Algunas aplicaciones de R en ecología: De la docencia elemental a la investigación avanzada

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De la docencia elemental a la investigación avanzada

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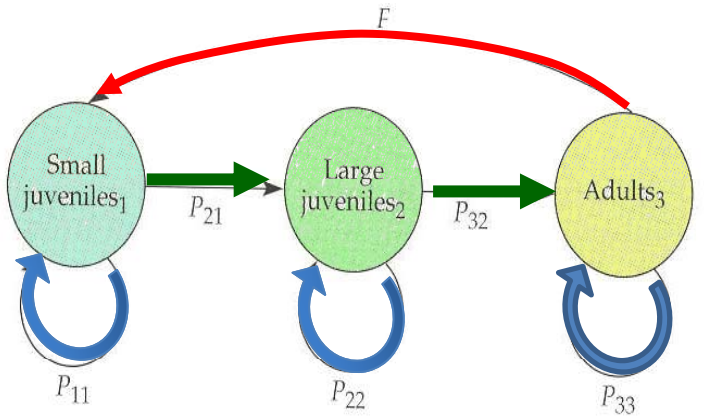
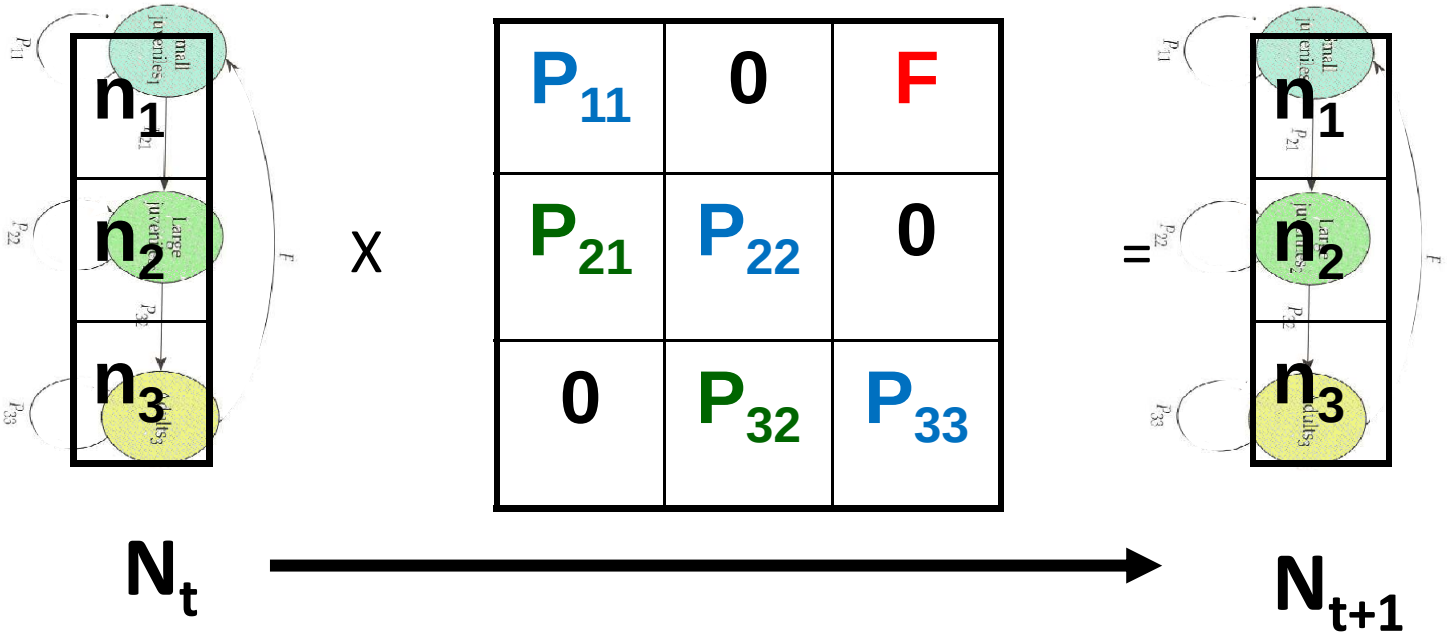
- **Rramas**
- **ecespa & dixon**
- **mpmcorrelogram**

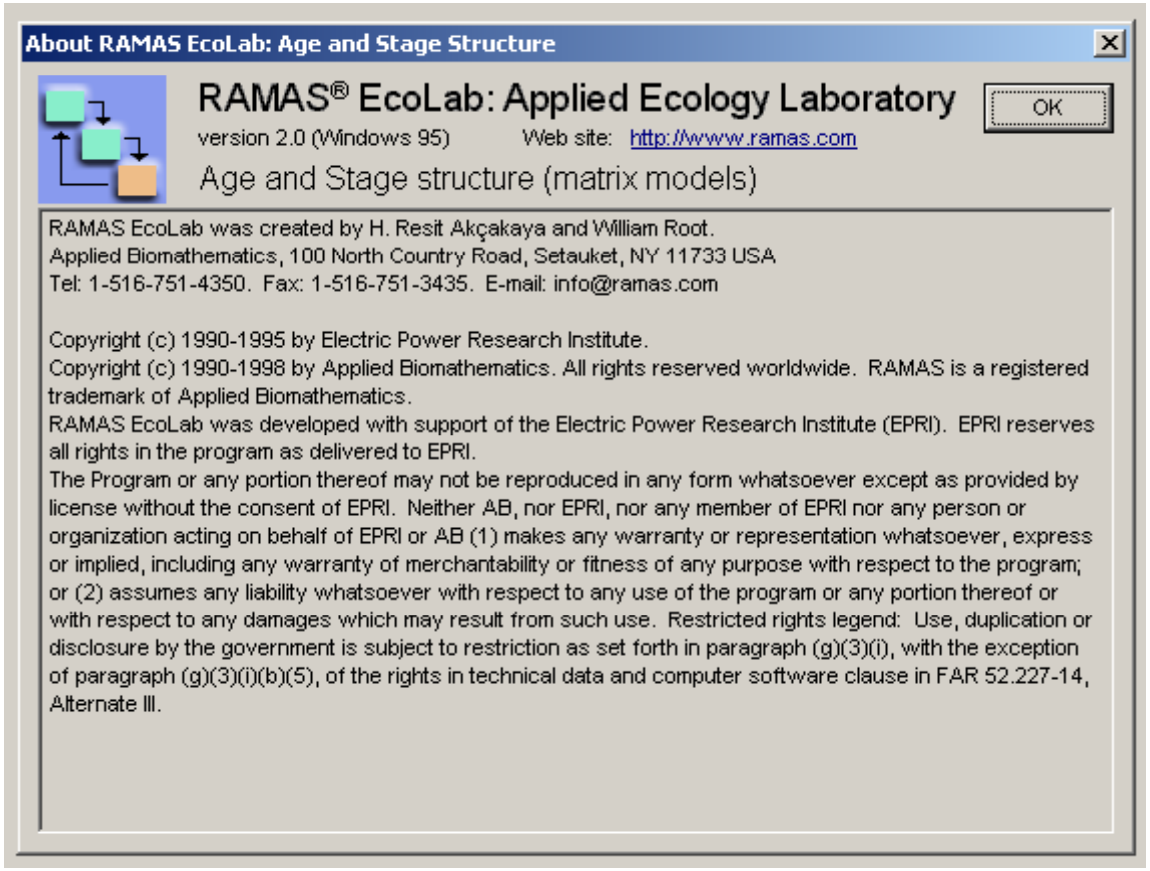
Modelos matriciales de poblaciones estructuradas.

	SJ	LJ	A
SJ	P_{11}	0	F
LJ	P_{21}	P_{22}	0
A	0	P_{32}	P_{33}



Proyecciones del tamaño poblacional




About RAMAS EcoLab: Age and Stage Structure
RAMAS® EcoLab: Applied Ecology Laboratory
OK
version 2.0 (Windows 95) Web site: http://www.ramas.com
Age and Stage structure (matrix models)
RAMAS EcoLab was created by H. Resit Akçakaya and William Root.
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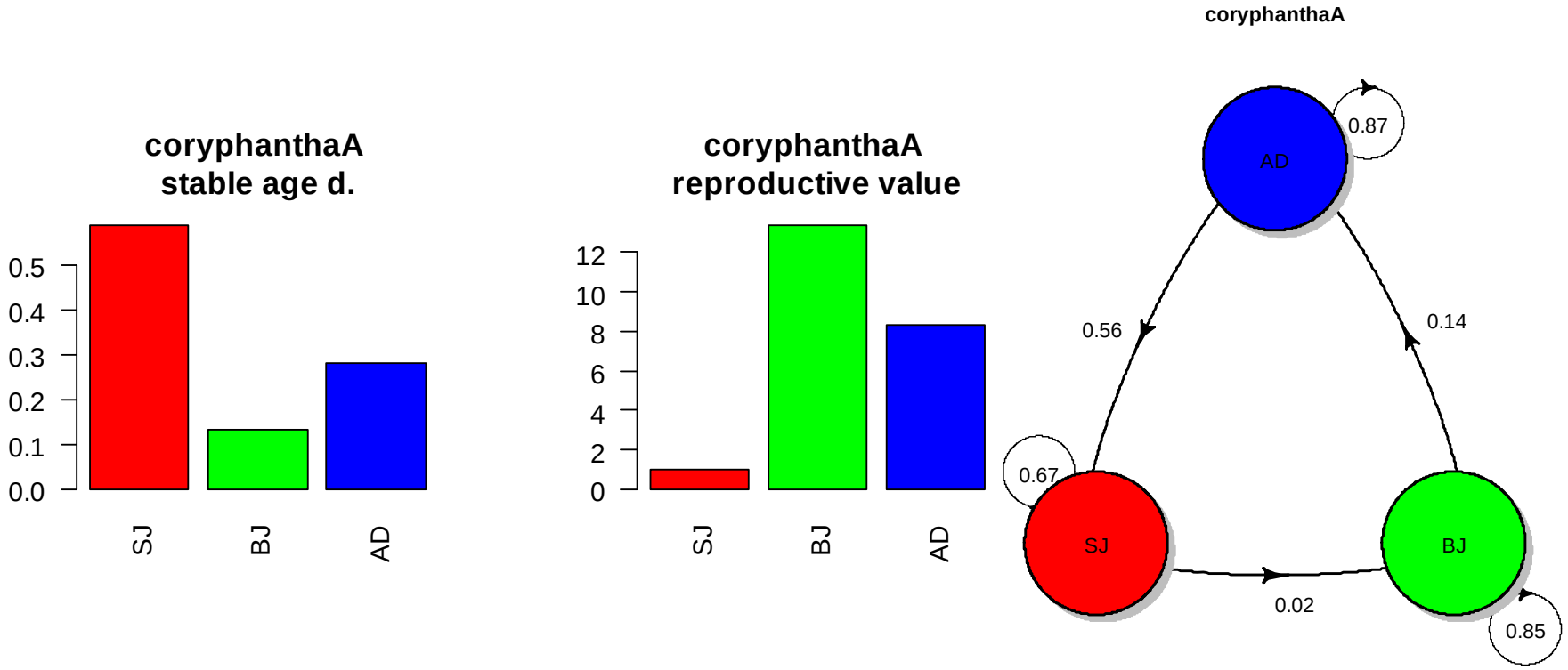
paquete Rramas:

```
>    coryphanthaA <- as.tmatrix(coryphanthaA)
>    summary(coryphanthaA)

transition matrix coryphanthaA

lambda: 0.937

stable stage distribution:
   SJ    BJ    AD
0.586 0.134 0.280


reproductive value:
    SJ     BJ     AD
 1.000 13.362  8.327

sensitivities:
      SJ    BJ    AD
SJ 0.124 0.029 0.059
BJ 1.663 0.381 0.793
AD 1.036 0.238 0.494


elasticities:
      SJ    BJ    AD
SJ 0.089 0.000 0.035
BJ 0.035 0.346 0.000
AD 0.000 0.035 0.459
```

paquete Rramas:

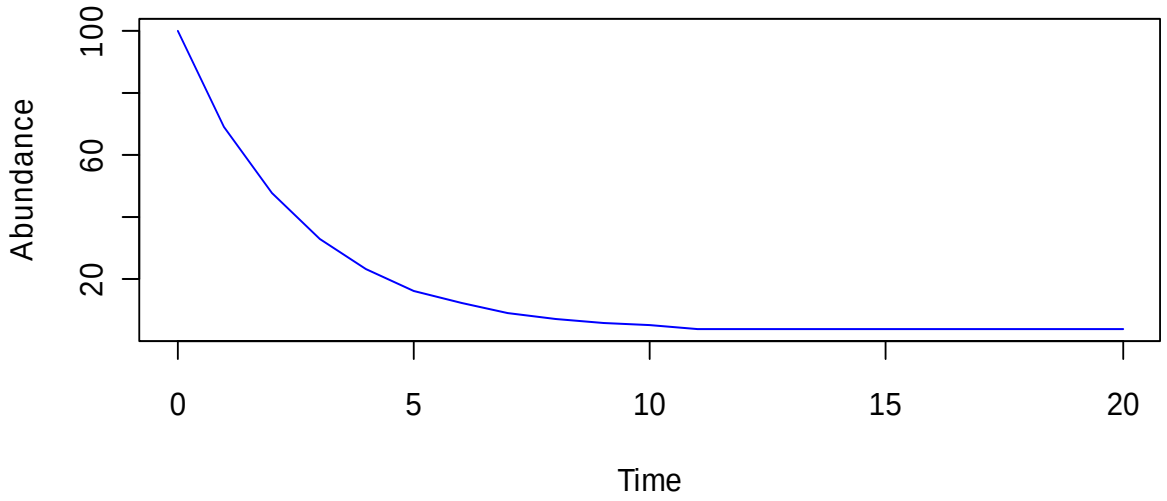
```
> plot(coryphanthaA)
```



paquete Rramas: proyecciones demográficas

```
>v0 <- c(100,0,0)
>simu20 <- projectn(v0=v0, mat=coryphanthaA, time = 20)
>plot(simu20, sum=FALSE)
>summary(simu20)
```

	Time	Abundance
1	0	100
2	1	69
3	2	48
4	3	33
5	4	23
6	5	16
7	6	12
8	7	9
9	8	7
10	9	6



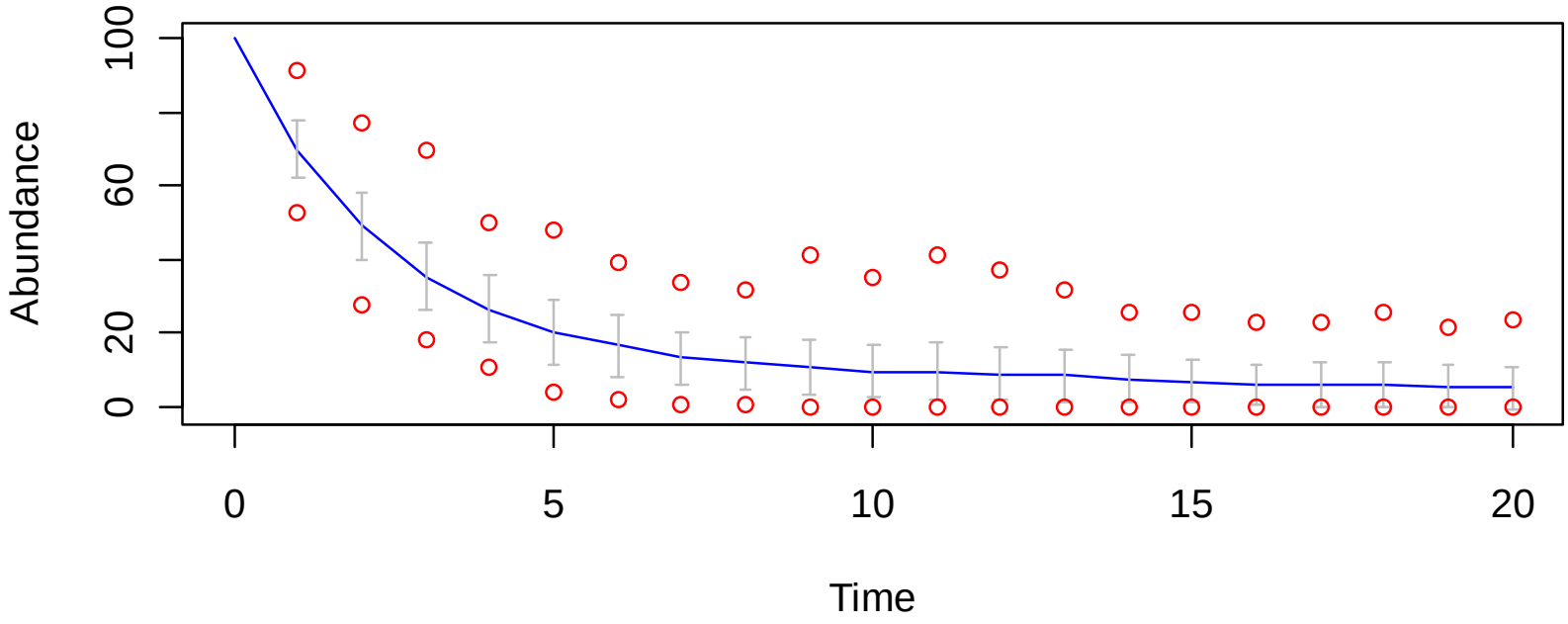
Rramas: estocasticidad demográfica y ambiental

```
>simu20.eds <- projectn(v0=v0, mat=coryphanthaA,
+    matsd =sdenv,  time = 20, nrep=100,
+    estdem=TRUE,estamb=TRUE)
> summary(simu20.eds)
```

	Time	Minimum	-1 S.D.	Average	+1 S.D.	Maximum
1	0	100	100.00	100.00	100.00	100
2	1	53	62.00	69.97	77.94	91
3	2	28	40.03	49.09	58.15	77
4	3	18	26.25	35.52	44.79	70
5	4	11	17.69	26.66	35.63	50
6	5	4	11.79	20.41	29.03	48
7	6	2	8.32	16.67	25.02	39

Rramas: estocasticidad demográfica y ambiental

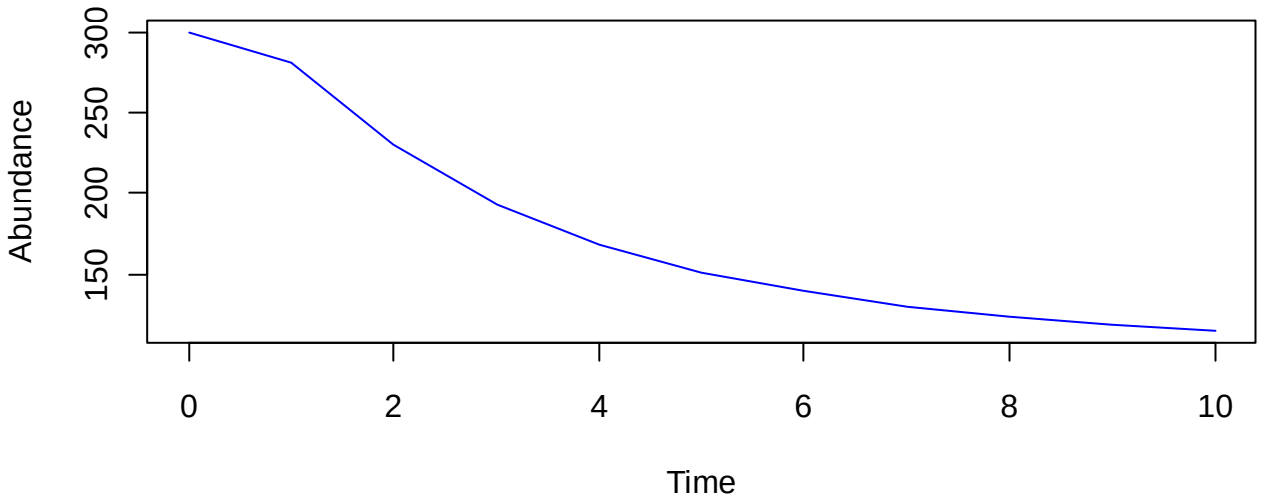
```
>simu20.eds <- projectn(v0=v0, mat=coryphanthaA,
+     matsd =sdenv,  time = 20, nrep=100,
+     estdem=TRUE,estamb=TRUE)
> plot(simu20.eds)
```



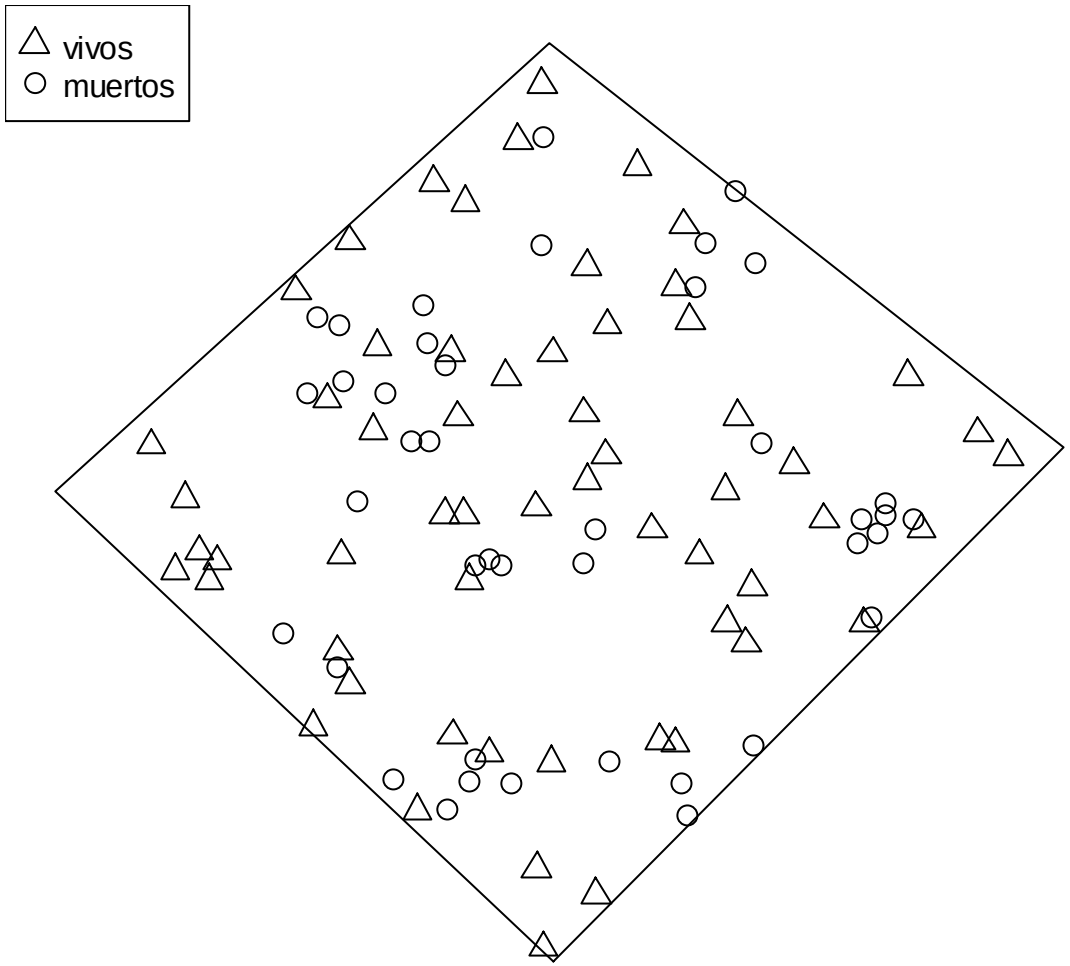
Rramas: opciones de manejo (refuerzo y cosecha)

```
> man <- c(10, 10, -0.5)
> p1 <- projectn(v0 = c(100, 100,100),
+        mat= coryphanthaA, management=man)
>summary(p1)
```

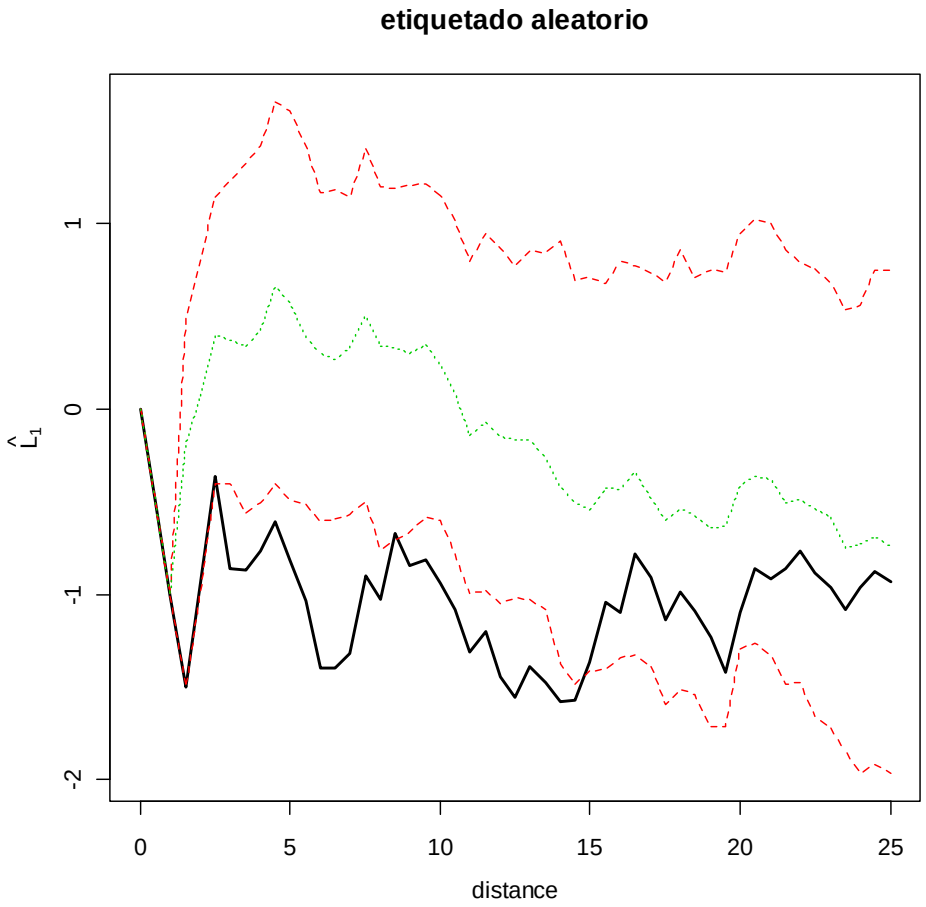
	Time	Abundance
1	0	300
2	1	281
3	2	231
4	3	193
5	4	168
6	5	151
7	6	139
8	7	130
9	8	123
10	9	118
11	10	115

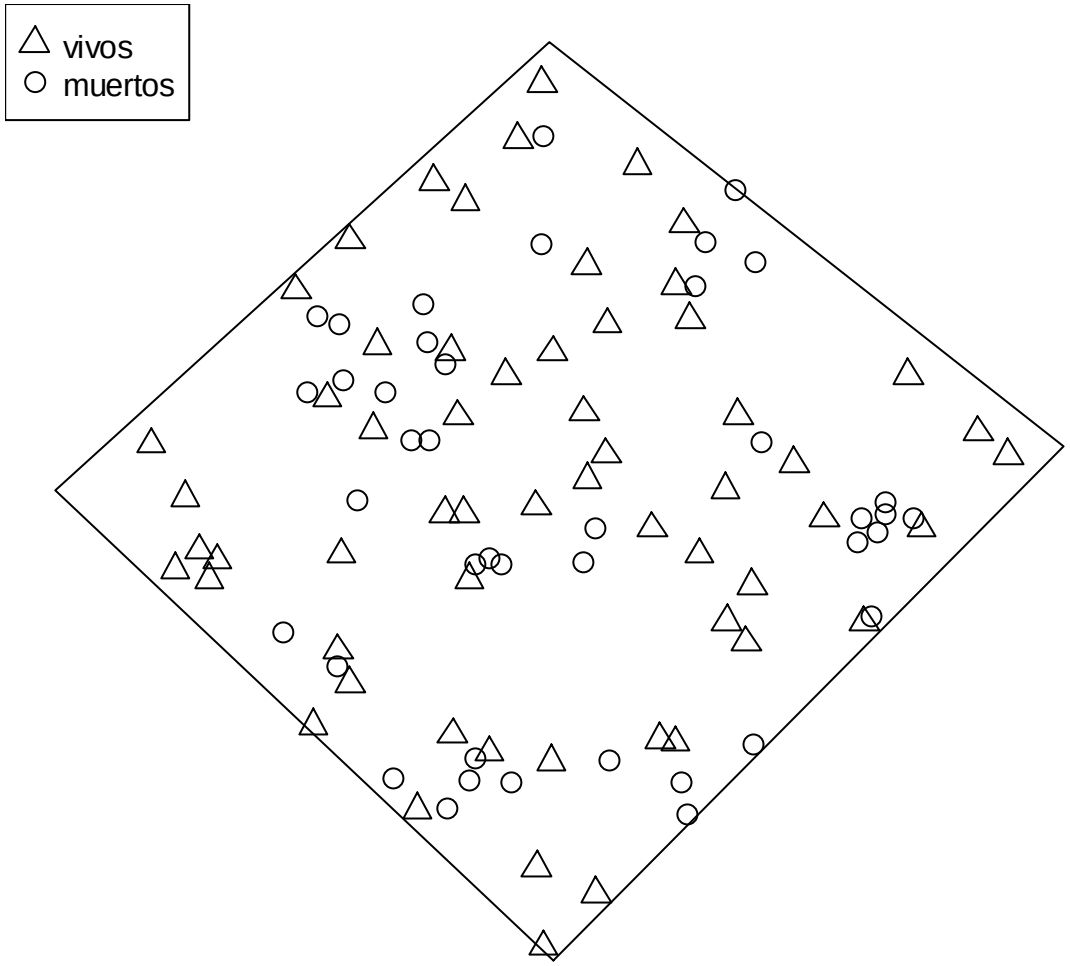


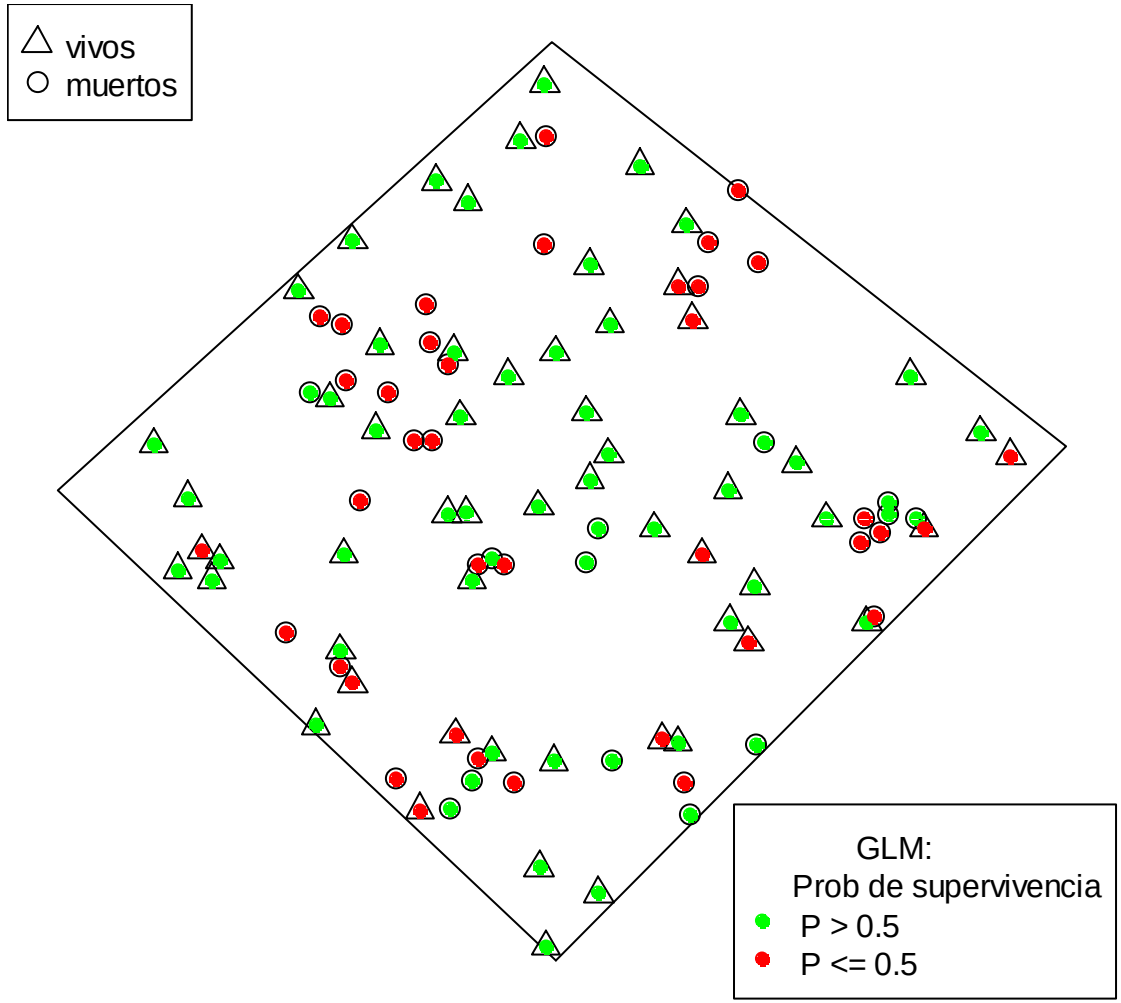
Patrones y procesos en comunidades vegetales



paquete **spatstat**: `Kest()`, `rlabel()`, etc

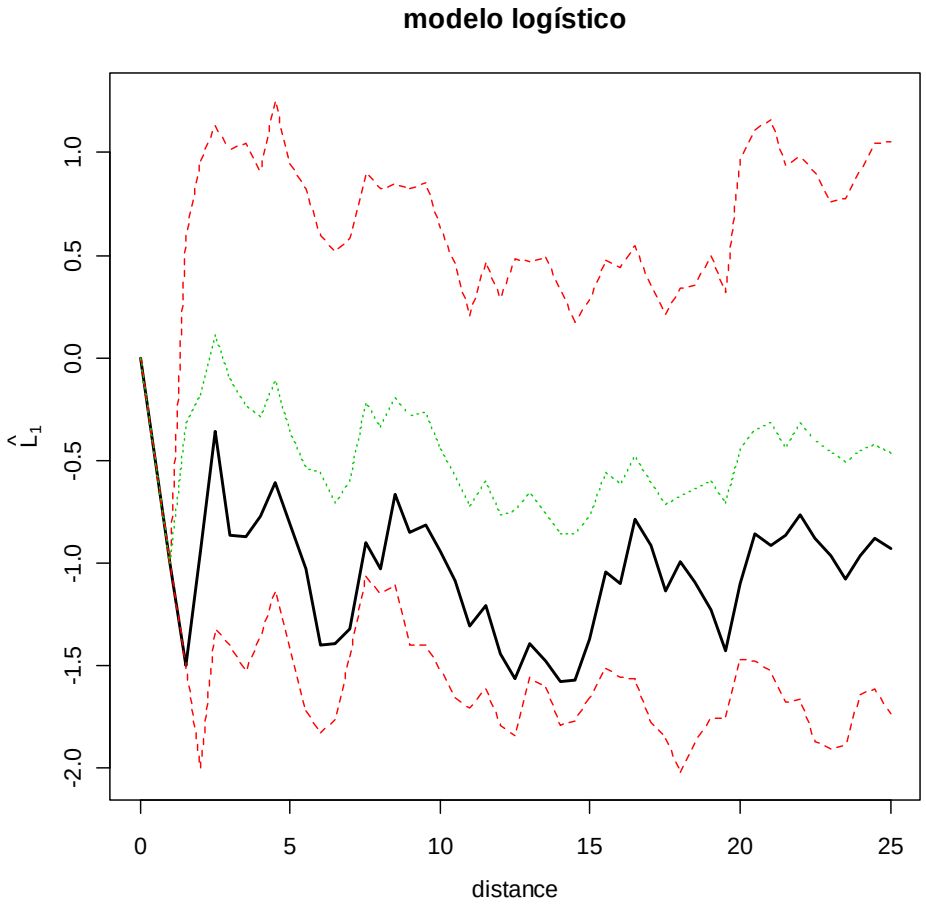



vivos
muertos

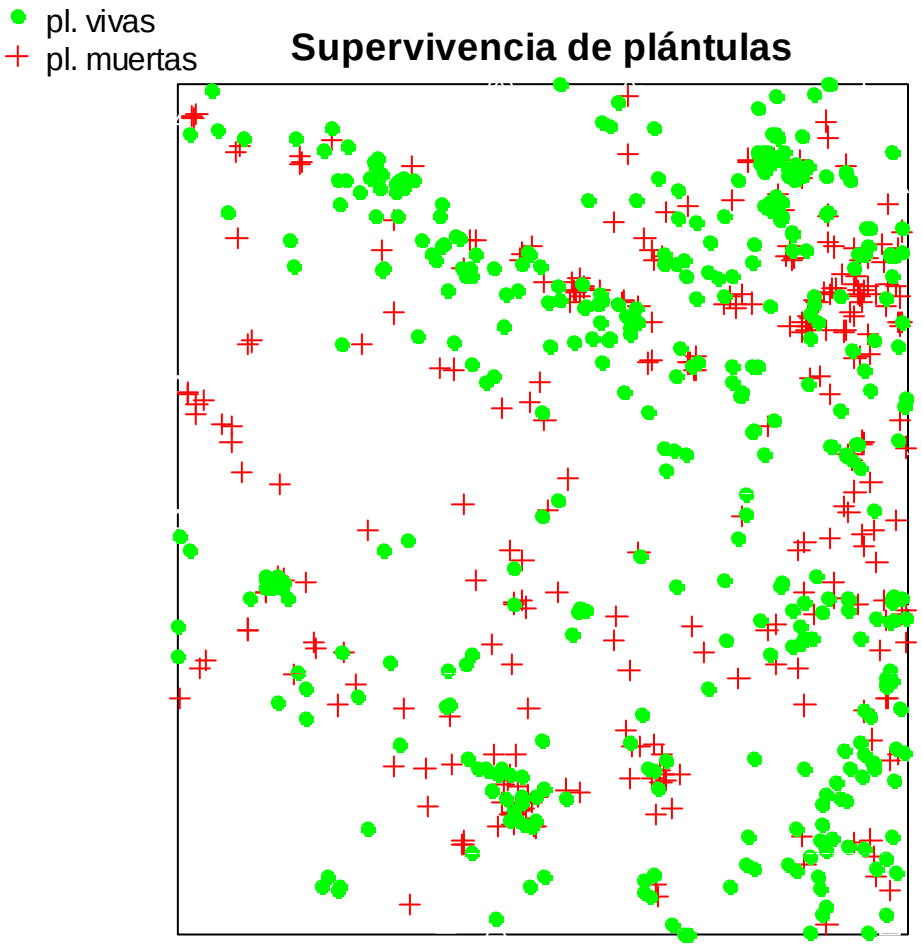


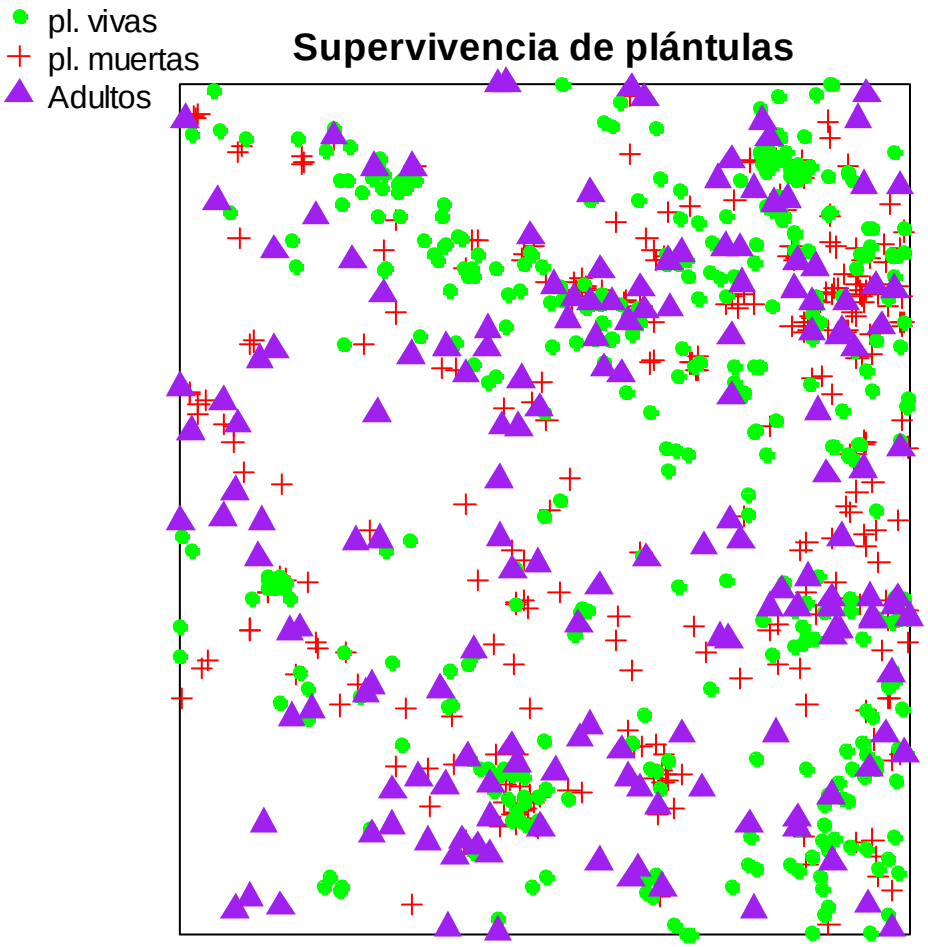
Olano, J.M., Laskurain, N.A., Escudero, A. and De la Cruz, M. 2009. Why and where adult trees die in a secondary temperate forest? The role of neighbourhood. *Annals of Forest Science* DOI: 10.1051/forest:2008074 .

paquete ecespa: **Kinhom.log()**



Olano, J.M., Laskurain, N.A., Escudero, A. and De la Cruz, M. 2009. Why and where adult trees die in a secondary temperate forest? The role of neighbourhood. *Annals of Forest Science* DOI: 10.1051/forest:2008074 .


pl. vivas
pl. muertas
Supervivencia de plántulas

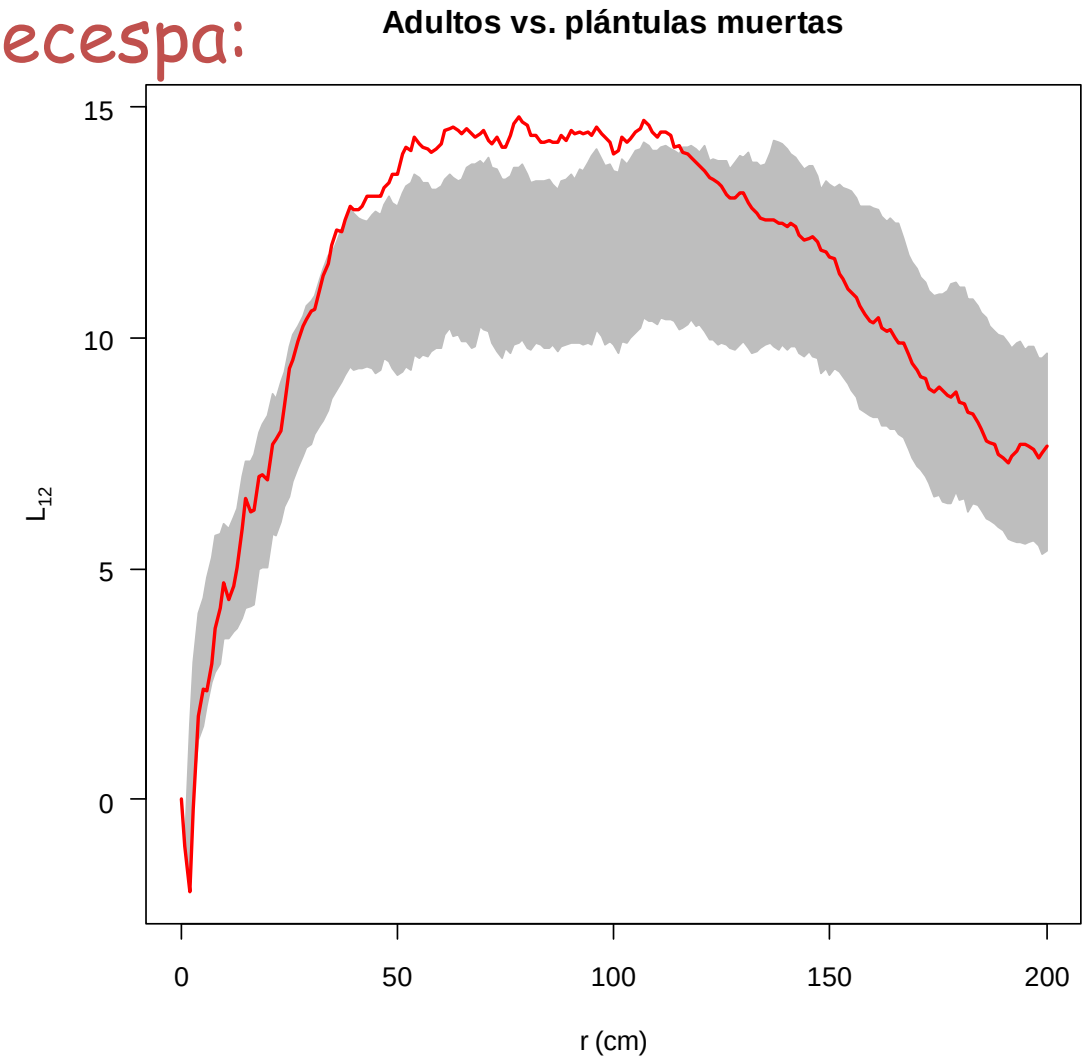


De la Cruz, M., Romao, R.L., Escudero, A. & Maestre, F.T. 2008. Where do seedlings go? A spatio-temporal analysis of early mortality in a semiarid specialist. *Ecography*.

.

paquete ecespa:

K012()



De la Cruz, M., Romao, R.L., Escudero, A. & Maestre, F.T. 2008. Where do seedlings go? A spatio-temporal analysis of early mortality in a semiarid specialist. *Ecography*.

.

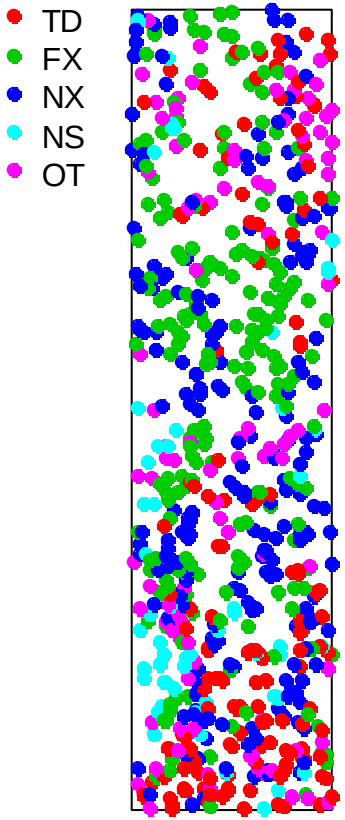
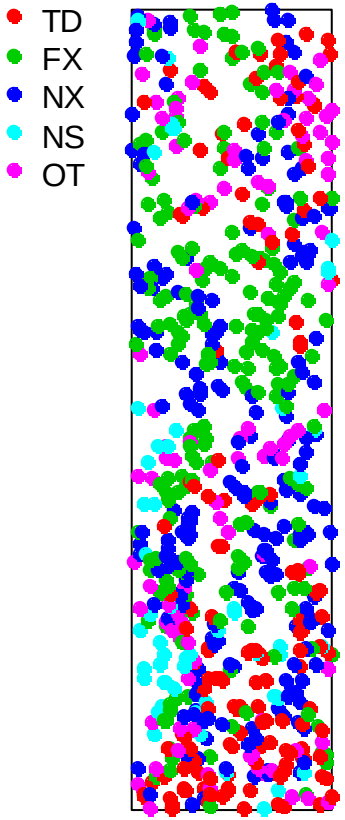


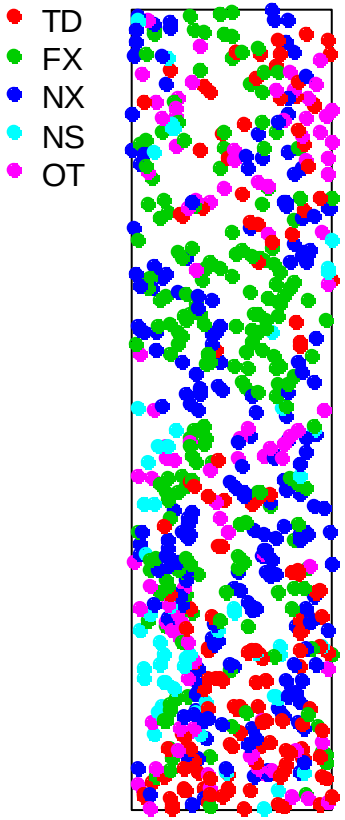
tabla de contingencia de frecuencias del vecino más próximo

paquete ecespa: **dixon2002()**



	df	Chi-sq	P.asymp	P.rand
Overall segregation	20	275.64	0.0000	0.00
From FX	4	70.99	0.0000	0.00
From NS	4	65.13	0.0000	0.00
From NX	4	41.27	0.0000	0.00
From OT	4	117.48	0.0000	0.00
From TD	4	7.09	0.1313	0.12

Granda, E., Escudero, A., De la Cruz, M. and Valladares, F. 2011. Juvenile–adult tree associations in a continental Mediterranean ecosystem: no evidence for sustained and general facilitation at increased aridity. *J. Veg. Sci.* DOI: 10.1111/j.1654-1103.2011.01343.x



	From	To	Obs	Expec.	S	Z	p-val.as	p-val.rnd
1	FX	FX	82	32.99	0.62	8.08	0.0000	0.0198
2	FX	NS	23	43.63	-0.35	-3.73	0.0002	0.0099
3	FX	NX	23	45.76	-0.38	-4.05	0.0001	0.0099
4	FX	OT	6	12.77	-0.35	-2.04	0.0410	0.0248
5	FX	TD	22	20.86	0.03	0.28	0.7820	0.9010
6	NS	FX	26	43.63	-0.27	-3.09	0.0020	0.0099
7	NS	NS	117	57.05	0.54	8.05	0.0000	0.0198
8	NS	NX	38	60.13	-0.26	-3.44	0.0006	0.0099
9	NS	OT	8	16.78	-0.34	-2.34	0.0194	0.0099
10	NS	TD	16	27.41	-0.26	-2.43	0.0150	0.0297
11	NX	FX	29	45.76	-0.24	-2.87	0.0041	0.0099
12	NX	NS	40	60.13	-0.23	-3.11	0.0019	0.0248
13	NX	NX	112	62.77	0.42	6.39	0.0000	0.0198
14	NX	OT	14	17.60	-0.11	-0.94	0.3484	0.4307
15	NX	TD	20	28.74	-0.18	-1.82	0.0682	0.0693
16	OT	FX	5	12.77	-0.47	-2.47	0.0135	0.0099
17	OT	NS	8	16.78	-0.40	-2.54	0.0112	0.0099
18	OT	NX	7	17.60	-0.50	-3.02	0.0025	0.0099
19	OT	OT	33	4.83	1.14	10.77	0.0000	0.0099
20	OT	TD	7	8.02	-0.07	-0.39	0.6952	0.5644
21	TD	FX	29	20.86	0.19	2.04	0.0418	0.0842
22	TD	NS	29	27.41	0.03	0.36	0.7180	0.5644
23	TD	NX	19	28.74	-0.24	-2.18	0.0295	0.0347
24	TD	OT	7	8.02	-0.06	-0.38	0.7008	0.6535
25	TD	TD	14	12.97	0.04	0.25	0.8011	0.6980

Granda, E., Escudero, A., De la Cruz, M. and Valladares, F. 2011. Juvenile–adult tree associations in a continental Mediterranean ecosystem: no evidence for sustained and general facilitation at increased aridity. *J. Veg. Sci.* DOI: 10.1111/j.1654-1103.2011.01343.x

Test de Mantel: correlación entre dos matrices

SIMILITUD

```
0.6
0.4 0.7
0.6 0.5 0.5
0.7 0.8 0.6 0.7
0.8 0.4 0.2 0.4 0.5
0.4 0.6 0.4 0.3 0.4 0.4
0.4 0.8 0.6 0.3 0.6 0.2 0.6
0.3 0.4 0.3 0.5 0.4 0.3 0.6 0.4
0.8 0.5 0.4 0.7 0.8 0.6 0.3 0.4 0.3
```

D. ESPACIAL

```
0.5
0.7 0.3
0.2 0.4 0.6
0.3 0.3 0.4 0.2
0.3 0.8 1.0 0.5 0.6
0.7 0.5 0.7 0.8 0.7 0.8
0.7 0.2 0.4 0.6 0.5 0.9 0.4
0.6 0.4 0.7 0.6 0.6 0.6 0.1 0.4
0.2 0.5 0.7 0.1 0.3 0.5 0.9 0.8 0.7
```

r= -0.8776

Correlograma de Mantel

SIMILITUD

```
0.6
0.4 0.7
0.6 0.5 0.5
0.7 0.8 0.6 0.7
0.8 0.4 0.2 0.4 0.5
0.4 0.6 0.4 0.3 0.4 0.4
0.4 0.8 0.6 0.3 0.6 0.2 0.6
0.3 0.4 0.3 0.5 0.4 0.3 0.6 0.4
0.8 0.5 0.4 0.7 0.8 0.6 0.3 0.4 0.3
```

D. ESPACIAL

```
0.5
0.7 0.3
0.2 0.4 0.6
0.3 0.3 0.4 0.2
0.3 0.8 1.0 0.5 0.6
0.7 0.5 0.7 0.8 0.7 0.8
0.7 0.2 0.4 0.6 0.5 0.9 0.4
0.6 0.4 0.7 0.6 0.6 0.6 0.1 0.4
0.2 0.5 0.7 0.1 0.3 0.5 0.9 0.8 0.7
```

Correlograma de Mantel

```
0.6
0.4 0.7
0.6 0.5 0.5
0.7 0.8 0.6 0.7
0.8 0.4 0.2 0.4 0.5
0.4 0.6 0.4 0.3 0.4 0.4
0.4 0.8 0.6 0.3 0.6 0.2 0.6
0.3 0.4 0.3 0.5 0.4 0.3 0.6 0.4
0.8 0.5 0.4 0.7 0.8 0.6 0.3 0.4 0.3
```

SIMILITUD

```
0.0
0.0 0.0
0.2 0.0 0.0
0.0 0.0 0.0 0.2
0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0 0.0 0.0
0.0 0.2 0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0 0.0 0.0 0.1 0.0
0.2 0.0 0.0 0.1 0.0 0.0 0.0 0.0 0.0
0.0
0.0 0.3
0.0 0.4 0.0
0.3 0.3 0.0 0.0
0.3 0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.4 0.0 0.0 0.0 0.4
0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.4
0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
```

DISTANCIA 1

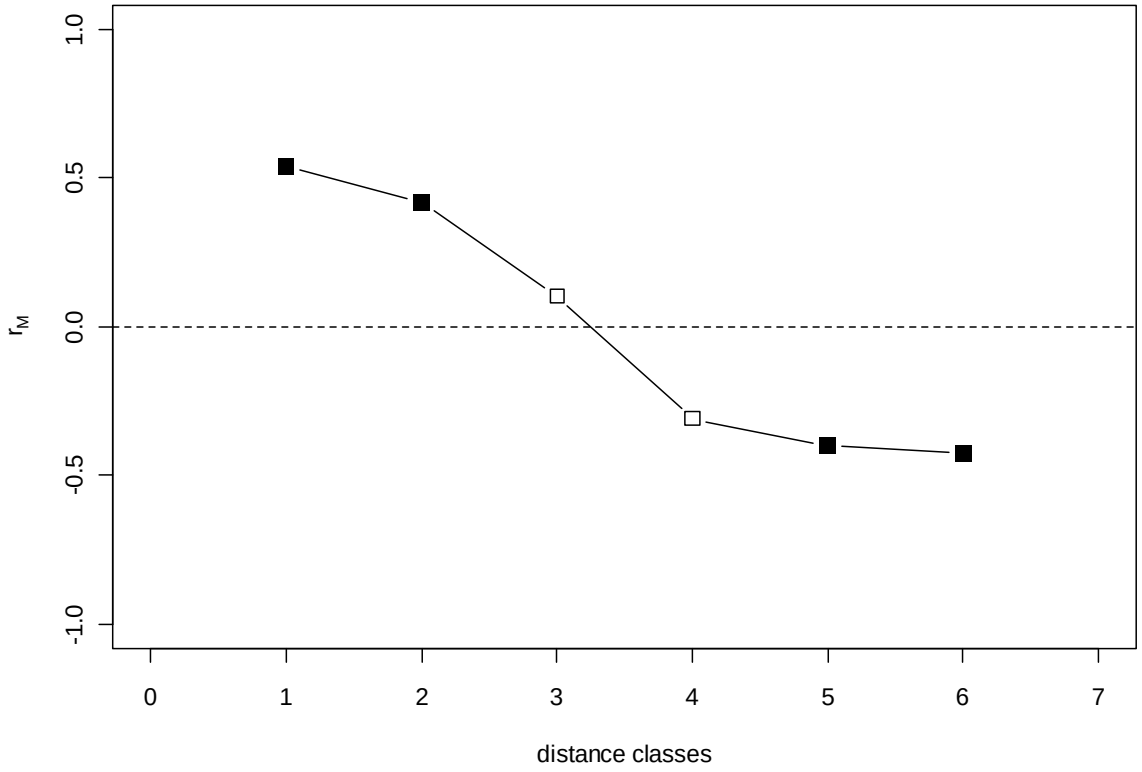
r_{M1}= 0.53847

DISTANCIA 2

r_{M2}= 0.42007

ETC

Correlograma de Mantel



Correlograma de Mantel parcial: **mpmcorrelogram()**

```
0.6
0.4 0.7
0.6 0.5 0.5
0.7 0.8 0.6 0.7
0.8 0.4 0.2 0.4 0.5
0.4 0.6 0.4 0.3 0.4 0.4
0.4 0.8 0.6 0.3 0.6 0.2 0.6
0.3 0.4 0.3 0.5 0.4 0.3 0.6 0.4
0.8 0.5 0.4 0.7 0.8 0.6 0.3 0.4 0.3
```

SIMILITUD

```
0.5
0.7 0.3
0.2 0.4 0.6
0.3 0.3 0.4 0.2
0.3 0.8 1.0 0.5 0.6
0.7 0.5 0.7 0.8 0.7 0.8
0.7 0.2 0.4 0.6 0.5 0.9 0.4
0.6 0.4 0.7 0.6 0.6 0.6 0.1 0.4
0.2 0.5 0.7 0.1 0.3 0.5 0.9 0.8 0.7
```

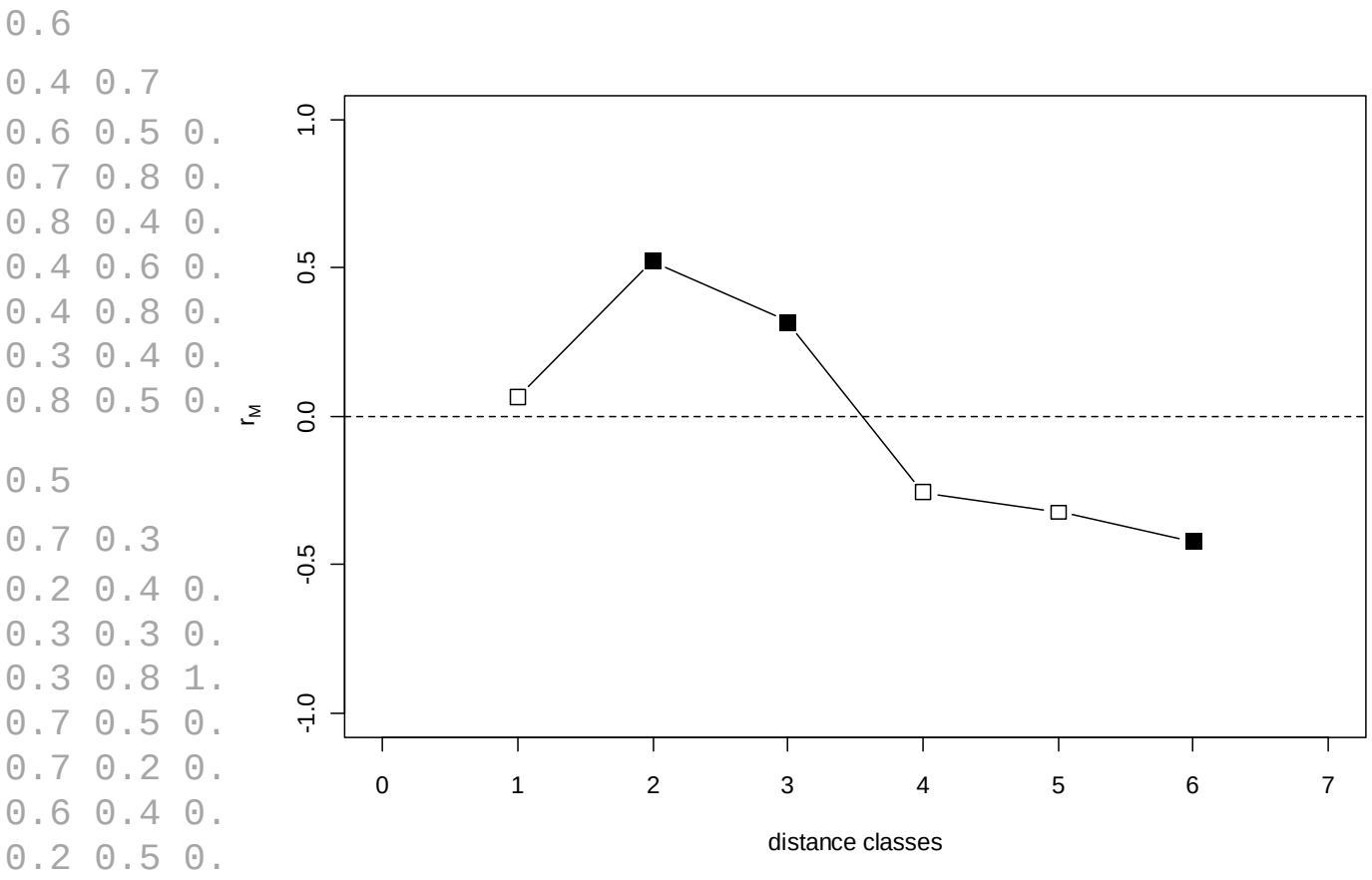
D. ESPACIAL

```
2.5
2.7 0.1
0.2 2.4 2.4
2.4 0.1 2.2 0.2
2.9 2.8 2.7 2.6 2.3
2.8 2.3 2.8 2.2 2.0 2.8
2.3 0.1 2.4 2.9 2.7 2.3 2.9
2.1 2.7 3.0 2.1 2.9 2.1 0.2 2.9
0.1 2.5 2.2 0.1 0.2 2.9 2.9 2.1 2.4
```

D. COVARIABLES

Matesanz S., Gimeno T.E., de la Cruz M., Escudero A. and Valladares F. 2011. Competition may explain the fine-scale spatial patterns and genetic structure of two co-occurring plant congeners. *J. Ecol.* 99: 838-848 .

Correlograma de Mantel parcial: **mpmcorrelogram()**



Matesanz S., Gimeno T.E., de la Cruz M., Escudero A. and Valladares F. 2011. Competition may explain the fine-scale spatial patterns and genetic structure of two co-occurring plant congeners. *J. Ecol.* 99: 838-848 .

Smart et al. 2004.
Bull. Ecol. Soc. Am.
85: 100-102

DEPARTMENTS

Technological Tools

A New Means of Presenting the Results of Logistic Regression

Introduction

The use of logistic regression analysis in ecological studies has greatly increased in recent years. It is a popular and useful statistical tool for predicting the probability of occurrence of a categorical dependent variable (e.g., presence or absence, male or female) based on predictor variables. The results of logistic regression have been presented in a number of ways in the scientific literature: equations with statistics (e.g., Sydeman et al. 1991, Stewart et al. 1996, Bolger et al. 1997, Gross and Kapuscinski 1997, Morrison 1998, Wiser et al. 1998*a*); probability response curves (e.g., Sydeman et al. 1991, Van Sickle et al. 1996, Wiser et al. 1998*a*); and bar charts of the percentage deviance explained by different models (e.g., Wiser et al. 1998*b*). However, these traditional means of presenting the results have many limitations in the information that they provide. We propose a new method for presenting logistic regression data, describe how it can be achieved with current software, and suggest that it

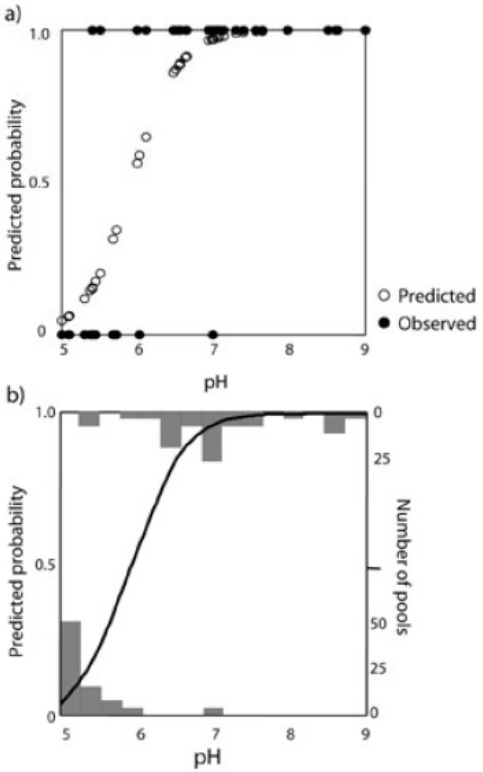


Fig. 1. Fitted logistic regression curves showing that the probability of pool occupation by an invertebrate (presence and absence) is dependent on pH. Both graphs present the same hypothetical data, but (a) is the traditional method of presenting logistic regression graphs produced in SPSS using overlay scatterplots, and (b) is the new method produced using a combination of SPSS and PowerPoint, where the histograms represent the observed data and the line is the predicted probability that a pool will be occupied.

Smart et al. 2004.
Bull. Ecol. Soc. Am.
85: 100-102

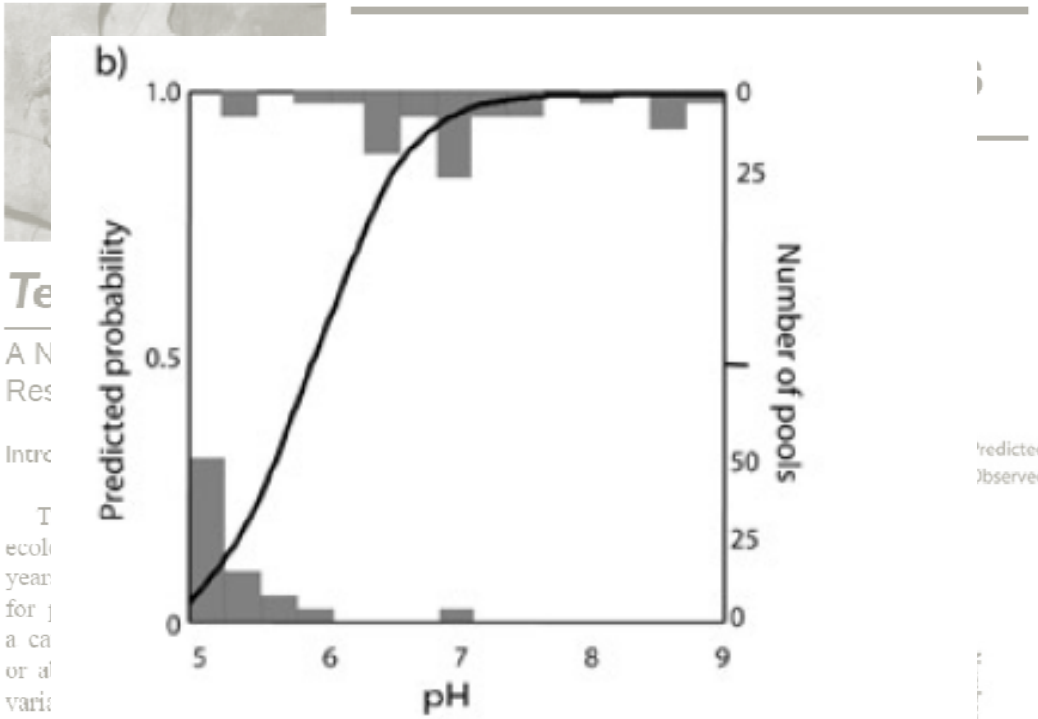


Fig. 1. Fitted logistic regression curves showing that the probability of pool occupation by an invertebrate (presence and absence) is dependent on pH. Both graphs present the same hypothetical data, but (a) is the traditional method of presenting logistic regression

using a combination of SPSS and PowerPoint.

PowerPoint, where the histograms represent the observed data and the line is the predicted probability that a pool will be occupied.

De la Cruz 2005. *Bull. Ecol. Soc. Am.* 86: 41-48

Emerging Technologies

Improving the Presentation of Results of Logistic Regression with R

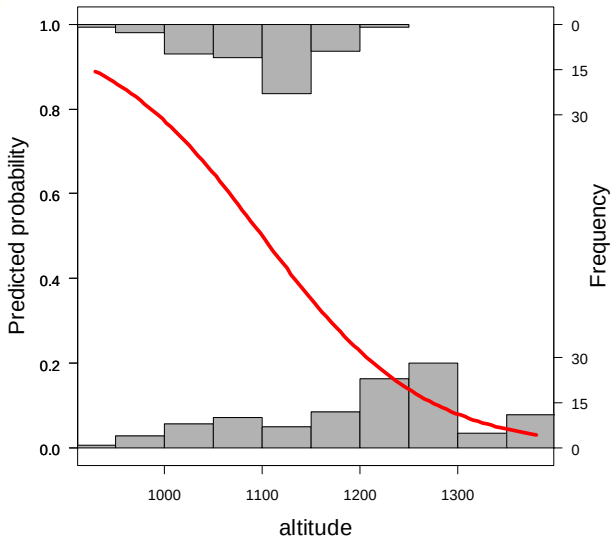
Introduction

In a recent issue of the *ESA Bulletin*, Smart et al. (2004) proposed an interesting new means of presenting the results of logistic regression, incorporating frequency histograms for each category of the dependent variable and an associated scale on the right-hand axis of the traditional probability plot. The new method of presentation clearly increases the information of the graph, but as they recognize, the manual production of these figures is time consuming. They suggest that software manufacturers should incorporate this type of combination graph in future updates of statistical packages.

In this note I show that we do not have to wait for software updates because we already have an easy means to produce and improve this kind of graph. I also provide some R functions to produce some variants of the combination graph.

An easy R approach

R is a free, open-source environment for statistical computing and graphics (R Development Core Team 2003). Its potential use for ecologists has only been described briefly (Elner 2001, Kangas 2004). Some of the developers of R were also innovators in statistical graphics (e.g., Chambers et al. 1983), so it is not



1) Set the draw area with function plot.
2) Use function hist to obtain the boundaries and the counts (i.e., the "heights") of the bins of histograms of the independent variable.
3) Scale the counts to adjust the height of the histograms to the desired height among the 0– 1 scale of the scatterplot. As one of the histograms will be drawn in the top of the graph, subtract from 1 their scaled counts.
4) Use repeatedly the function polygon with the scaled counts and boundaries data to draw the bins of each histogram.
5) Use the function axis and the scaled counts to

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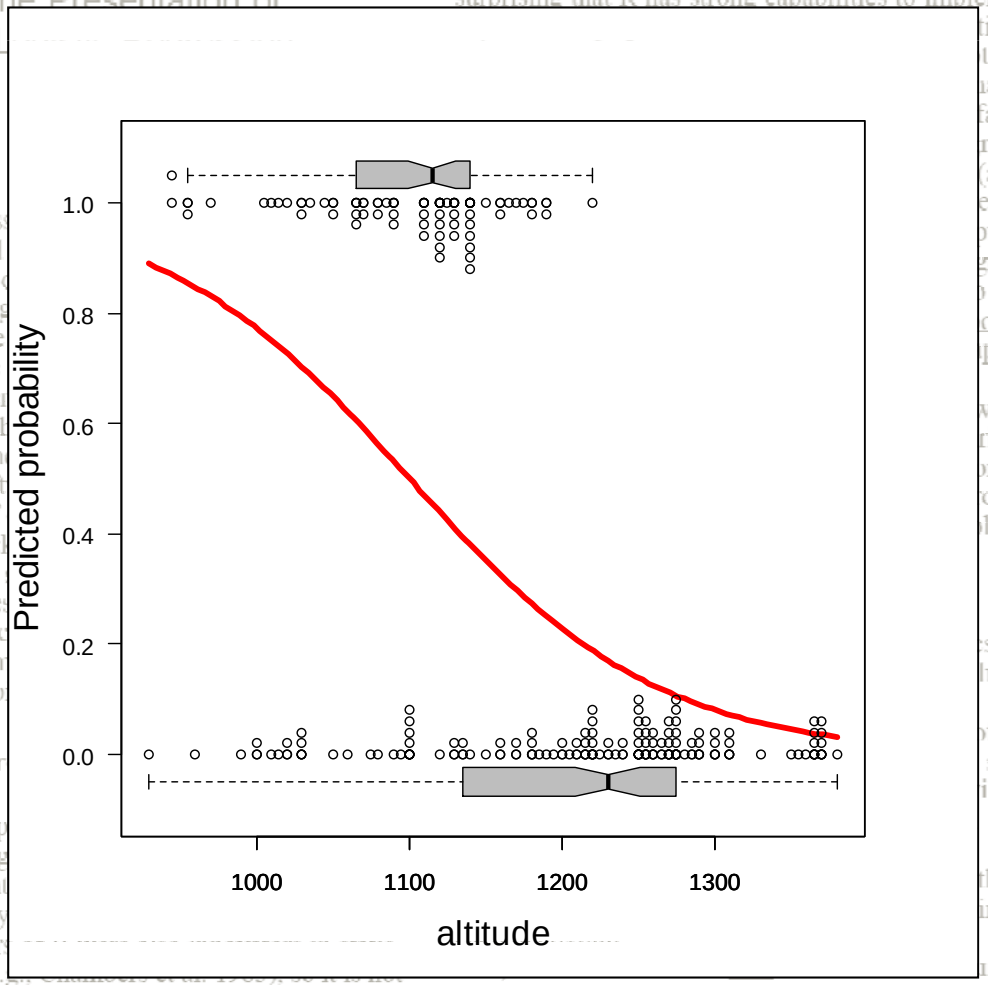

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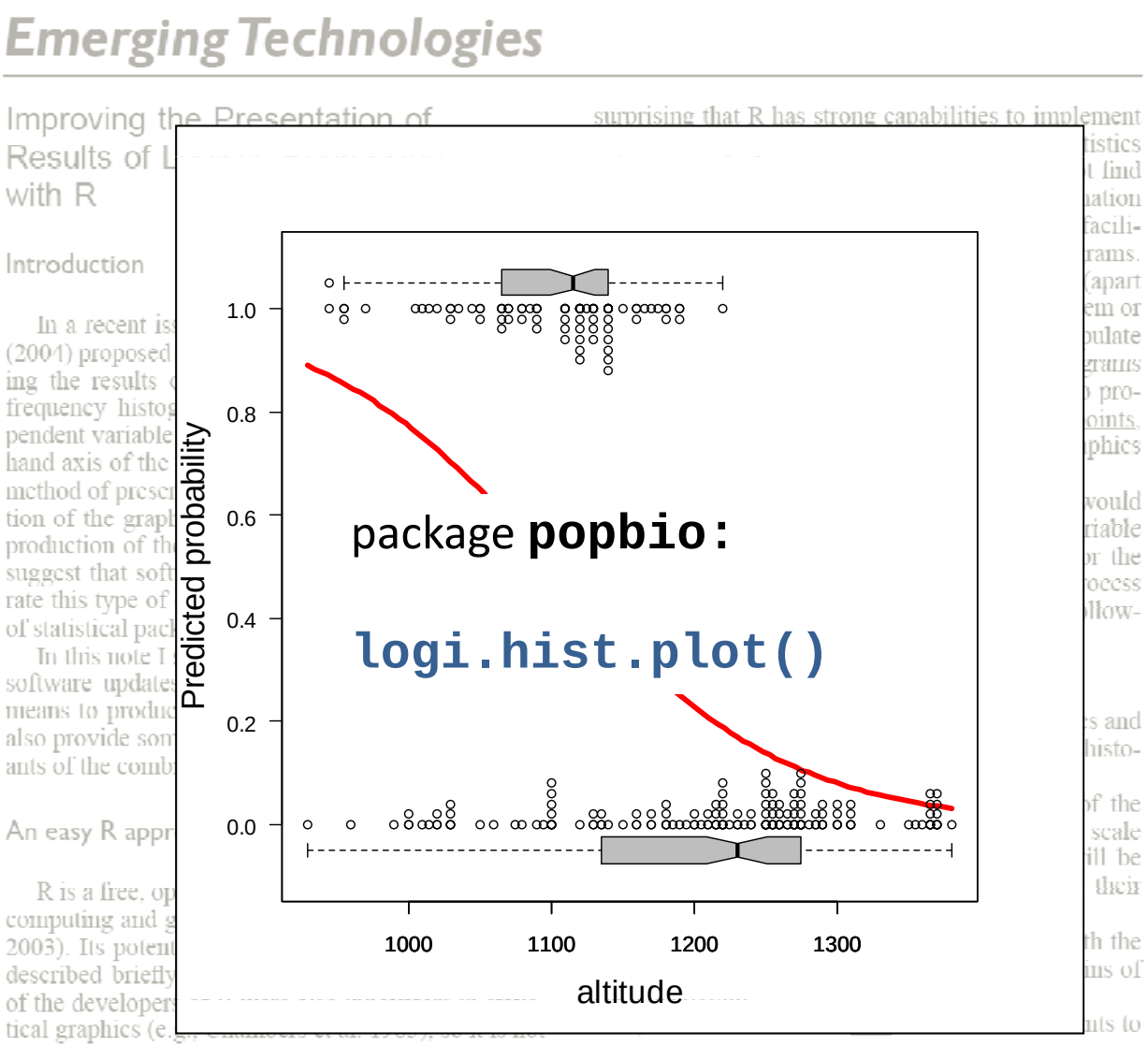

```
>library(fortunes)
> fortune("This is R")
```

Evelyn Hall: I would like to know how (if) I can extract some of the information from the summary of my nlme.

Simon Blomberg: **This is R. There is no if. Only how.**

-- Evelyn Hall and Simon 'Yoda' Blomberg

R-help (April 2005)