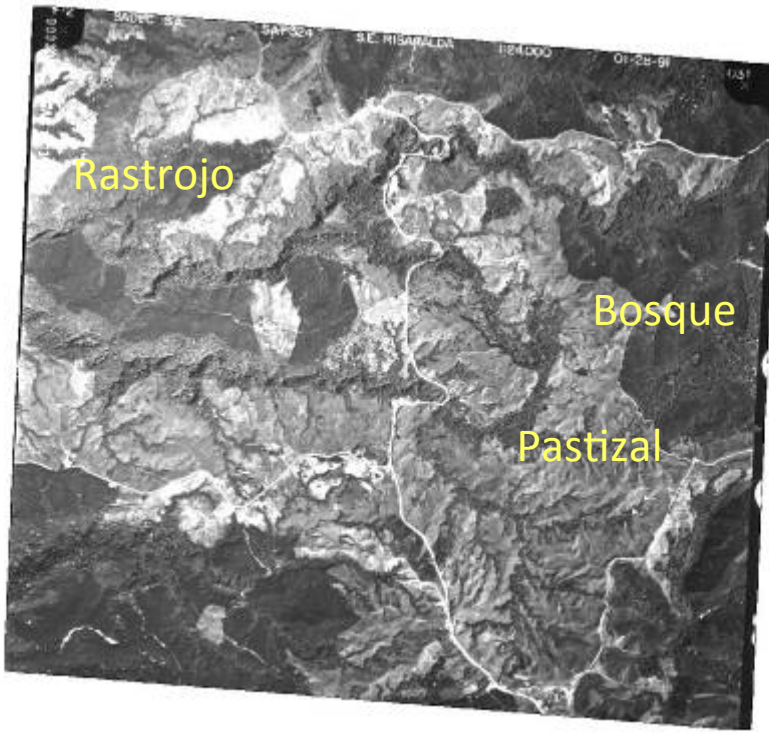
Conectividad: heterogeneidad, escala y movimiento

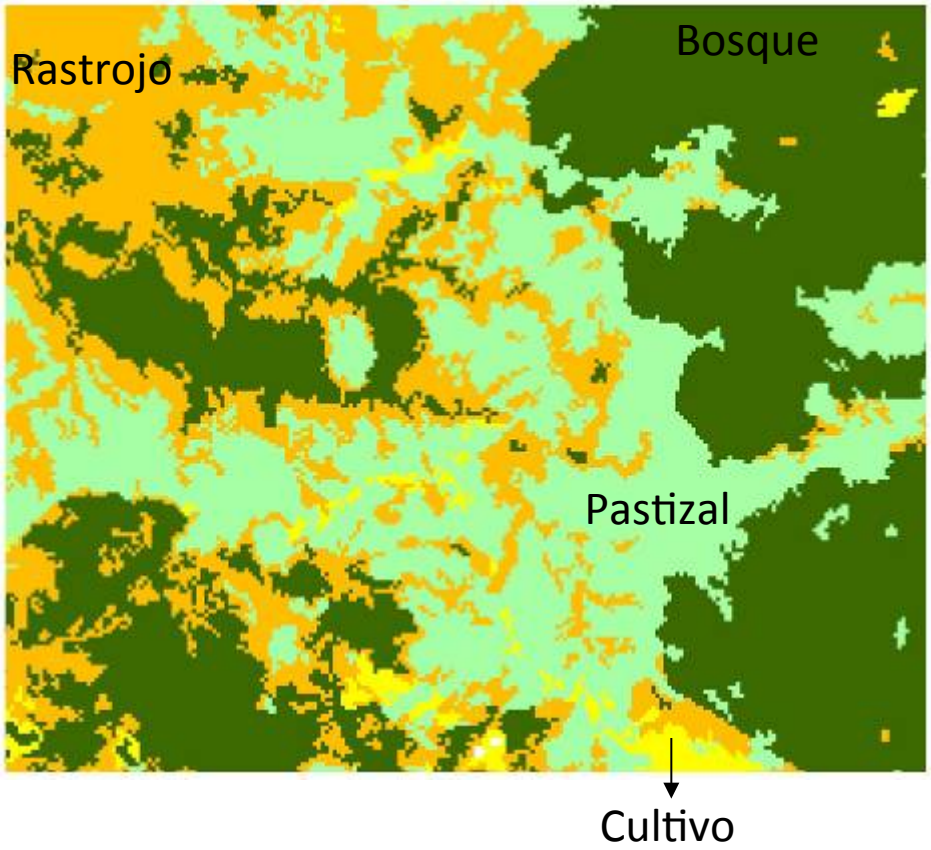
Gustavo Kattan

Pontificia Universidad Javeriana Cali

A escala de paisaje: mosaico de ecosistemas (coberturas)



Fotografía aérea



Fotointerpretación

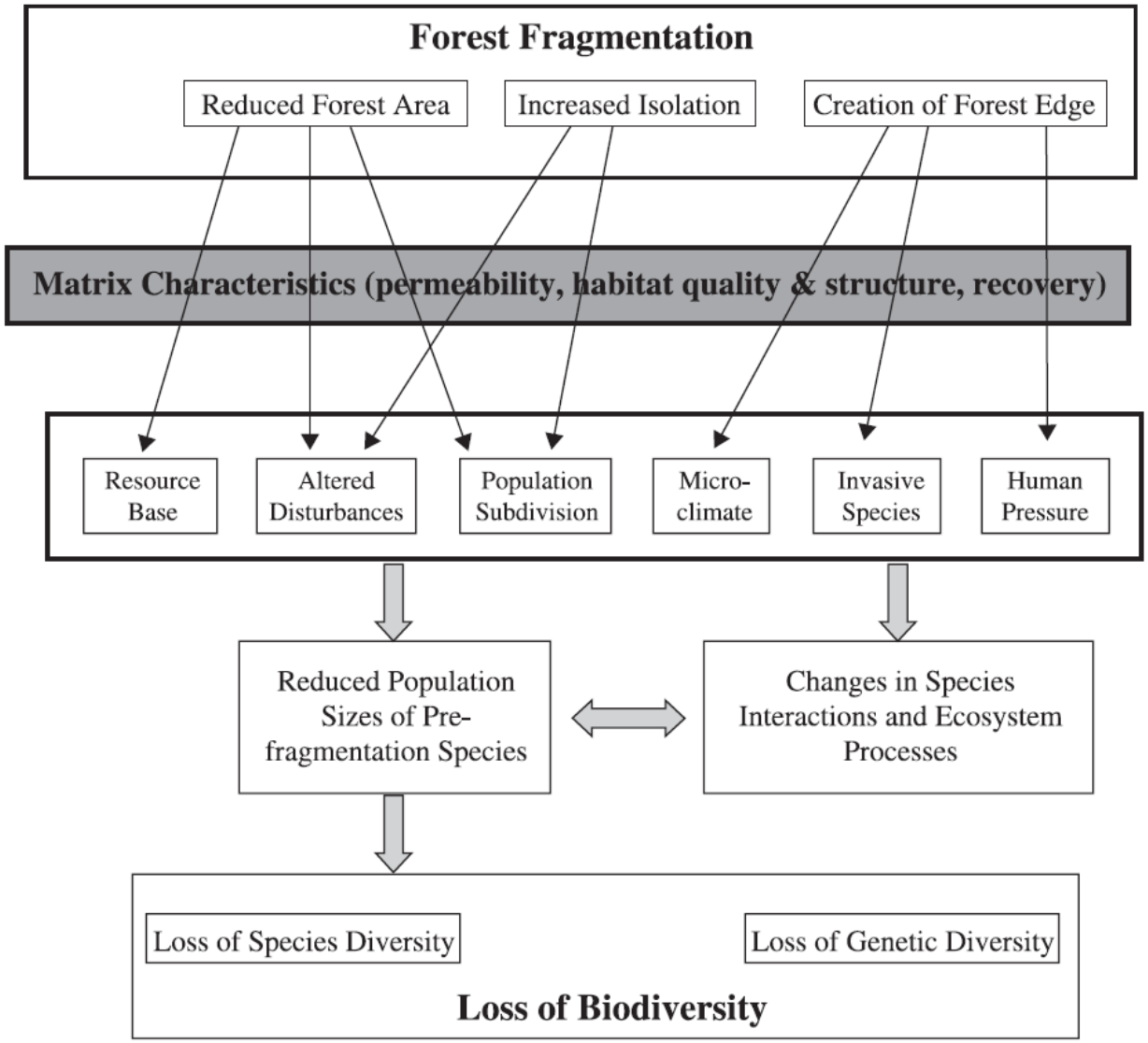


Figure 2 Conceptual model of forest fragmentation effects, modified from Zuidema *et al.* (1996) and Lindenmayer & Franklin (2002) to incorporate matrix effects.

Kupfer et al. 2006, Global Ecol. Biogeogr. 15:8-20

Mecanismos de extinción

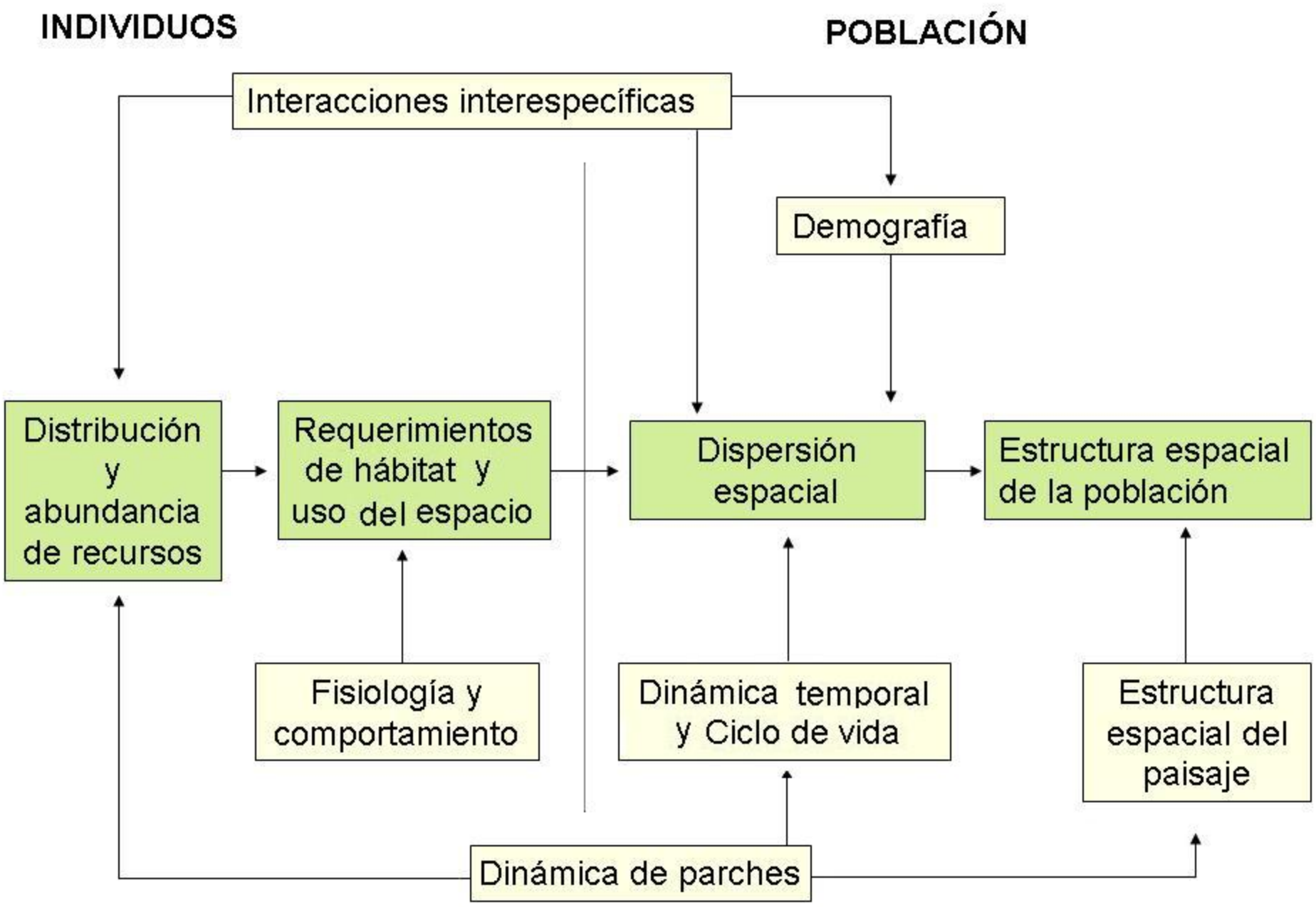
- Efectos de aislamiento: dependen de la capacidad de la especie de cruzar una matriz hostil

Oleria fumata

¿Cómo responden las especies a la matriz?

heterogeneidad, escala y movimiento

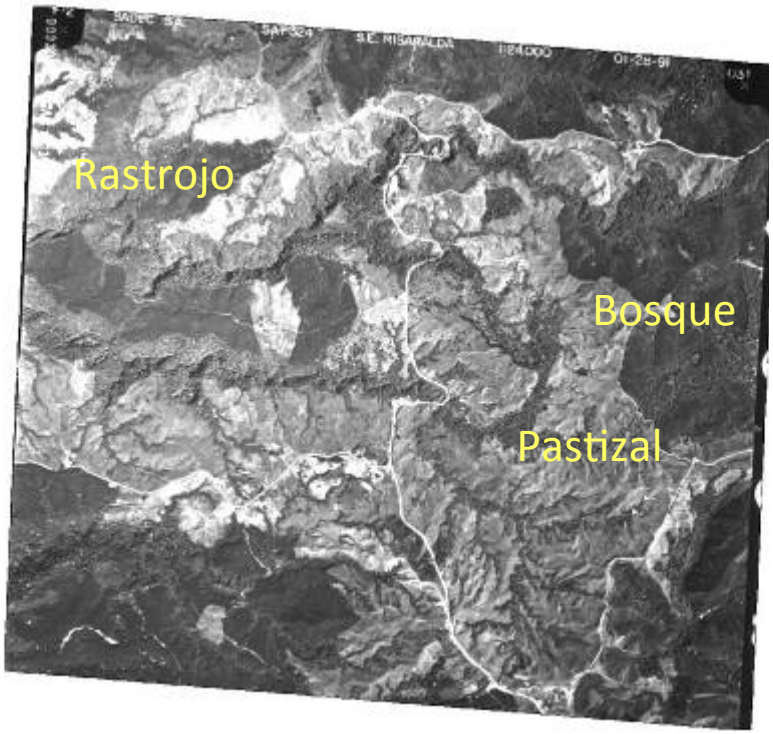
- Poblaciones: las unidades básicas de la conservación
- Paisajes: la escala integradora de la diversidad biológica


INDIVIDUOS
POBLACIÓN
Interacciones interespecíficas
Demografía
Distribución y abundancia de recursos
Requerimientos de hábitat y uso del espacio
Dispersión espacial
Estructura espacial de la población
Fisiología y comportamiento
Dinámica temporal y Ciclo de vida
Estructura espacial del paisaje
Dinámica de parches

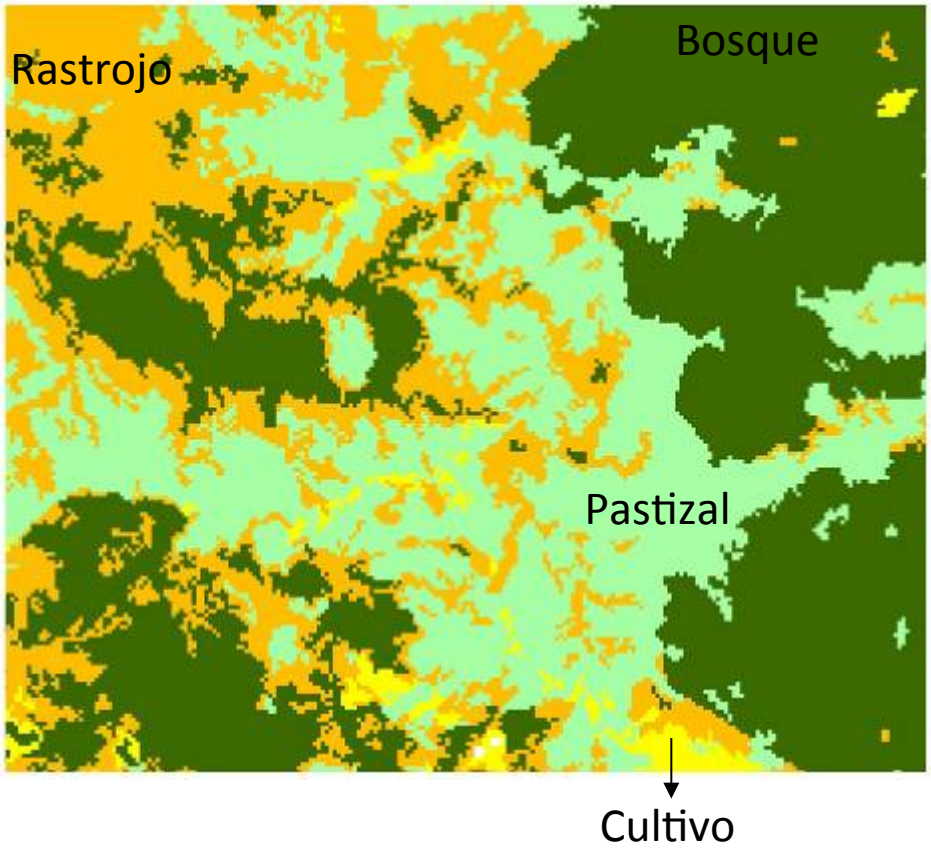
La naturaleza es heterogénea a todas las escalas espaciales y temporales

Se pueden identificar parches de diferentes características fisicas y bióticas.

A escala de paisaje: mosaico de ecosistemas (coberturas)



Fotografía aérea

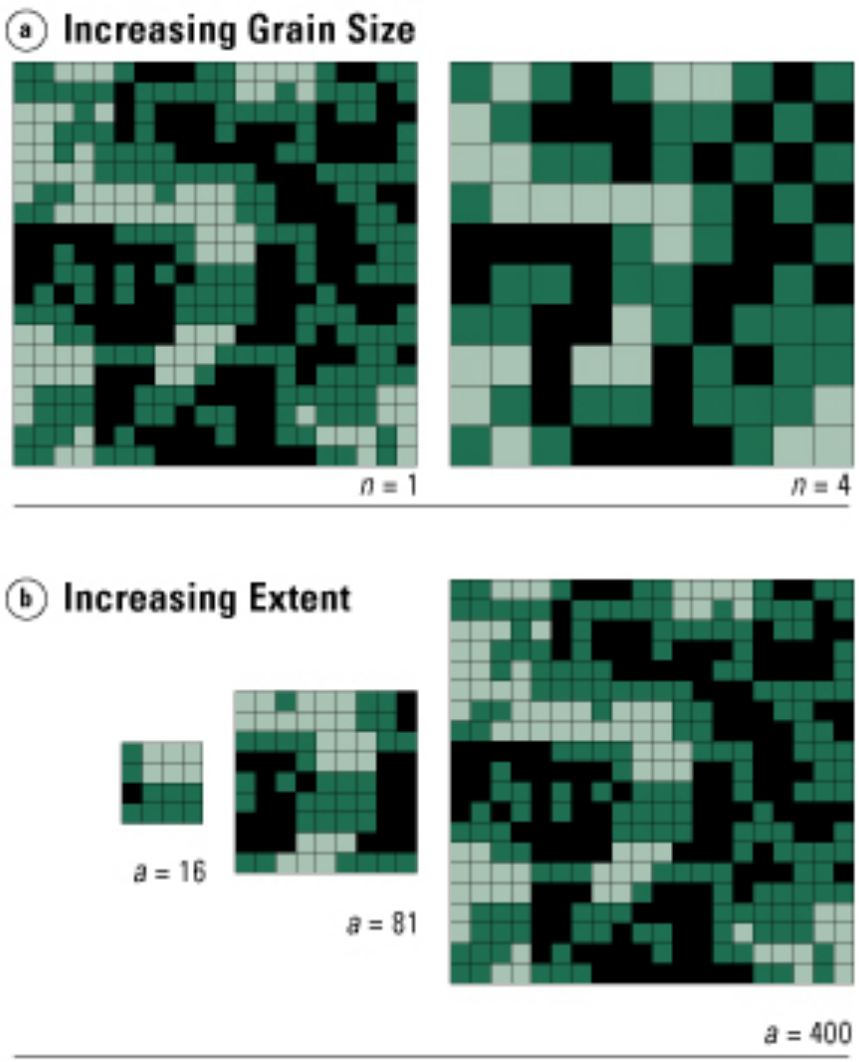


Fotointerpretación

A escala de ecosistema

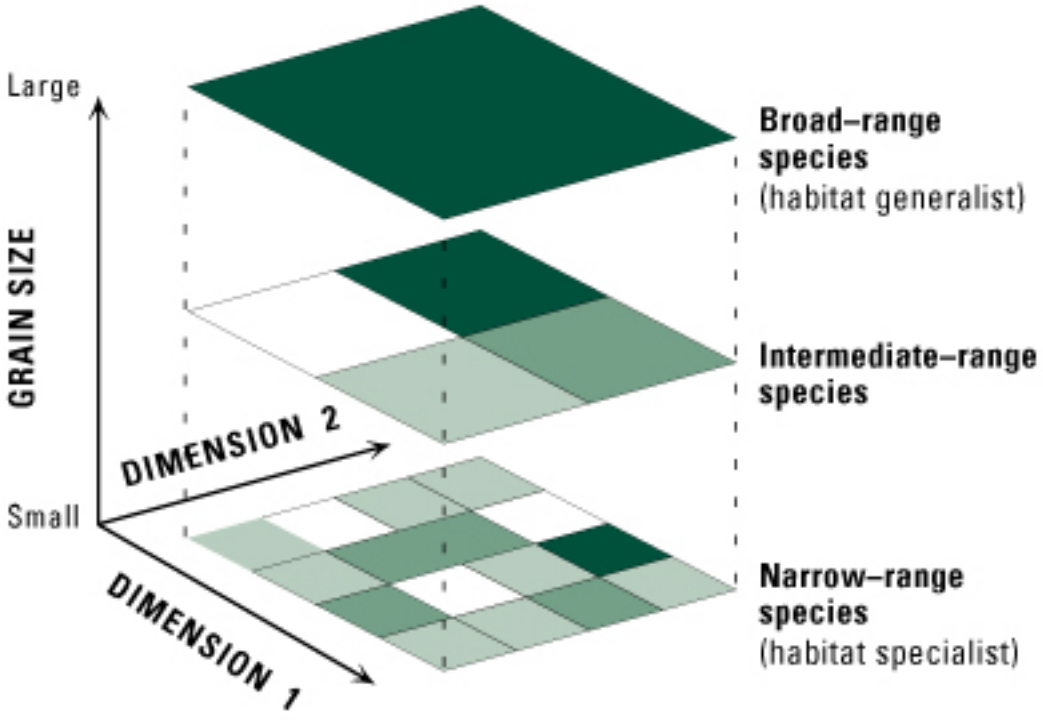
A escala local

Escala espacial: 2 componentes



Extensión

Grano


Large
GRAIN SIZE
Small
DIMENSION 2
DIMENSION 1
Broad–range species (habitat generalist)
Intermediate–range species
Narrow–range species (habitat specialist)

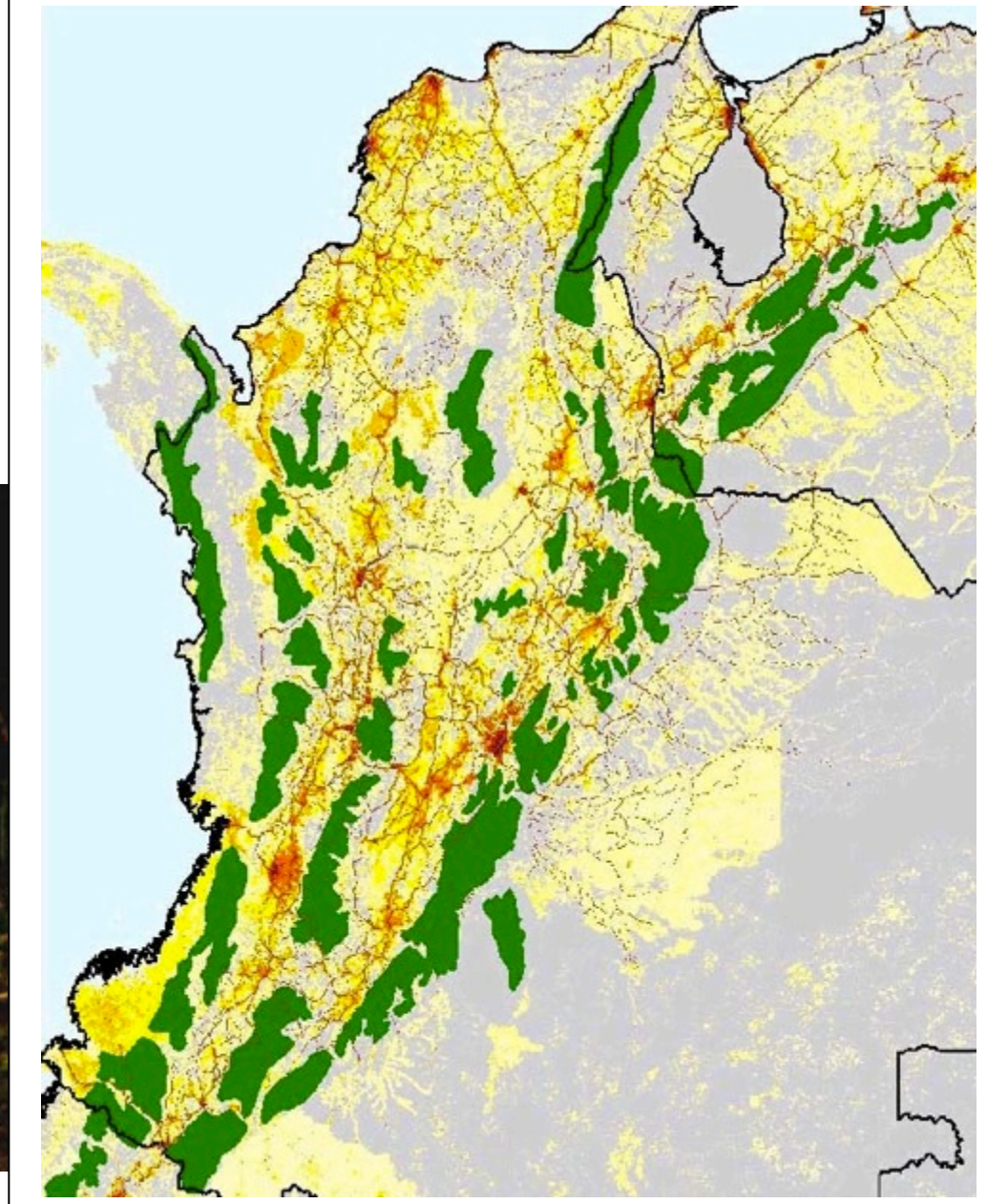
Movimientos de los animales en el paisaje

- Movimientos diarios del individuo dentro de su área de actividad ("home range")
- Movimientos estacionales de la población (migraciones) (escalas)
- Diseminación de propágulos o dispersión postnatal de juveniles (plantas: movimiento de polinizadores y diseminación de semillas

Oso andino

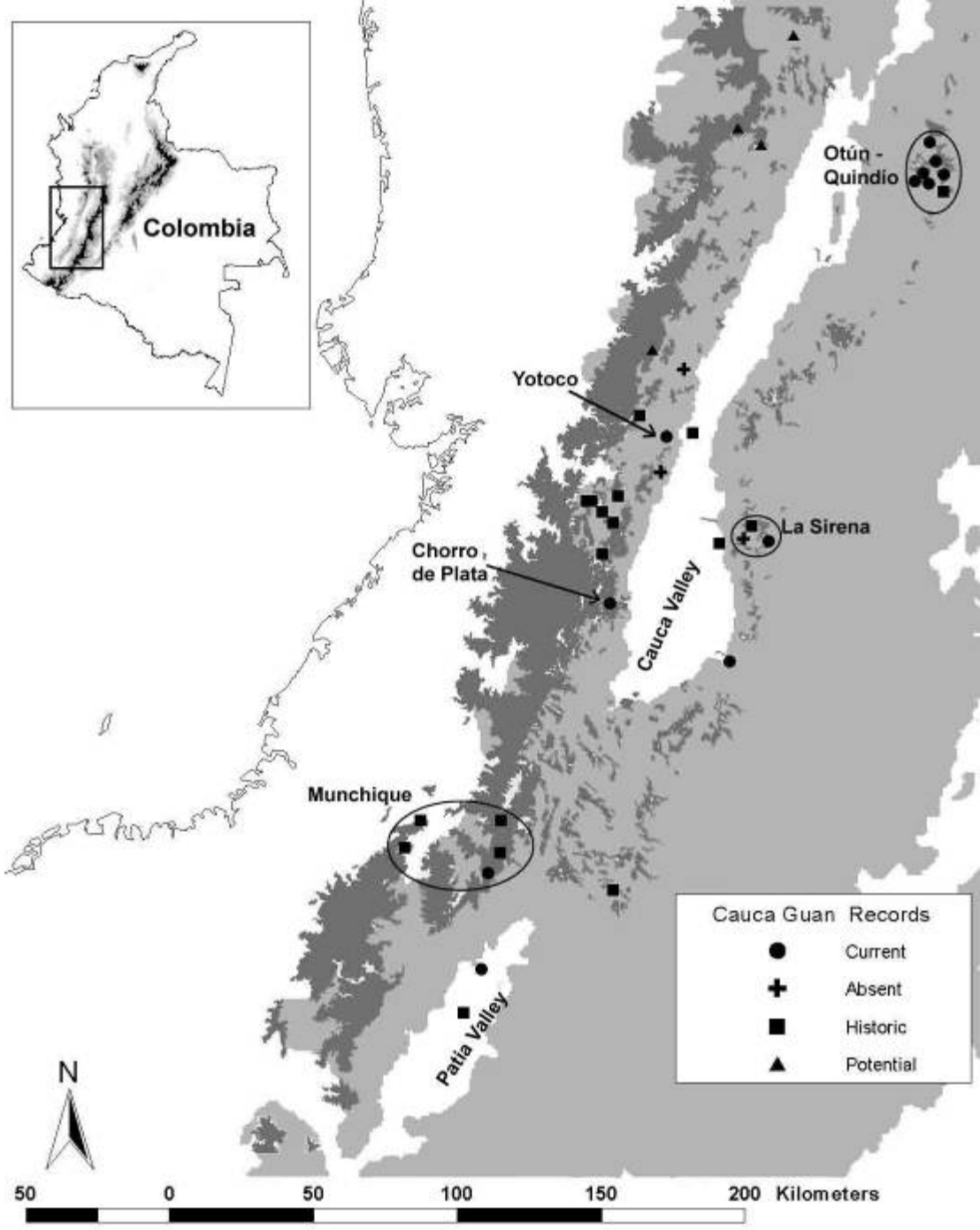
- Distribución geográfica reducida al 42% del área original.
- Fragmentada en 113 bloques de >100 km^2

Kattan et al. 2004, Oryx



Distribución actual de la pava caucana

Fuente: Kattan et al. 2006, Bird Conservation International (en prensa)



Spatial variation in population density of an endemic and endangered bird, the Cauca Guan (*Penelope perspicax*)

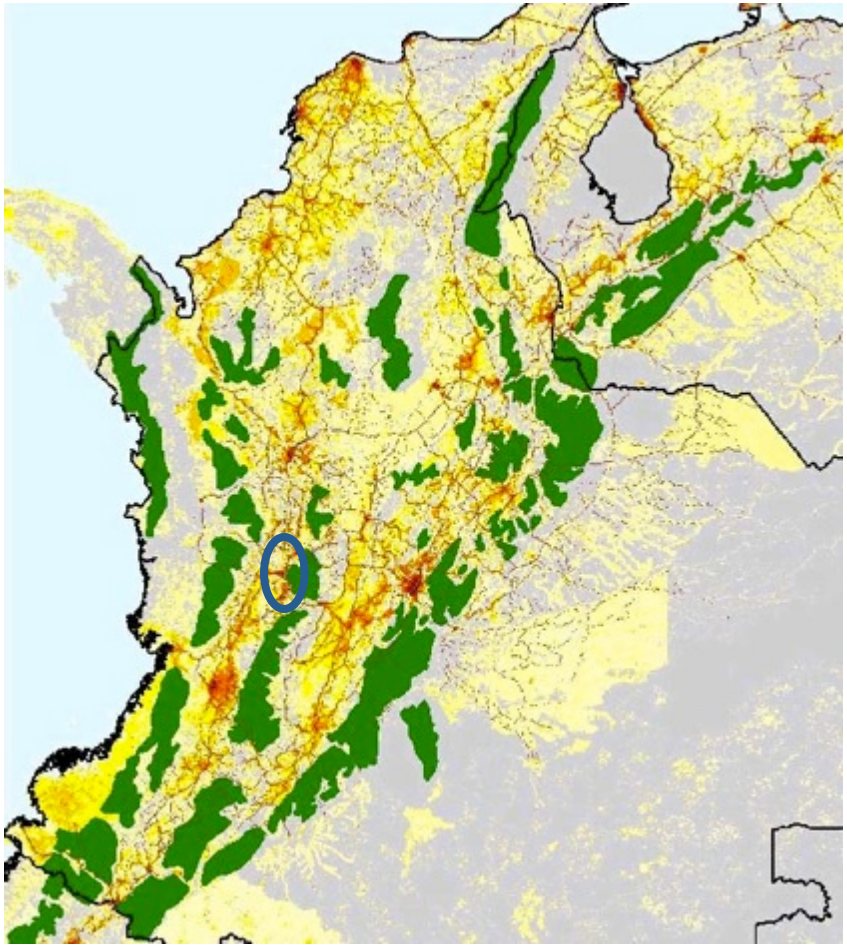
Gustavo H. Kattan[1], Néstor Roncancio[2,3], Yurany Banguera[4], Margarita Kessler-Rios[5], Gustavo A. Londoño[6], Oscar Humberto Marín[7] and Marcia C. Muñoz[8]

Table 2. Group sizes and population densities of Cauca Guan in different habitats at three sites on the Cauca Valley slopes, Colombia.

Locality/habitat	Group size (individuals)		Density (ind./km^2)		
	Mean	95% CI[a]	Mean	95% CI	CV[b]
Yotoco	1.6	1.4-1.9	10.8	7.4-16	19.3
Barbas					
Total	1.1	1.0-1.2	14	8.2-23.9	23.6
Forest	1.1	1.0-1.2	18.4	7.8-43.8	25.1
Stream	1.1	1.0-1.2	10.6	5.5-20.4	32
Bremen					
Total	1.2	1.1-1.3	21.3	13.6-33.5	21.3
Old-growth forest	1.4	1.1-1.8	10.8	3.6-31.6	38.4
Secondary forest	1.5	1.2-1.7	42.2	31.7-56.2	12.2
Early regeneration	1.2	1.0-1.5	14.8	4.3-50.6	42.6
Stream	1.5	1.0-2.3	16.5	5.0-55.0	47.8

Tropical Conservation Science 2014

Tororoi de Miller
(*Grallaria milleri*)



G. milleri

Population density: 1.3 ind/ha

Territory size: 0.5-5.4 ha

Habitat use and abundance of antpittas

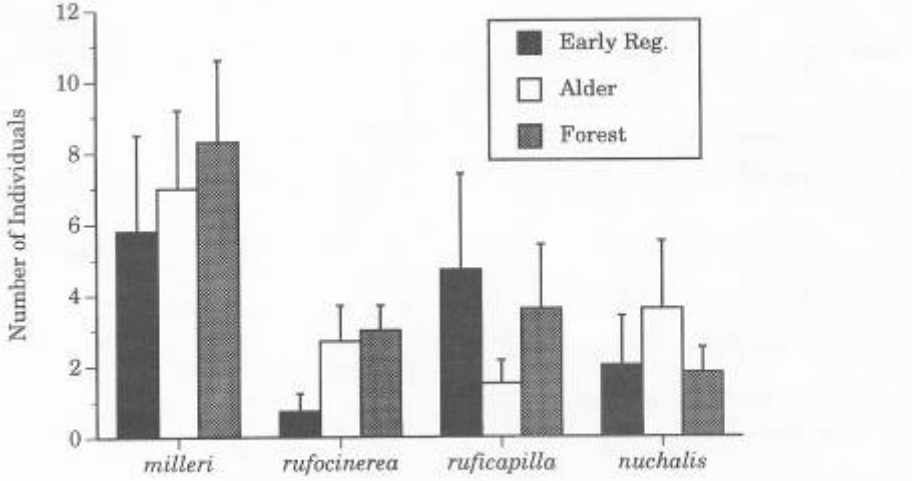


Figure 1. Density, in number of birds per 500-m transect ($n = 10$ transects), of four *Grallaria* species in three habitats in the range 2,400–2,600 m. Bars represent one standard error.

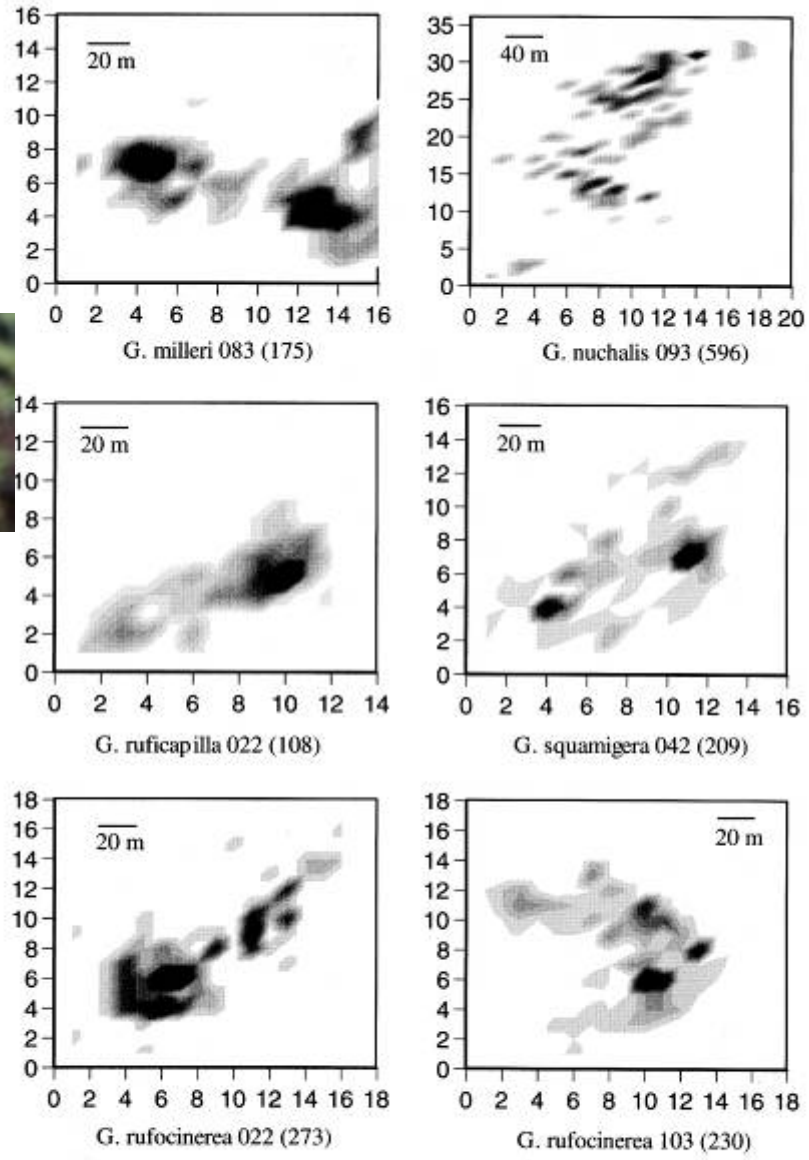
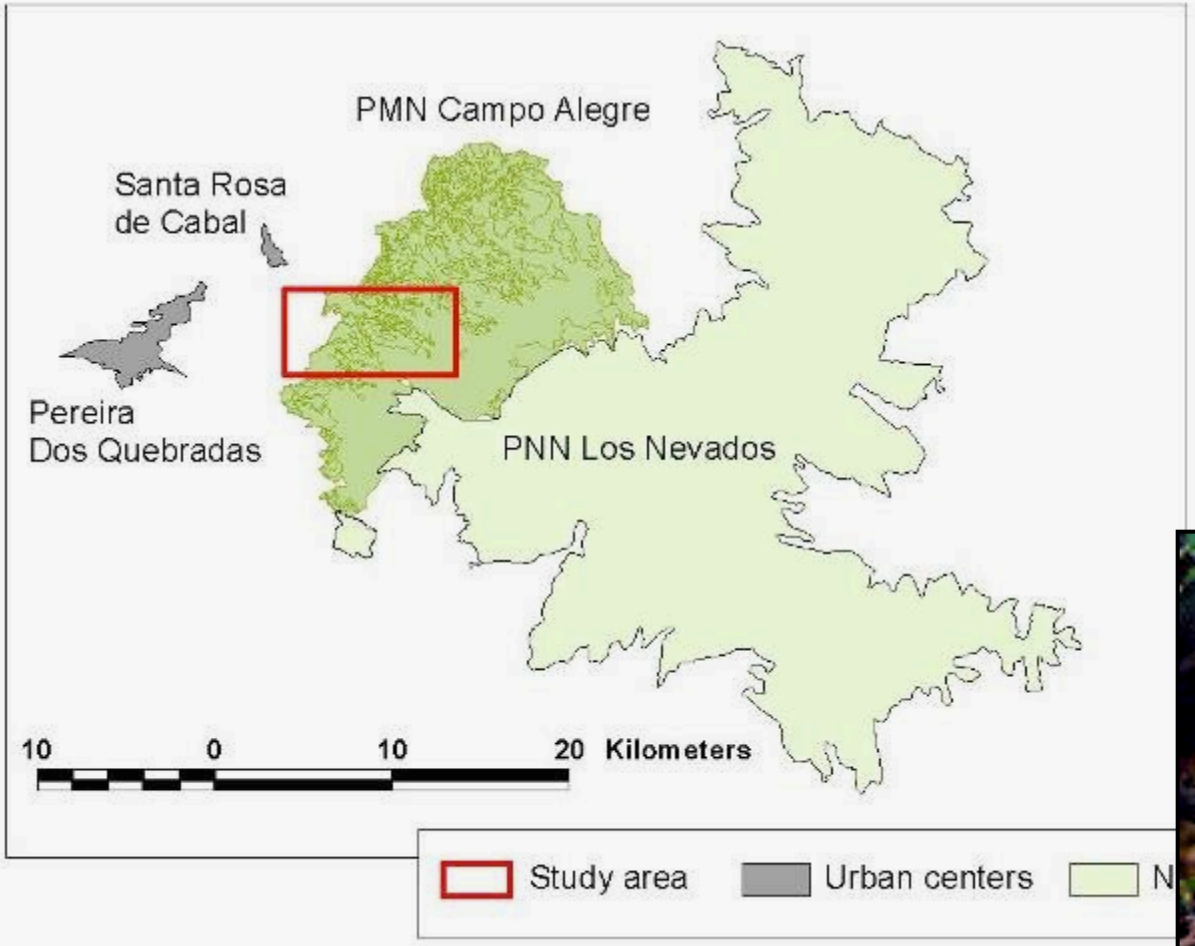
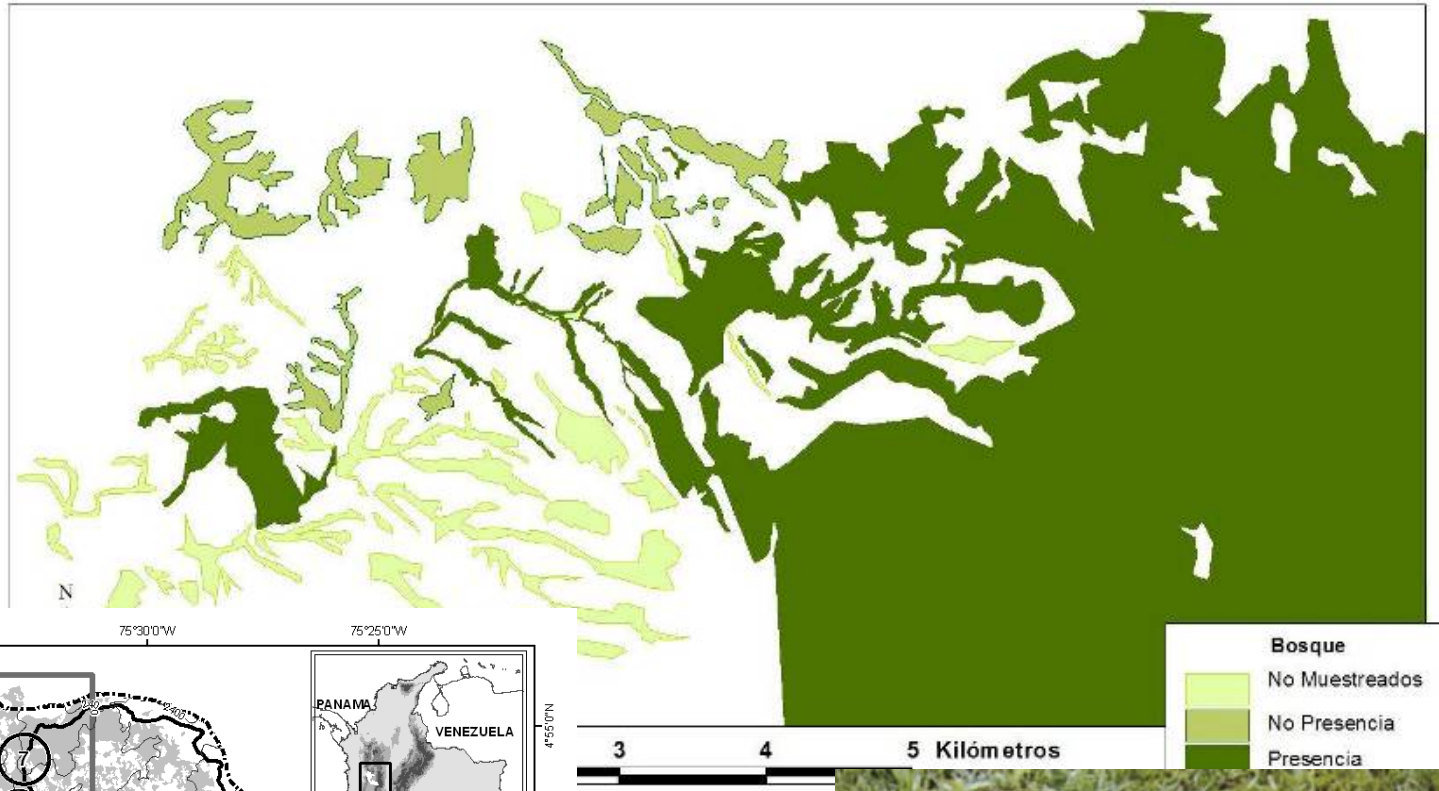
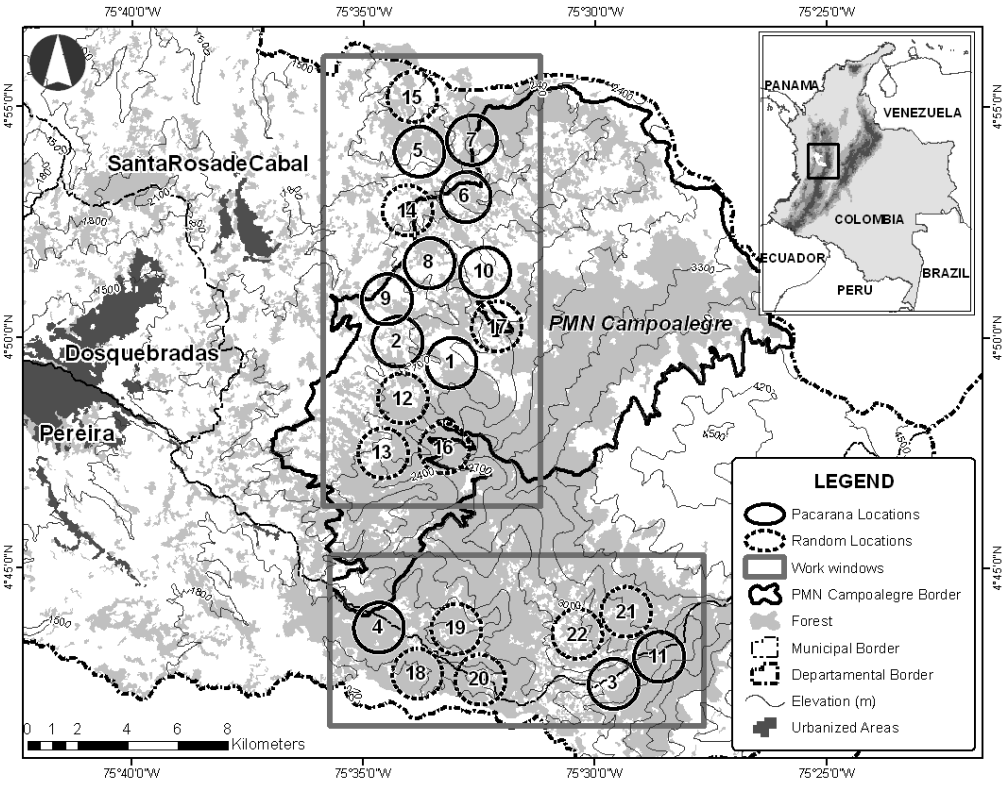


Figure 1. Representation of the territories of six antpittas of five species obtained by radio-tracking individuals for periods of 30–60 days at Ucumarí Regional Park, Colombia, 1995–2000. Intensity of shading indicates density of records and intensity of use of space. Numbers in parenthesis indicate number of records on which the figure is based. Axis scales are relative measures of distance. The scale for *G. nuchalis* is distorted on the Y axis.

Guagua loba
(*Dinomys branickii*)




N
Bosque
No Muestreados
No Presencia
Presencia
3
4
5 Kilómetros


75°40'0"W
75°35'0"W
75°30'0"W
75°25'0"W
4°55'0"N
4°50'0"N
4°45'0"N
SantaRosadeCabal
Dosquebradas
Pereira
PMN Campoalegre
PANAMA
VENEZUELA
COLOMBIA
ECUADOR
PERU
BRAZIL
LEGEND
Pacarana Locations
Random Locations
Work windows
PMN Campoalegre Border
Forest
Municipal Border
Departamental Border
Elevation (m)
Urbanized Areas
0 1 2 4 6 8
Kilometers

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ENDANGERED SPECIES RESEARCH
Endang Species Res

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OPEN ACCESS

Multiscale patterns of habitat and space use by the pacarana *Dinomys branickii*: factors limiting its distribution and abundance

Carlos A. Saavedra-Rodríguez[1,2,*], Gustavo H. Kattan[3,4], Karin Osbahr[5], Juan Guillermo Hoyos[4]

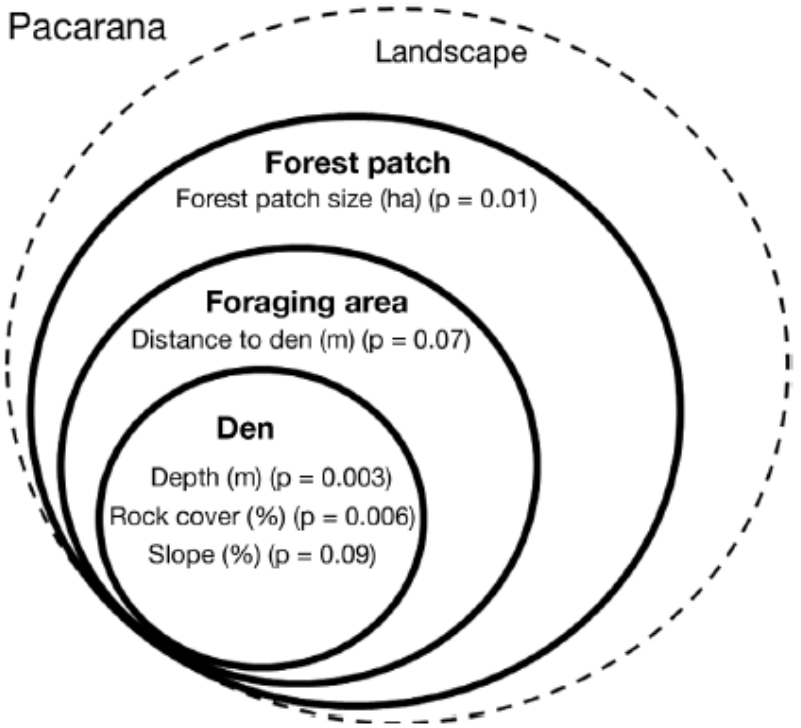

Fig. 2. *Dinomys branickii*. Conceptual diagram of factors determining pacarana habitat use at 4 spatial scales in the Central Andes of Colombia (after Bunnell & Huggard 1999)

Conservation Value of Remnant Riparian Forest Corridors of Varying Quality for Amazonian Birds and Mammals

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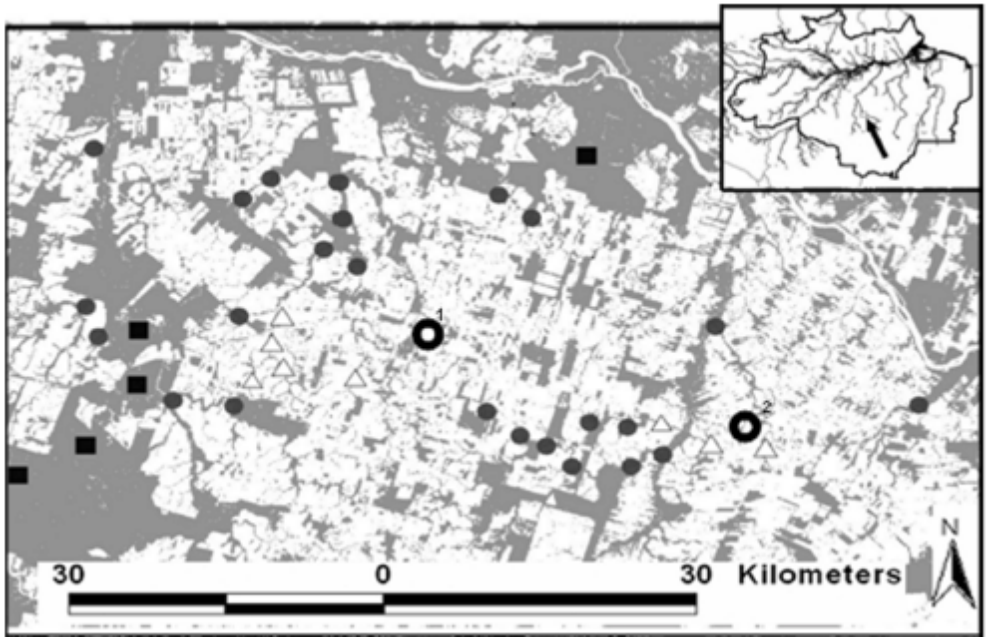
Conservation Biology, Volume 22, No. 2, 439–449

DOI: 10.1111/j.1523-1739.2007.00870.x



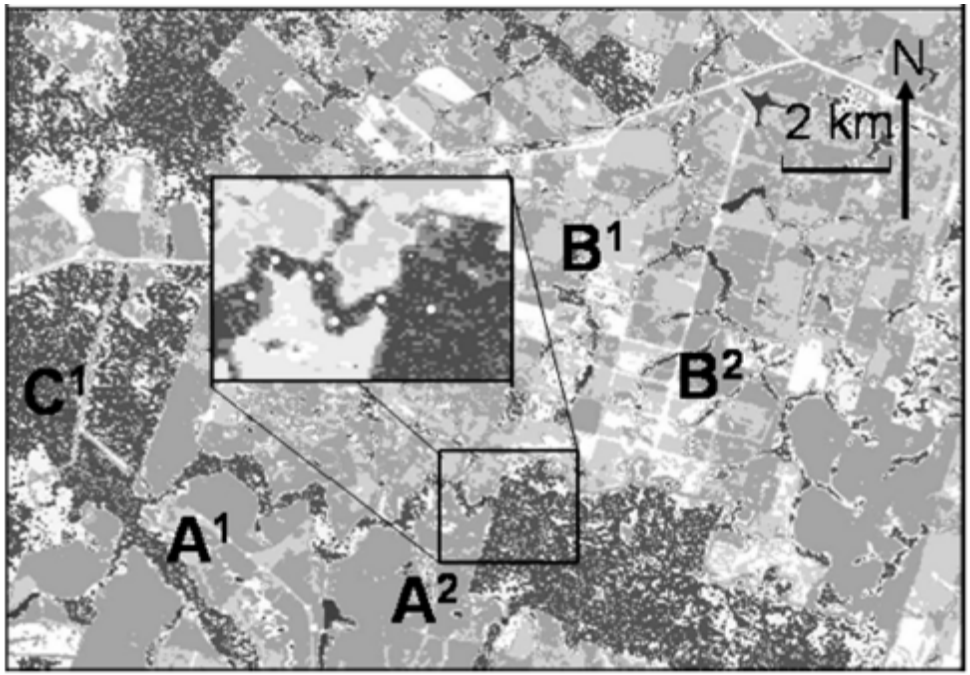


Figure 1. Map of study area around Alta Floresta, Mato Grosso, Brazil (09°53′S; 56°28′W), showing the sites sampled in connected (solid circles) and unconnected (open triangles) forest corridors and control sites (solid squares) embedded within continuous forest sites. Forest and nonforest cover are shaded gray and white, respectively. Open circles denote urban areas and 1 is Alta Floresta and 2 is Carlinda. Rectangular insets (lower panel) show examples of connected (A) and unconnected (B) corridors and a control site in continuous forest (C).

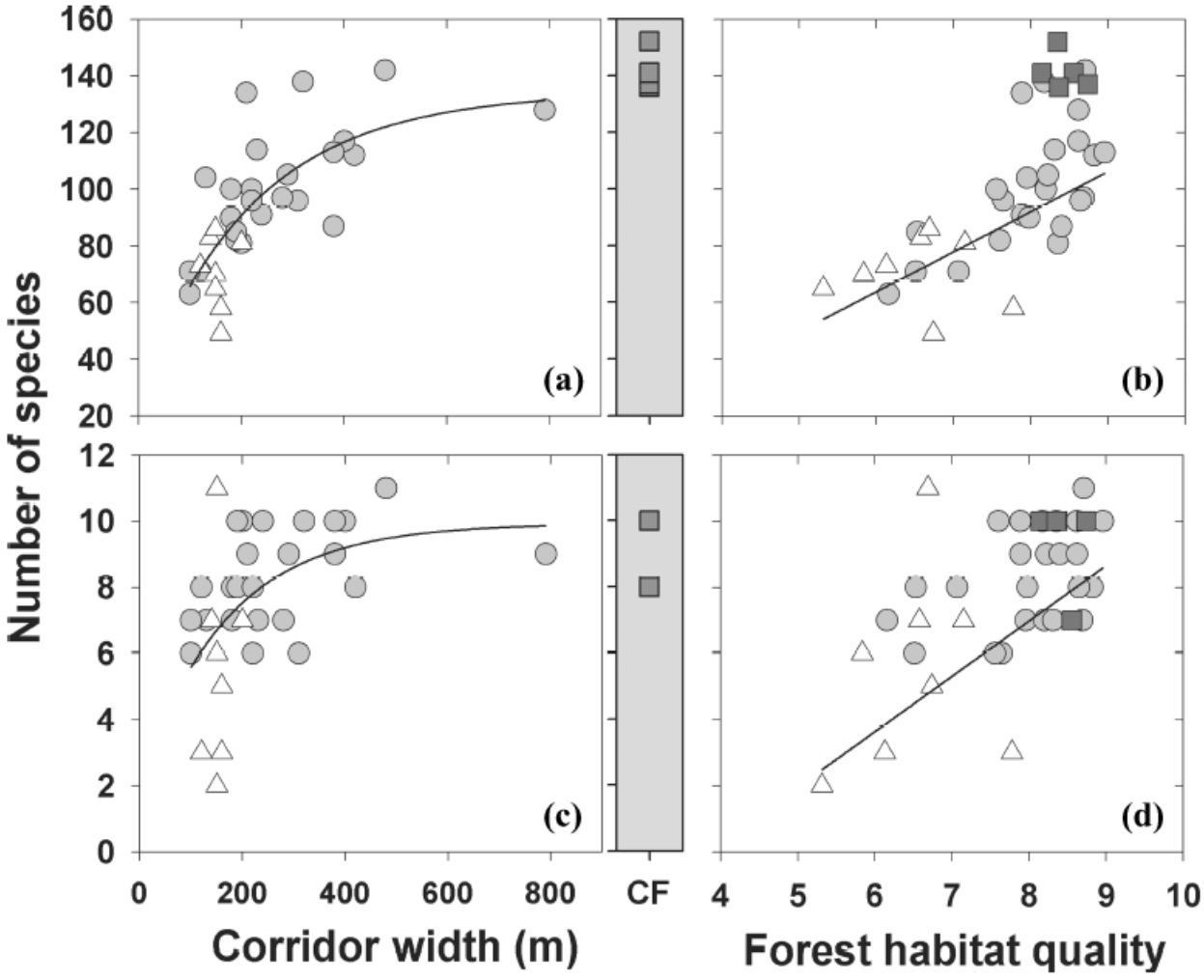


Figure 2. Relationships between vertebrate species richness and mean corridor width and forest quality for riparian forest corridors that are either connected (shaded circles) or unconnected (open triangles) to large forest patches and control sites within continuous forest patches (CF, dark-shaded squares): (a, b) birds and (c, d) mammals.

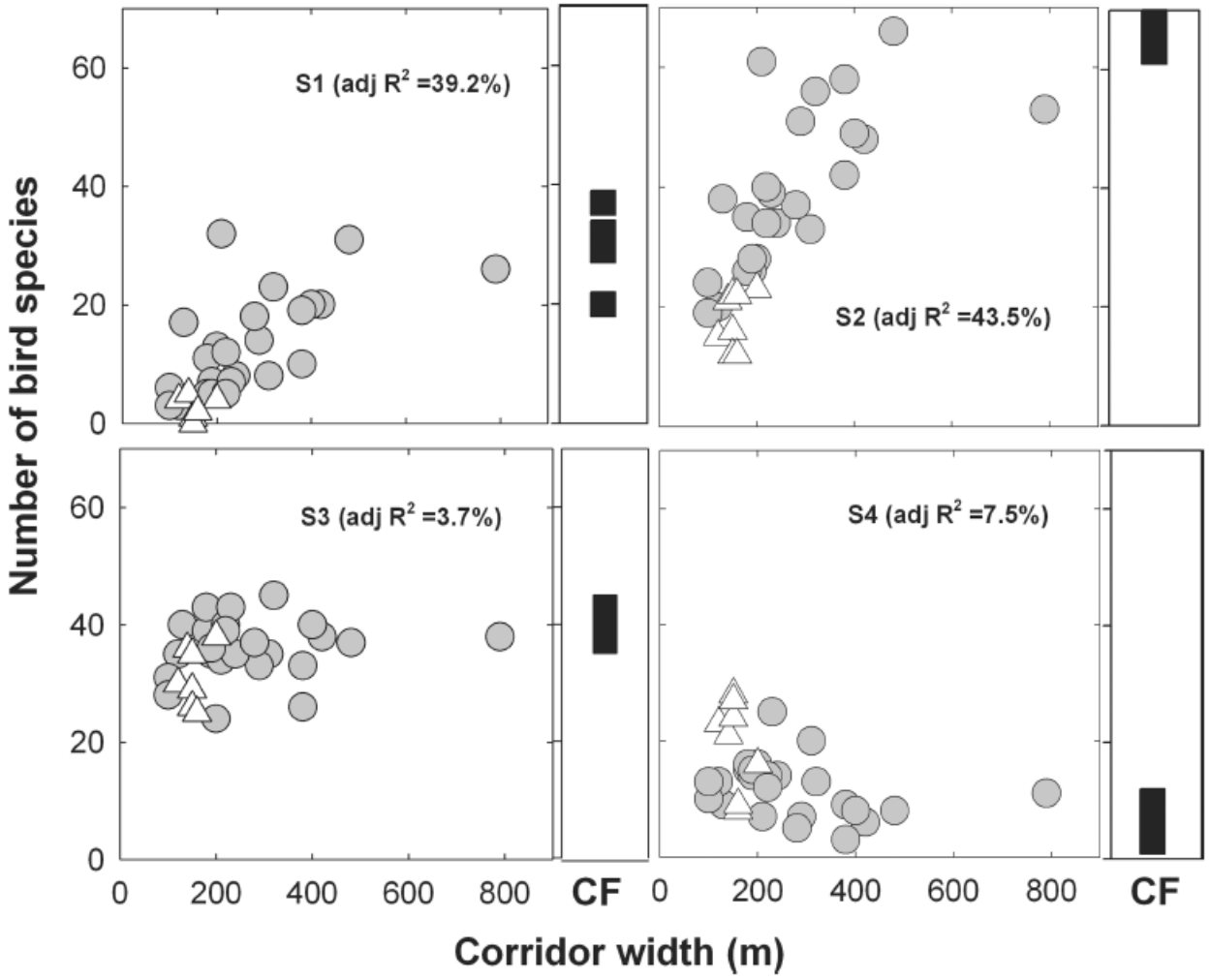


Figure 3. Relationships between species richness and corridor width for 4 functional groups of bird species with varying degrees of habitat sensitivity (sensitivity classes; S1, all strict forest understory and midstory species; S2, all remaining species dependent on primary forest; S3, forest species able to tolerate secondary or highly degraded forest; S4, primarily nonforest species including scrub and open-habitat countryside species). Open triangles, gray circles, and black squares indicate unconnected corridors, connected corridors, and control riparian sites, respectively.

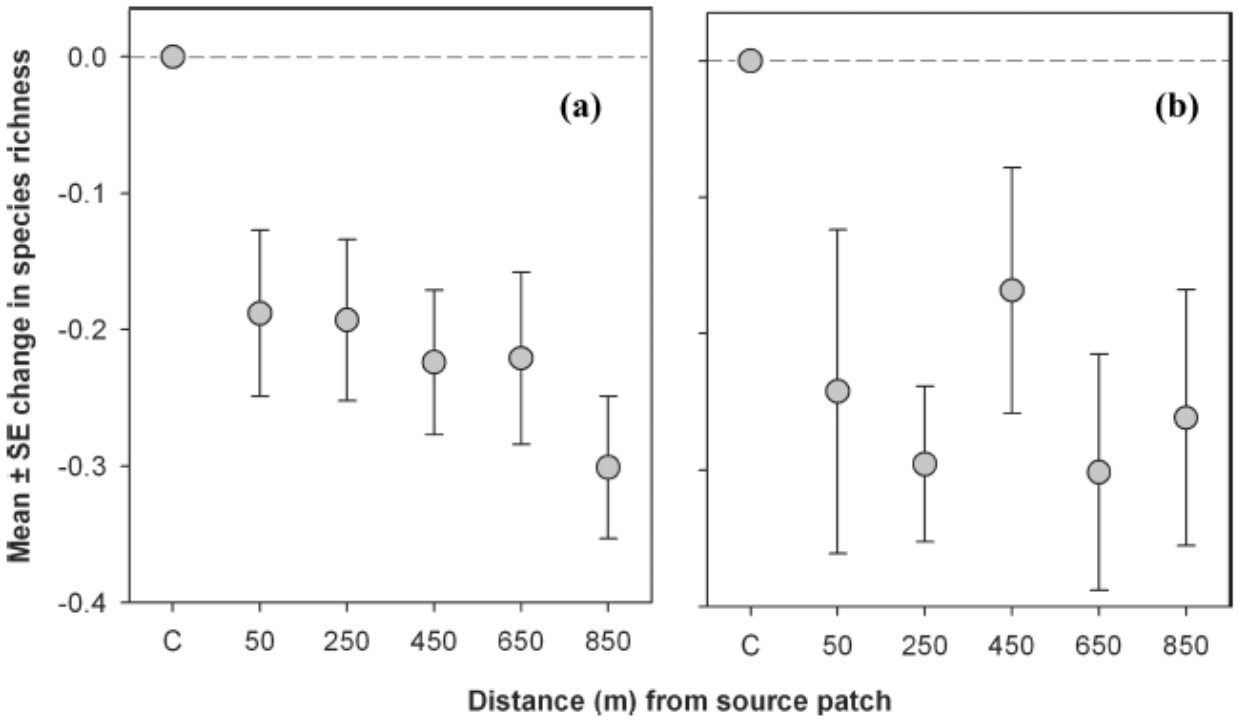


Figure 4. Changes in species richness (ΔS) for (a) birds and (b) mammals along connected corridors as a function of distance from their respective source-forest patch nodes.

Riparian corridors enhance movement of a forest specialist bird in fragmented tropical forest

Cameron S. Gillies[1] and Colleen Cassady St. Clair

19774–19779 | PNAS | December 16, 2008 | vol. 105 | no. 50

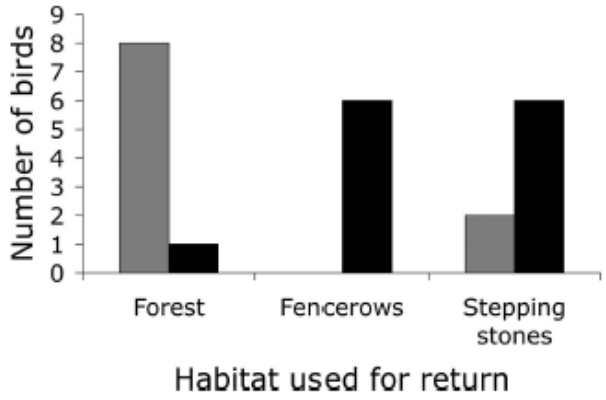


Fig. 1. Habitat used by antshrikes (gray bars) and wrens (black bars) that returned after translocation in fencerow or pasture treatments.

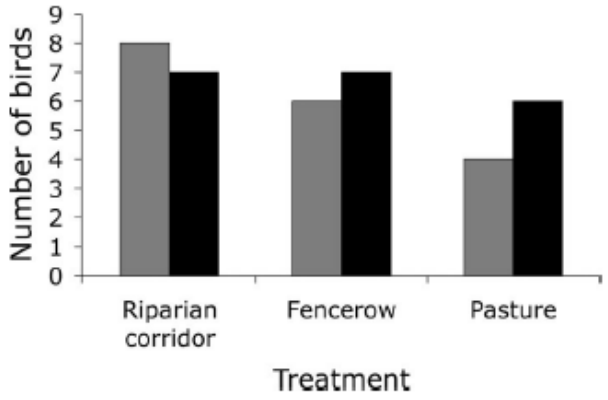


Fig. 3. Return success by antshrikes (gray bars) and wrens (black bars) in the three treatments following translocation. Ten individuals of each species were translocated in each treatment.

Effects of Patch Size and Type of Coffee Matrix on Ithomiine Butterfly Diversity and Dispersal in Cloud-Forest Fragments

SANDRA B. MURIEL*†‡ AND GUSTAVO H. KATTAN*§

*Fundación EcoAndina/Wildlife Conservation Society Colombia Program, Apartado Aéreo 25527, Cali, Colombia
†Departamento de Biología, Universidad del Valle, Cali, Colombia

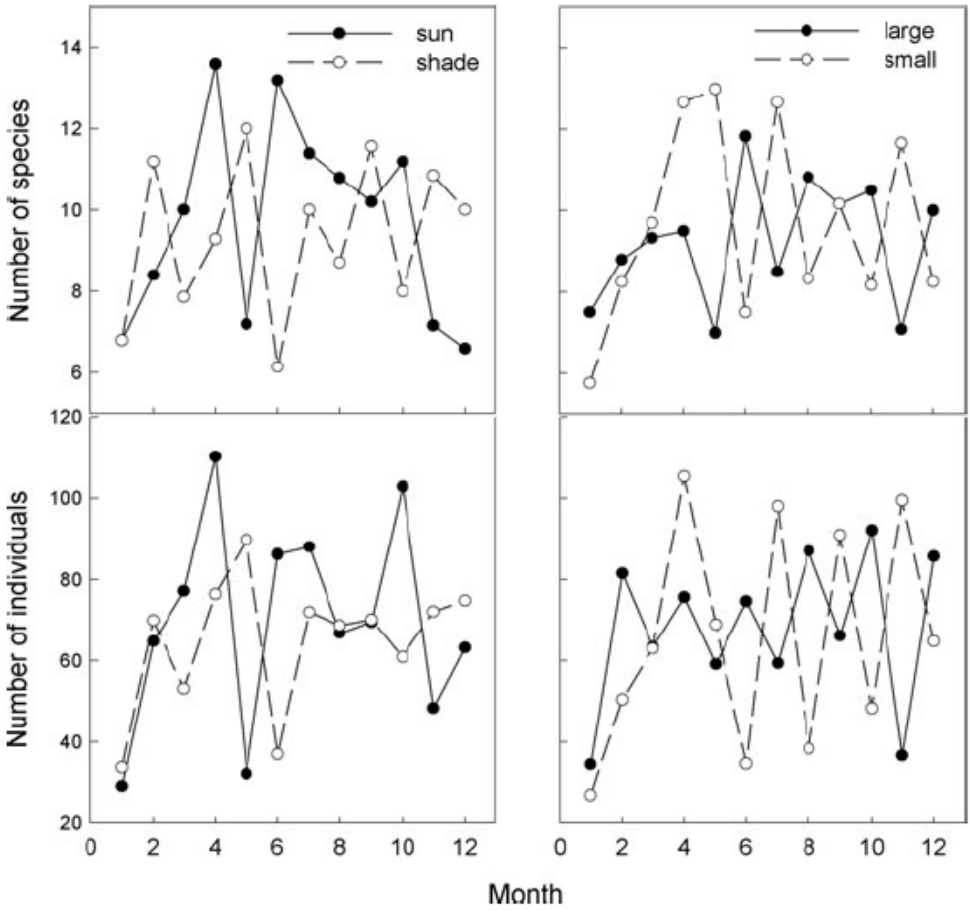


Figure 1. Mean numbers of species and individuals of ithomiine butterflies recorded per month in a 12-month study in large (n = 6) and small (n = 6) forest fragments in sun- (n = 5) and shade-coffee (n = 7) matrices in the northwestern Andes of Colombia. Month number 1 is December 2003.

Effects of Patch Size and Type of Coffee Matrix on Ithomiine Butterfly Diversity and Dispersal in Cloud-Forest Fragments

SANDRA B. MURIEL*†‡ AND GUSTAVO H. KATTAN*§

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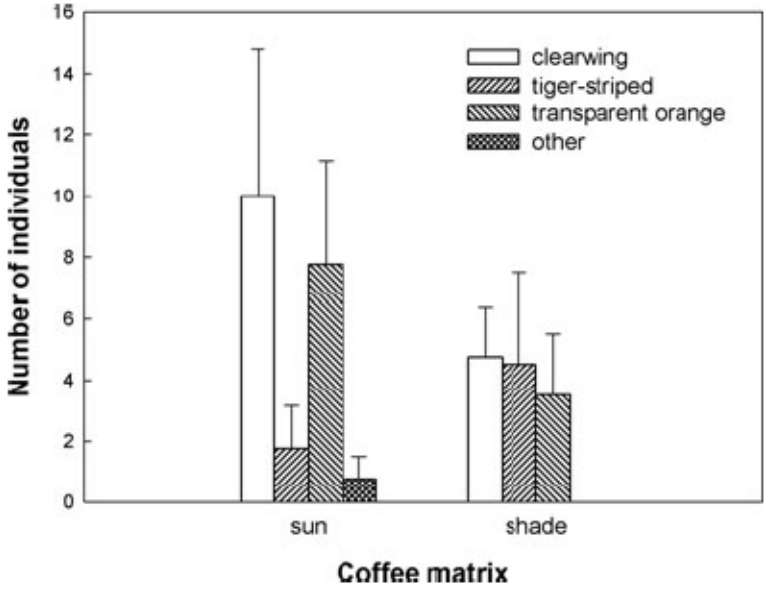


Figure 3. Abundance of ithomiine butterflies in four wing-color groups flying in sun- and shade-coffee matrix in the Colombian Andes.

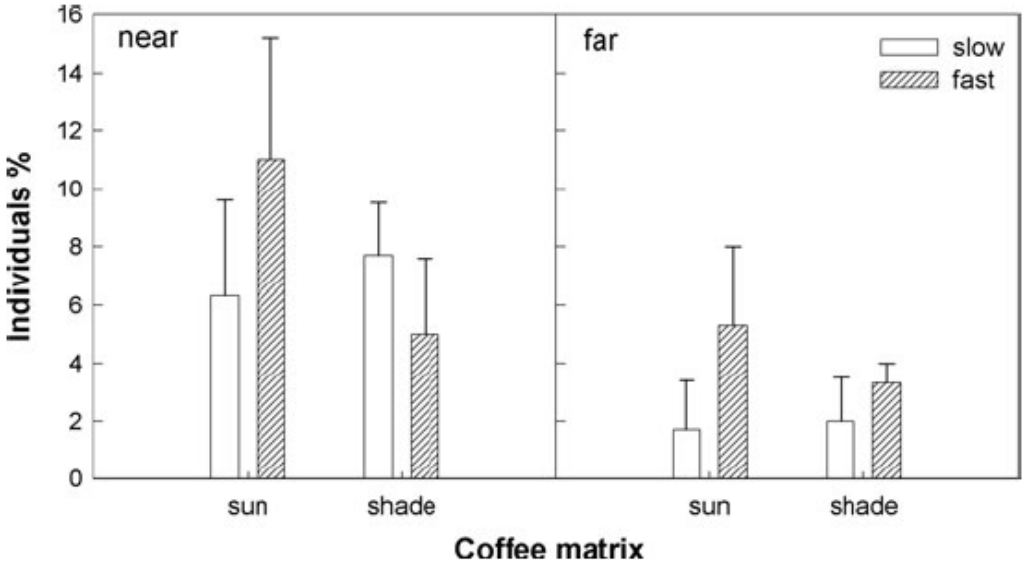


Figure 4. Flight speeds of ithomiine butterflies flying in sun- and shade-coffee matrix near (1–30 m) and far (300–500 m) from the forest fragment. Bars show percentage of individuals in each category.

Biodivers Conserv (2010) 19:1205–1223
DOI 10.1007/s10531-009-9750-z

REVIEW PAPER

Does the type of matrix matter? A quantitative review of the evidence

Jayme Augusto Prevedello · Marcus Vinícius Vieira

Abstract It has been increasingly recognized that the type of matrix surrounding habitat patches can affect biodiversity in landscapes, but there were only qualitative reviews of the subject focused on particular taxonomic groups. We present a quantitative review of studies from 1985 to 2008 that compared effects of different matrix types on individuals, populations and communities. We compiled 104 studies, most on animals, covering a broad range of landscape types and spatial scales. Most studies were empirical, focused on individuals and communities, and evaluated abundance/richness in the patch as the dependent variable. The type of matrix surrounding habitat patches influenced the studied parameters in 95% of the studies, but such effects were overall smaller compared to patch size or isolation effects. Matrix type effects were strongly species-specific, with different species responding differently to matrix type in 96% of studies comparing species or group of species. In 88% of studies, matrix types more similar in structure to the patch had higher quality for the studied organisms from the point of view of functional connectivity. Overall, the type of matrix is important, but patch size and isolation are the main determinants of ecological parameters in landscapes. Matrix quality generally increases with increasing structural similarity with habitat patches, a pattern that could be used as a general guideline for management of the matrix in fragmented landscapes.

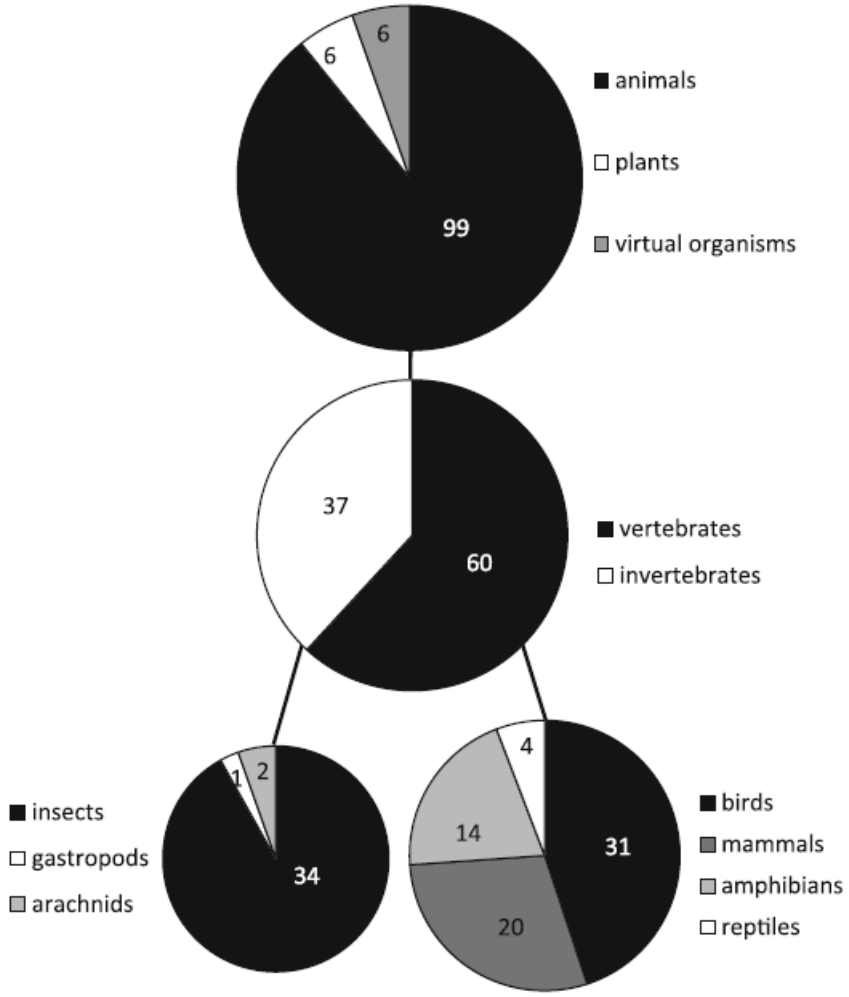


Fig. 2 Taxonomic groups studied in the papers evaluating matrix type effects on biodiversity. The number of studies in each group is indicated. Some papers studied more than one biological group

Matrix matters, Prevedello & Vieira

- Revisión de 104 estudios, 1985 a 2008
- Factores de diseño: efectos de tipo de matriz (comparación de dos o más tipos de matriz), área del parche y aislamiento
- Variables de respuesta: a nivel de individuos, poblaciones o comunidades (ver figura)

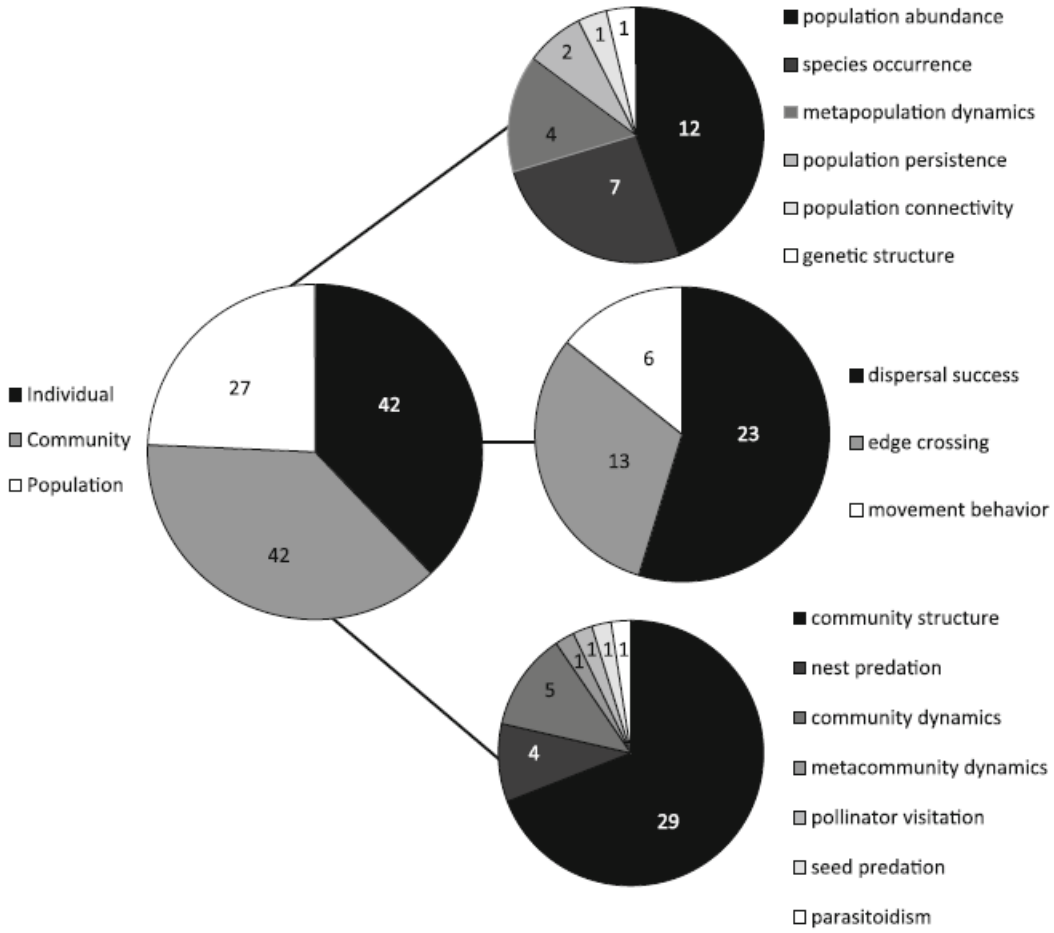


Fig. 3 Ecological approaches and main concepts studied in the papers evaluating matrix type effects on biodiversity

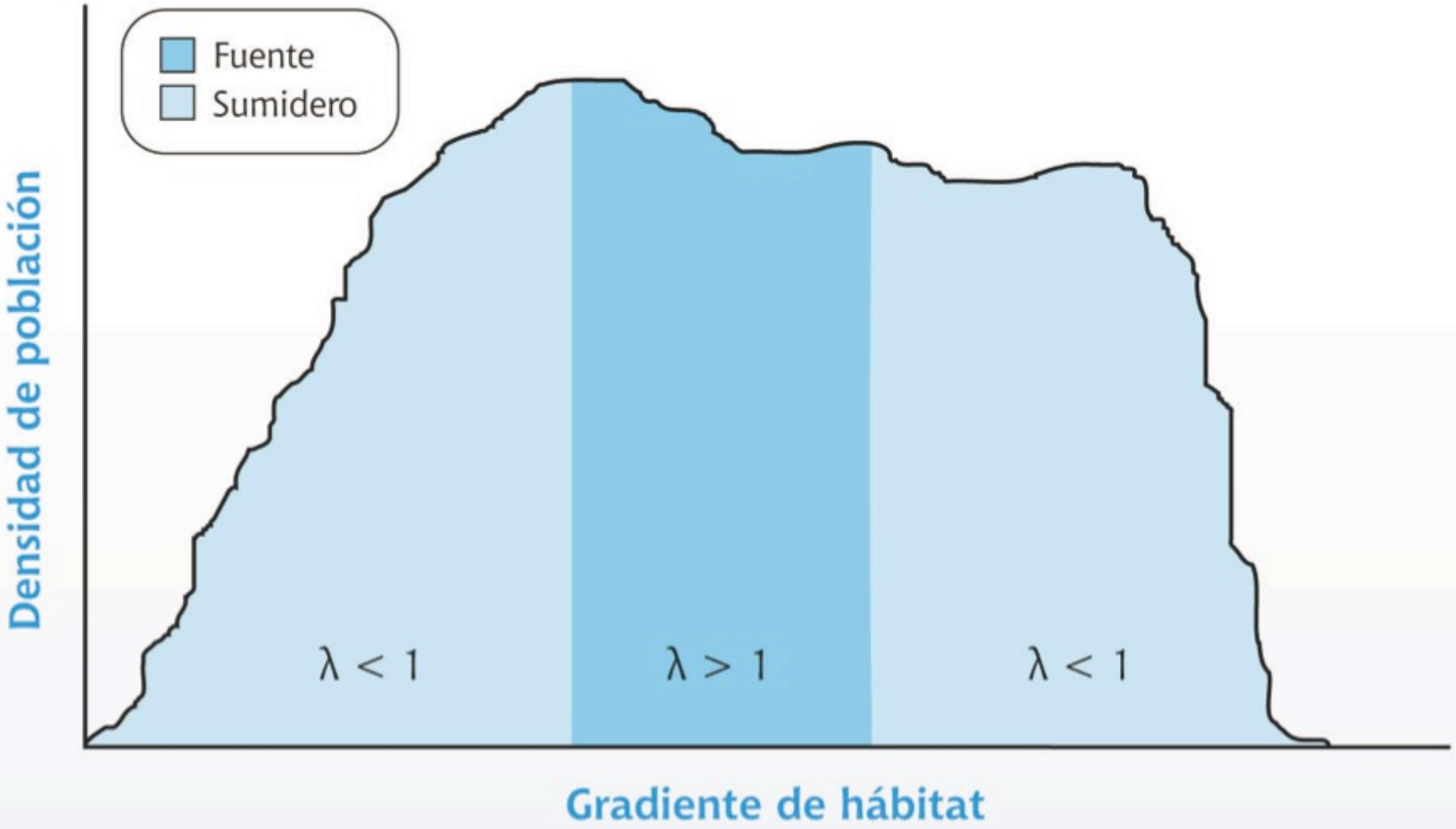
Matrix matters, Prevedello & Vieira

- Efectos significativos del tipo de matriz sobre la variable respuesta en prácticamente todos los estudios revisados
- Comparación de efecto de matriz (M) vs efecto de área/aislamiento (A/A): 41 estudios
- M > A/A – 13
- M = A/A – 5
- M < A/A – 23

Matrix matters, Prevedello & Vieira

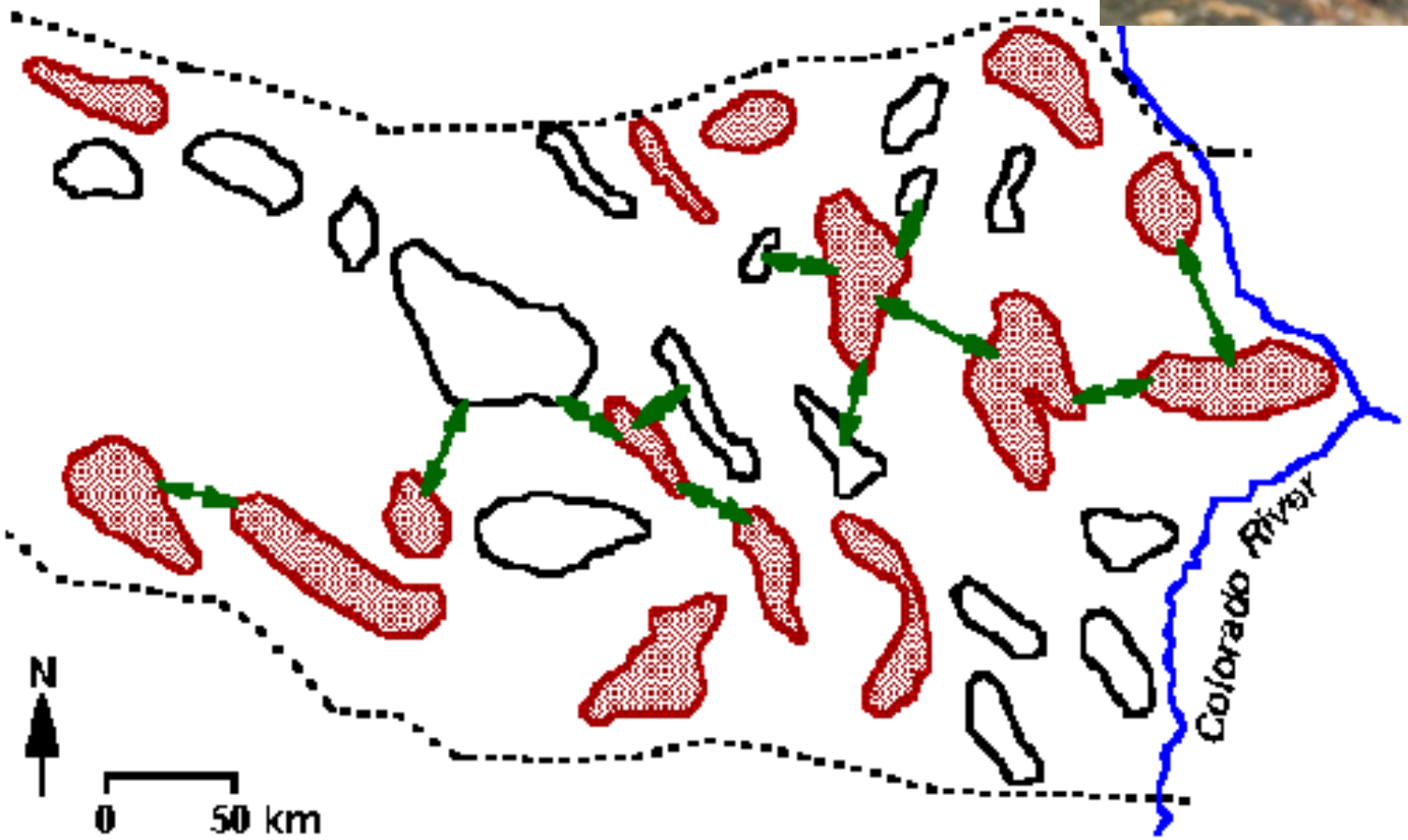
- Efectos de la matriz:
- Permeabilidad al movimiento – matrices más similares estructuralmente al parche tienen mayor calidad
- Calidad como hábitat
- Fuente de perturbaciones
- Los efectos de la matriz dependen de la especie/grupo taxonómico

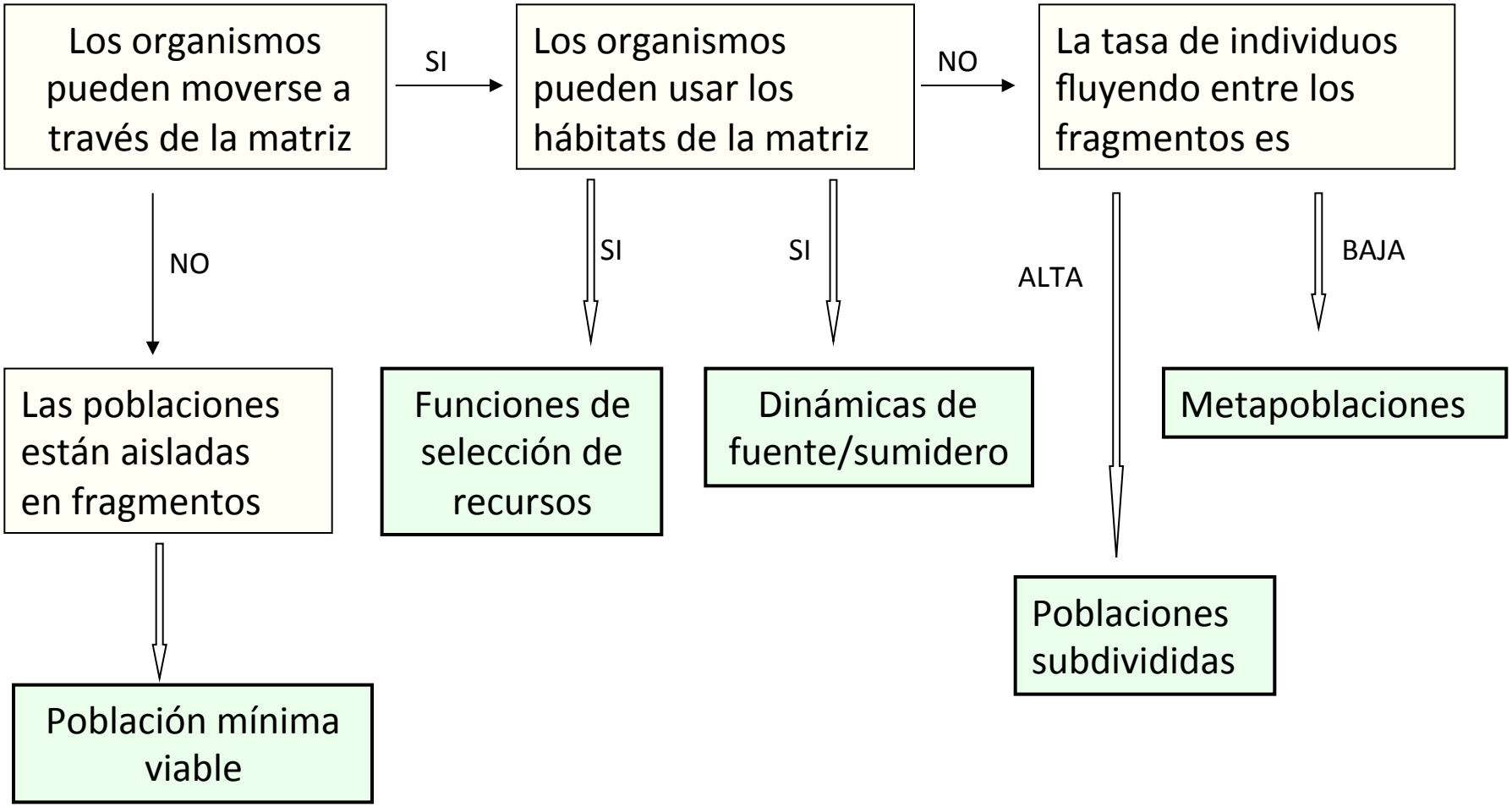
Modelo de dinámica de fuentes y sumideros para poblaciones de una especie distribuidas a lo largo de un gradiente simple, que representa qué tan apropiado es el hábitat para la especie, lo cual se ve reflejado en su densidad poblacional



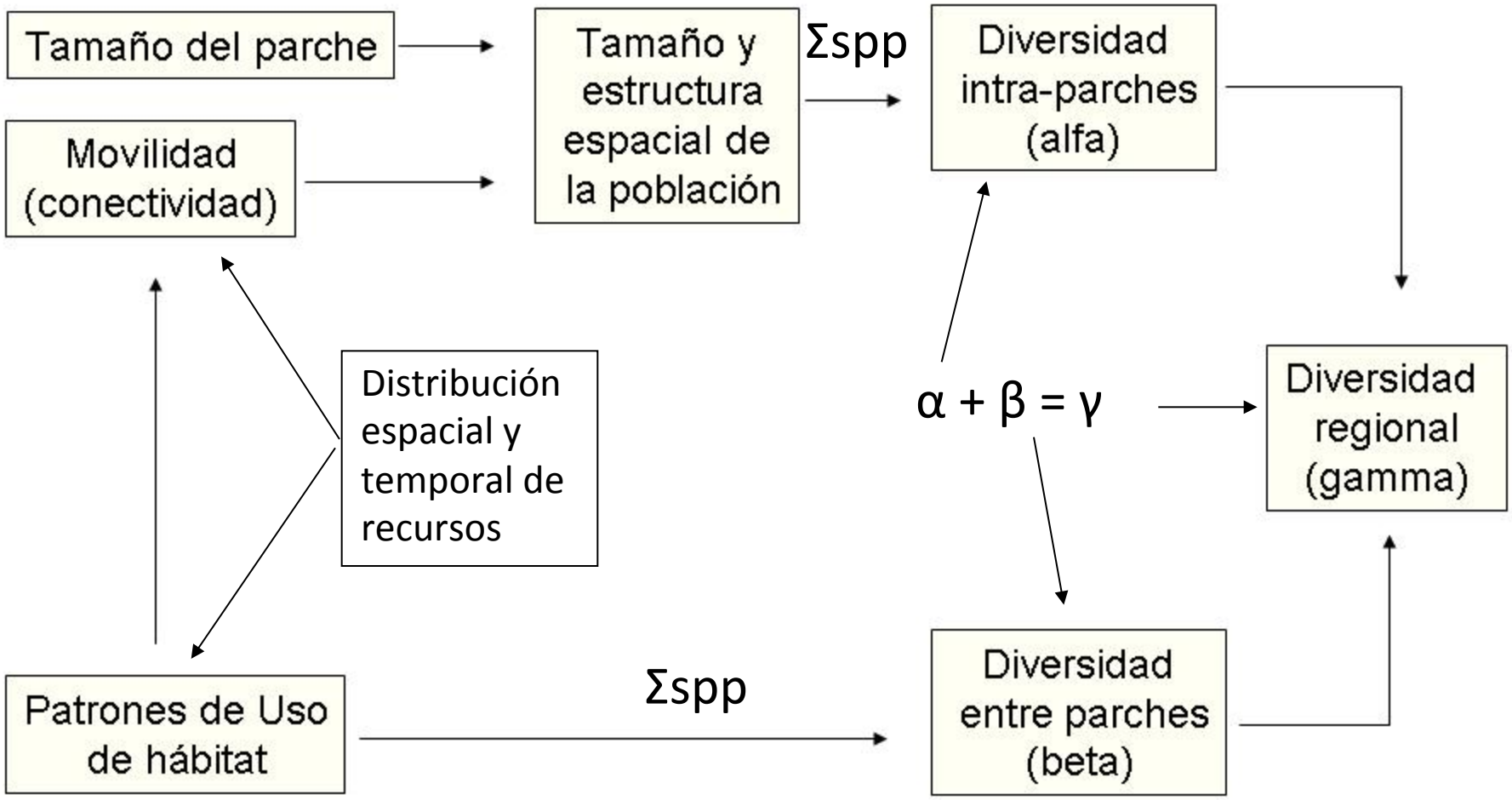
Metapoblaciones

Ovis canadensis




Los organismos pueden moverse a través de la matriz
SI
Los organismos pueden usar los hábitats de la matriz
NO
La tasa de individuos fluyendo entre los fragmentos es
NO
SI
SI
ALTA
BAJA
Las poblaciones están aisladas en fragmentos
Funciones de selección de recursos
Dinámicas de fuente/sumidero
Metapoblaciones
Poblaciones subdivididas
Población mínima viable

Poblaciones integradas en paisajes



G

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C

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S