Curvas de acumulación e índices de completitud.

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Riqueza de especies (S)

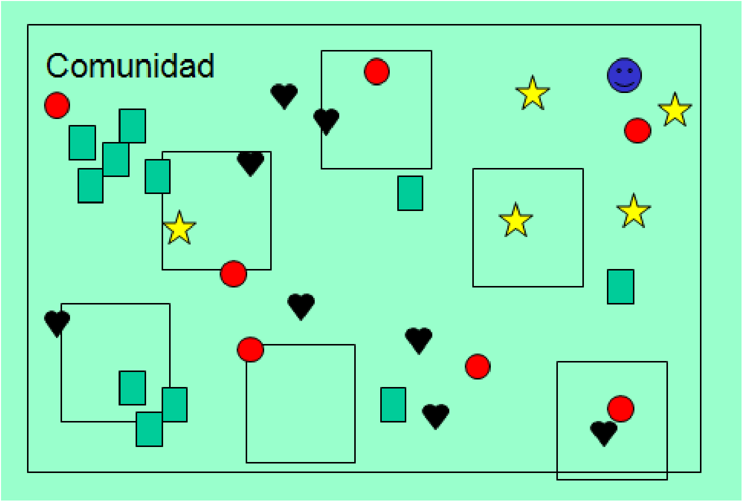
- Es la medida más sencilla
- Número de especies en una unidad de análisis

Simple

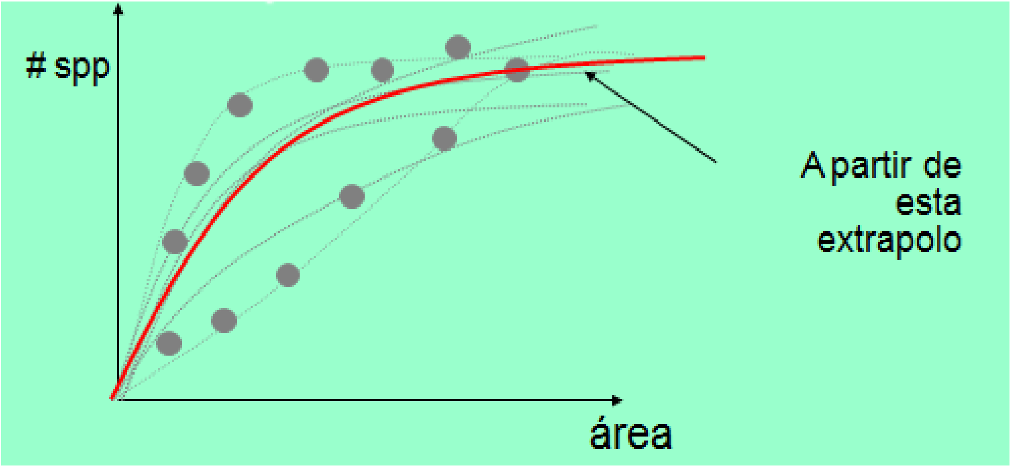
Complejo

- Pocas veces podemos determinar los valores reales.
- Usamos estimadores: métodos o funciones utilizados para conocer el valor del parámetro.

Ecología de comunidades

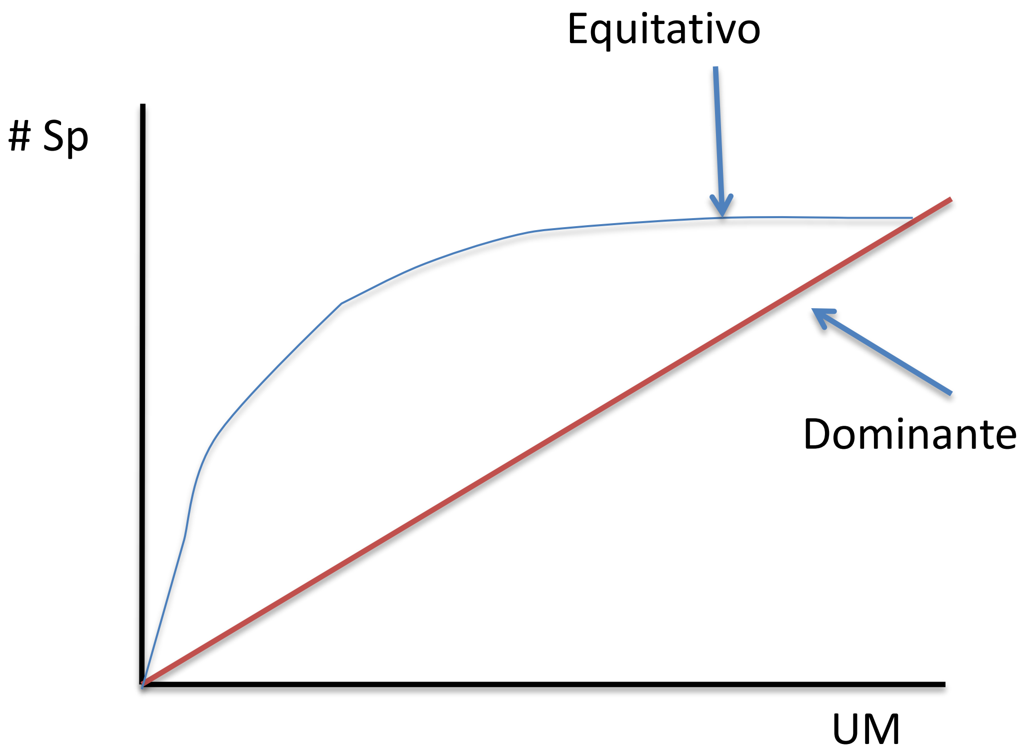


Curva de acumulación de especies es el número de especies acumuladas a lo largo de una medida de esfuerzo de muestreo (UM).



La forma de la curva depende del orden en que tome las UM para acumularlas.

Curvas de acumulación

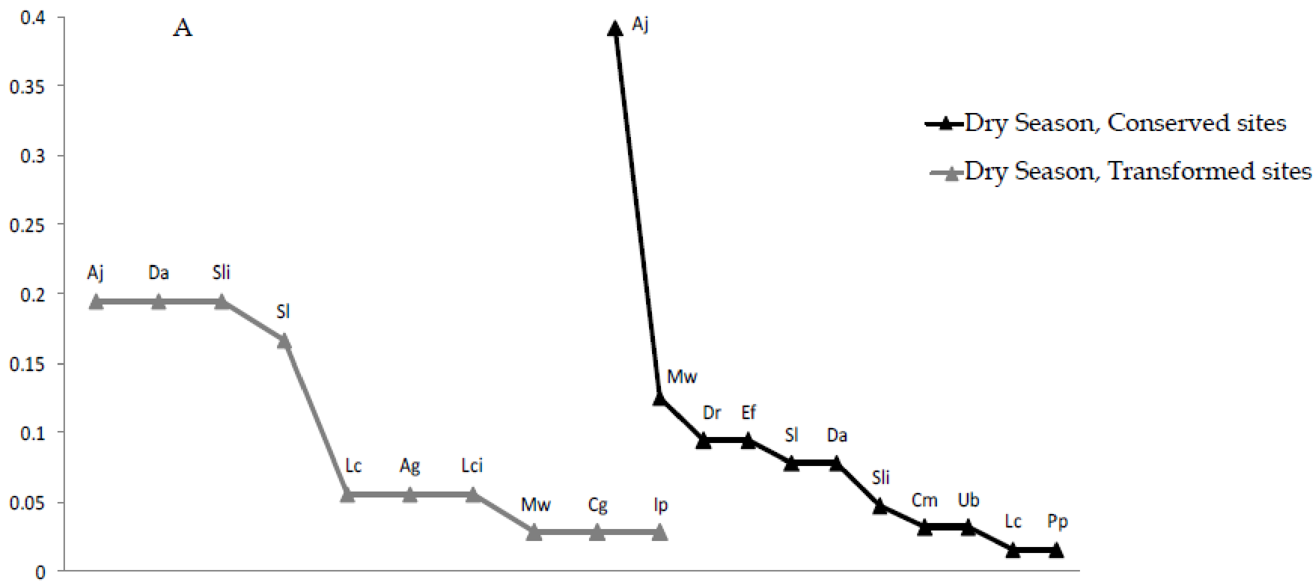


Las curvas de acumulación de especies muestran la tasa a la que nuevas especies se encuentran, mas no la riqueza total.

Que tal si extrapolamos?

Sí, si fuiste sistemático en las muestras y tu universo en homogéneo.

Estimadores Paramétricos



- Curva de rango abundancia o abundancia de especies y ajustarla a unos parámetros de distribuciones como log normal, serie geométrica, vara quebrada, etc.

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Estimadores No Paramétricos

Se basan en las especies raras.

$$S_{\mathrm{Chao1}} = S_{\mathrm{obs}} + \frac{n_1^2}{2n_2}$$

- Chao 1 : Especies encontradas una vez (singletones) y Especies encontradas dos veces (doubletones).
- Chao 2: Especies encontradas en sólo una muestra, Especies encontradas en dos muestras.
- ACE – ICE: Especies < 10
- Jackknife1 y 2: Especies encontradas en una o dos muestras.

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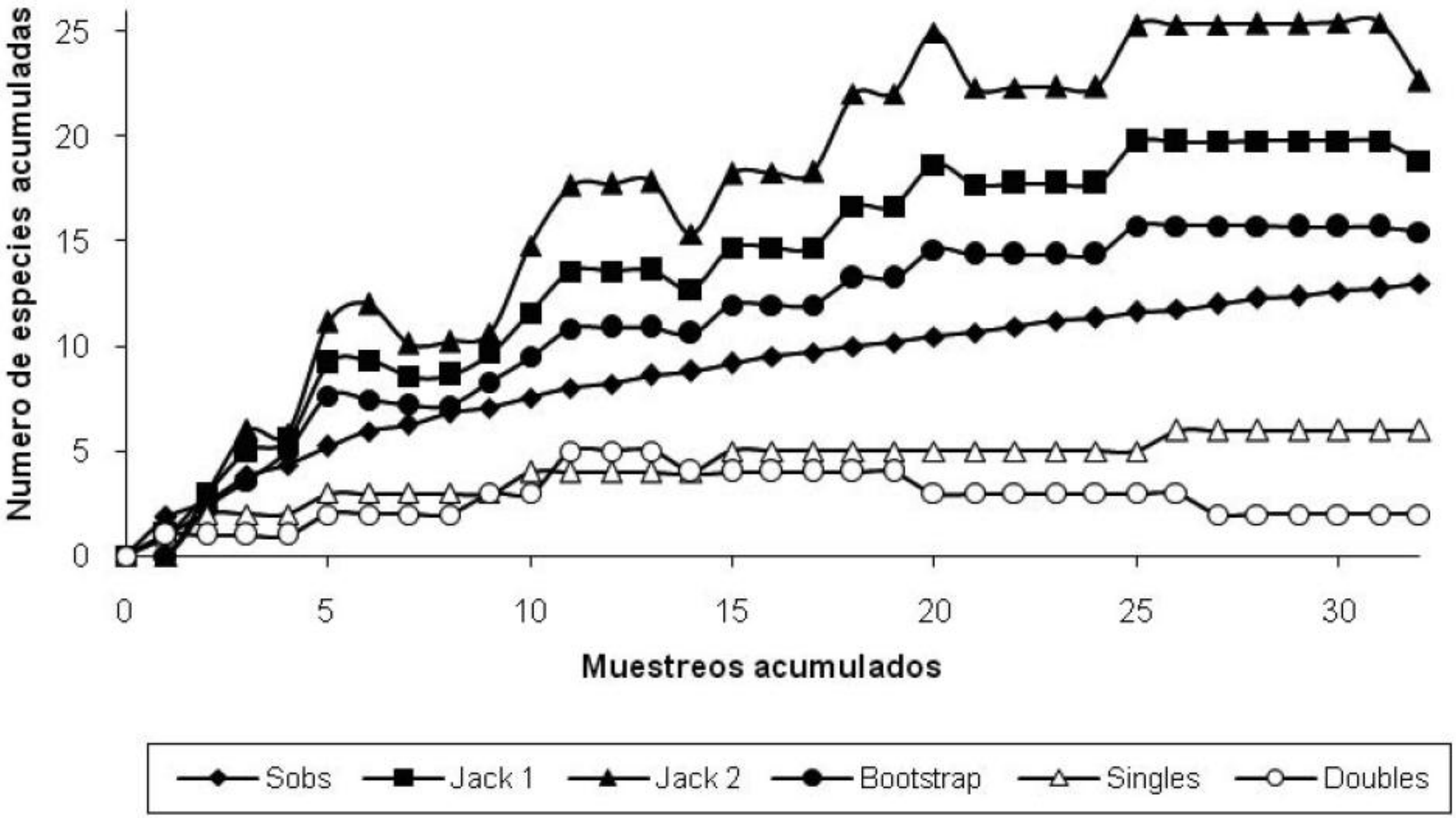
Estimadores No Paramétricos



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Índice de completitud

- Es la relación entre la riqueza observada y la riqueza estimada.

Tabla 1. Riqueza observada y estimada de serpientes en el Parque Nacional Natural Isla Gorgona.

	Riqueza estimada	Representatividad (%)
Sobs	13	
Jacknife 1 orden	16.67	77.8%
Jacknife 2 orden	22	59.1%
Bootstrap	13.24	98.2%

C = Sob/Ses

0 < C < 1

Y para datos de colecciones…

Ecography 30: 152–160, 2007
doi: 10.1111/j.2006.0906-7590.04627.x

Subject Editor: Carsten Rahbek. Accepted 20 December 2006

Forum

Assessing completeness of biodiversity databases at different spatial scales

Jorge Soberón, Raul Jiménez, Jordan Golubov and Patricia Koleff

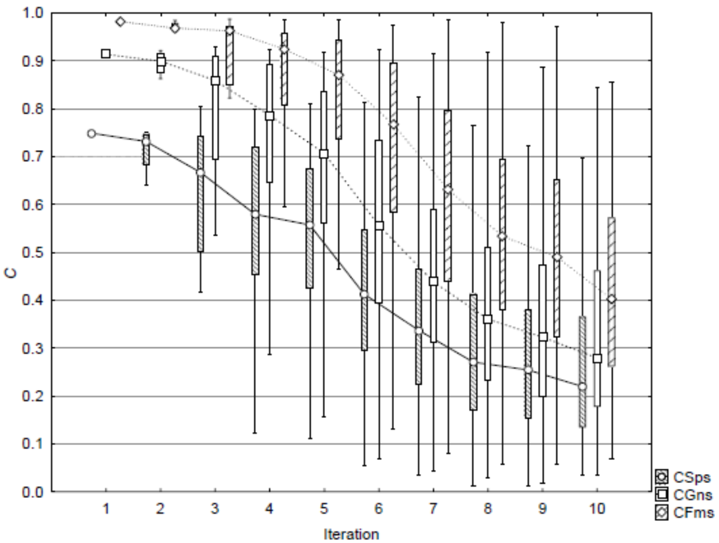

Fig. 1. Box and whisker diagram for the completeness index (C) for the taxonomic categories species (circles, close-dashed boxes), genera (squares, open boxes) and families (diamonds, wide-dashed boxes). The median value of C is displayed for all resolutions. For details see Table 2. Boxes contain 25–75% of observations and whiskers the non-outlier range.

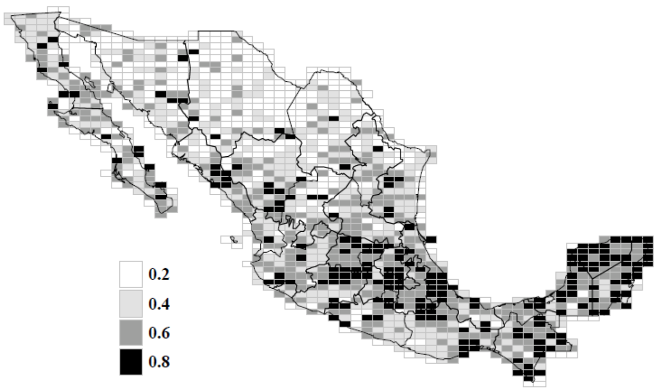

Fig. 3. Geographic distribution of the upper boundary of four categories of values of the completeness index C, for species, at the 7th iteration (cells have an area of 481.58 km^2). Dark gray corresponds to the highest values of C, pale gray to the lowest. White represents no data or not enough data to calculate a value of C.

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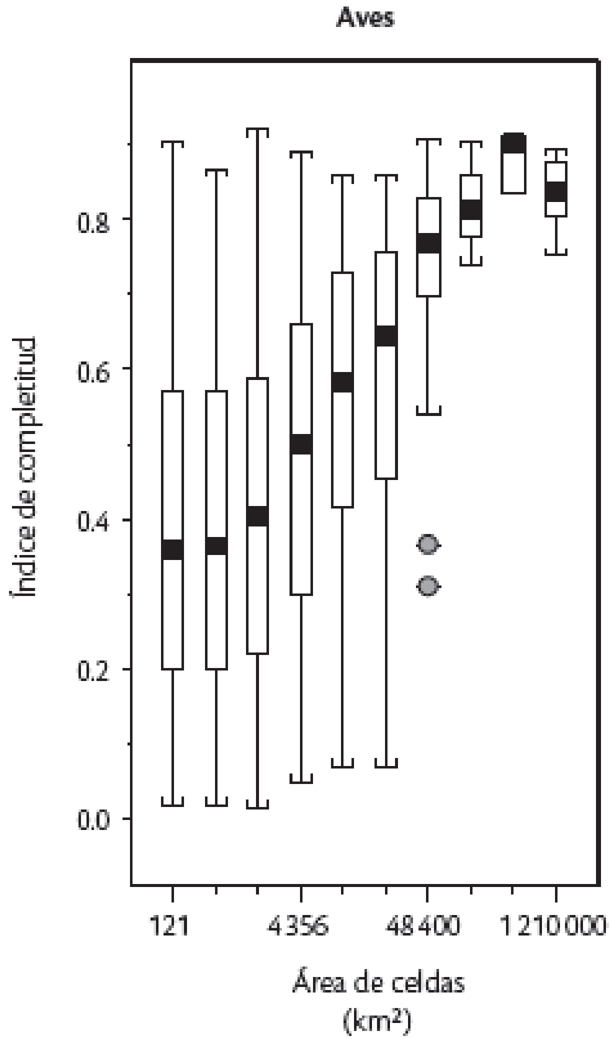

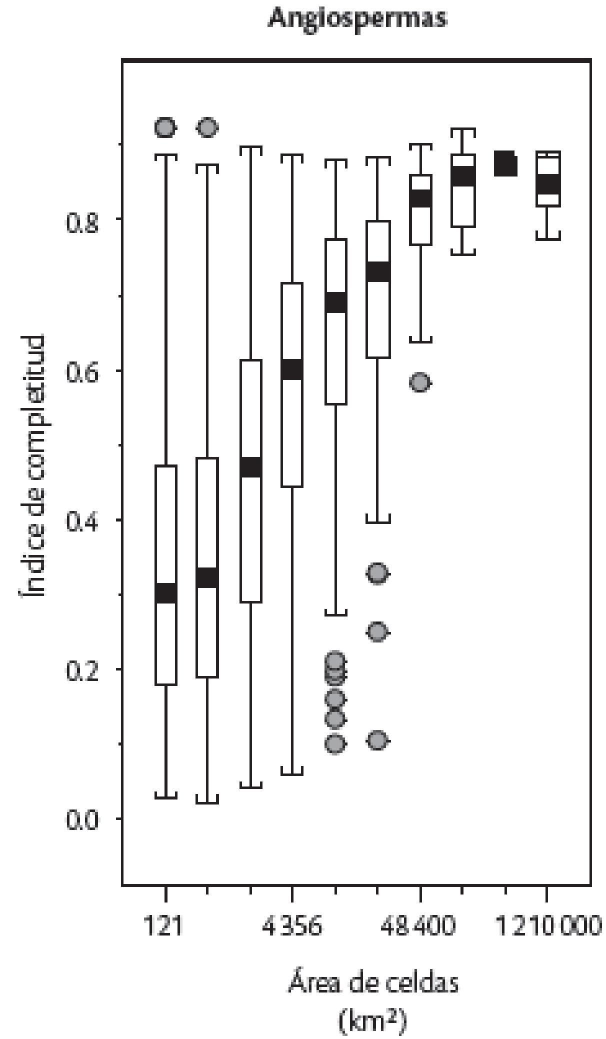

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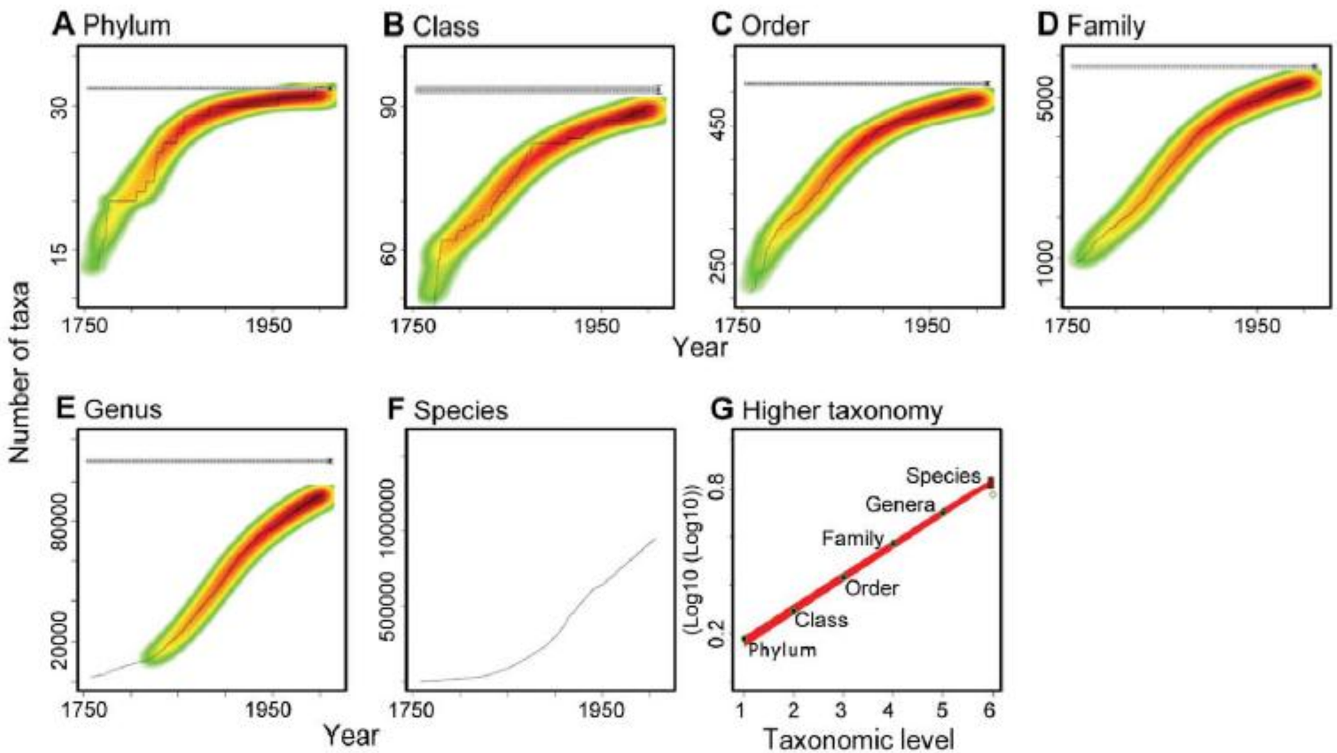
How Many Species Are There on Earth and in the Ocean?

Camilo Mora[1,2]*, Derek P. Tittensor[1,3,4], Sina Adl[1], Alastair G. B. Simpson[1], Boris Worm[1]

1 Department of Biology, Dalhousie University, Halifax, Nova Scotia, Canada, 2 Department of Geography, University of Hawaii, Honolulu, Hawaii, United States of America, 3 United Nations Environment Programme World Conservation Monitoring Centre, Cambridge, United Kingdom, 4 Microsoft Research, Cambridge, United Kingdom



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- ~8.7 millones (±1.3 millones) eucariotas
- ~2.2 millones (±0.18 milliones) marinos.
- ~1.2 millones especies descritas taxonómicamente en 250 años
- 86% de las especies presentes en la tierra y 91% en los océanos aún esperan ser descritas.

Múltiples métodos estimar riqueza

Table 1. Available methods for estimating the global number of species and their limitations.

Case Study	Limitations
Macroecological patterns	
Body size frequency distributions. By extrapolation from the frequency of large to small species, May [7] estimated 10 to 50 million species of animals.	May [7] suggested that there was no reason to expect a simple scaling law from large to small species. Further studies confirmed different modes of evolution among small species [4] and inconsistent body size frequency distributions among taxa [4].
Latitudinal gradients in species. By extrapolation from the better sampled temperate regions to the tropics, Raven [10] estimated 3 to 5 million species of large organisms.	May [2] questioned the assumption that temperate regions were better sampled than tropical ones; the approach also assumed consistent diversity gradients across taxa which is not factual [4].
Species-area relationships. By extrapolation from the number of species in deep-sea samples, Grassle & Maciolek [13] estimated that the world's deep seafloor could contain up to 10 million species.	Lambshead & Bouchet [12] questioned this estimation by showing that high local diversity in the deep sea does not necessarily reflect high global biodiversity given low species turnover.
Diversity ratios	
Ratios between taxa. By assuming a global 6:1 ratio of fungi to vascular plants and that there are ~270,000 species of vascular plants, Hawksworth [20] estimated 1.6 million fungi species.	Ratio-like approaches have been heavily critiqued because, given known patterns of species turnover, locally estimated ratios between taxa may or may not be consistent at the global scale [3,12] and because at least one group of organisms should be well known at the global scale, which may not always be true [15]. Bouchet [6] elegantly demonstrated the shortcomings of ratio-based approaches by showing how even for a well-inventoried marine region, the ratio of fishes to total multicellular organisms would yield ~0.5 million global marine species whereas the ratio of Brachyura to total multicellular organisms in the same sampled region would yield ~1.5 million species.
Host-specificity and spatial ratios. Given 50,000 known species of tropical trees and assuming a 5:1 ratio of host beetles to trees, that beetles represent 40% of the canopy arthropods, and that the canopy has twice the species of the ground, Erwin [9] estimated 30 million species of arthropods in the tropics.	

(Mora et.al. 2011)

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Múltiples métodos estimar riqueza

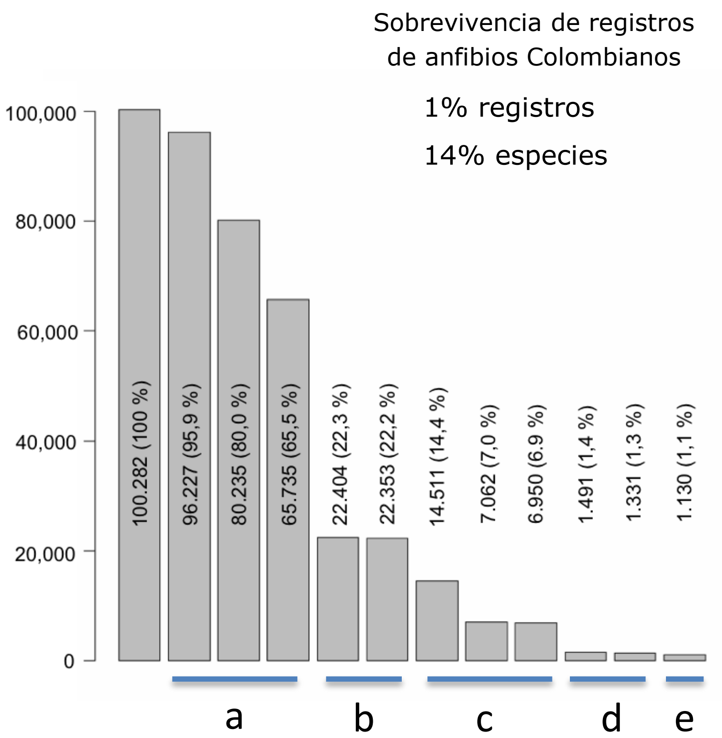
Known to unknown ratios. Hodkinson & Casson [18] estimated that 62.5% of the bug (Hemiptera) species in a sampled location were unknown; by assuming that 7.5%–10% of the global diversity of insects is bugs, they estimated between 1.84 and 2.57 million species of insects globally.	
Taxonomic patterns	
Time-species accumulation curves. By extrapolation from the discovery record it was estimated that there are ~19,800 species of marine fishes [23] and ~11,997 birds [22].	This approach is not widely applicable because it requires species accumulation curves to approach asymptotic levels, which is only true for a small number of well-described taxa [22–23].
Authors-species accumulation curves. Modeling the number of authors describing species over time allowed researchers to estimate that the proportion of flowering plants yet to be discovered is 13% to 18% [21].	This is a very recent method and the effect of a number of assumptions remains to be evaluated. One is the extent to which the description of new species is shifting from using taxonomic expertise alone to relying on molecular methods (particularly among small organisms [26]) and the other that not all authors listed on a manuscript are taxonomic experts, particularly in recent times when the number of coauthors per taxa described is increasing [21,38], which could be due to more collaborative research [38] and the acknowledgment of technicians, field assistants, specimen collectors, and so on as coauthors (Philippe Bouchet, personal communication).
Analysis of expert estimations. Estimates of ~5 million species of insects [15] and ~200,000 marine species [14] were arrived at by compiling opinion-based estimates from taxonomic experts. Robustness in the estimations is assumed from the consistency of responses among different experts.	Erwin [5] labeled this approach as "non-scientific" due to a lack of verification. Estimates can vary widely, even those of a single expert [5,6]. Bouchet [6] argues that expert estimations are often passed on from one expert to another and therefore a robust estimation could be the "same guess copied again and again".

(Mora et.al. 2011)

Retos

- Concepto de especie.
- Detectabilidad de las diferentes especies.
- Fortalecer las líneas de investigación taxonómicas.
- Manejo de la calidad y sesgo de los datos

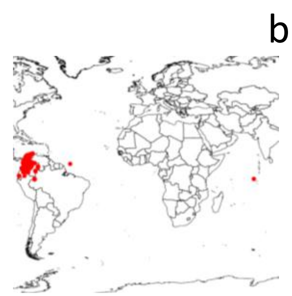
Verificación de datos



Protocolos de depuración implementados en R version 2.15.0

Etapas de depuración:

a. Verificación de nombre de especie
b. Verificación de coordenada geográfica
c. Consistencia con departamento, municipio y localización en zona rural
d. Remoción de duplicados
e. Remoción de valores extremos



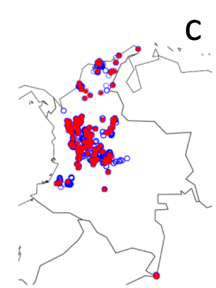
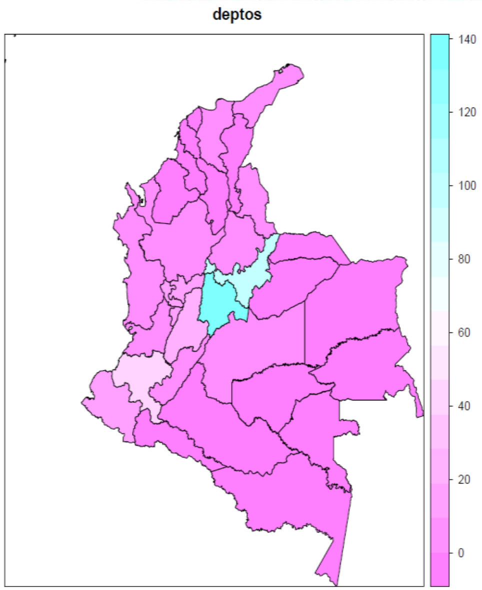
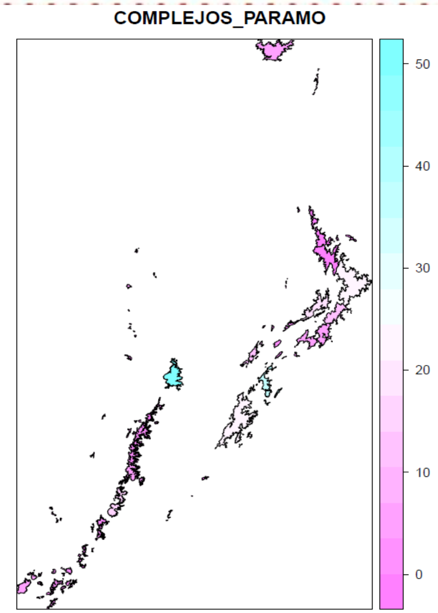
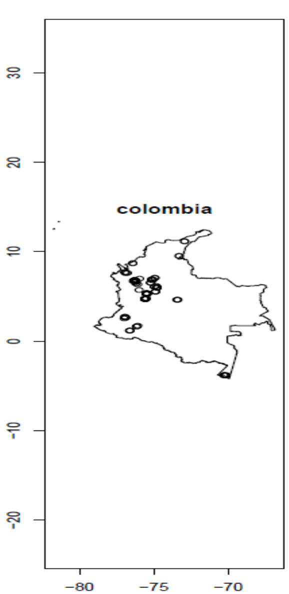


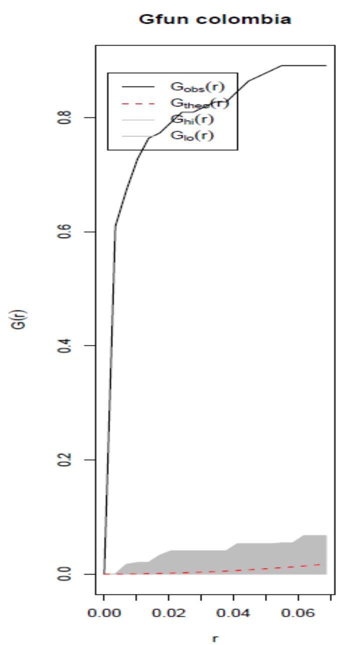
DIAGRAMA METODOLOGICO PARA VACIOS GEOGRAFICOS

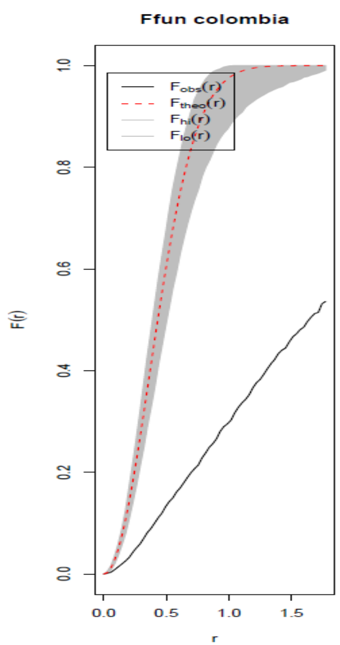




COMPLEJO	CUENTA
Nevados	49
Chingaza	38
Cruz Verde-Sumapaz	23
Cocuy	22
Guantiva-Rusia	20
Guanacas-Puracé-Coconucos	15
Guerrero	13
Pisba	11
Santa Marta	6
Chiles-Cumbal	5
Tota-Bijagual-Mamapacha	5
Frontino-Urrao	4
Nevado del Huila-Moras	4
Iguaque-Merchán	3
Las Hermosas	3
La Cocha-Patascoy	2
Duende	1
Rabanal y río Bogotá	1
Sotará	1
NA's	1542







Meta 1

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