Ecologia Urbana

Aula 5 - Padrões em larga escala
(Macroecologia de cidades)

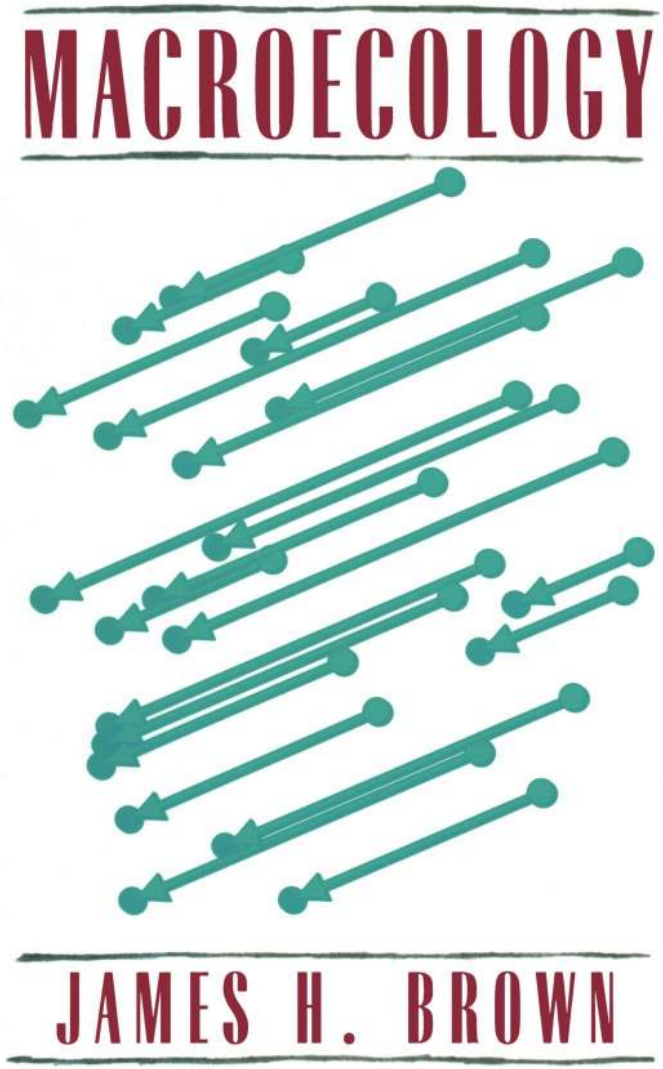
1989

Articles

Macroecology: The Division of Food and Space Among Species on Continents

JAMES H. BROWN AND BRIAN A. MAURER

3 MARCH 1989 ARTICLES 1145

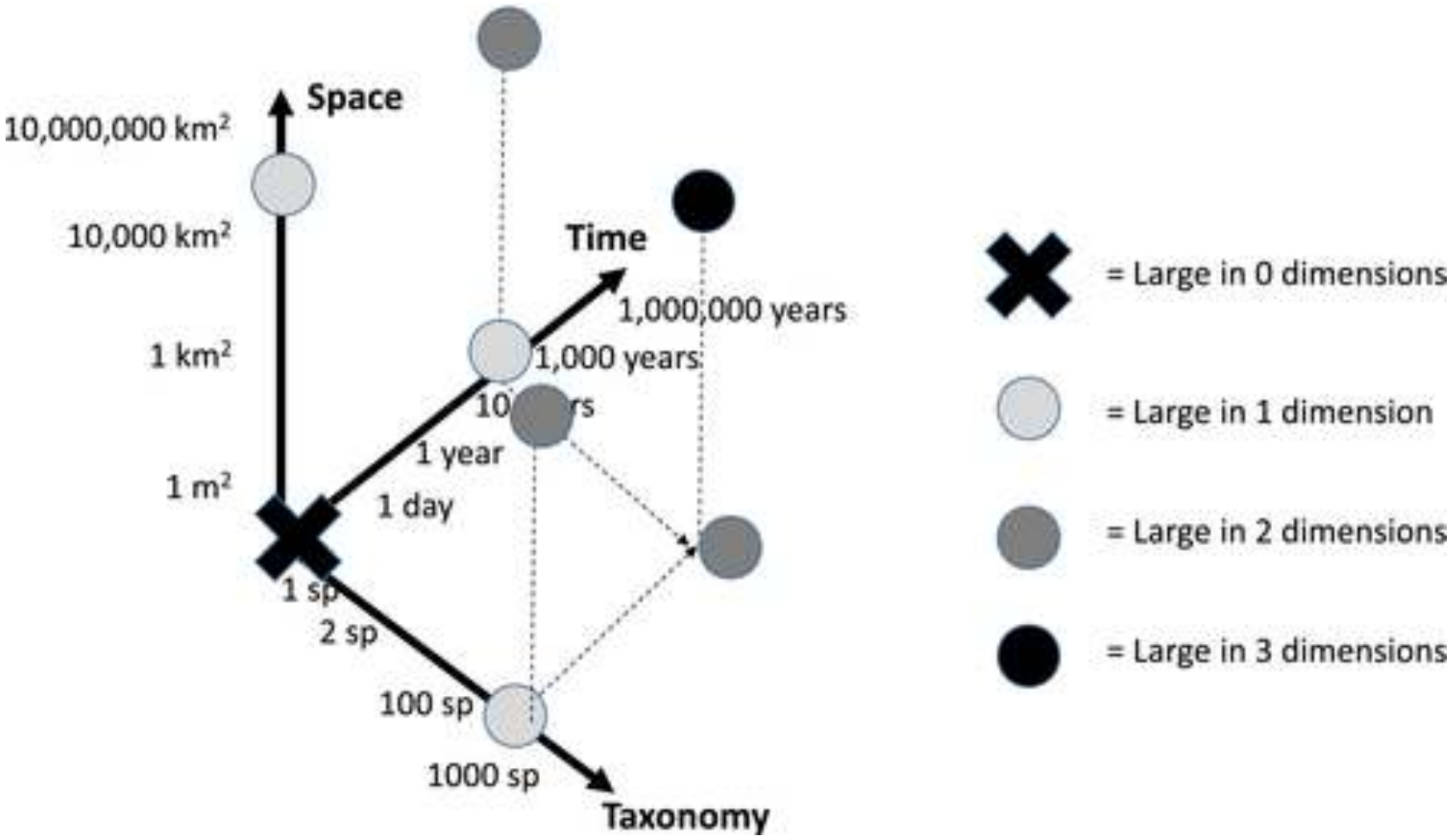


1995

Definição de Macroecologia

"Investigação não experimental, estatística das relações entre a dinâmica e interações de populações de espécies que tem sido tipicamente estudadas em pequenas escalas por ecólogos e os processos de especiação, extinção e expansão e contração de range que são investigados numa escala muito maior por biogeógrafos, paleontólogos, e macroevolucionistas."

Brown, 1995

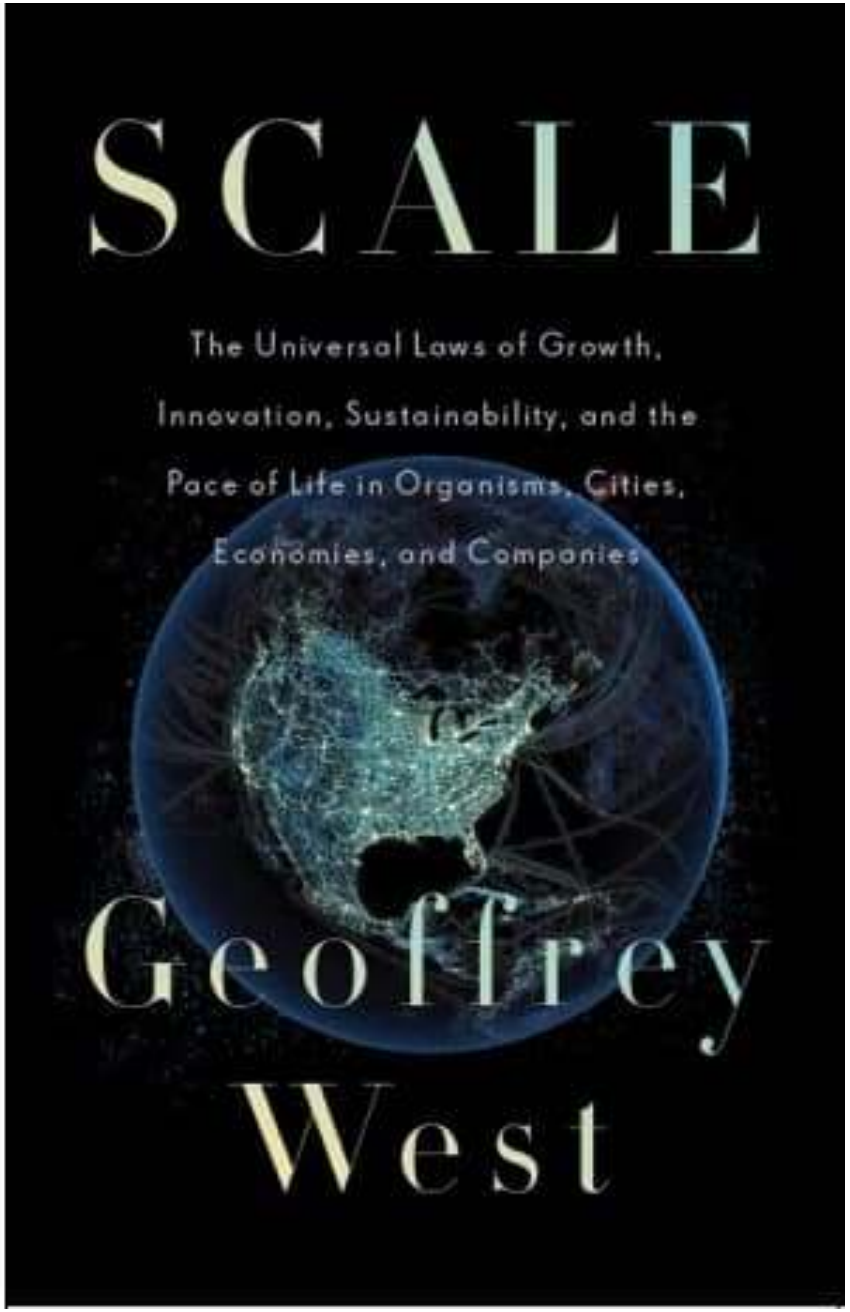


Global Ecology and Biogeography, Volume: 28, Issue: 1, Pages: 6-17, First published: 27 December 2018, DOI: (10.1111/geb.12855)

Ciência da Complexidade
Sistemas complexos

Macroecologia e SFI

- James Brown, Geoffrey West e Brian Enquist começaram a trabalhar em conjunto no SFI
- Macroecologia passou a tratar espécies como "partículas"
  - Buscar generalização => comportamento de um gás
  - Explicação da relação entre tamanho do corpo e outras variáveis (tamanho da prole, tempo de vida, metabolismo etc)
- Abordagem foi expandida por West para outros sistemas, incluindo cidades



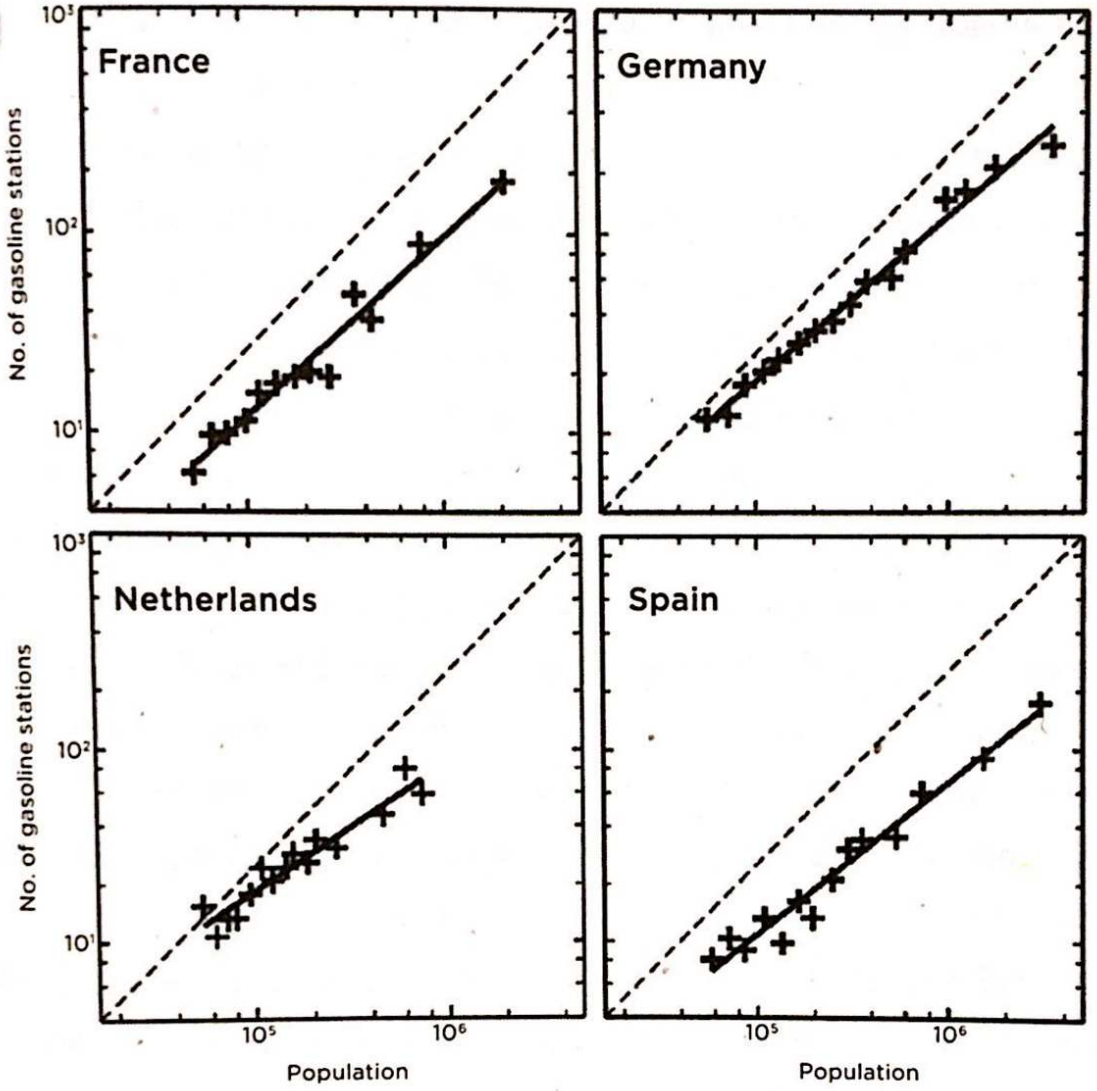
2017

5

FROM THE ANTHROPOCENE TO THE URBANOCENE

A Planet Dominated by Cities

FIG. 33



The number of gasoline stations plotted logarithmically against the size of cities in four European nations showing that they all scale sublinearly with a similar exponent. The dotted line has a slope of 1 and indicates linear scaling.

FIG. 39

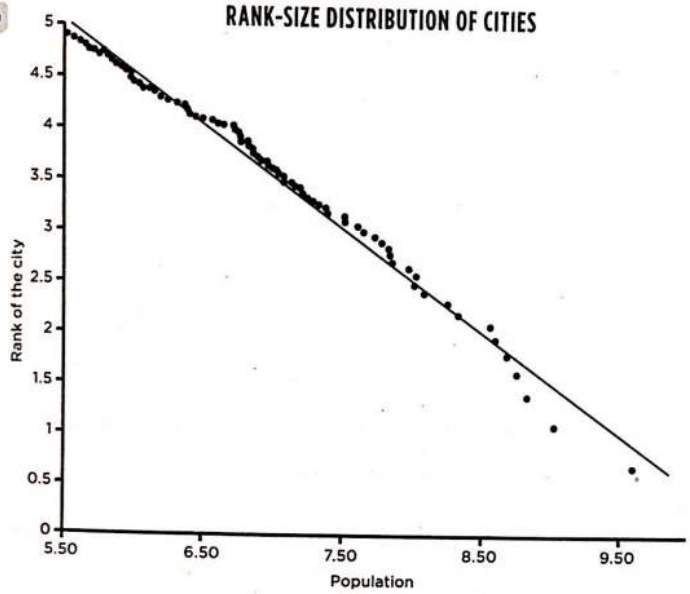

RANK-SIZE DISTRIBUTION OF CITIES
Rank of the city
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
5.50
6.50
7.50
8.50
9.50
Population

FIG. 40

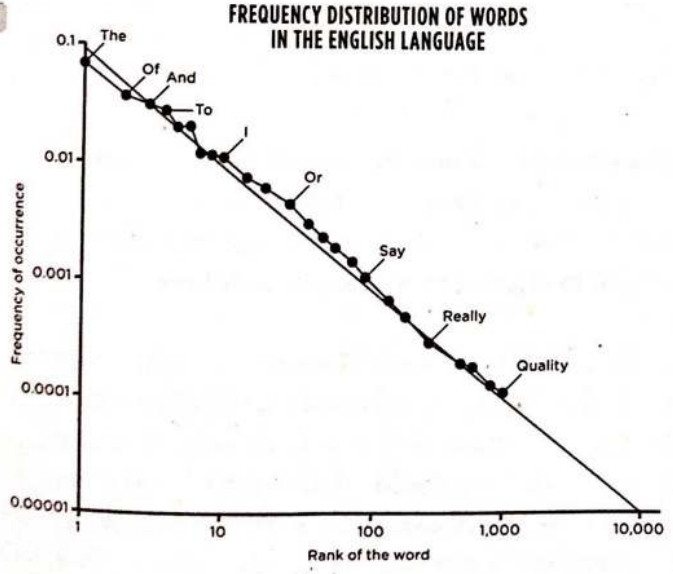
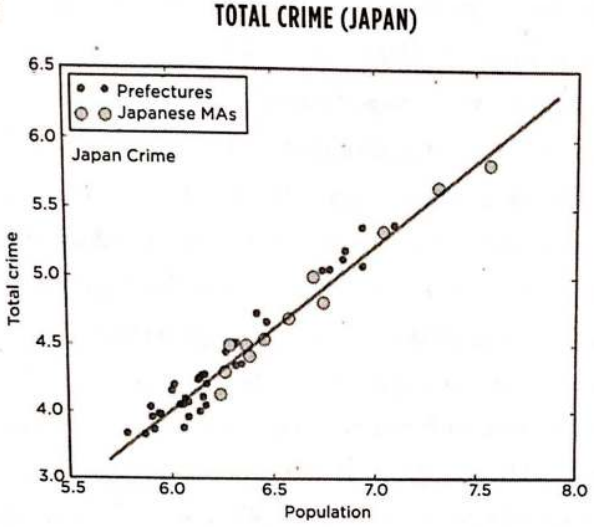

FREQUENCY DISTRIBUTION OF WORDS
IN THE ENGLISH LANGUAGE
Frequency of occurrence
0.1
0.01
0.001
0.0001
0.00001
The
Of
And
To
I
Or
Say
Really
Quality
1
10
100
1,000
10,000
Rank of the word

FIG. 36



Slope = 1.21 [1.08, 1.35]

FIG. 37

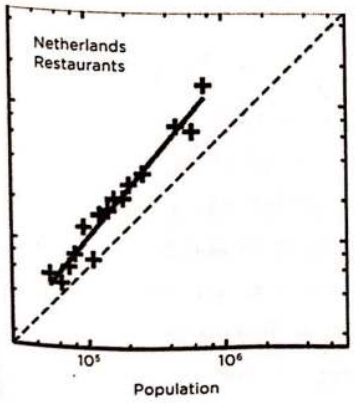
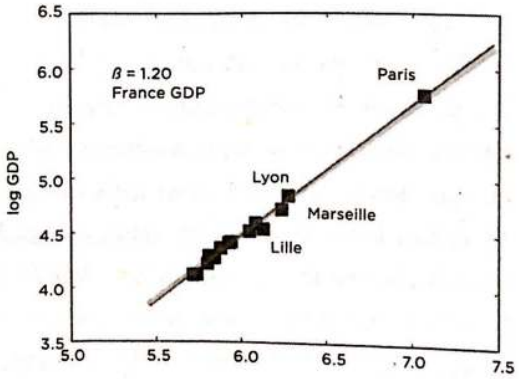


FIG. 38



Opposite and this page: The scaling of a variety of socioeconomic metrics as a function of population size in a number of different urban systems showing the remarkable similarity of their superlinear exponents (the slopes of all the graphs are close to the same value of 1.15): (34 top) Wages in the United States. (34 bottom) The number of professional people ("supercreatives") in the United States. (35) The number of patents produced in the United States.[4] (36) Crime in Japan. (37) Restaurants in the Netherlands. (38) GDP in France.

FIG. 34

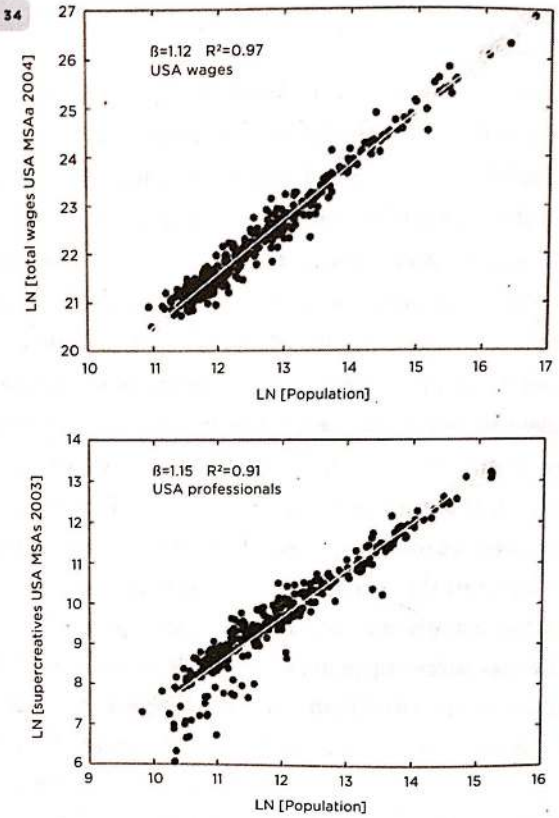
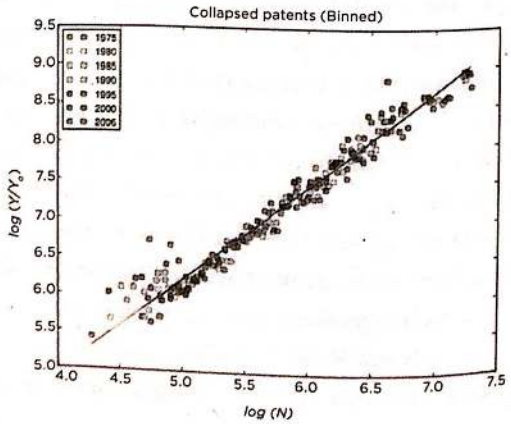


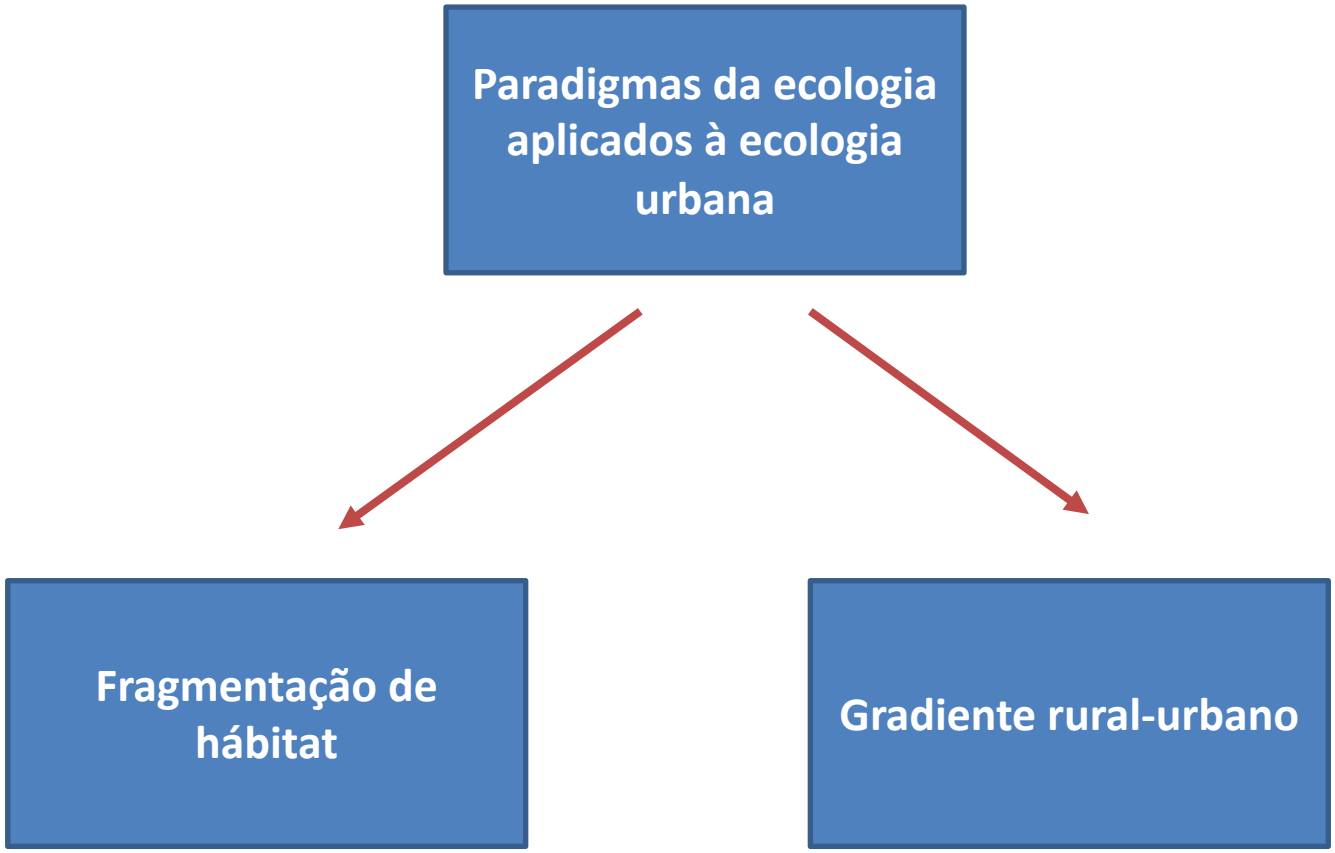
FIG. 35

INNOVATION MEASURED BY PATENTS



Macroecologia de cidades

- Em nível global a densidade populacional humana -> proxy para urbanização
- Diversidade de pássaros não é alterada na escala regional, mas sim localmente
  - Heterogeneidade de hábitats é mantida na região, mas não na escala de cidades
- Mesmo padrão se repete para espécies ameaçadas, introduzidas e endêmicas


Paradigmas da ecologia aplicados à ecologia urbana
Fragmentação de hábitat
Gradiente rural-urbano

ECOLOGY LETTERS

Ecology Letters, (2014) doi: 10.1111/ele.12297

LETTER

Urbanisation tolerance and the loss of avian diversity

Daniel Sol,[1,2*†] Cesar González-Lagos,[1,3†] Darío Moreira,[4] Joan Maspons[1] and Oriol Lapiedra[1]

Abstract

Urbanisation is considered an important driver of current biodiversity loss, but the underlying causes are not fully understood. It is generally assumed that this loss reflects the fact that most organisms do not tolerate well the environmental alterations associated with urbanisation. Never-

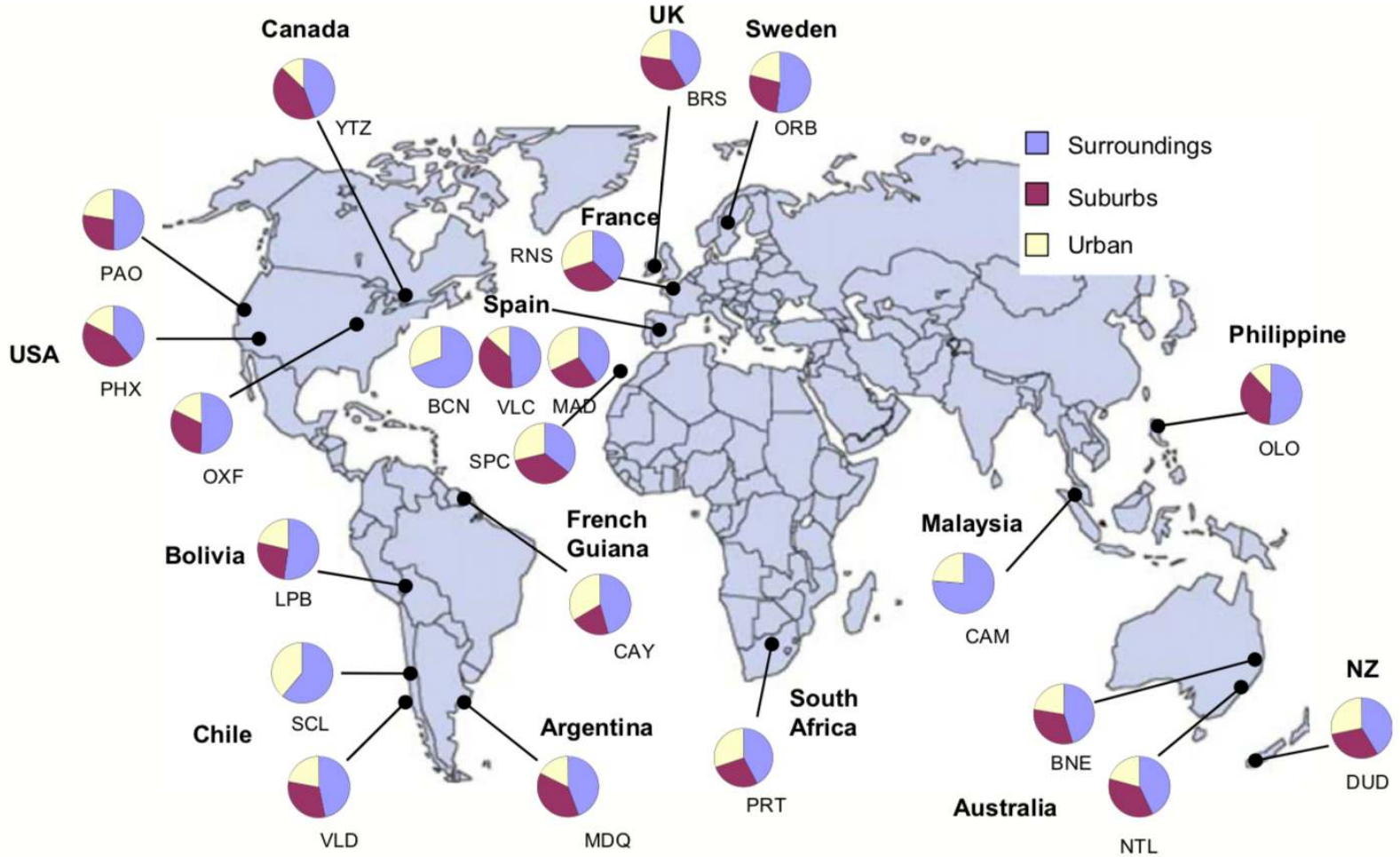


Table 1 Best model accounting for differences between urban avoiders and urban exploiters based on a MCMCglmm including region, species and phylogeny as random factors

	UA vs. UE (n = 358)				RUA vs. UE (n = 268)
	Post. mean	Lower 95% CI	Upper 95% CI	pMCMC	pMCMC
Fixed effects					
(Intercept)	−16.44	−33.75	−2.00	0.006	0.024
Brood value	−8.68	−16.75	−1.68	0.002	<0.001
Habitat breadth	6.50	−5.63	17.16	0.214	0.044
Social breeding					
Colonial	0.00	–	–	–	–
Facultative	−1.52	−7.97	4.88	0.654	0.096
Solitary	−5.48	−12.00	−0.26	0.026	<0.001
Nest site					
Ground	0.00	–	–	–	–
Holes	4.54	−1.59	11.20	0.091	0.026
Other	1.69	−3.80	7.17	0.524	0.821
Season					
Non-reproductive	0.00	–	–	–	–
Reproductive	−1.43	−3.51	0.65	0.172	0.034
Random effects					
Location	22.00	2.06	60.75	–	–
Species	32.49	2.73	84.51	–	–
Phylogeny	56.34	0.01	196.10	–	–

Each variable is tested together with the other variables. MCMC P-values for fixed effects are also provided for differences between strict urban avoiders and urban exploiters. CI = Confidence interval; UA = urban avoiders; RUA = strict urban avoiders; UE = Urban exploiters.

ECOLOGY LETTERS

Ecology Letters, (2017) doi: 10.1111/ele.12769

LETTER

Urbanisation and the loss of phylogenetic diversity in birds

Daniel Sol,[1,2]* Ignasi Bartomeus,[3] César González-Lagos[4,5] and Sandrine Pavoine[6]

Abstract

Despite the recognised conservation value of phylogenetic diversity, little is known about how it is affected by the urbanisation process. Combining a complete avian phylogeny with surveys along urbanisation gradients from five continents, we show that highly urbanised environments supported on average 450 million fewer years of evolutionary history than the surrounding natural

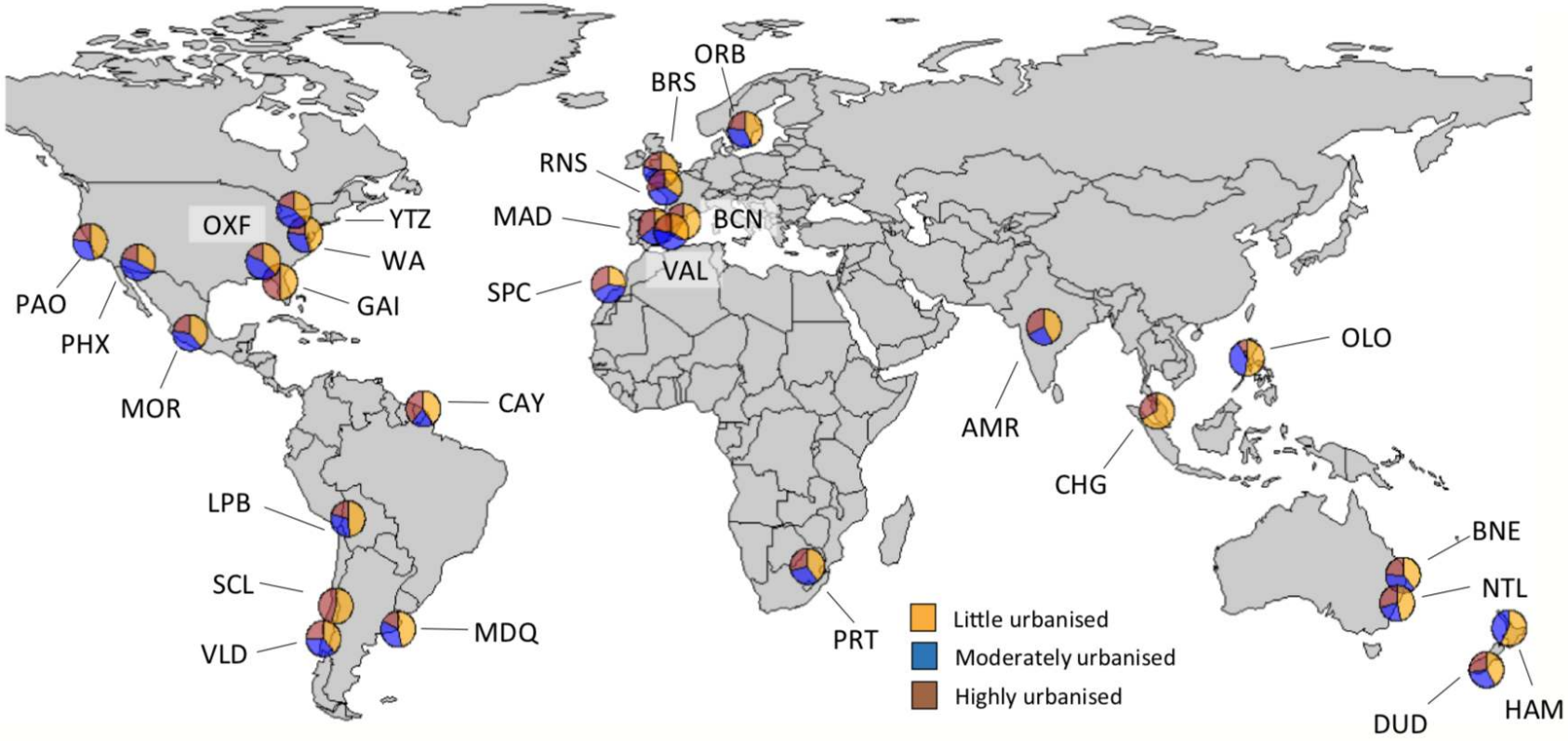


Figure 1 Worldwide location of the study regions, showing the proportion of Faith's phylogenetic diversity (PD) according to the degree of urbanisation. The abbreviations for the regions are in the Appendix S2. Note that not all the regions contain all the habitats.

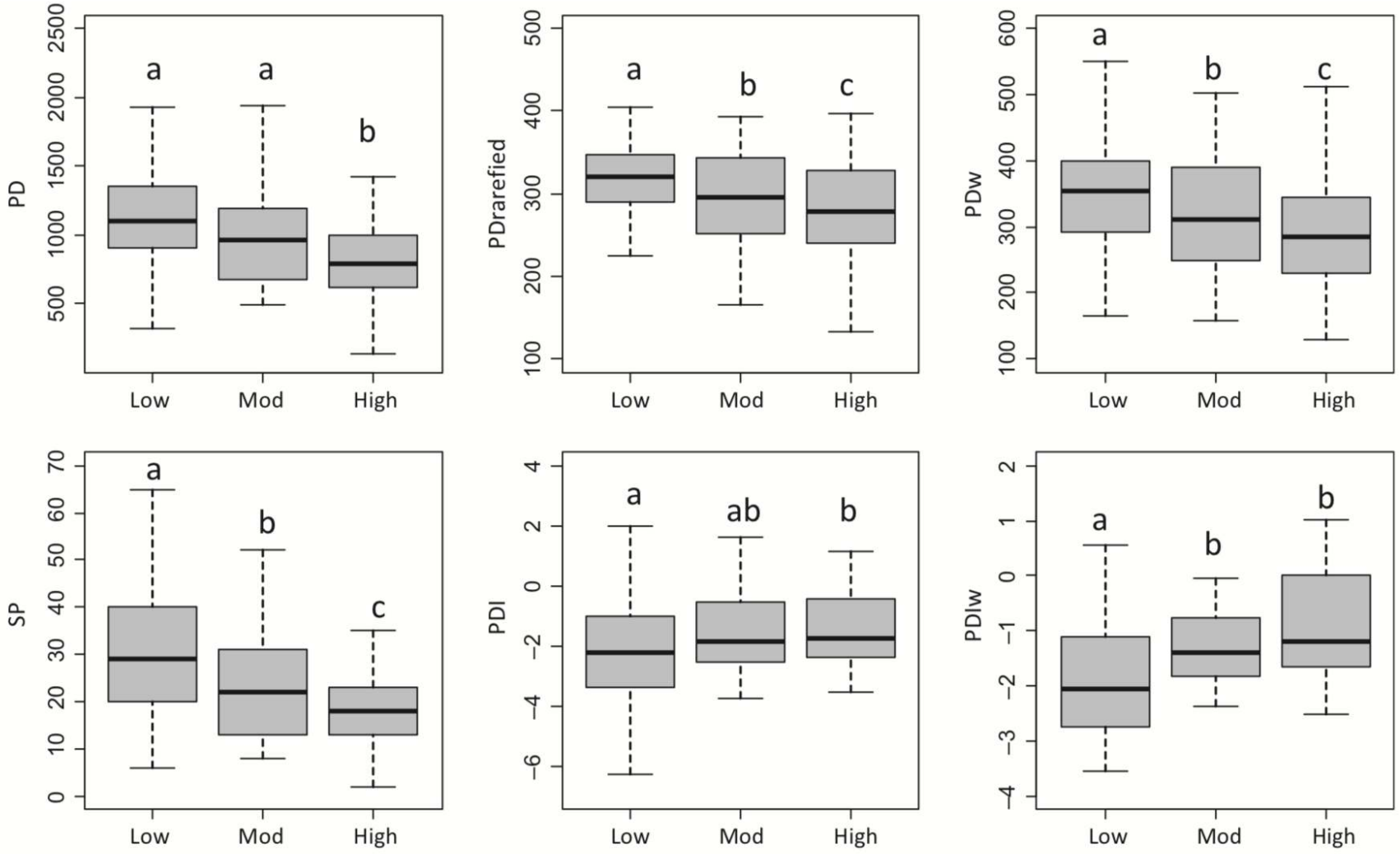


Figure 2 Differences in phylogenetic richness (PD, in million years), rarefied phylogenetic richness (PDrarefied), phylogenetic richness taking into account species relative abundance (PDw), species richness (SP), and standardised effect sizes of PD (PDI) and PDw (PDIw) among little urbanised (low), moderately urbanised (mod) and highly-urbanised (high) environments for native species. Letters indicate differences among habitats at $P < 0.05$ (see Tables S1 and 3, S5 and 6 for full models), examined by changing the level of reference with which the other habitats are compared.

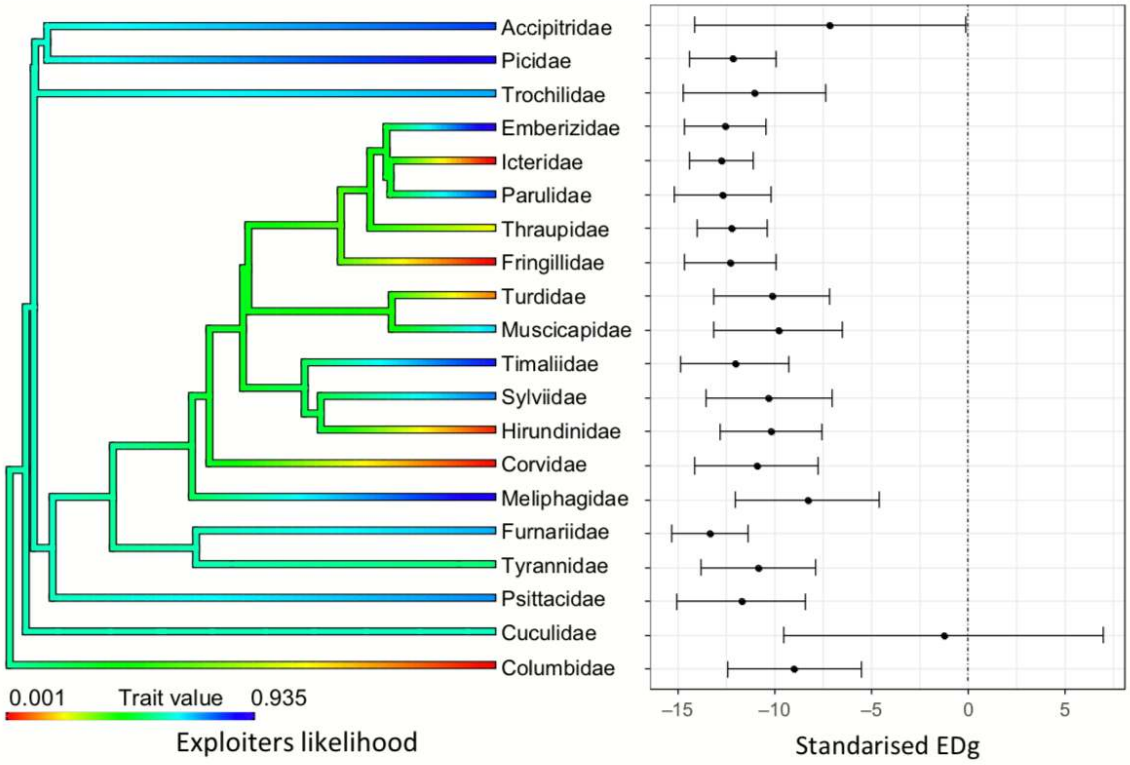


Figure 4 Left panel, family level variation in the likelihood to contain urban exploiters. Values close to 0 indicate that the family has more urban exploiters than expected by chance whereas values close to 1 suggest that the family has less exploiters than expected by chance. States of internal nodes are Maximum Likelihood reconstructions as implemented in the function "contMap" of Phytools (Revell 2011). Only families with 15 or more species are presented. For more details, see Table S7. Right panel, evolutionary distinctiveness (EDg) averaged for all the species of each family and standardised by substracting the EDg averaged across all avian families. Confidence intervals represent ± standard deviations. Values below zero indicate that the family has an EDg lower than the mean estimated for all the avian families.

ECOLOGY LETTERS

Ecology Letters, (2015) **18**: 581–592 doi: 10.1111/ele.12427

REVIEW AND SYNTHESIS

Biodiversity in cities needs space: a meta-analysis of factors determining intra-urban biodiversity variation

Joscha Beninde,[1]* Michael Veith[1] and Axel Hochkirch[1]

Abstract

Understanding varying levels of biodiversity within cities is pivotal to protect it in the face of global urbanisation. In the early stages of urban ecology studies on intra-urban biodiversity focused

Ecology Letters, Volume: 18, Issue: 6, Pages: 581-592, First published: 10 April 2015, DOI: (10.1111/ele.12427)

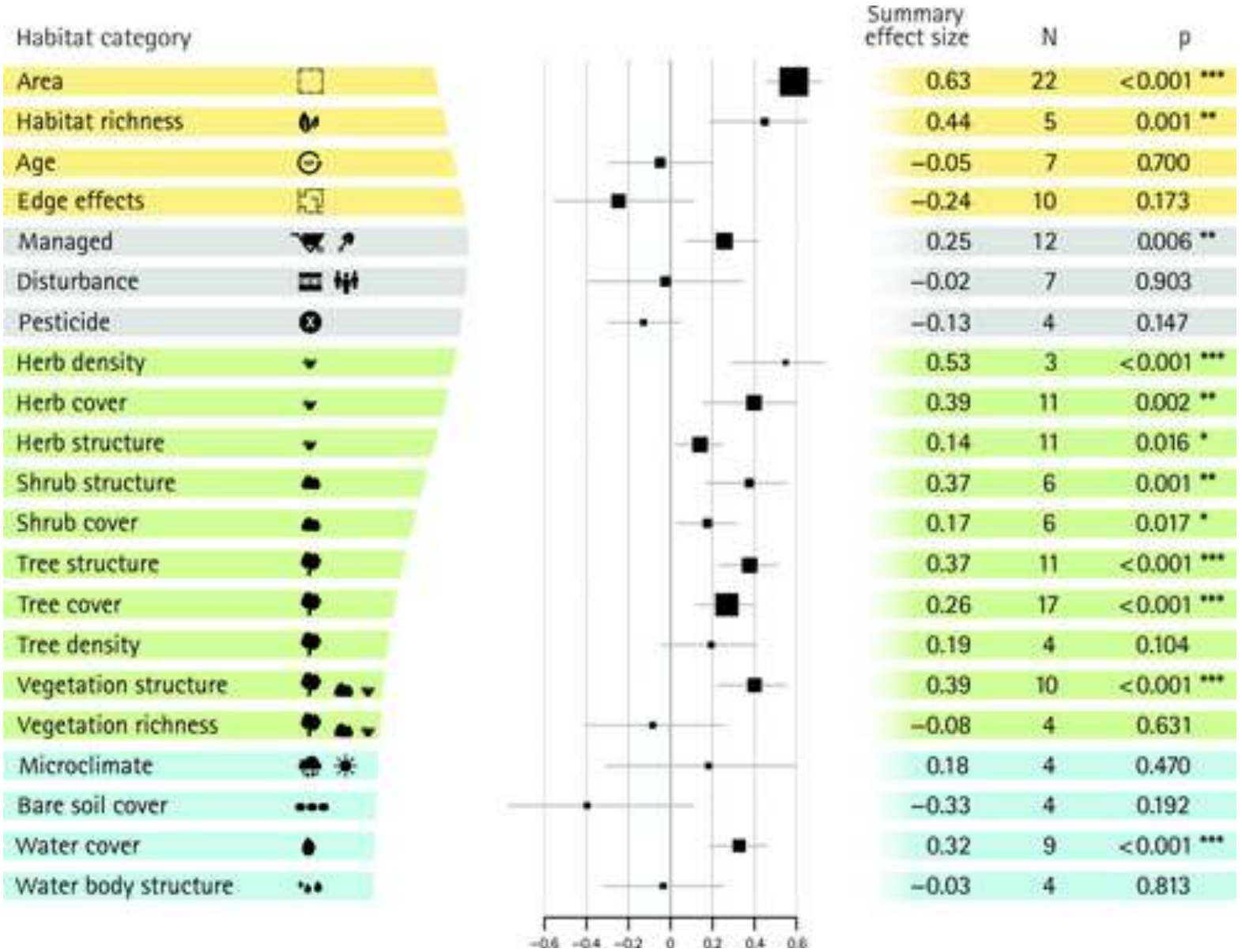


Figure 3 Summary effect sizes of random-effect models for all local factors calculated for species richness; size of square of summary effect corresponds to sample size of model. Orange: design variables; grey: management variables; green: biotic variables; blue: abiotic variables.

Ecology Letters, Volume: 18, Issue: 6, Pages: 581-592, First published: 10 April 2015, DOI: (10.1111/ele.12427)

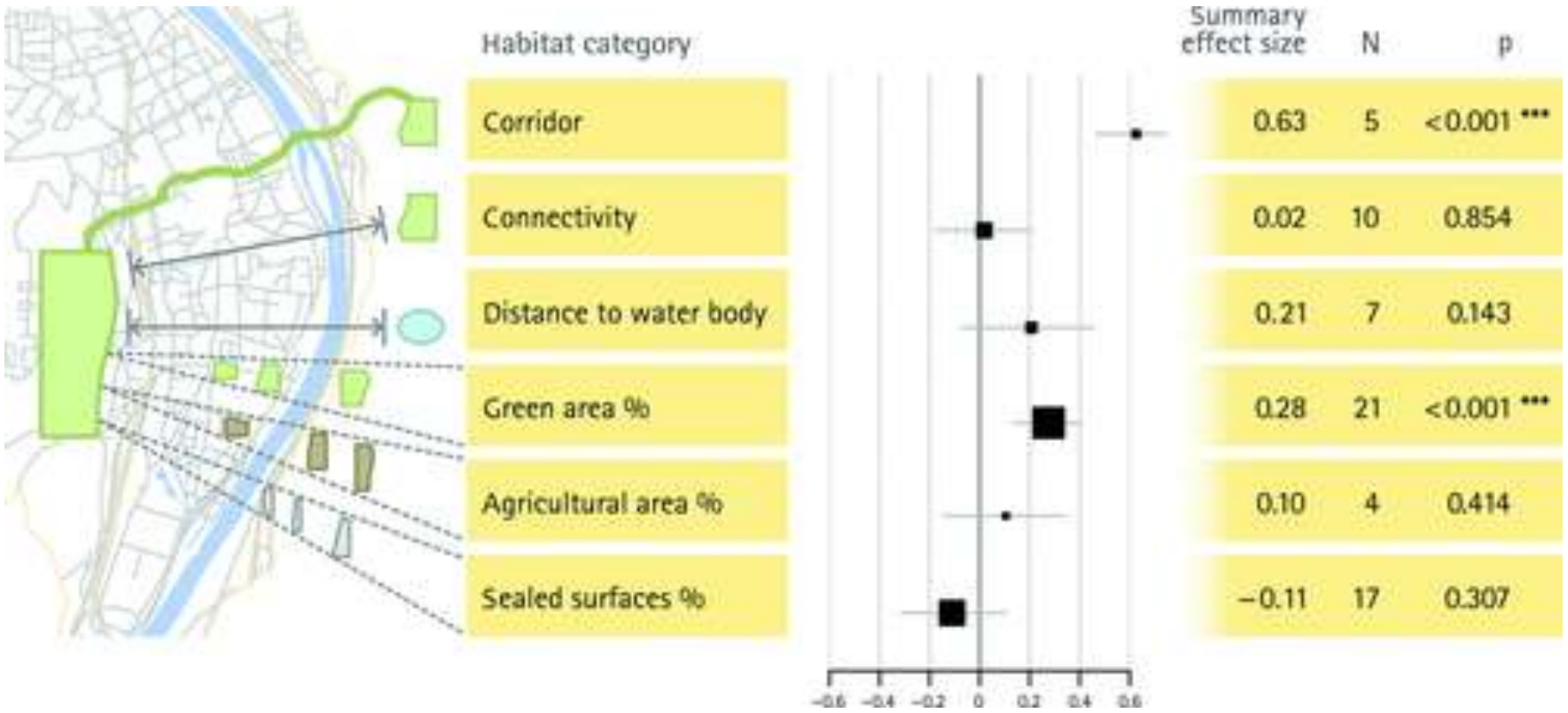


Figure 4 Summary effect sizes of random-effect models for all landscape factors calculated for species richness; size of square of summary effect corresponds to sample size of model. Orange: design variables.

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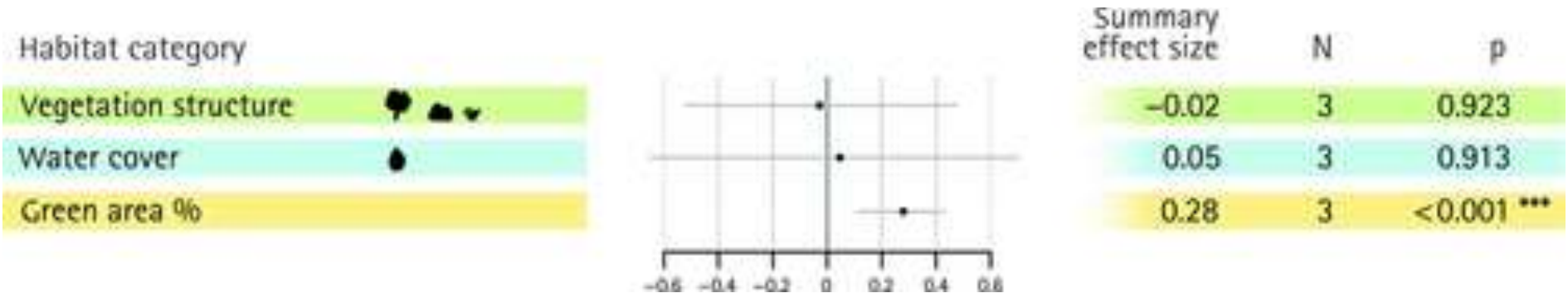


Figure 5 Summary effect sizes of random-effect models for all variables calculated for species diversity; size of square of summary effect corresponds to sample size of model. Orange: design variables; green: biotic variables; blue: abiotic variables.

Ecology Letters, Volume: 18, Issue: 6, Pages: 581-592, First published: 10 April 2015, DOI: (10.1111/ele.12427)

ECOLOGY LETTERS

Ecology Letters, (2019) **22**: 365–376 doi: 10.1111/ele.13199

LETTER

One strategy does not fit all: determinants of urban adaptation in mammals

Luca Santini,[1]* Manuela González-Suárez,[2] Danilo Russo,[3] Alejandro Gonzalez-Voyer,[4] Achaz von Hardenberg[5] and Leonardo Ancillotto[3]

Abstract

Urbanisation exposes wildlife to new challenging conditions and environmental pressures. Some mammalian species have adapted to these novel environments, but it remains unclear which characteristics allow them to persist. To address this question, we identified 190 mammals regularly recorded in urban settlements worldwide, and used phylogenetic path analysis to test hypotheses regarding which behavioural, ecological and life history traits favour adaptation to urban environments for different mammalian groups. Our results show that all urban mammals produce larger

One strategy does not fit all: determinants of urban adaptation in mammals

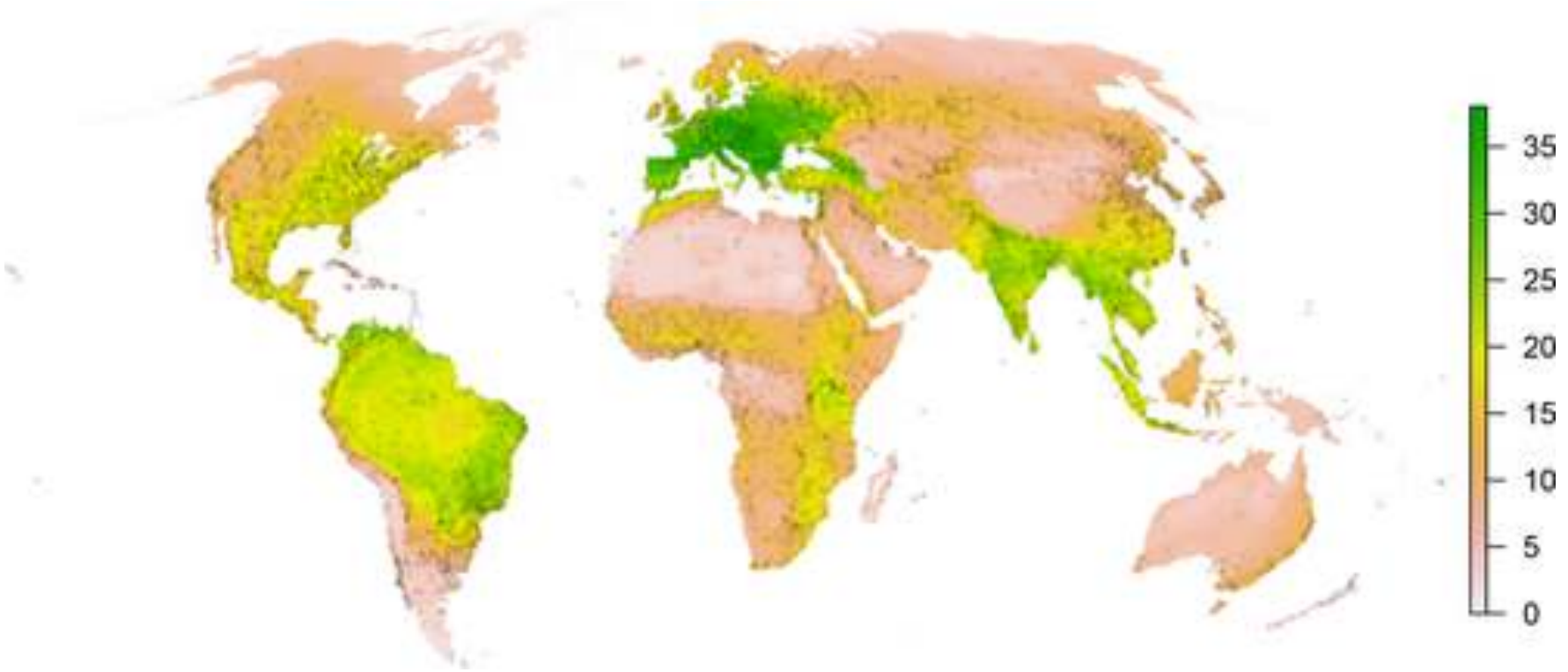
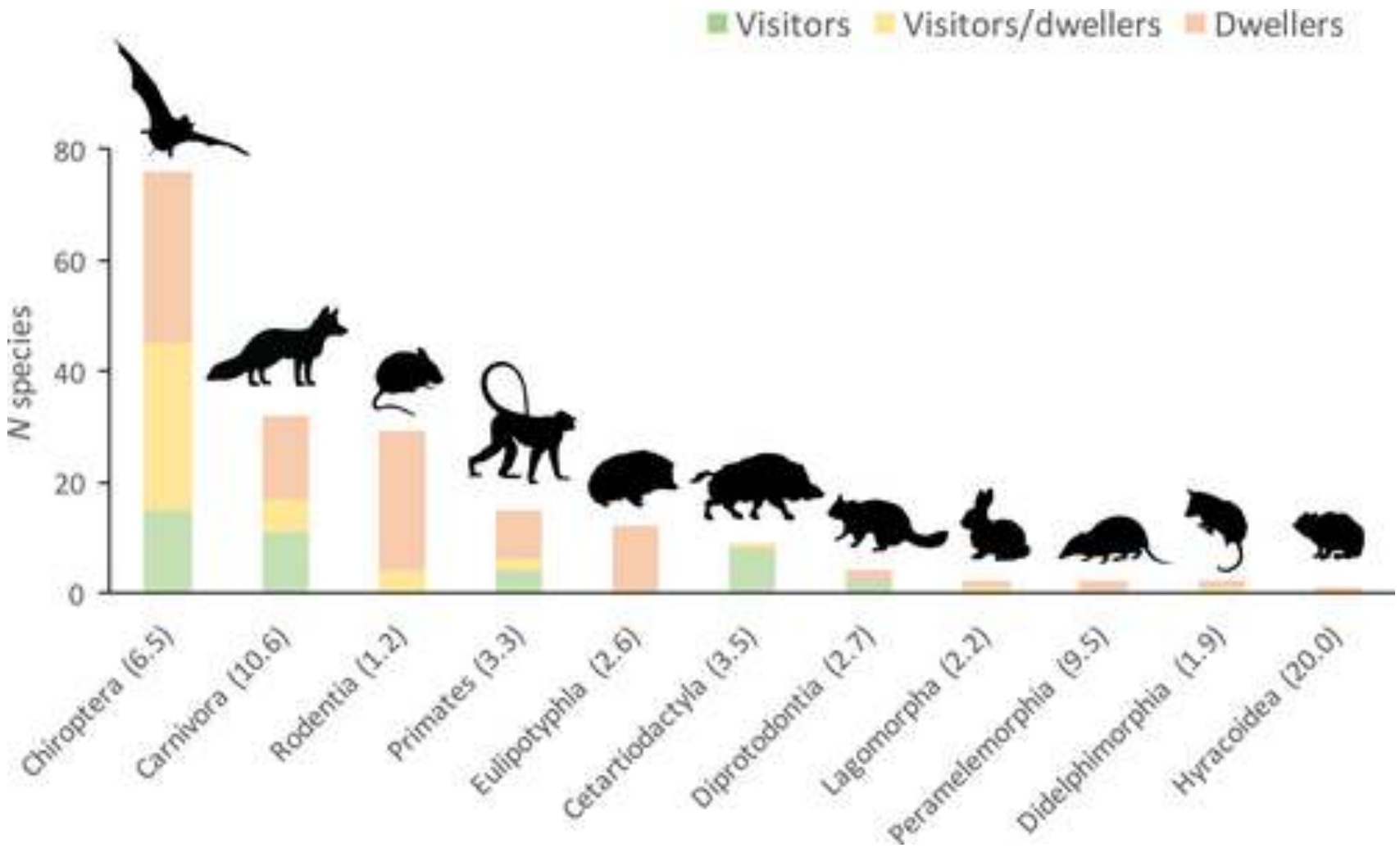


Figure 1 Species richness map of urban mammals. Circles represent urban settlements with > 10 000 people.

Ecology Letters, Volume: 22, Issue: 2, Pages: 365-376, First published: 20 December 2018, DOI: (10.1111/ele.13199)

One strategy does not fit all: determinants of urban adaptation in mammals



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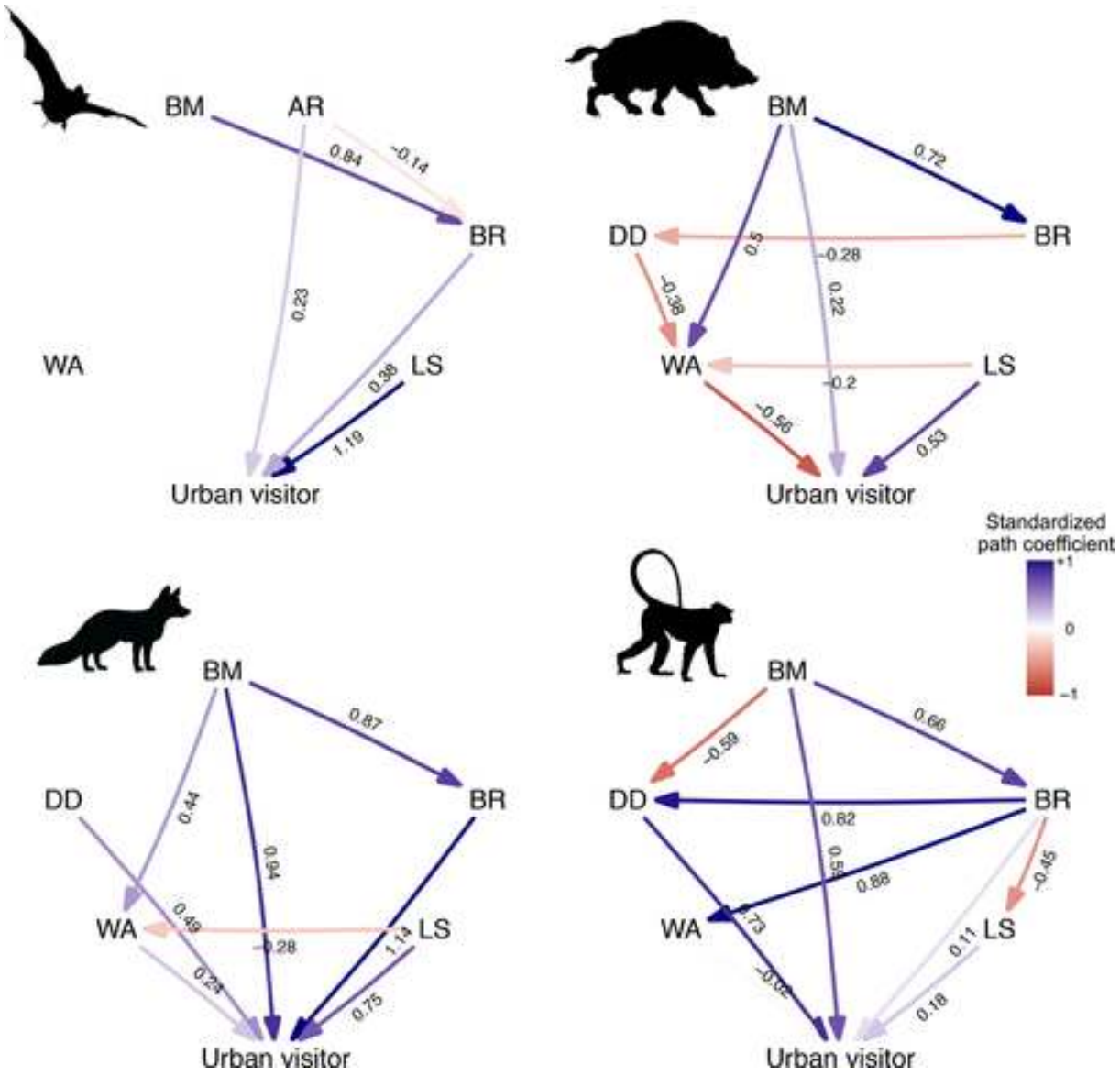

Figure 3 Average models for urban visitors. Values represent standardised average coefficients. BM = Body mass; AR = Aspect Ratio; DD = Diet diversity (not modelled in bats); BR = Brain mass; WA = Weaning age; LS = Litter size. Silhouettes indicate mammalian orders as in Fig. 1.

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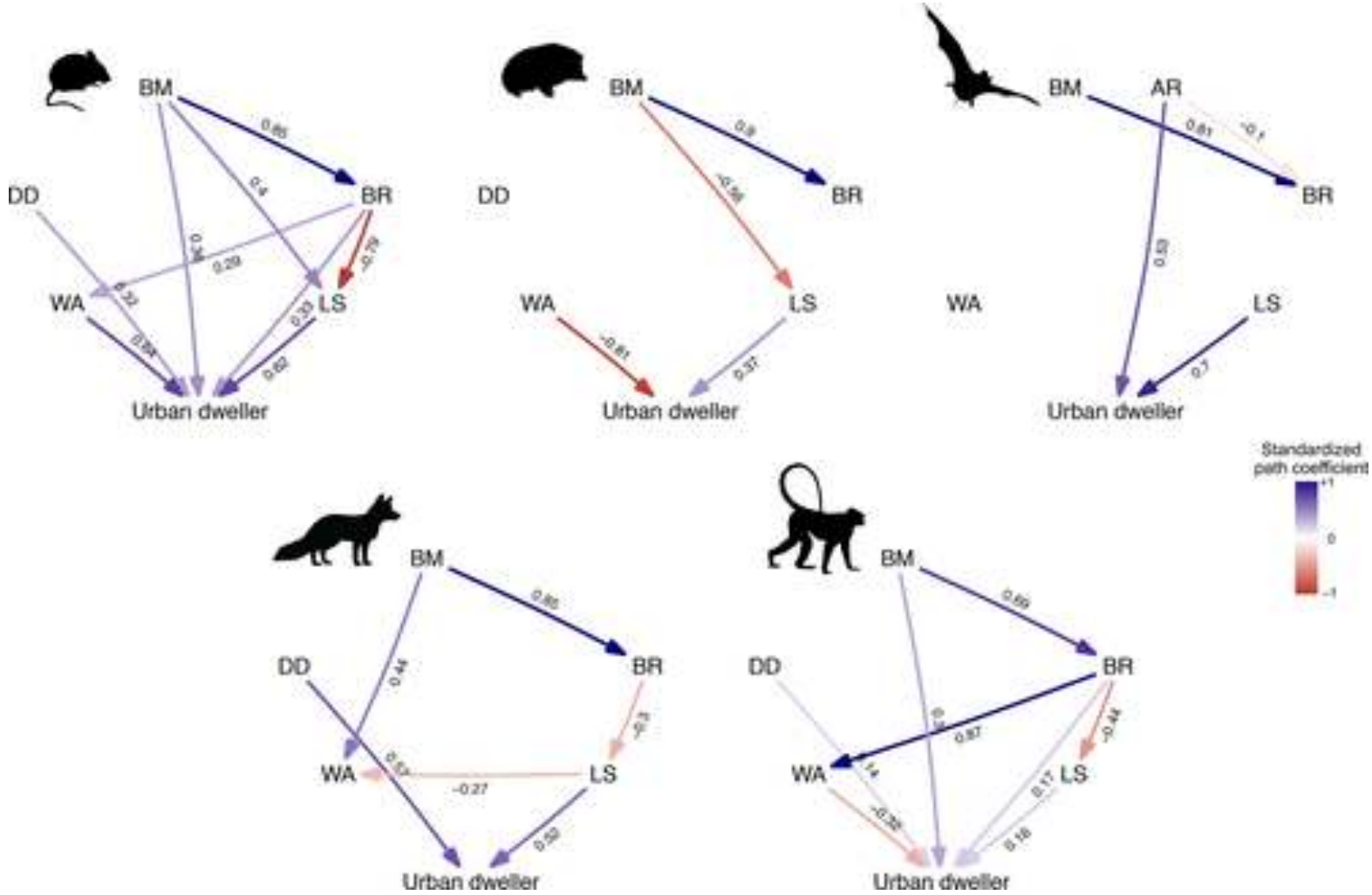

Figure 4 Average models for urban dwellers. Values represent standardised average coefficients. BM = Body mass; AR = Aspect Ratio; DD = Diet diversity (not modelled in bats); BR = Brain mass; WA = Weaning age; LS = Litter size. Silhouettes indicate mammalian orders as in Fig. 1.

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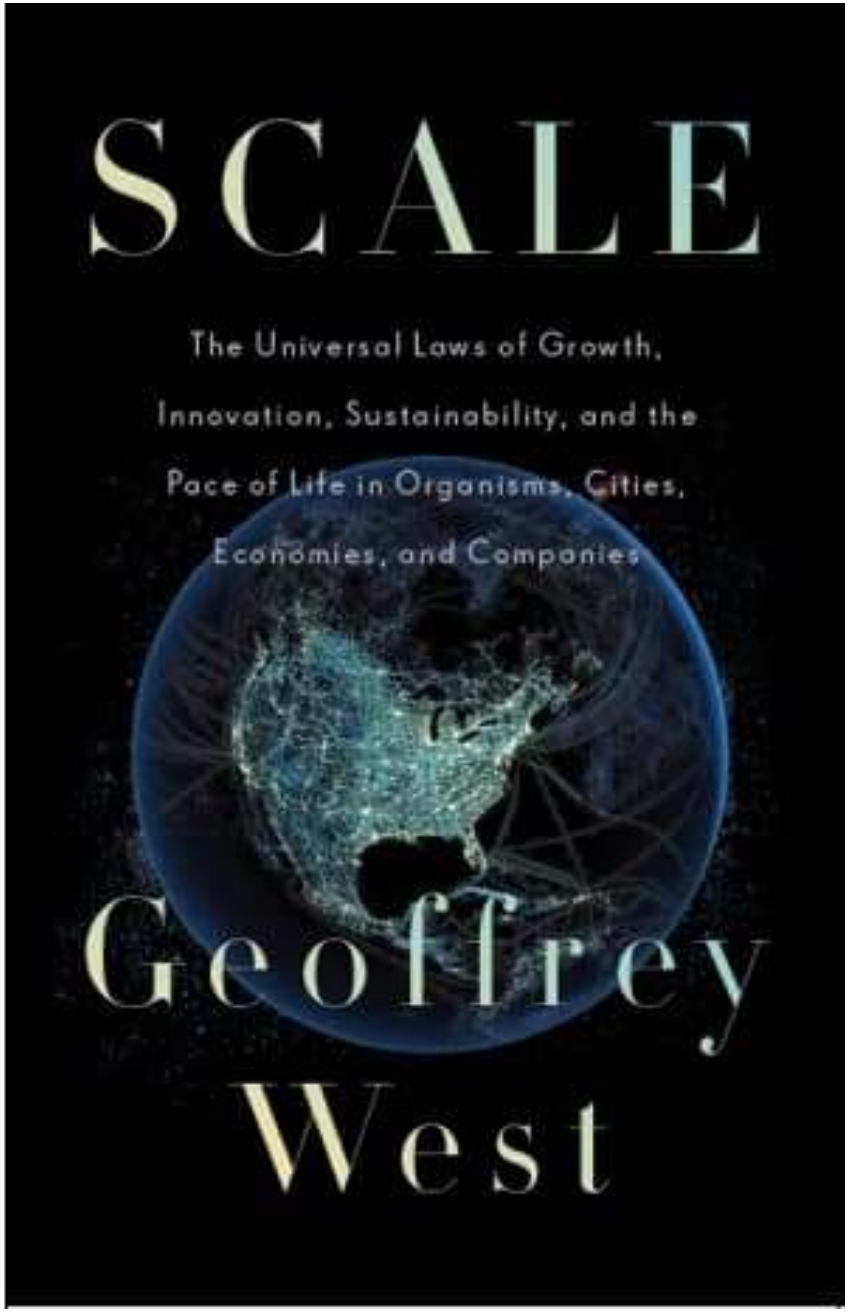
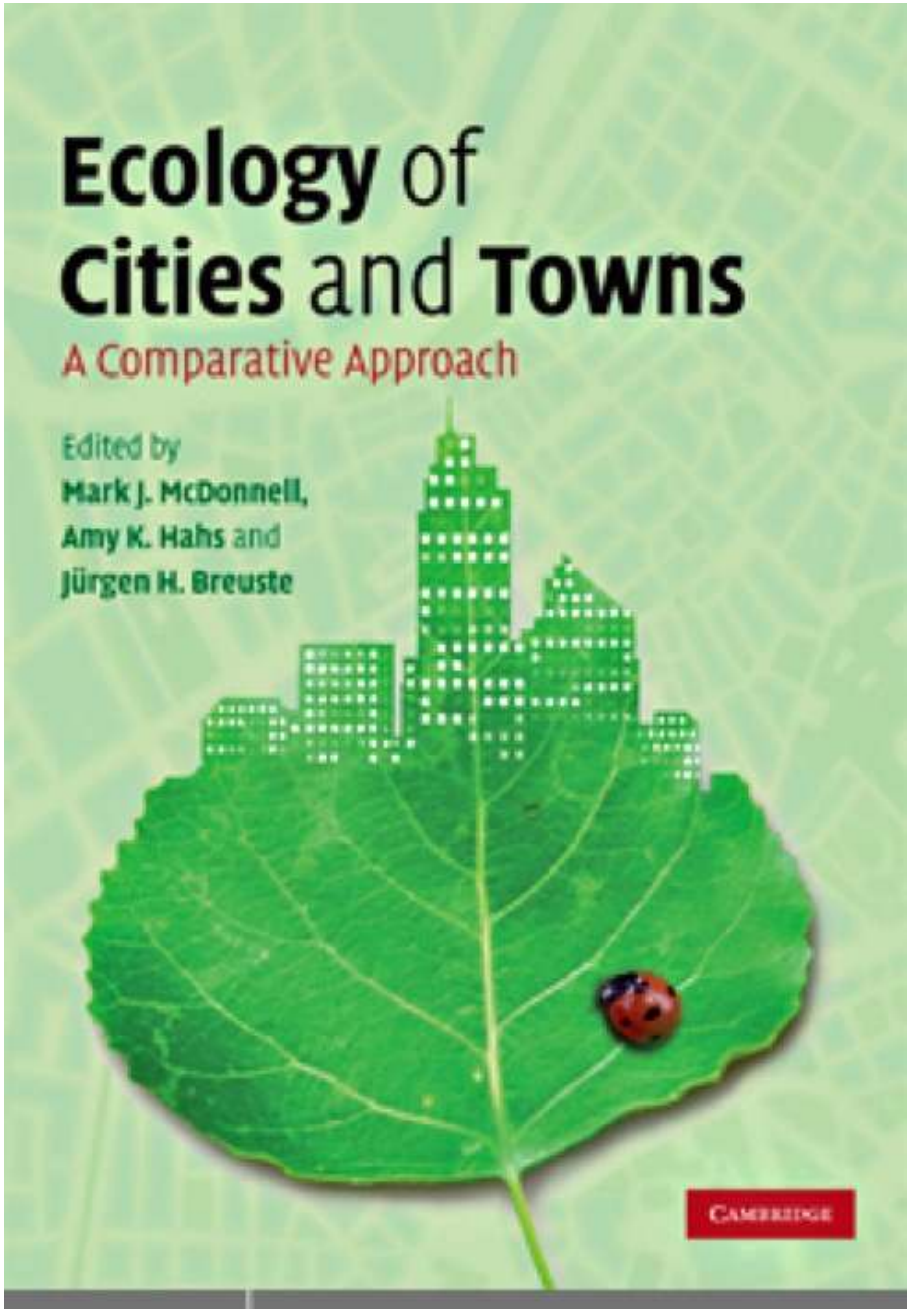

SCALE
The Universal Laws of Growth, Innovation, Sustainability, and the Pace of Life in Organisms, Cities, Economies, and Companies
Geoffrey West


Ecology of Cities and Towns
A Comparative Approach
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Amy K. Hahs and
Jürgen H. Breuste
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