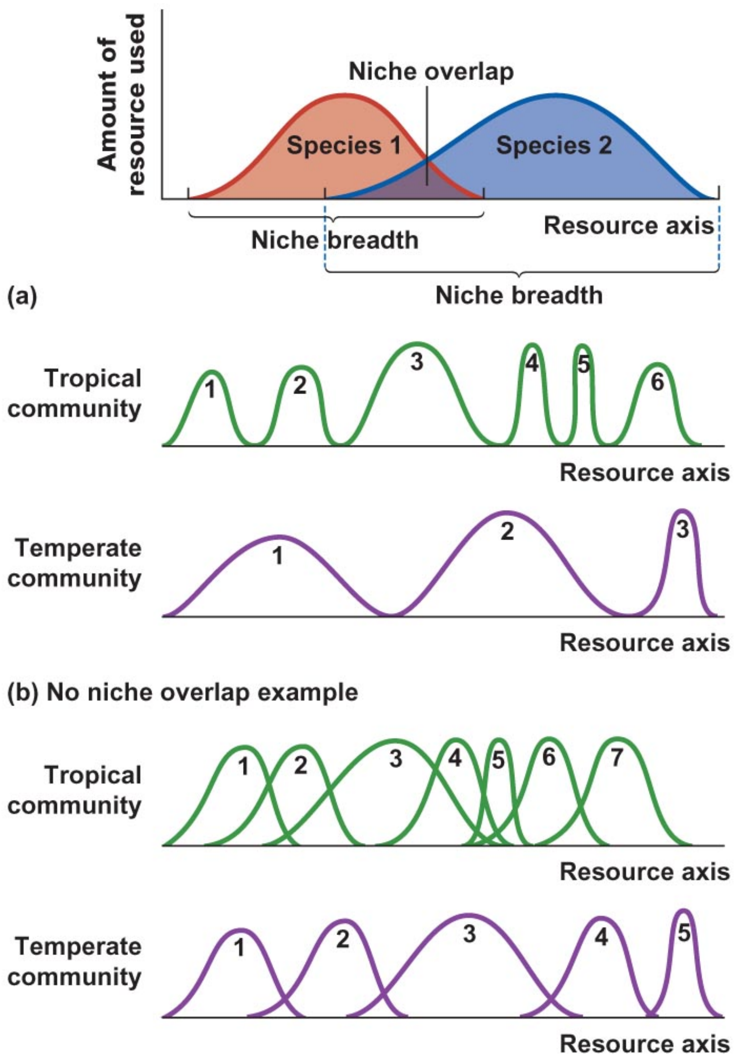


Fuente: Condamine et al. (2012) Ecology Letters 15: 267-277

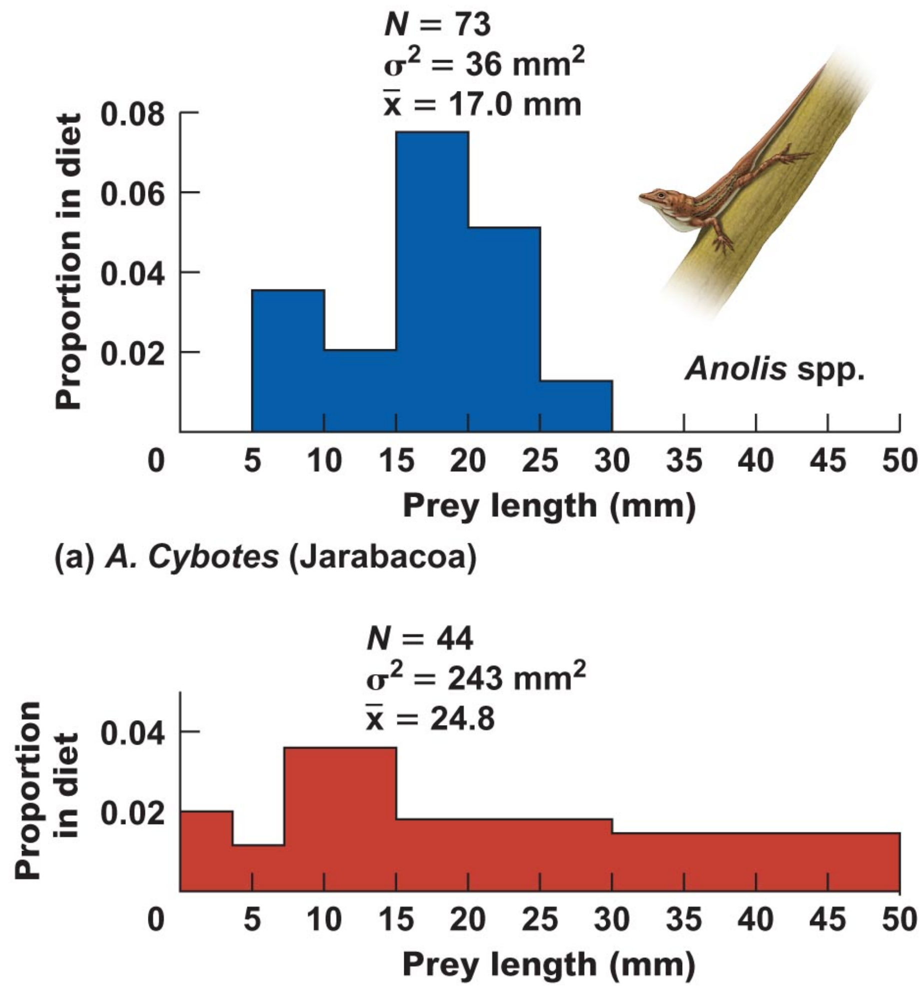
Explicaciones de los gradientes: Área geográfica



Explicaciones de los gradientes: Interacciones interespecíficas

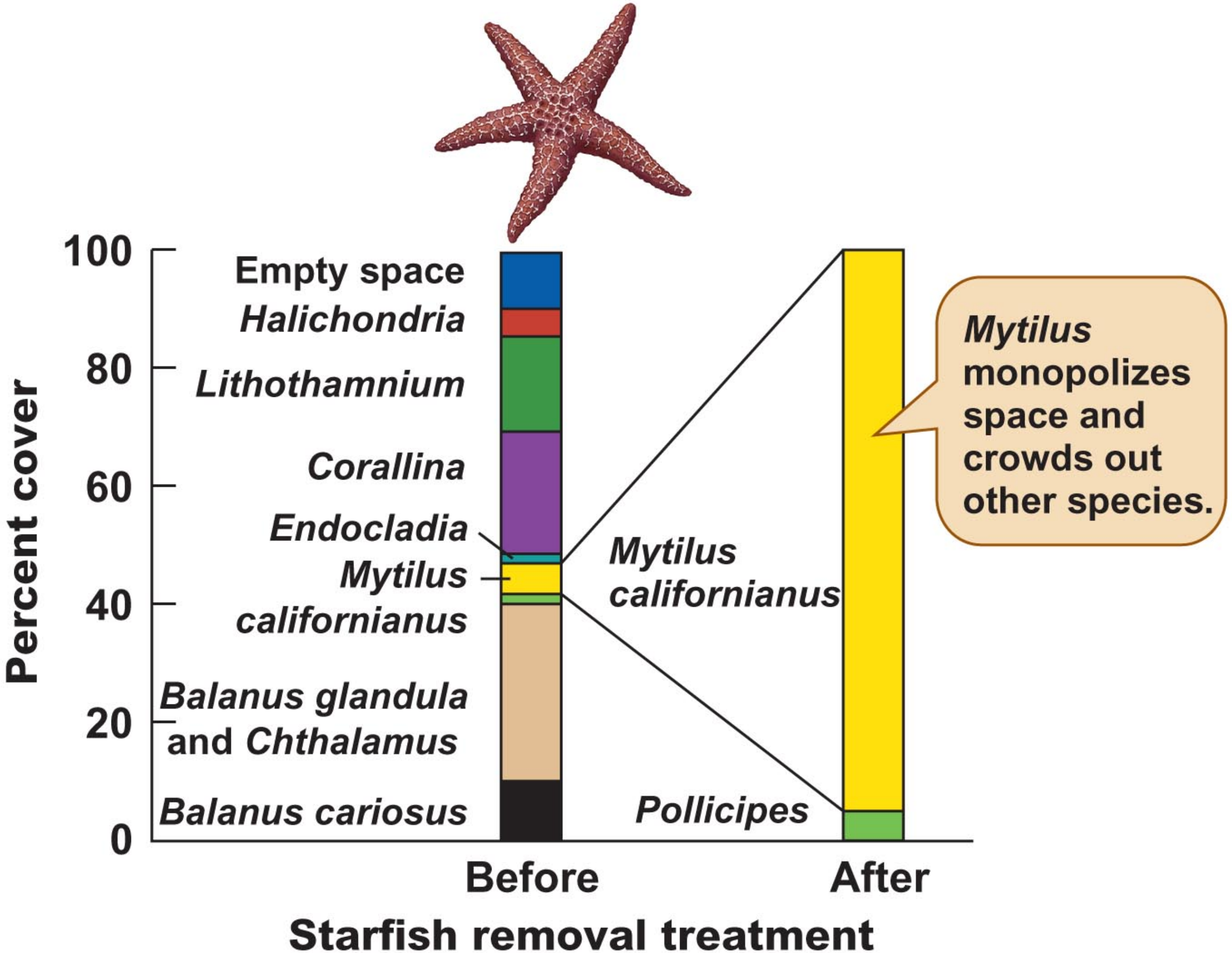


(c) Constant niche breadth example

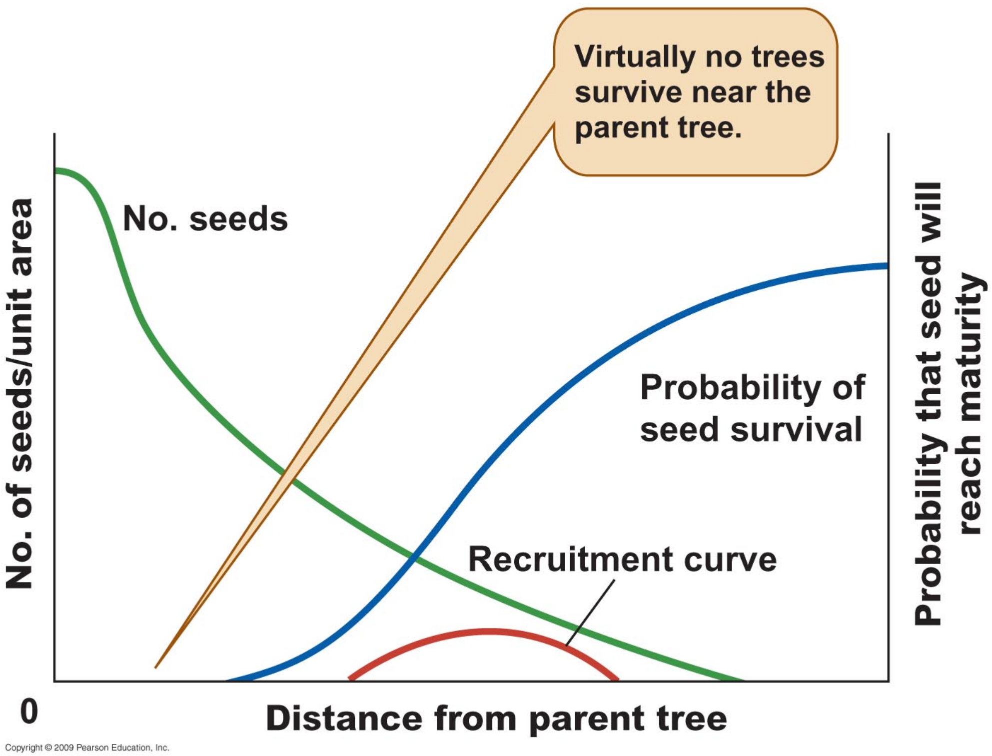


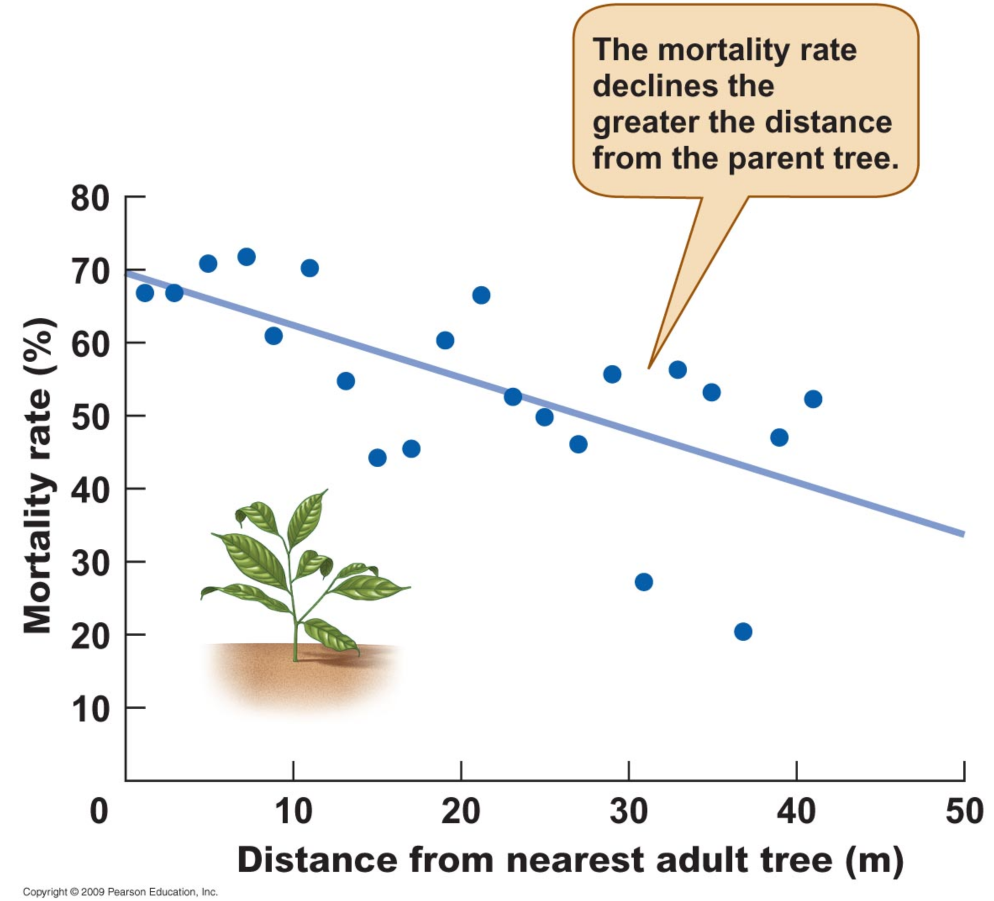
(b) *A. Marmoratus ferreus* (Marie Galante)

Explicaciones de los gradientes: Interacciones interespecíficas

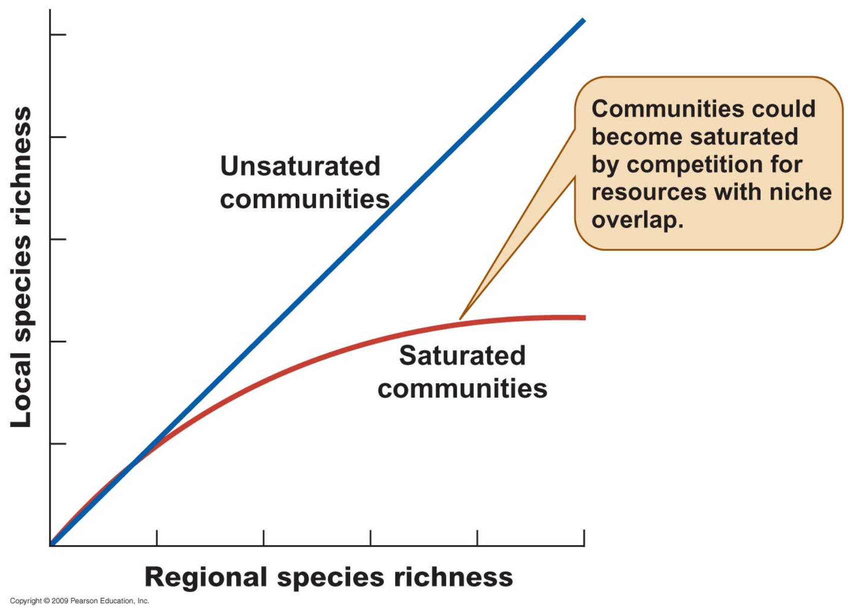


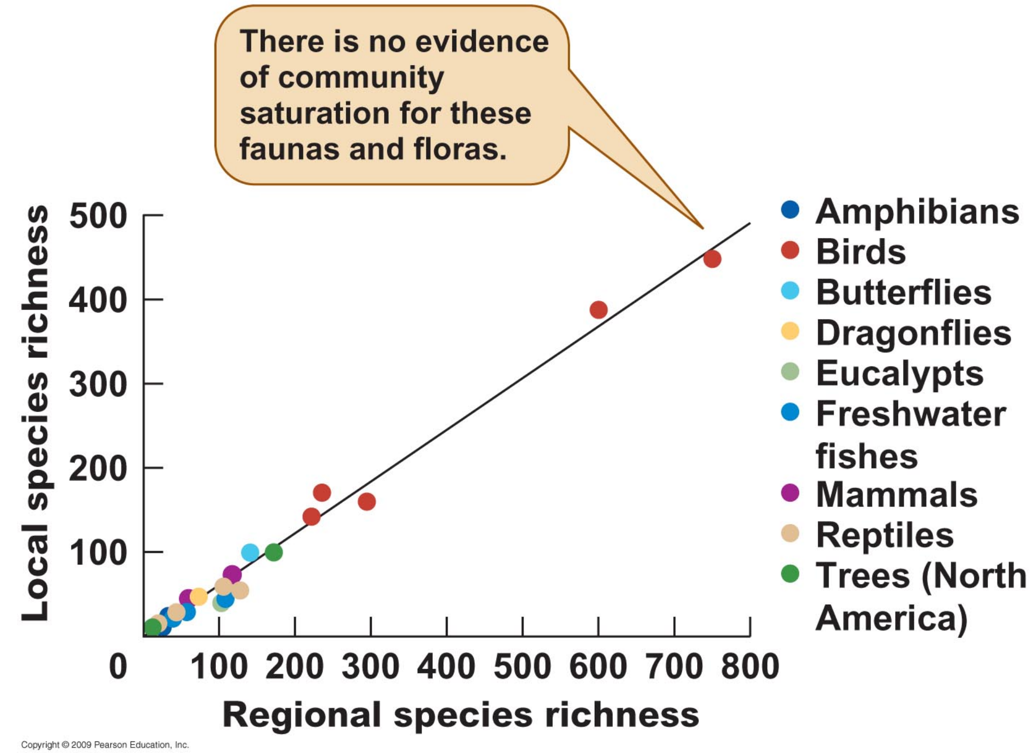
Explicaciones de los gradientes: Interacciones interespecíficas





Explicaciones de los gradientes: Interacciones interespecíficas Diversidad local vs. regional





Explicaciones de los gradientes: Interacciones interespecíficas Diversidad local vs. regional

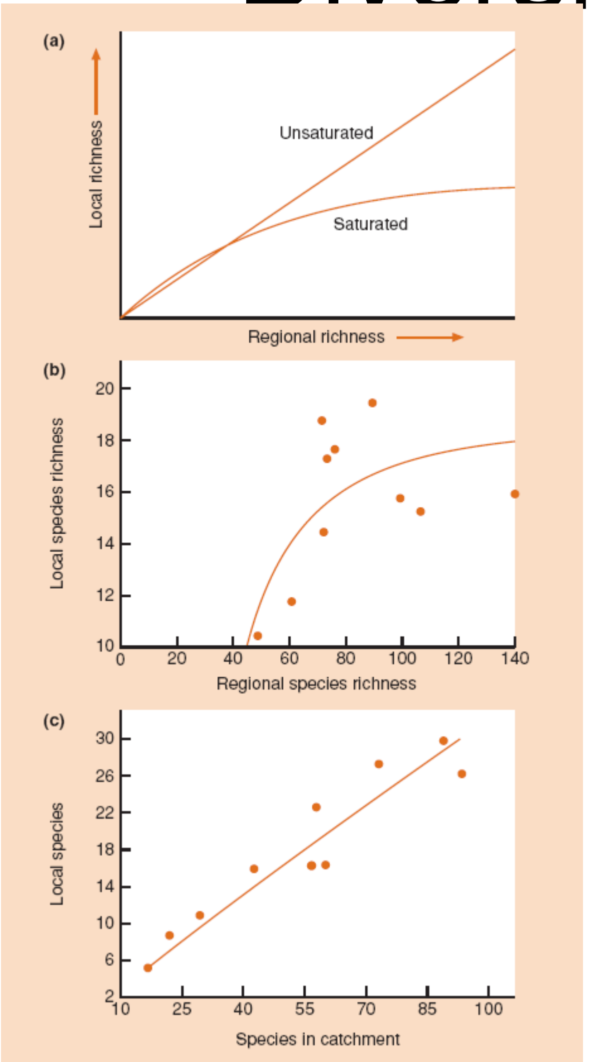
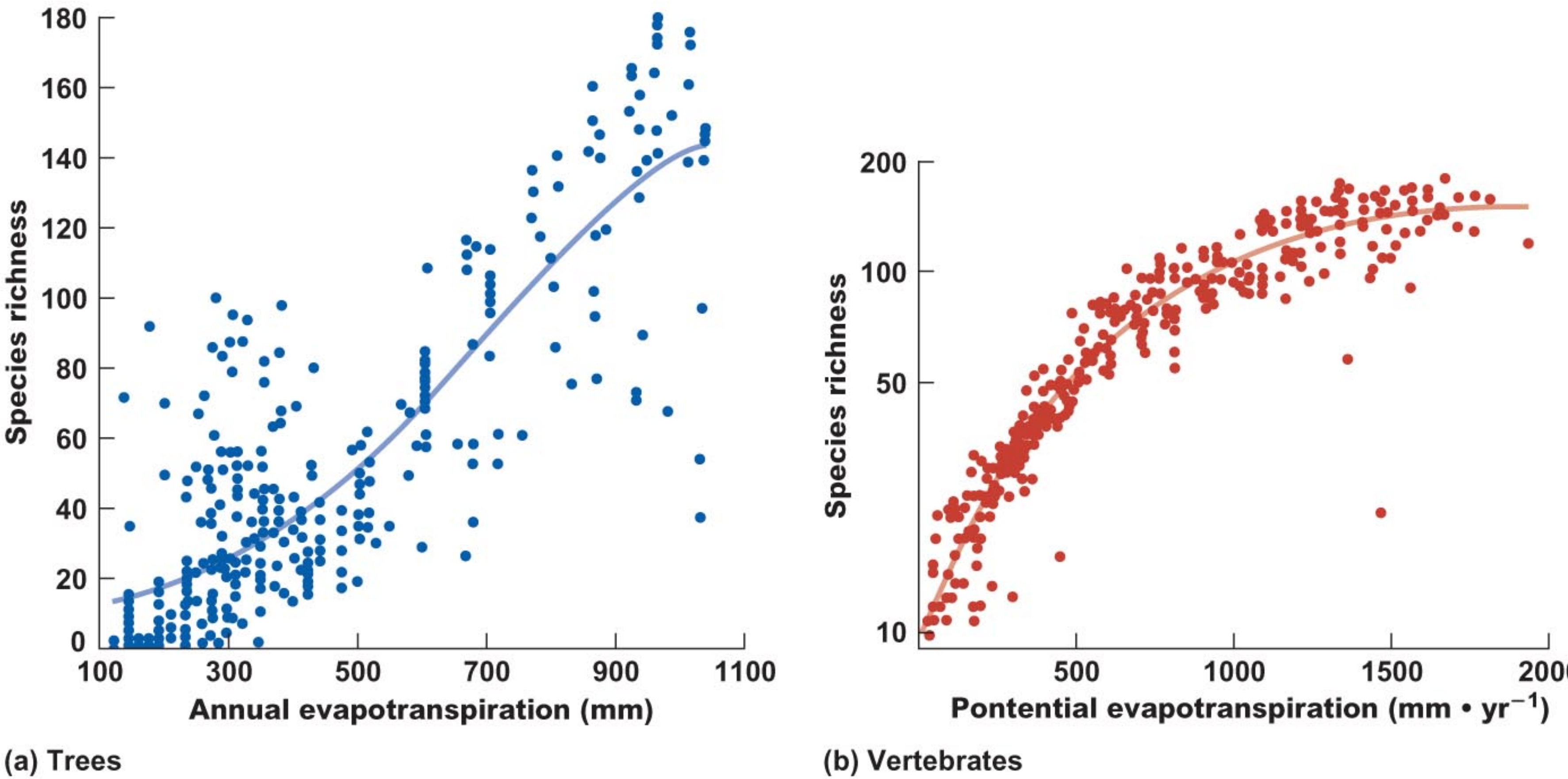
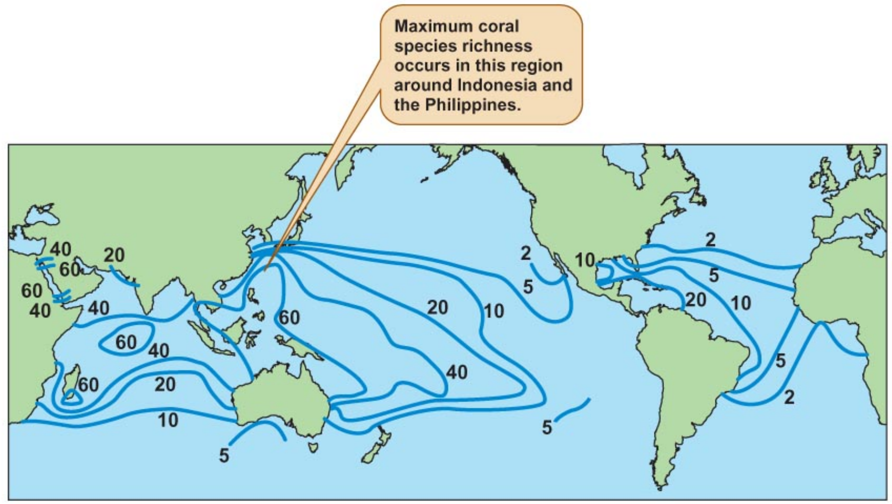


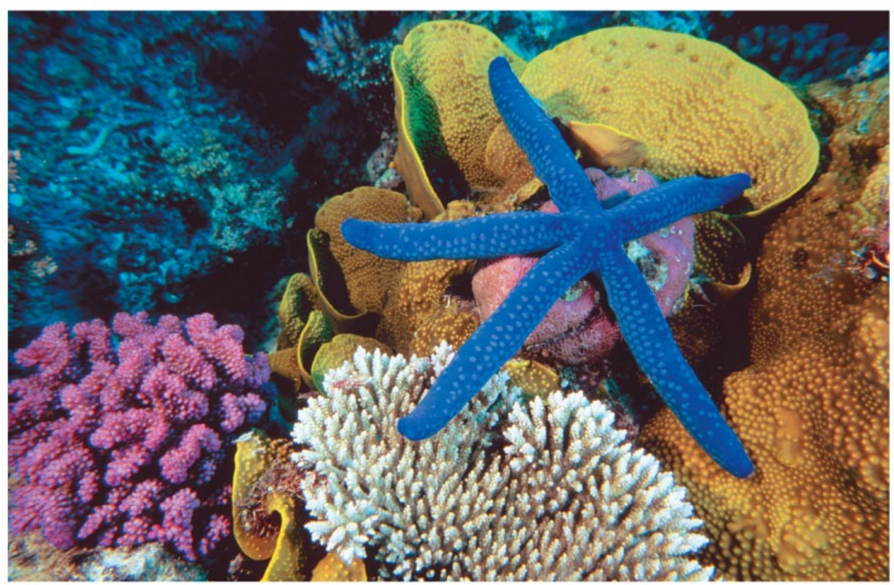
Figure 21.2 (a) In a saturated community, local richness is expected to increase with regional richness at very low levels of regional richness, but to quickly reach an upper limit. In an unsaturated community, on the other hand, local richness is expected to be a constant proportion of regional richness. (After Srivastava, 1999.) (b) Asymptotic relationship between local richness of litter-dwelling ant communities in 1 m^2 quadrats in 10 forest remnants in Brazil in relation to the size of the regional species pool (assumed to be the total number of species in the forest remnant concerned). (After Soares *et al.*, 2001.) (c) Nonasymptotic relationship between local species richness (number recorded over equal-sized areas of a river bed) and regional species pools (the number of species present in the entire drainage basin from which the local sample was drawn). (After Rosenzweig & Ziv, 1999.)

Explicaciones de los gradientes: Energía disponible



Explicaciones de los gradientes: Energía disponible





Explicaciones de los gradientes: Energía disponible

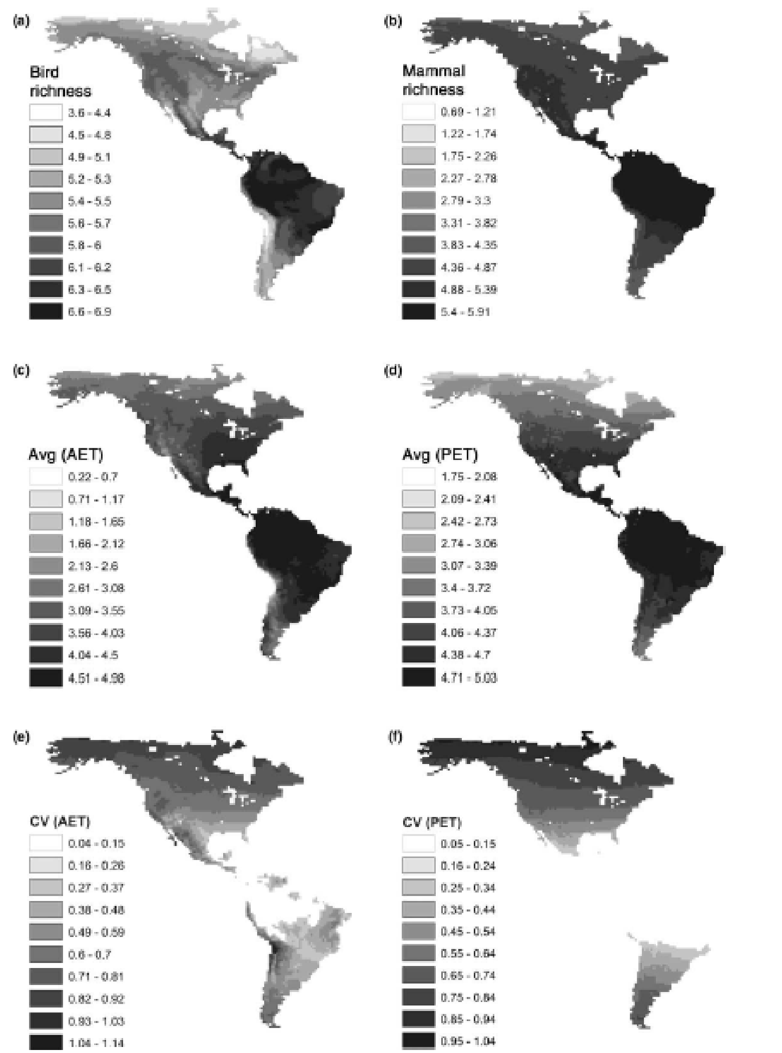


Figure 1. Energy and species richness distribution maps (all variables represented as logarithms). (a) Bird richness. (b) Mammal richness. (c) Average AET. (d) Average PET. (e) Coefficient of variation of AET. (f) Coefficient of variation of PET.

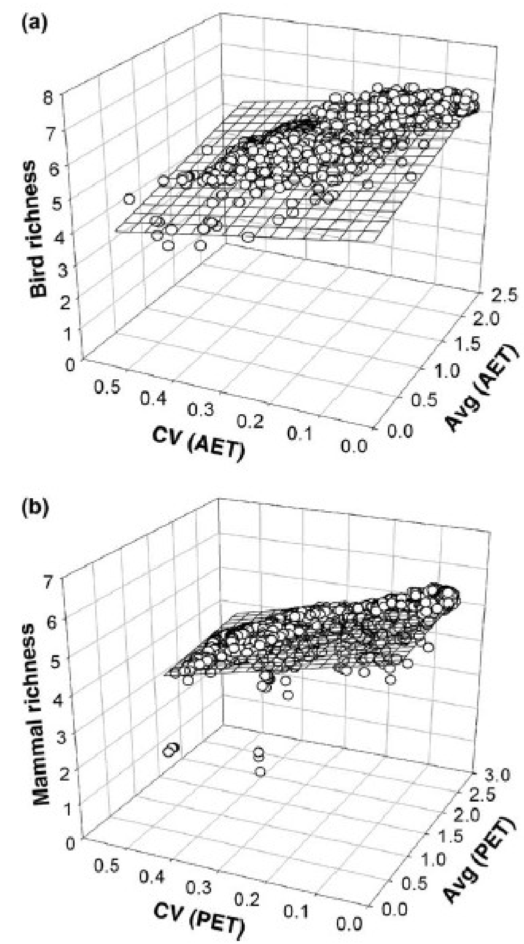


Figure 2. Bird and mammal species richness versus the average (AVG) and the coefficient of variation (CV) of available energy (all variables represented in logarithms). (a) Birds. (b) Mammals.

Fuente: Carrara & Vázquez (2010) Ecography 33: 942-948

Explicaciones de los gradientes: neutralidad (efecto del dominio medio)

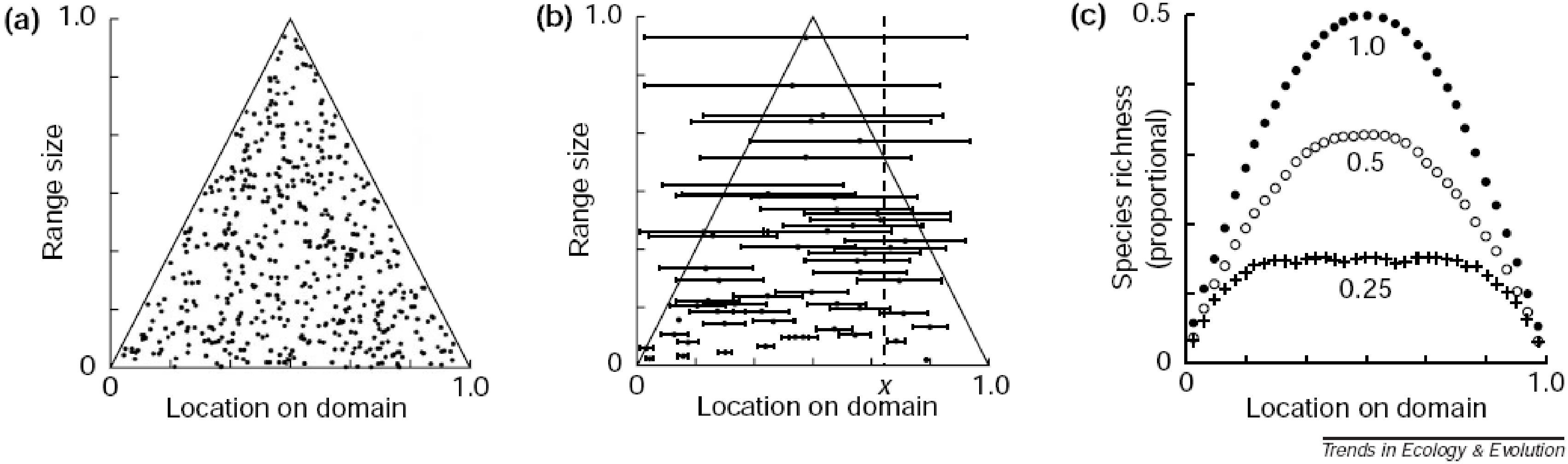
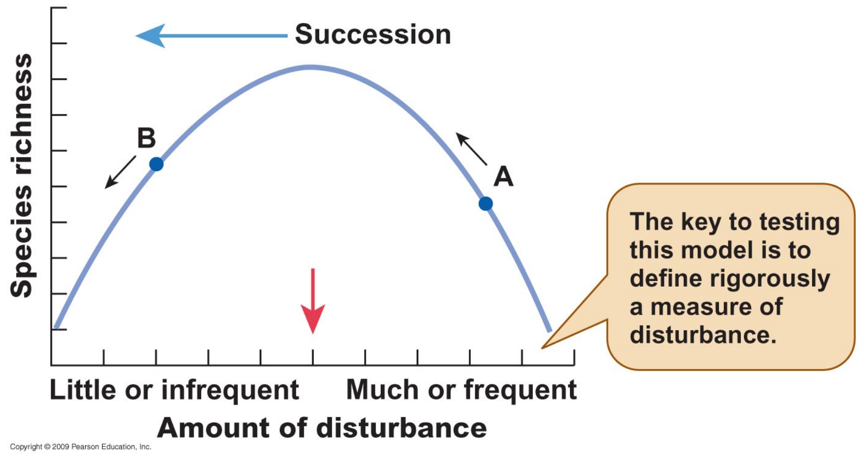
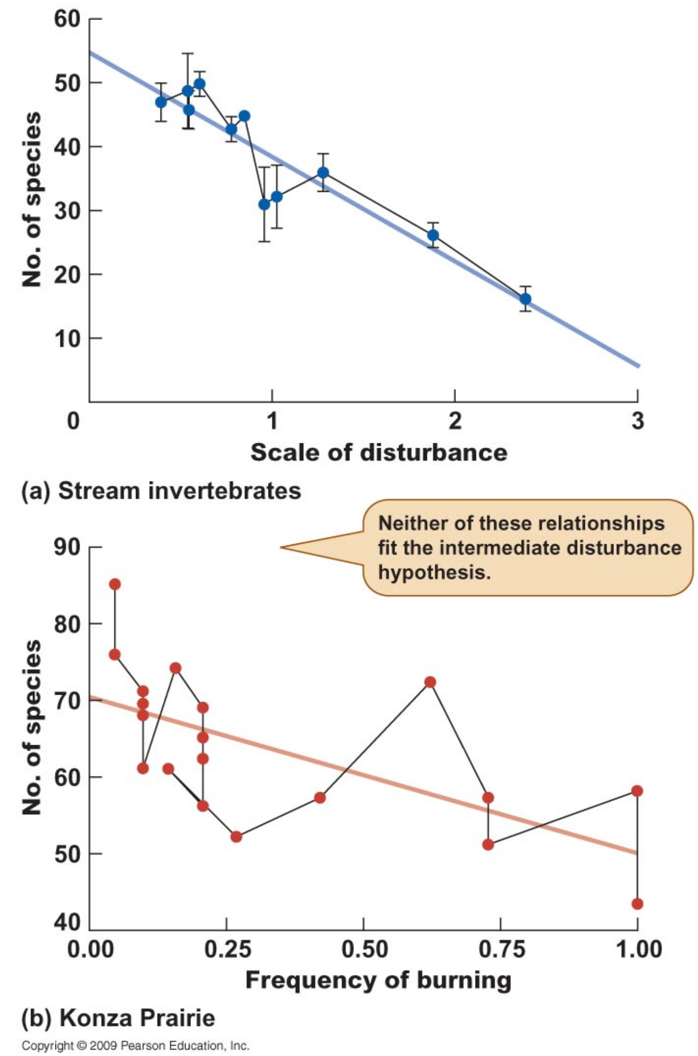


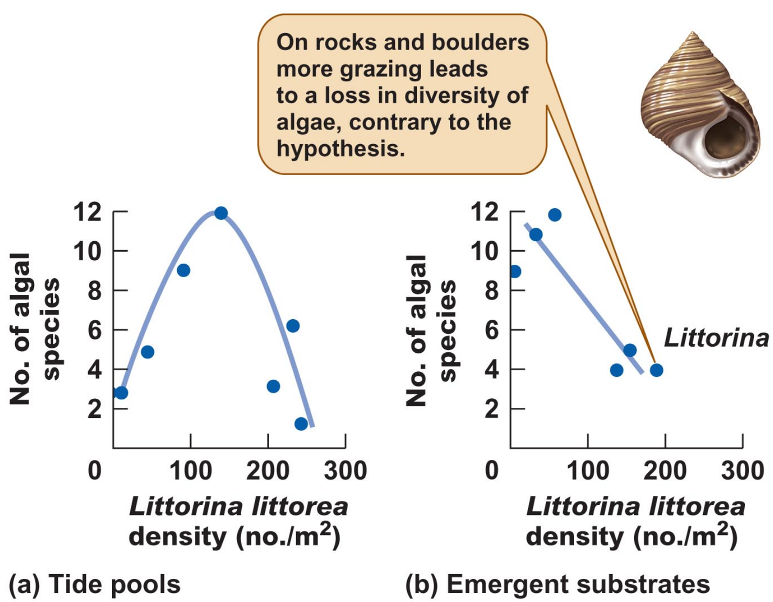
Fig. 1. A fully stochastic null model for species richness gradients within a bounded domain[11]. For particular sets of species, the unit domain might represent elevation from sea level to mountaintop[16], ocean depth from the surface to the abyss[14], distance from one end of a large island to another (Fig. 3), latitude from the northern to the southern end of the continental New World (Fig. 2a), or latitude from the northern to the southern limit of the distribution of a clade (Fig. 2b). In (a), the range size for each species is plotted against its range midpoint (500 species shown). In this model (Box 2), midpoints and range values are generated as a uniform random coverage of feasible values. In (b), the ranges for a subset (50 species) of the points in (a) are shown as horizontal lines centred on their midpoints. Because the domain is bounded at 0 and 1, all midpoint-range coordinate pairs – the points in (a) and (b) – must lie within the isosceles triangle. For any point *x* in the domain, richness is computed as the number of horizontal range lines that a vertical line at *x* (the broken line) would intersect. In (c), the closed circles show the pattern of species richness across the domain for the points in (a) and (b). The open circles plot species richness when maximum range size is limited to half the domain (0.5) and the crosses show richness for a maximum range size of 0.25. The ordinate in (c) scales richness as a proportion of all species in the simulation. In all cases, the richness peaks at the domain midpoint. Only the top curve is parabolic and peaks at a proportional richness of 0.5. Note the more pronounced mid-domain effect when larger ranges are permitted. *Modified, with permission, from Ref. 11.*

Fuente: Colwell & Lees (2000) TREE 15: 70-76

Gradientes a escala local y perturbaciones







Teórica 9: Esquema conceptual

- Definición de comunidad
- Medición de la biodiversidad
- Explicaciones de la estructura de las comunidades
- Gradientes geográficos en la diversidad
- Cambio comunitario: Sucesión

Sucesión: cambio en la composición comunitaria

- Sucesión primaria: colonización de sitios nuevos, estériles hasta el momento
- Sucesión secundaria: cambios que suceden a las perturbaciones en sitios ya colonizados

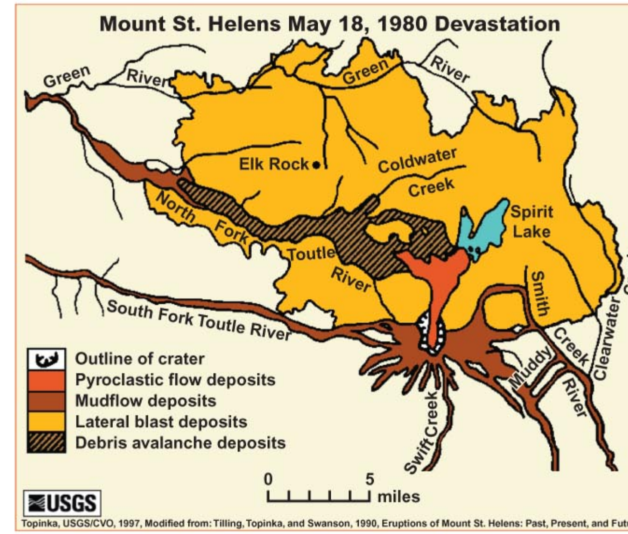
Sucesión primaria en el Monte Saint Helens

(b)

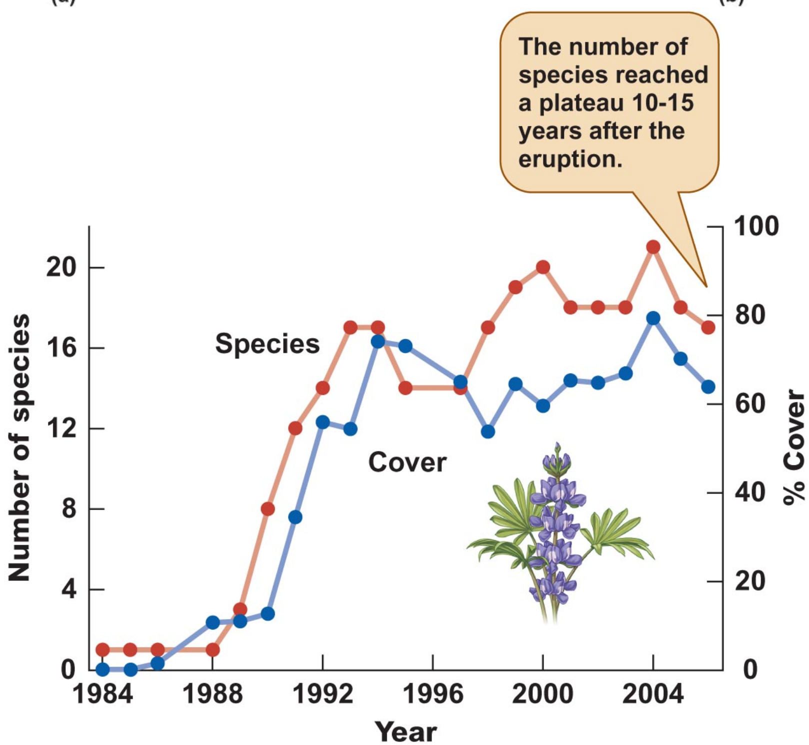
Copyright

(a)

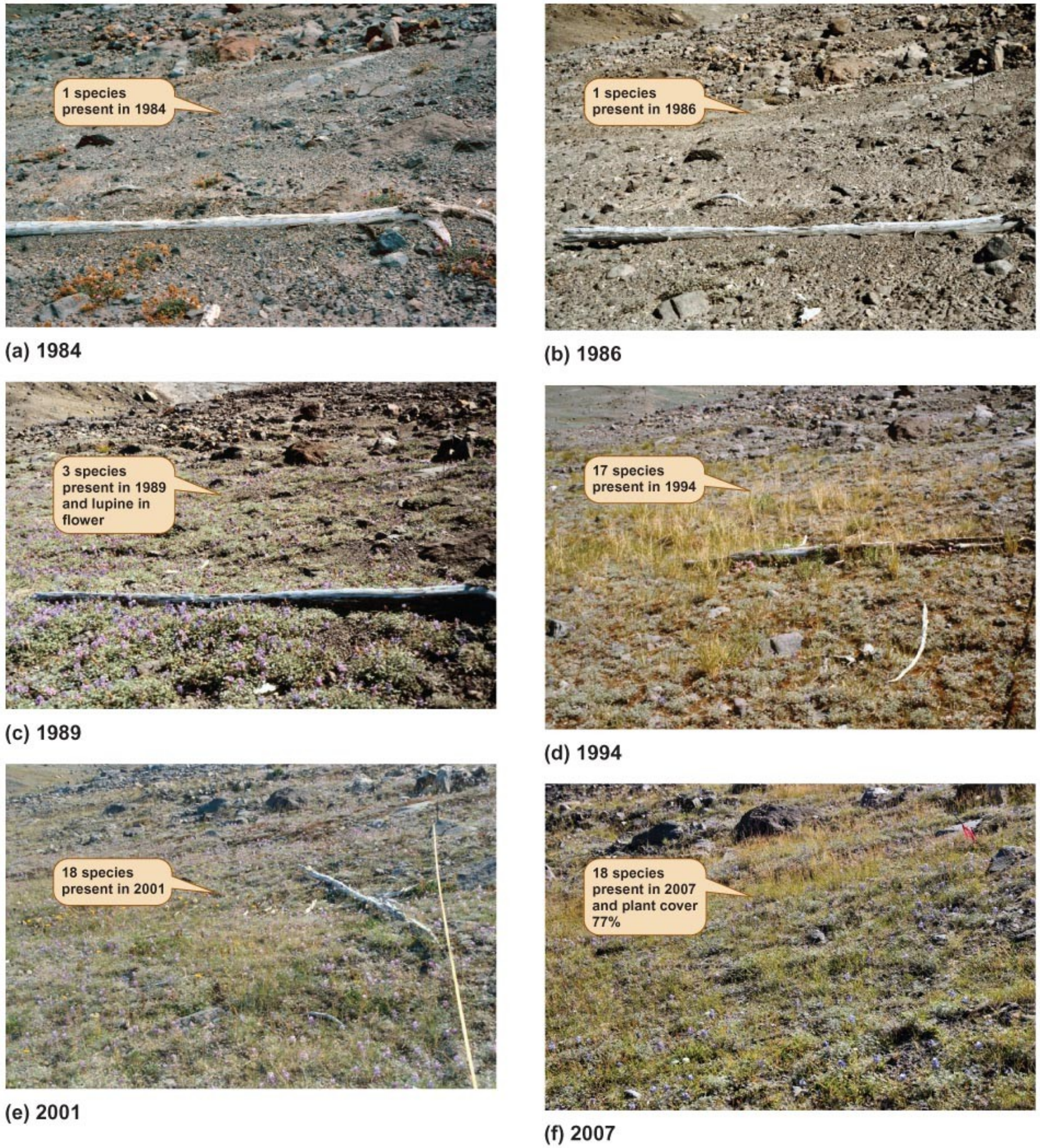
(a)



(b)



Sucesión primaria en el Monte Saint Helens



Isla de Surtsey, Islandia

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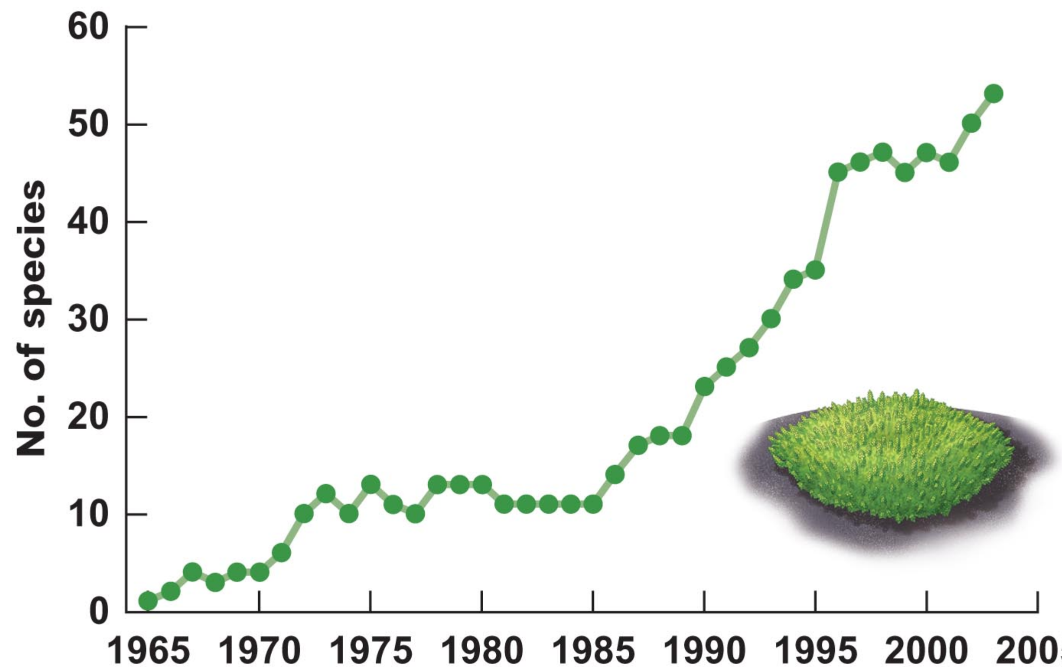

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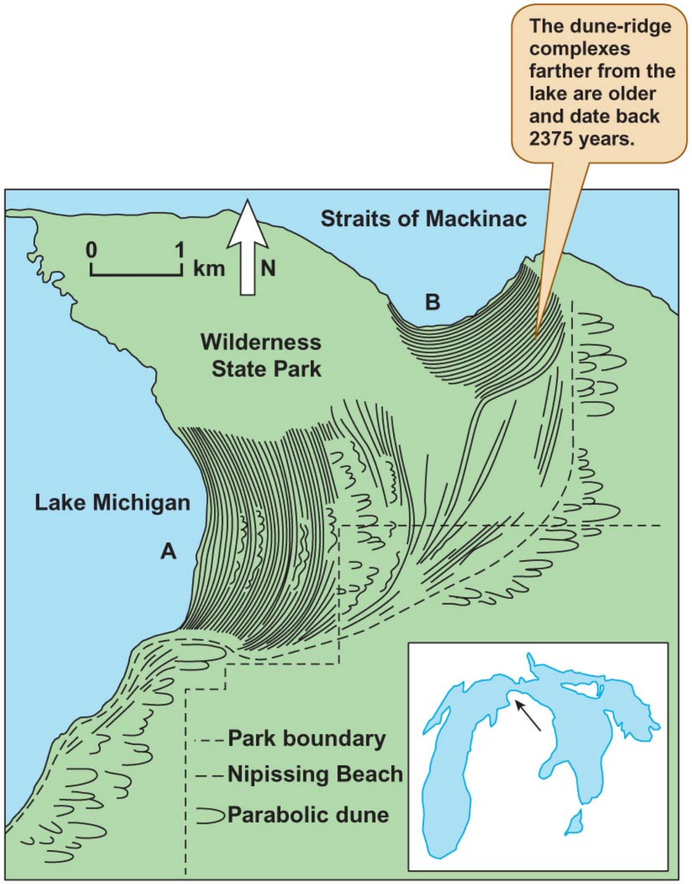
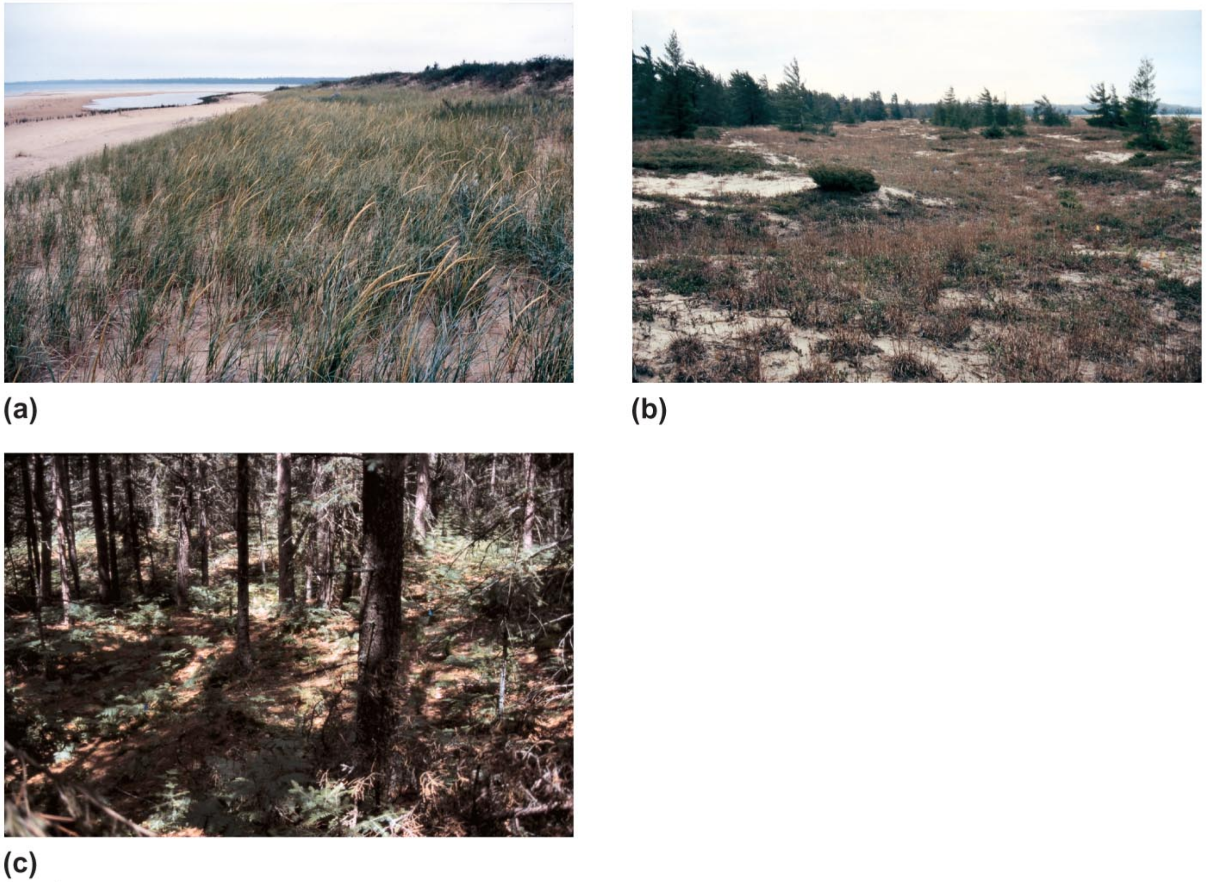
Dunas del lago Michigan, EE.UU.





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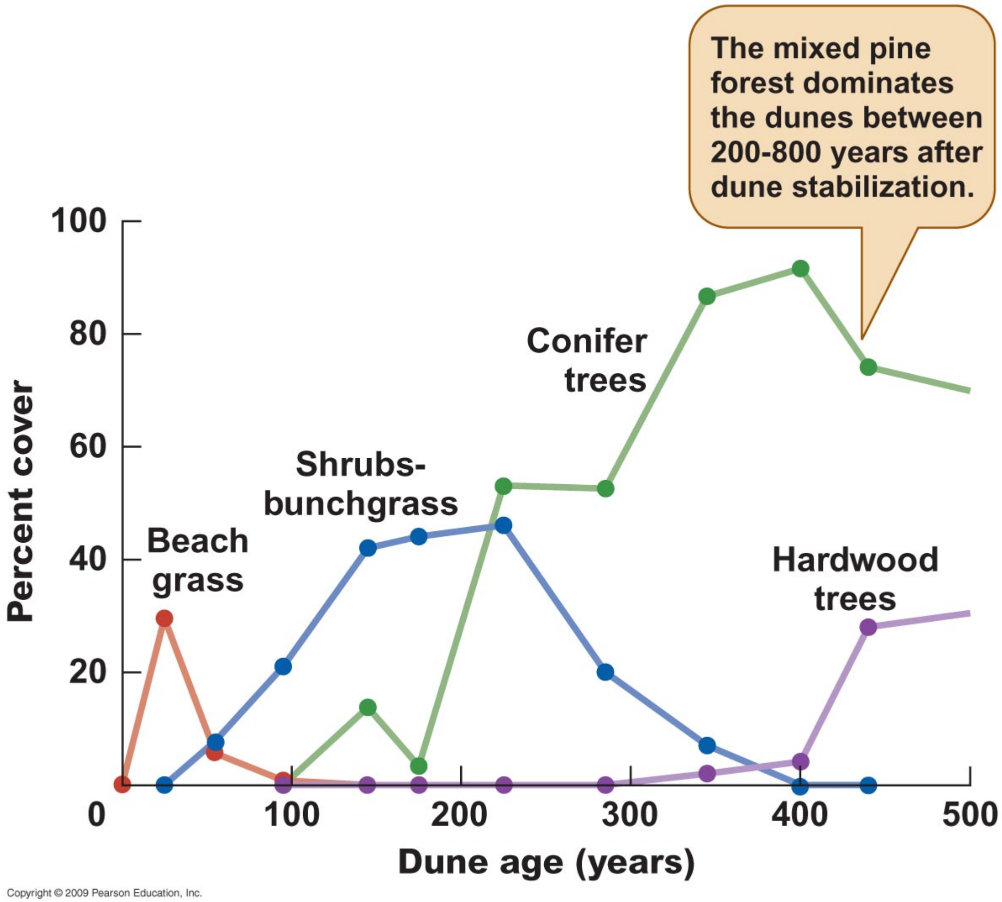
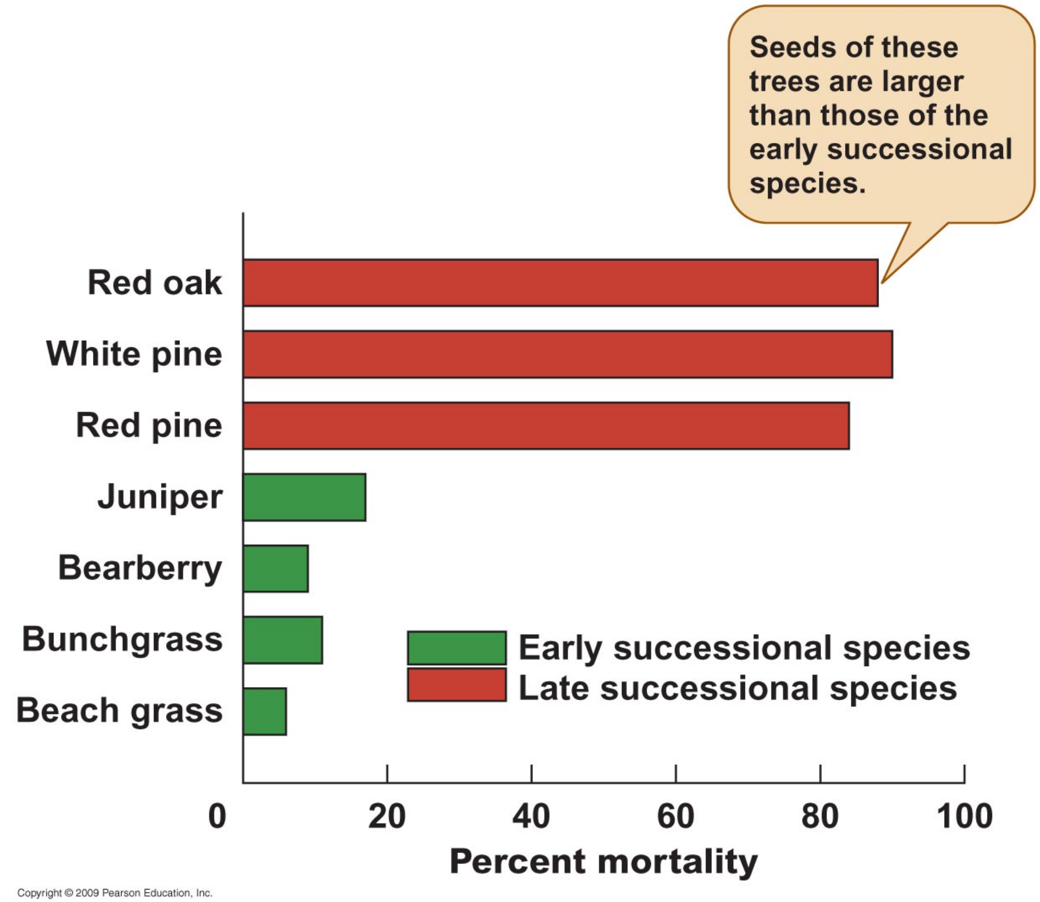
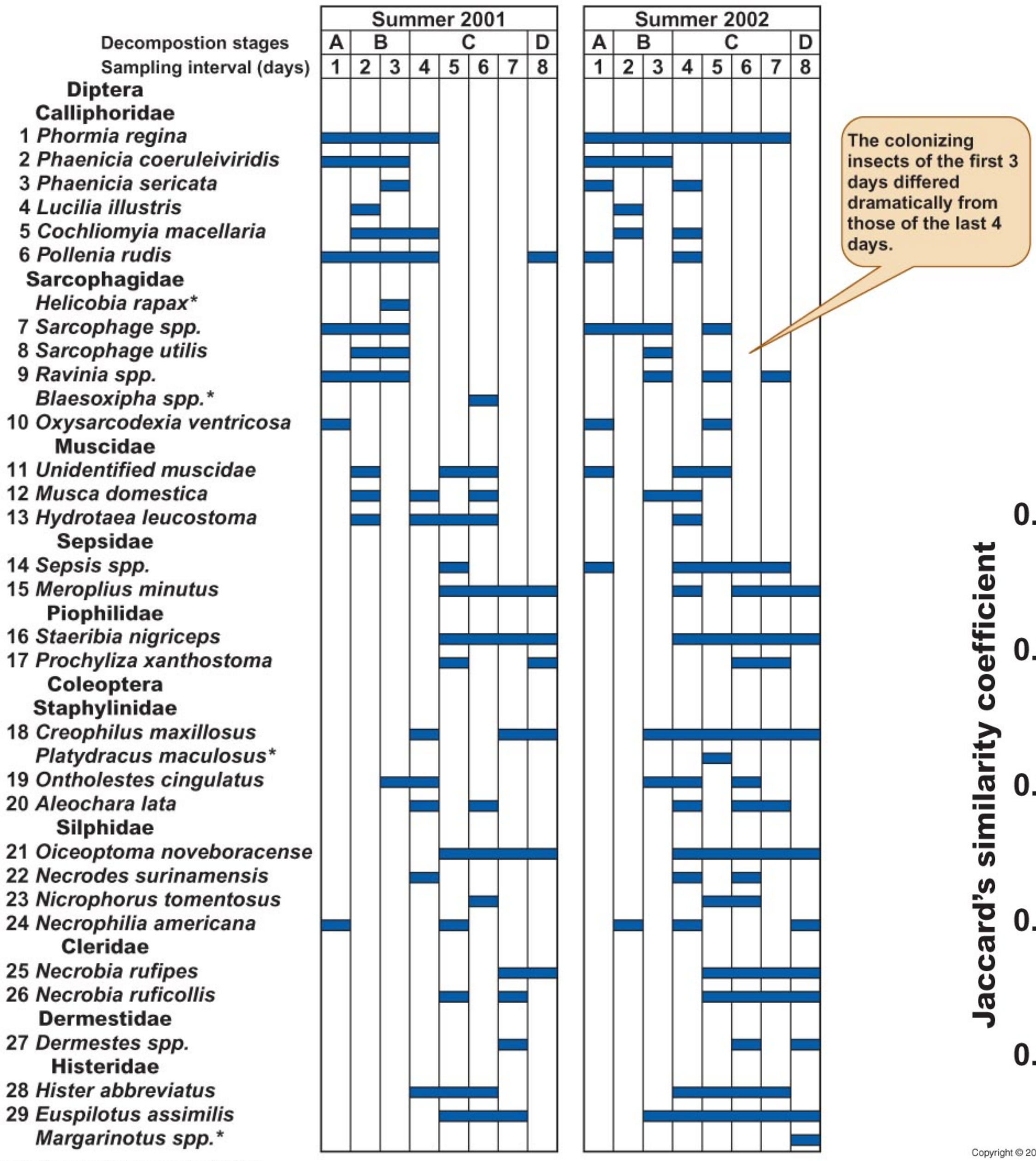
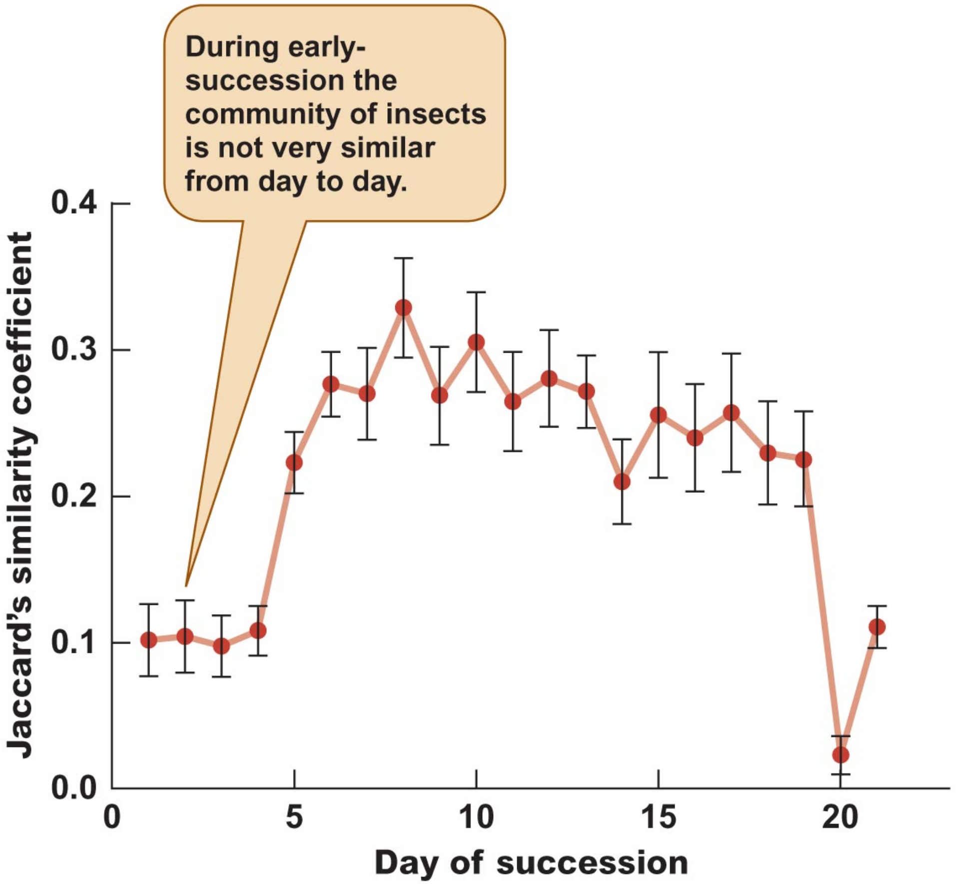




Sucesión de insectos en cadáveres





Cambio temporal en interacciones

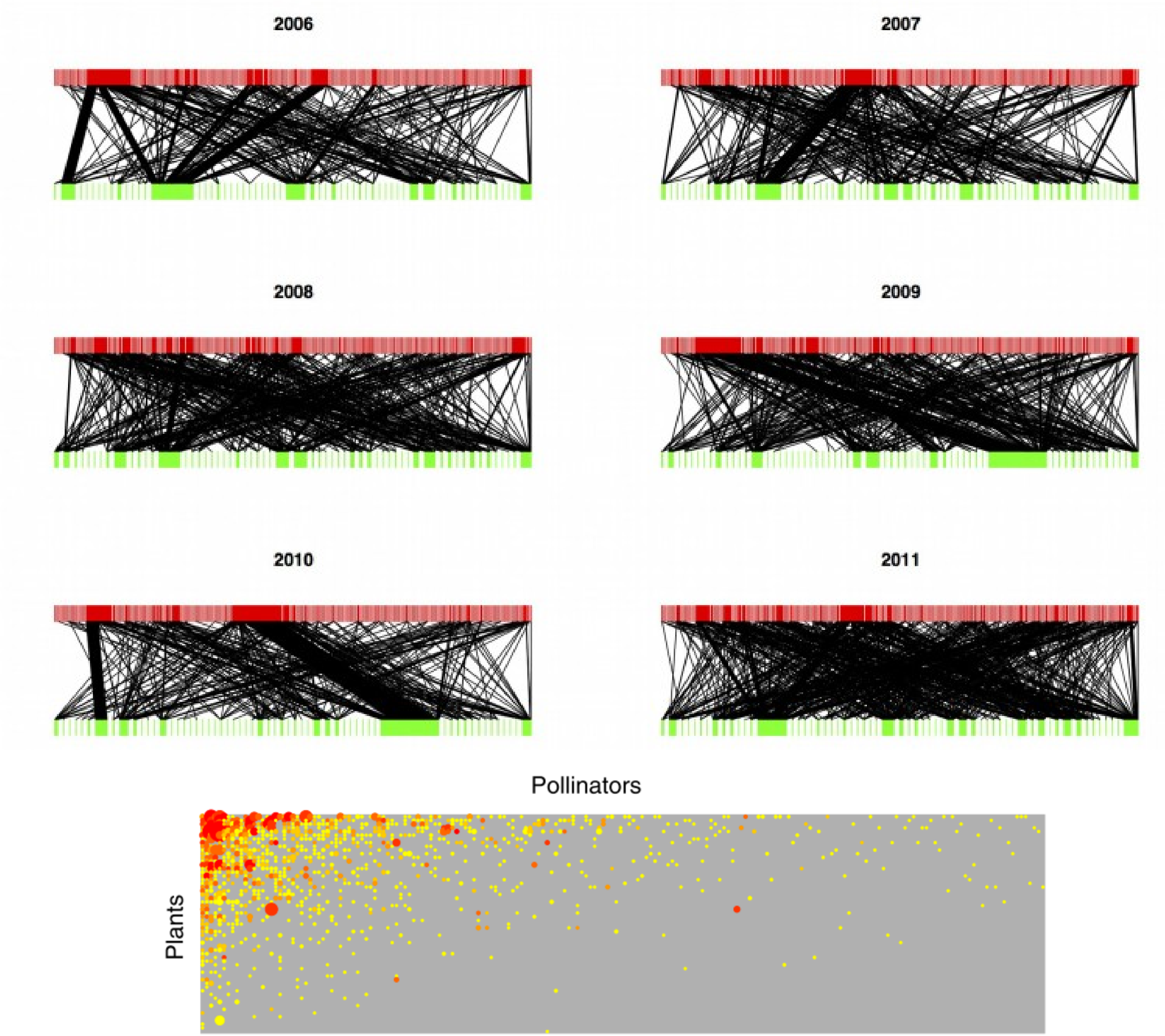
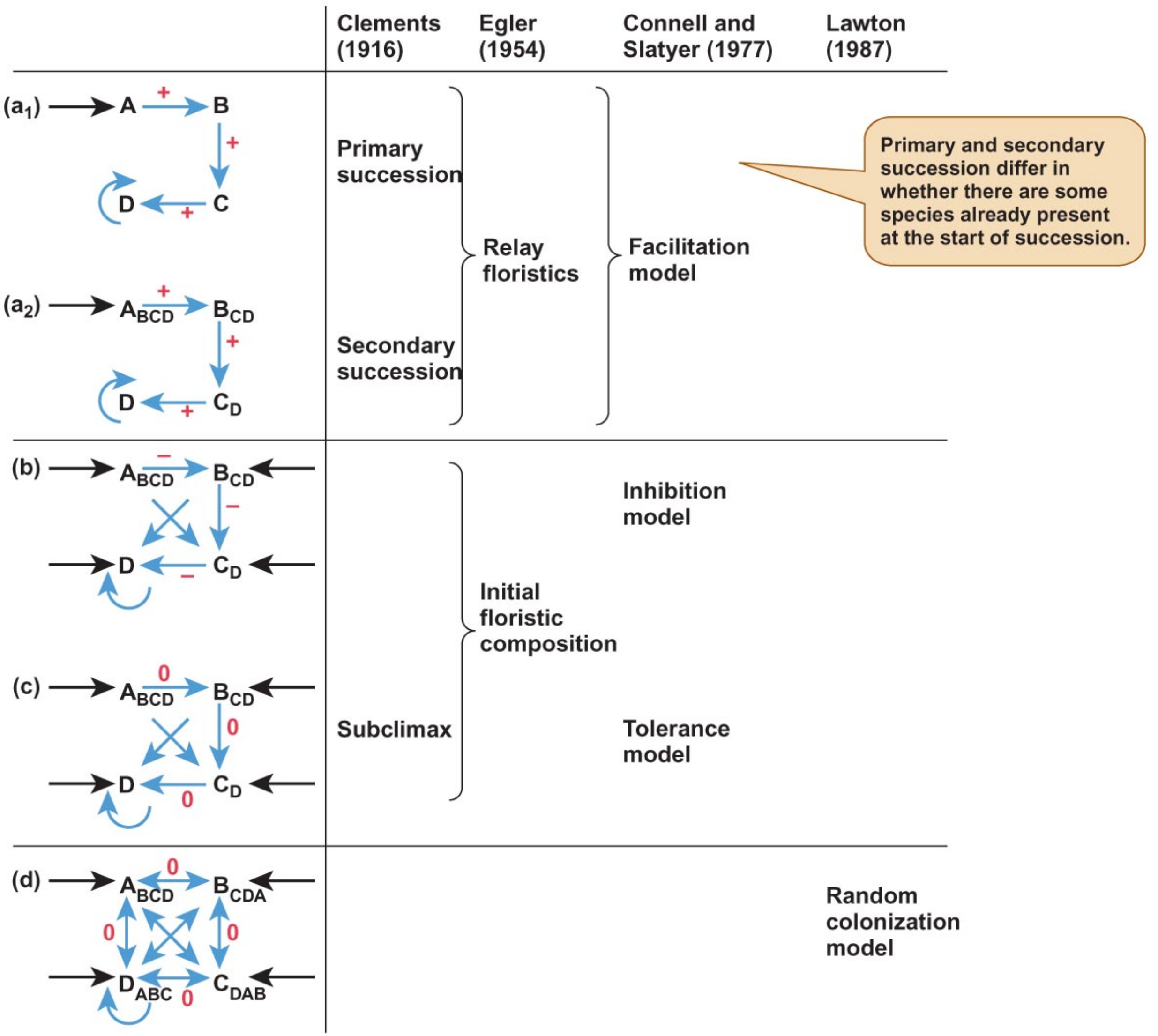


FIG. 1. Matrix depicting combined plant pollinator network of 1,050 unique interactions among 59 plant species (columns) and 196 pollinators (rows) across the six years of the study in Villavicencio Monte Desert, Argentina. Interactions are arranged to show nestedness. Heat ramp colors indicate the number of years that an interaction occurred from 1 to 6 yr, with hotter colors representing more years. Circle size represents interaction frequency. Interactions that occurred in many years (red) are mostly restricted to the upper left corner in the matrix core and also tend to have high interaction frequency (large circles).

Chacoff et al. (2018) Ecology 99: 21-28

Mecanismos de sucesión



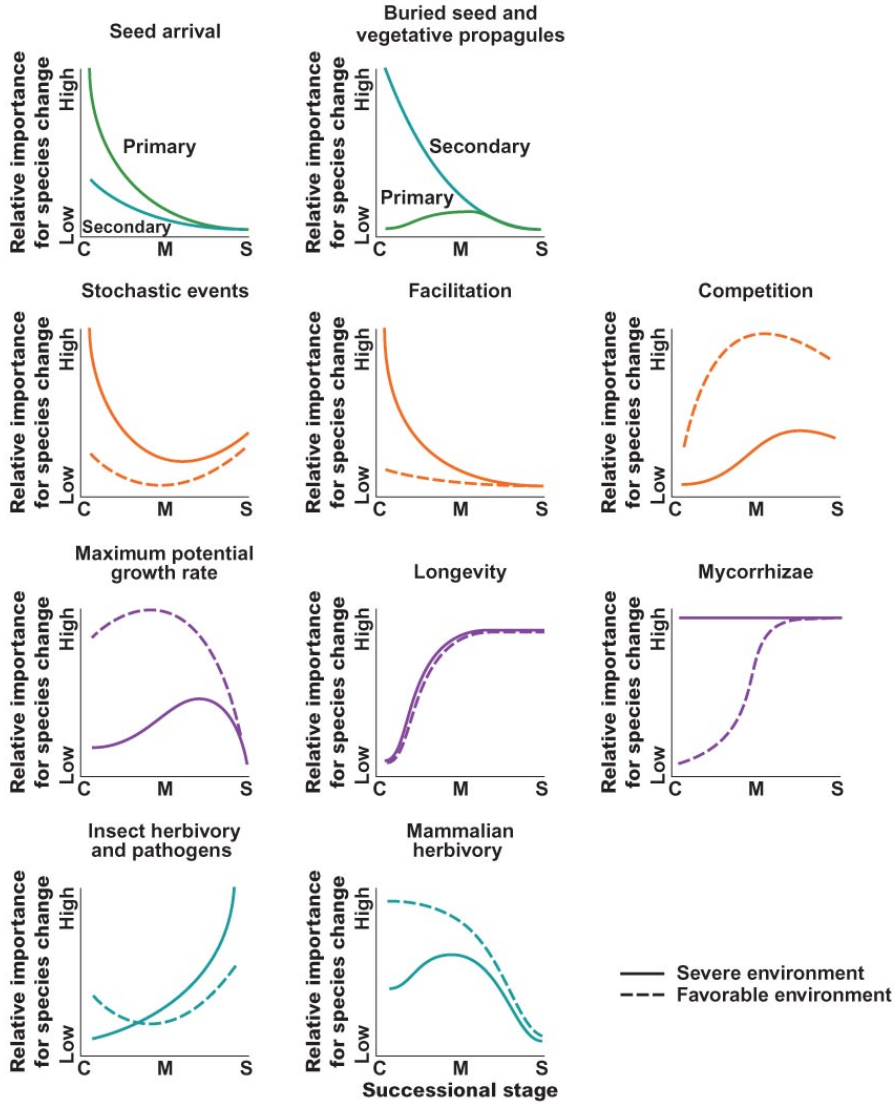
Características de las especies en las etapas sucesionales

Table 18.1 Physiological and life history characteristics of early- and late-successional plants.

Characteristic	Early succession	Late succession
Photosynthesis		
Light-saturation intensity	high	low
Light-compensation point	high	low
Efficiency at low light	low	high
Photosynthetic rate	high	low
Respiration rate	high	low
Water-use efficiency		
Transpiration rate	high	low
Mesophyll resistance	low	high
Seeds		
Number	many	few
Size	small	large
Dispersal distance	large	small
Dispersal mechanism	wind, birds, bats	gravity, mammals
Viability	long	short
Induced dormancy	common	uncommon?
Resource-acquisition rate	high	low?
Recovery from nutrient stress	fast	slow
Root-to-shoot ratio	low	high
Mature size	small	large
Structural strength	low	high
Growth rate	rapid	slow
Maximum life span	short	long

SOURCE: From Huston and Smith (1987).

Mecanismos sucesionales



Dinámica de parches

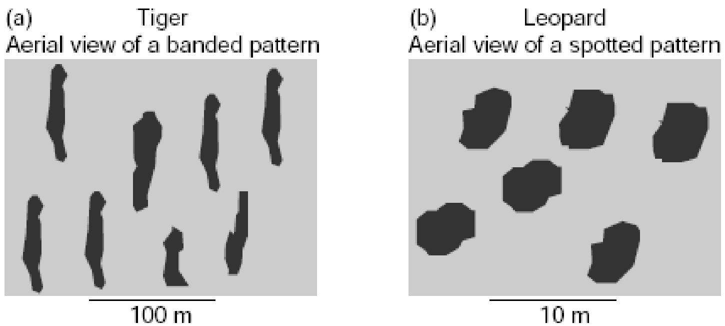
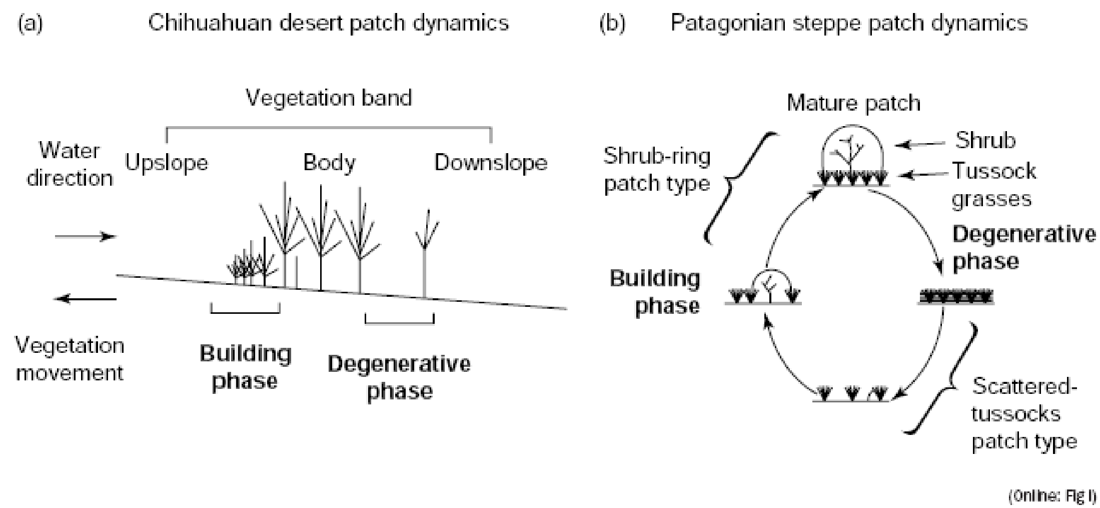


Fig. 1. Vegetation in arid lands is commonly arranged in a two-phase mosaic composed of high plant-cover patches in a low-cover matrix. Vegetation patches are usually dominated by woody plants that form bands or spots. Banded vegetation is referred to as a 'tiger' pattern (a) and spotted vegetation is here named as a 'leopard' pattern (b).

Box 1. Patch dynamics in tiger and leopard patterns

Patch dynamics in both tiger and leopard patterns (Fig. 1) are associated with growth and mortality of woody plants. The Chihuahuan desert is an example of banded vegetation (a); in this ecosystem, most recruitment of shrubs and trees occurs in the upslope of the band. Mature individuals are located in the body of the band, whereas dying individuals are downslope of the band. Active growth (building phase) occurs in the upslope front of the band, where most of the seeds transported by run-off water is collected, and where the balance between competition and facilitation is more favorable for young plants. Downslope, mortality is the dominant process because most run-on water has infiltrated upslope and most nutrients have been sequestered in the front and the body of the bands (degenerative phase)[13,16,29]. The result of these vegetation dynamics is that bands 'climb' the slope as recruitment occurs in the upslope shifting-ecotone of the bands and mortality occurs mostly in the downslope border.



In the spotted vegetation of the Patagonian steppe (b), the model that relates the two patch types of the mosaic indicates that establishment of a shrub can occur in any location in the low-cover matrix. As the shrub grows (building phase), it creates a neighborhood with aerial protection that promotes both seed accumulation and seedling establishment, resulting in the formation of a ring of tussock grasses. As the ring of grasses is completed, competition between the grasses overshadows facilitation by the shrub, and establishment of grass seedlings decreases[30]. When the shrub dies and begins to collapse (degenerative phase), aerial protection disappears and below-ground competition dominates over any facilitation effects. Therefore, mortality of grasses increases, leading to a thinning of the ring of grasses. Tussock mortality slows down as grass density reaches values equivalent to that of the matrix; the ring then loses both its identity and the remnant grass individuals form the scattered-tussock patch type[17].

Fuente: Aguiar y Sala (1999) TREE 14: 273-277

Teórica 9: Recapitulación

- Las comunidades pueden caracterizarse por su riqueza, abundancia relativa, composición y estructura de interacciones
- La estructura comunitaria depende los procesos de selección, deriva, especiación y dispersión
- La diversidad de especies varía geográficamente, lo cual puede ser explicado por varios procesos alternativos no excluyentes
- Las comunidades cambian en el tiempo por procesos de sucesión primaria y secundaria