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BIOL 812

Graphical Concepts

Vector vs. Raster Formats

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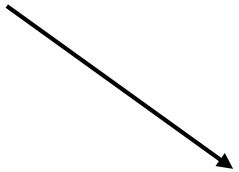
Vector



Formats:

SVG

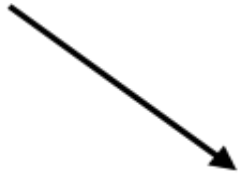
PDF

EPS

AI

PS

Raster



Formats:

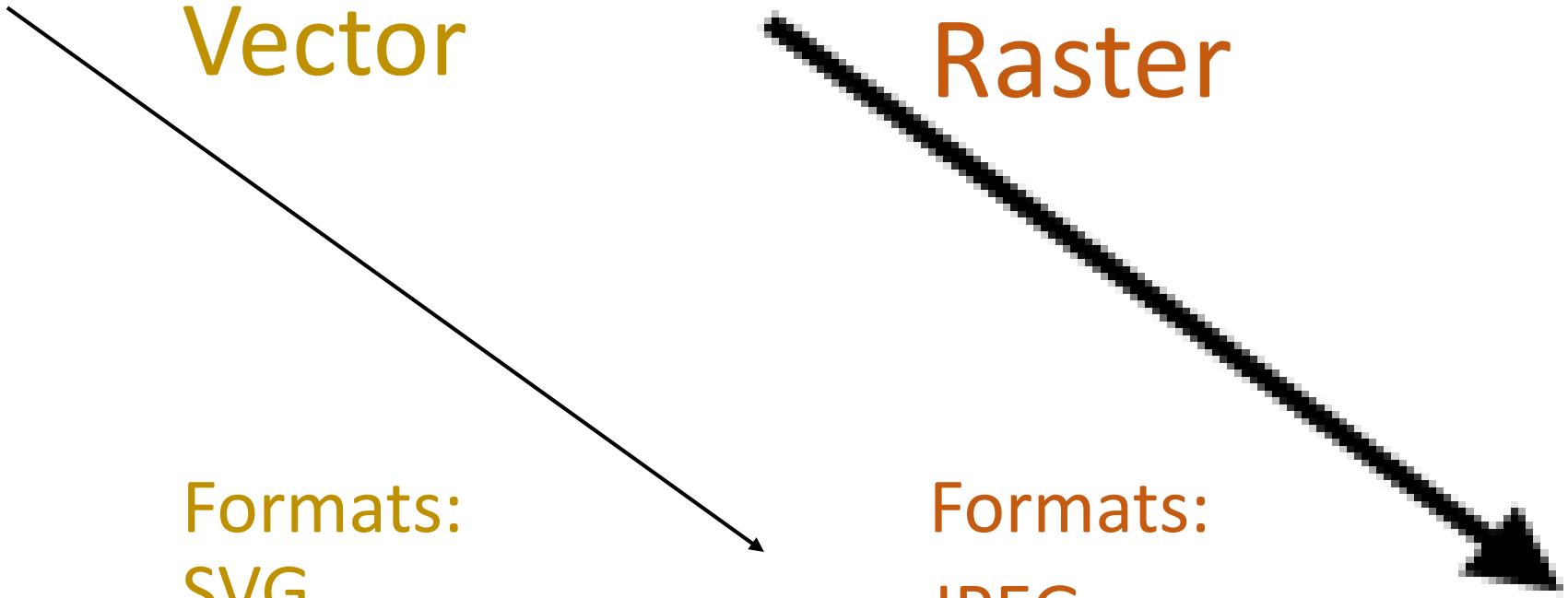
JPEG

PNG

TIFF

BMP

Vector vs. Raster Formats



Formats:
SVG
PDF
EPS
AI
PS

Formats:
JPEG
PNG
TIFF
BMP

Changing formats

Easy, no loss of information

Vector

Raster

Hard – which pixels to keep?

Pixel dimension determines file size

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Pixel Dimension = Physical size x Resolution

Large size, low resolution

Small size, high resolution

Same pixel dimension

RGB (screen) vs CMYK (print)

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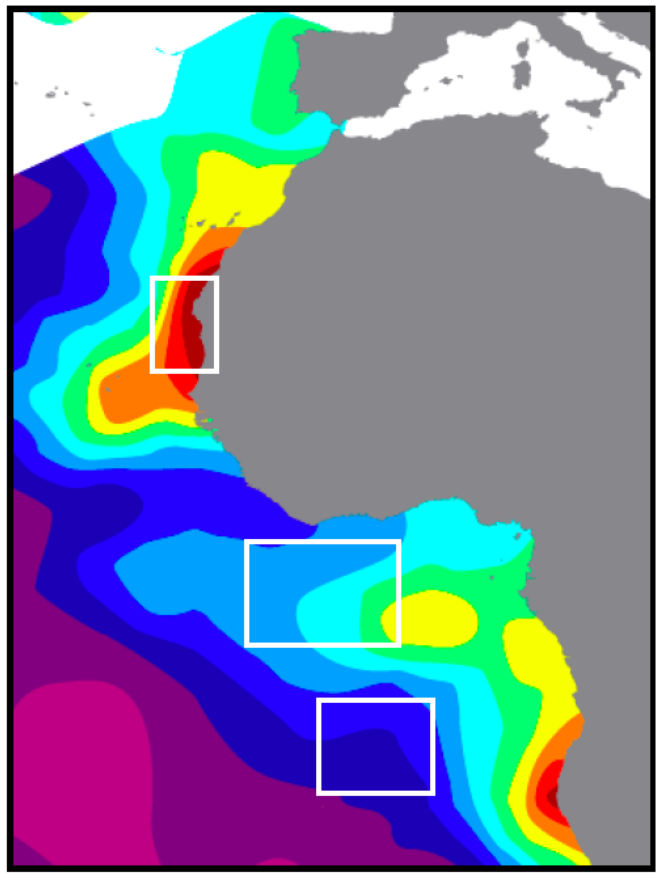
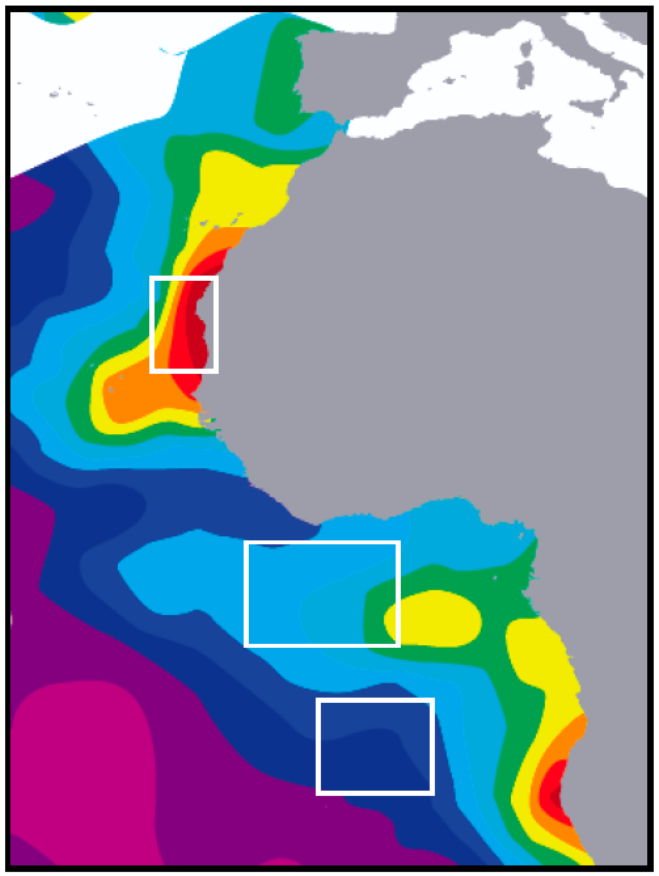
Screen

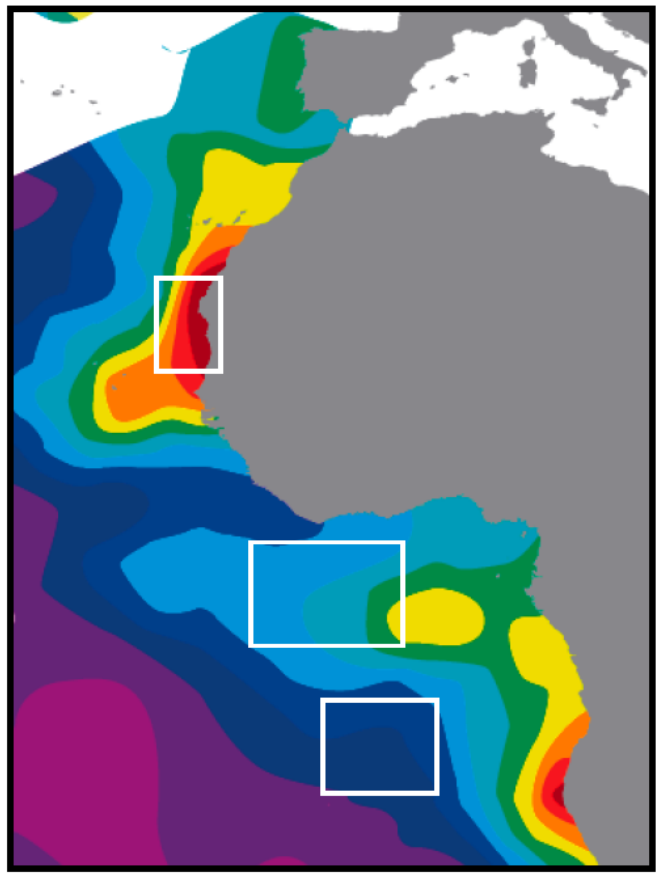
Print



RGB



CMYK
Coated paper



CMYK
Uncoated paper

Haddock & Dunn (2010)

Useful graphics software

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DON'T USE POWERPOINT FOR PUBLICATION

Advanced, expensive, steep learning curve:

- Adobe Photoshop (pixels)
- Adobe Illustrator (vectors)

FREE Software:

- GIMP (pixels) http://www.gimp.org/
- Inkscape (vectors) https://inkscape.org/en/

EBImage for Image Analysis in R

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Bioconductor: bioinformatics tools in R

http://www.bioconductor.org/packages/release/bioc/html/EBImage.html

EBImage – R-based image processing

http://www.bioconductor.org/packages/release/bioc/html/EBImage.html

Quick EBImage intro tutorial:

http://www.bioconductor.org/packages/release/bioc/vignettes/EBImage/inst/doc/EBImage-introduction.pdf

Full documentation:

http://www.bioconductor.org/packages/release/bioc/manuals/EBImage/man/EBImage.pdf

Anatomy of a ggplot() plot

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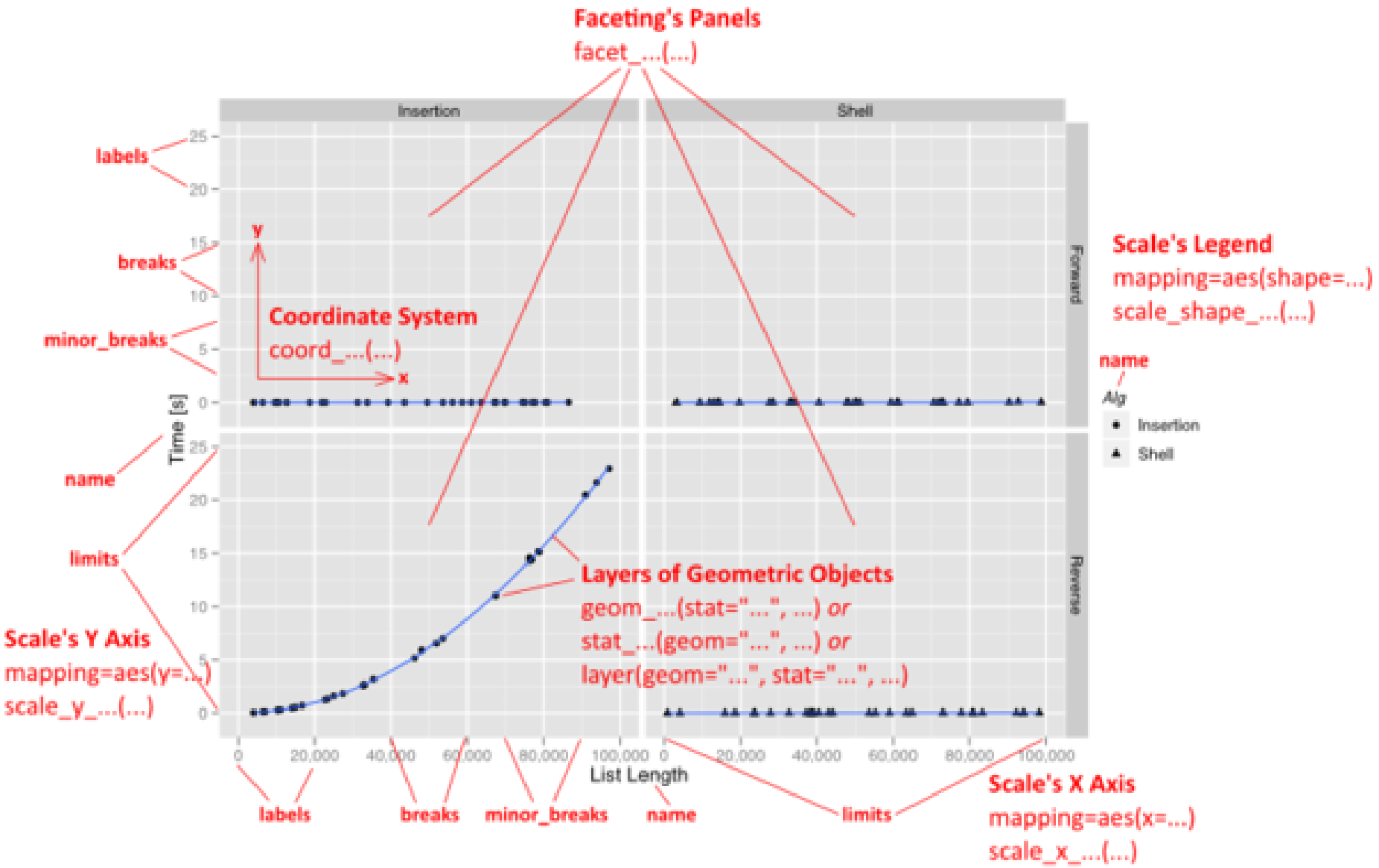


http://sape.inf.usi.ch/quick-reference/ggplot2

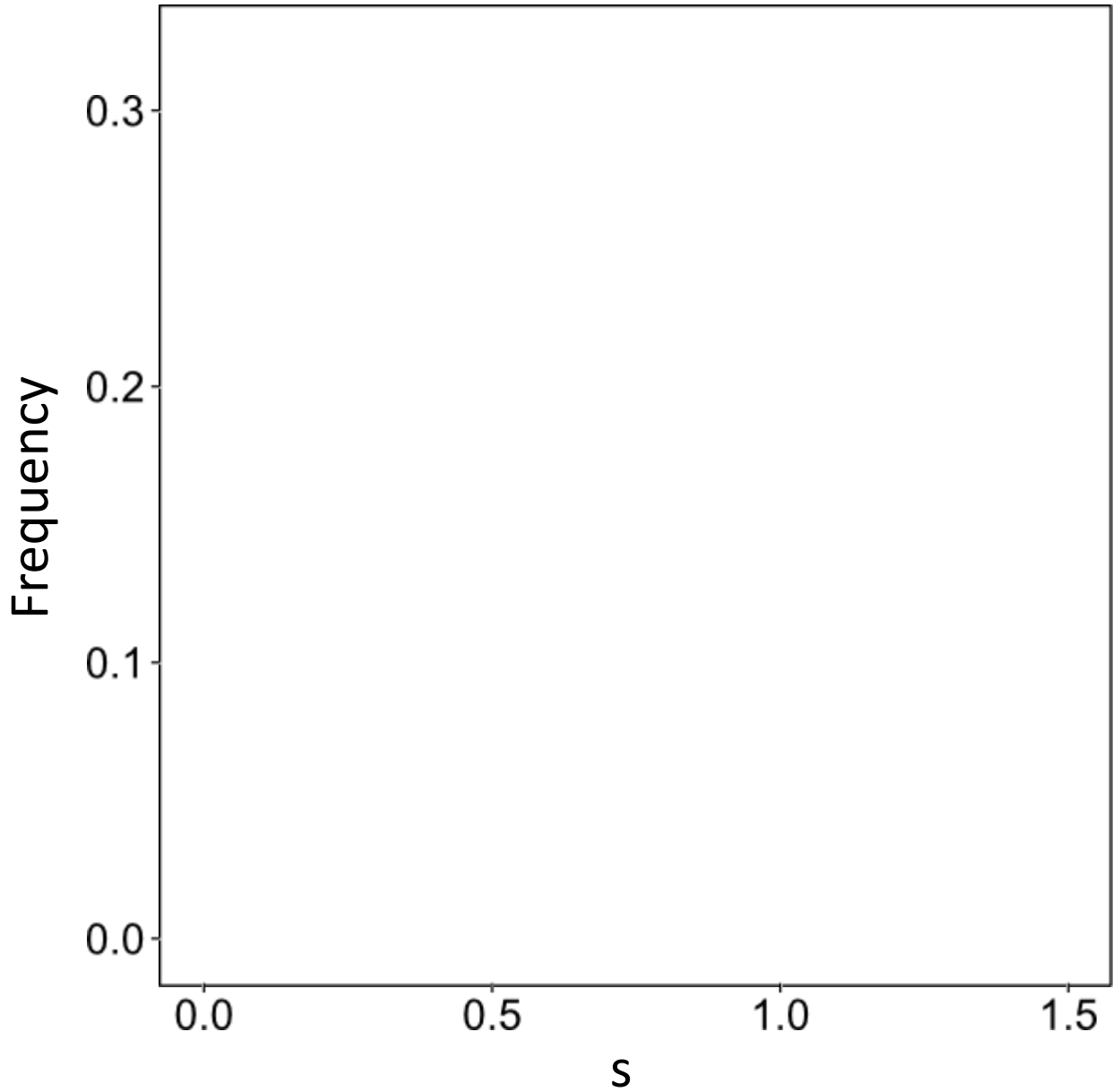
Ggplot2 grammar of graphics

- data
  - any information you want to plot
- geoms
  - geometric objects (lines, points, polygons)
- stats
  - statistical transformations applied to the data (e.g. binning for histograms)
- scale
  - scales of conversion from data to visual space (e.g. legend, range and scale of axes)

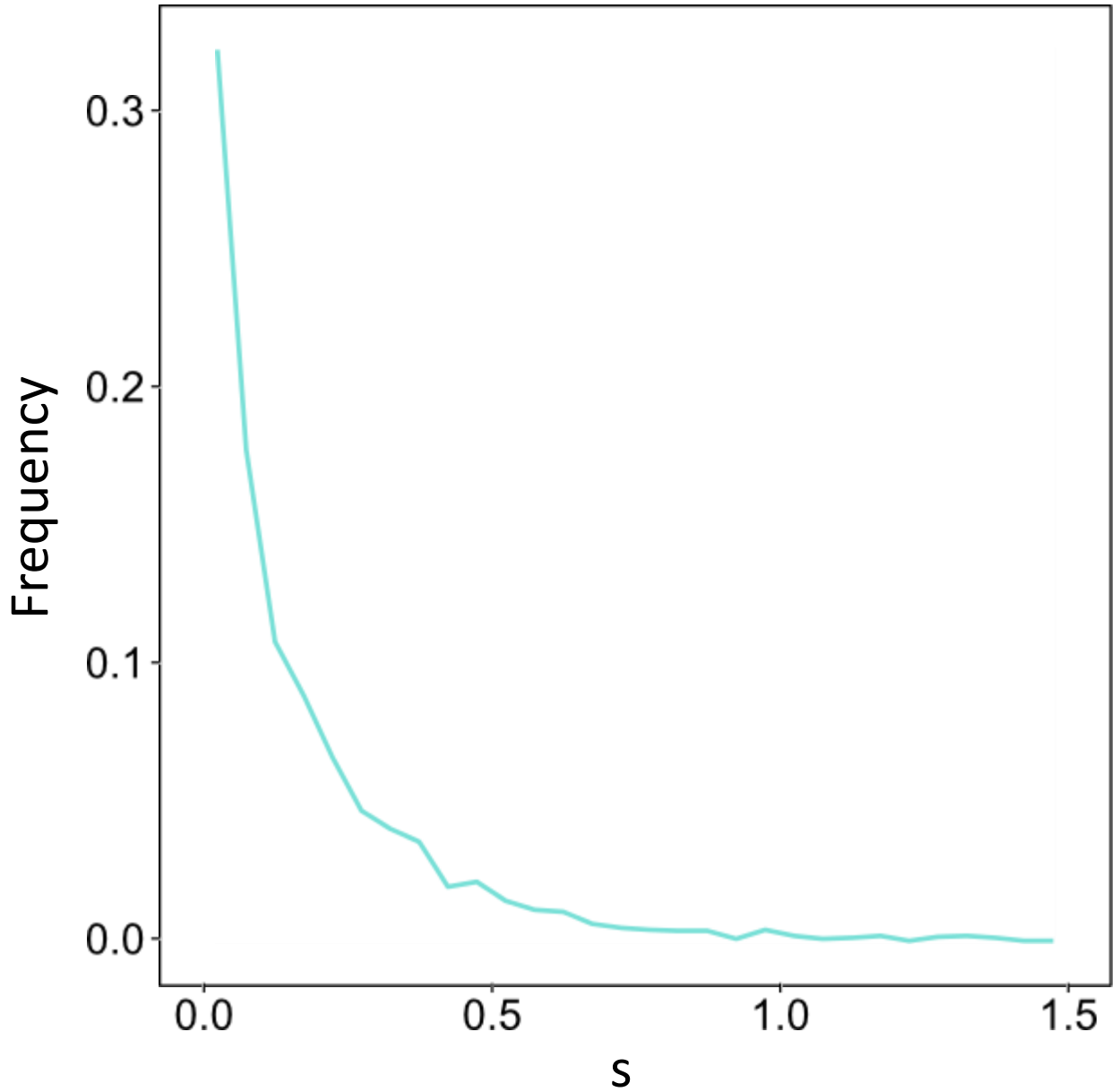
- coord
  - coordinate system of the graph (e.g. Cartesian, polar, lat/long)
- facet
  - break up data into separate graphs
- aes
  - aesthetic mapping describes how data is mapped (e.g. x, y, colour)
- theme
  - fine-tune appearance (e.g. background colour, gridlines)

Build graphics as ‘layers’

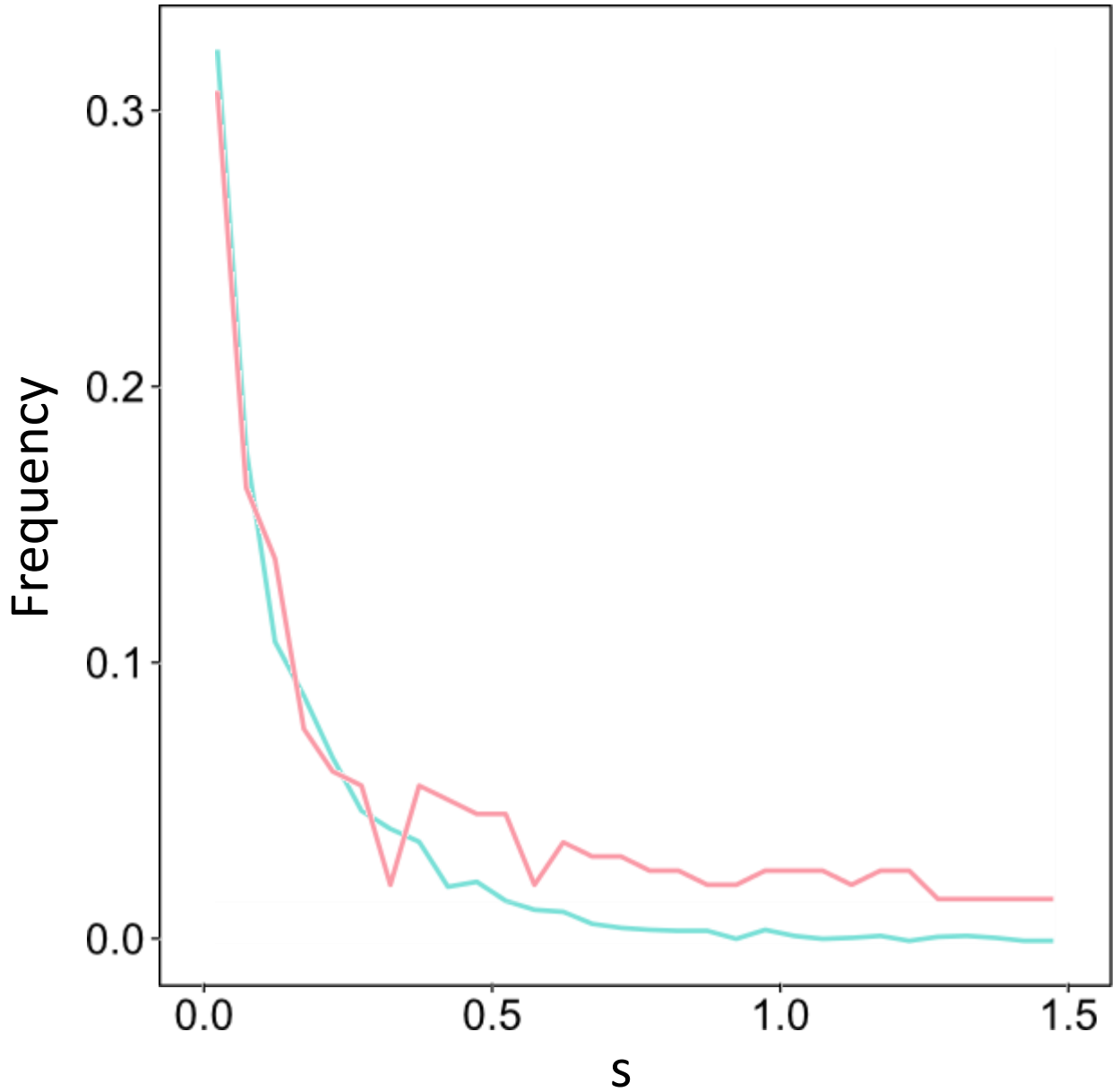
Build graphics as layers in ggplot



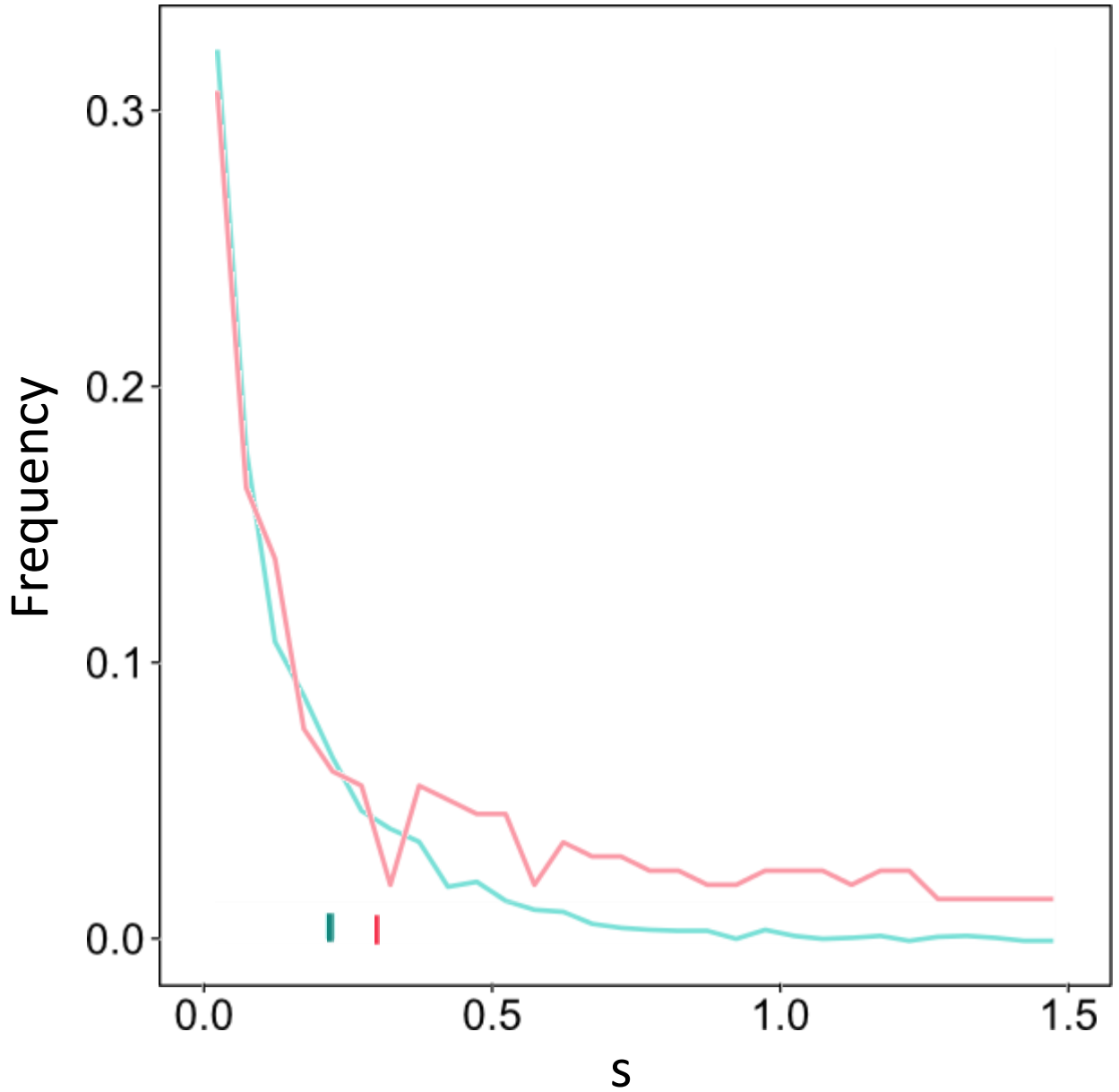
Build graphics as layers in ggplot



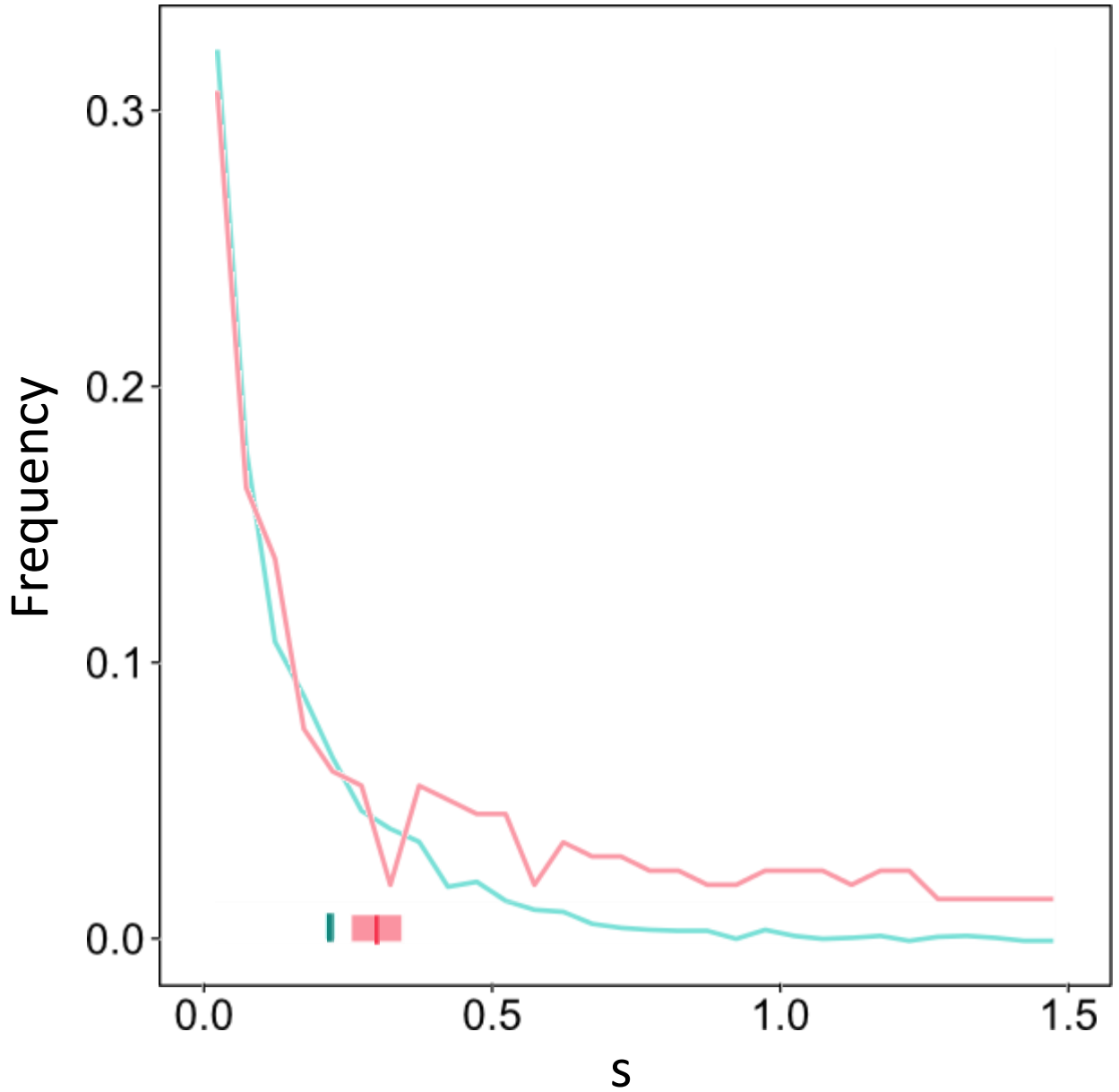
Build graphics as layers in ggplot



Build graphics as layers in ggplot



Build graphics as layers in ggplot



Geom list

Name	Description
abline	Line, specified by slope and intercept
area	Area plots
bar	Bars, rectangles with bases on y-axis
blank	Blank, draws nothing
boxplot	Box and whiskers plot
contour	Display contours of a 3d surface in 2d
crossbar	Hollow bar with middle indicated by horizontal line
density	Display a smooth density estimate
density_2d	Contours from a 2d density estimate
errorbar	Error bars
histogram	Histogram
hline	Line, horizontal
interval	Base for all interval (range) geoms
jitter	Points, jittered to reduce overplotting
line	Connect observations, in ordered by x value
linerange	An interval represented by a vertical line
path	Connect observations, in original order
point	Points, as for a scatterplot
pointrange	An interval represented by a vertical line, with a point in the middle
polygon	Polygon, a filled path
quantile	Add quantile lines from a quantile regression
ribbon	Ribbons, y range with continuous x values
rug	Marginal rug plots
segment	Single line segments
smooth	Add a smoothed condition mean.
step	Connect observations by stairs
text	Textual annotations
tile	Tile plot as densely as possible, assuming that every tile is the same size.
vline	Line, vertical

Table 4.2.: Geoms in `ggplot2`

Name	Default stat	Aesthetics
abline	abline	colour, linetype, size
area	identity	colour, fill, linetype, size, **x**, **y**
bar	bin	colour, fill, linetype, size, weight, **x**
bin2d	bin2d	colour, fill, linetype, size, weight, **xmax**, **xmin**, **ymax**, **ymin**
blank	identity	
boxplot	boxplot	colour, fill, **lower**, **middle**, size, **upper**, weight, **x**, **ymax**, **ymin**
contour	contour	colour, linetype, size, weight, **x**, **y**
crossbar	identity	colour, fill, linetype, size, **x**, **y**, **ymax**, **ymin**
density	density	colour, fill, linetype, size, weight, **x**, **y**
density2d	density2d	colour, linetype, size, weight, **x**, **y**
errorbar	identity	colour, linetype, size, width, **x**, **ymax**, **ymin**
freqpoly	bin	colour, linetype, size
hex	binhex	colour, fill, size, **x**, **y**
histogram	bin	colour, fill, linetype, size, weight, **x**
hline	hline	colour, linetype, size
jitter	identity	colour, fill, shape, size, **x**, **y**
line	identity	colour, linetype, size, **x**, **y**
linerange	identity	colour, linetype, size, **x**, **ymax**, **ymin**
path	identity	colour, linetype, size, **x**, **y**
point	identity	colour, fill, shape, size, **x**, **y**
pointrange	identity	colour, fill, linetype, shape, size, **x**, **y**, **ymax**, **ymin**
polygon	identity	colour, fill, linetype, size, **x**, **y**
quantile	quantile	colour, linetype, size, weight, **x**, **y**
rect	identity	colour, fill, linetype, size, **xmax**, **xmin**, **ymax**, **ymin**
ribbon	identity	colour, fill, linetype, size, **x**, **ymax**, **ymin**
rug	identity	colour, linetype, size
segment	identity	colour, linetype, size, **x**, **xend**, **y**, **yend**
smooth	smooth	alpha, colour, fill, linetype, size, weight, **x**, **y**
step	identity	colour, linetype, size, **x**, **y**
text	identity	angle, colour, hjust, **label**, size, vjust, **x**, **y**
tile	identity	colour, fill, linetype, size, **x**, **y**
vline	vline	colour, linetype, size

Table 4.3.: Default statistics and aesthetics. Emboldened aesthetics are required.

R graphics inspiration

Multiple plots

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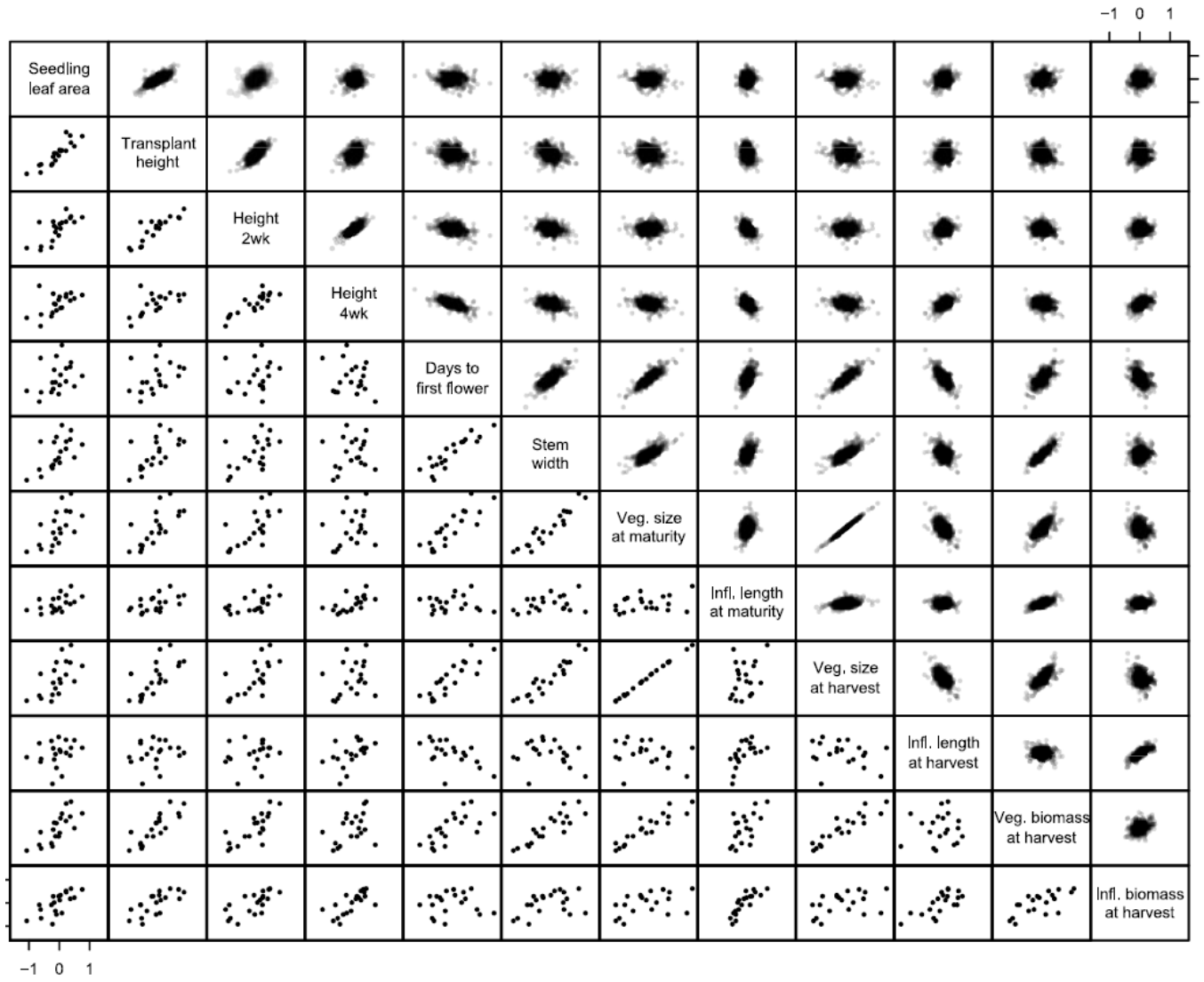
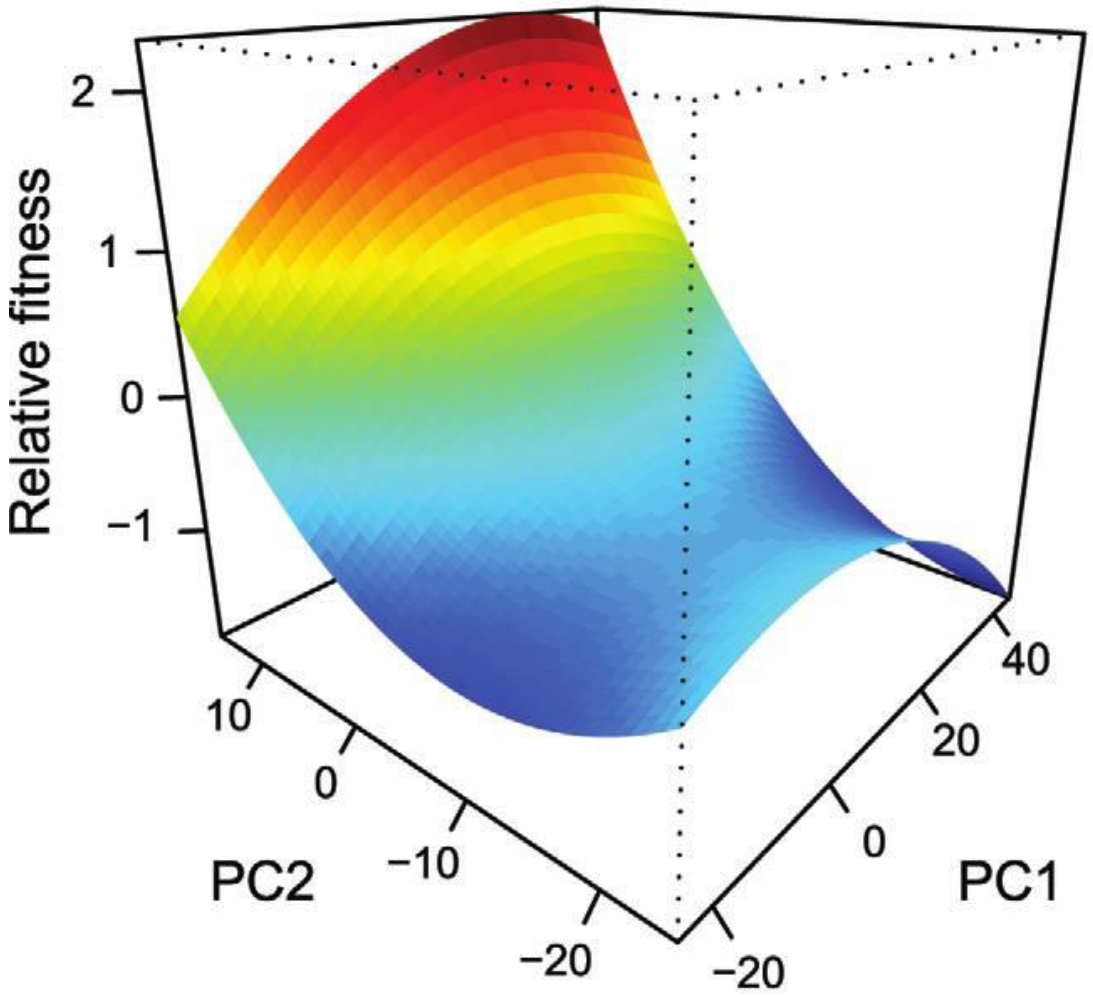
Pairwise regressions



lattice package

3D Surface Plots

Plot of fitness (z axis) for two principal component traits (PC1 and PC2)



persp() function

GIS/Mapping

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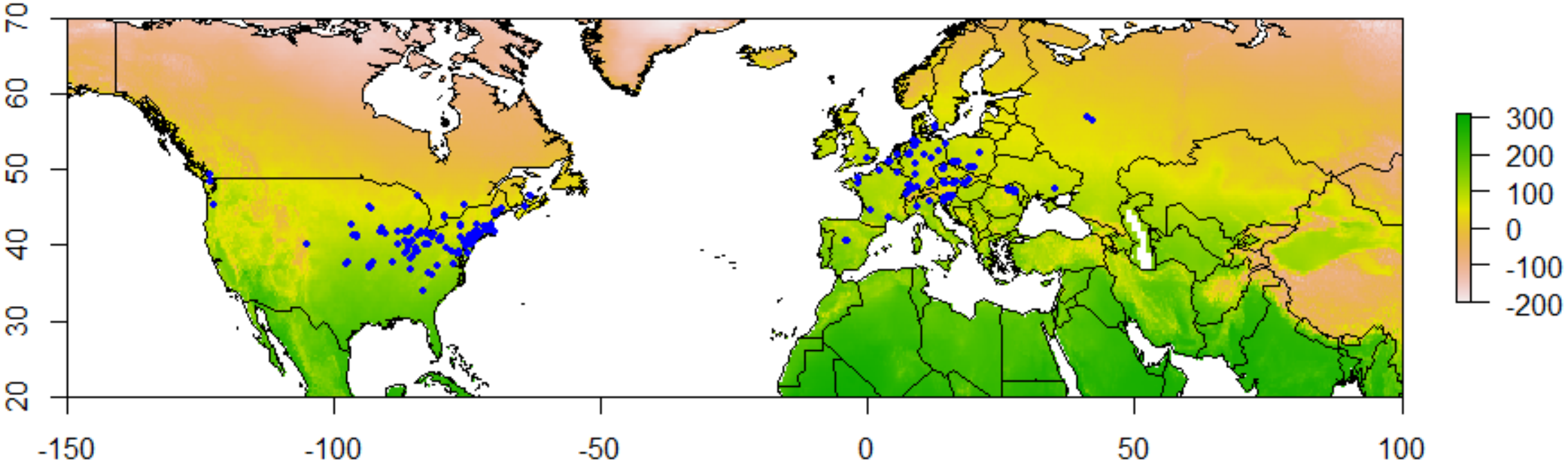
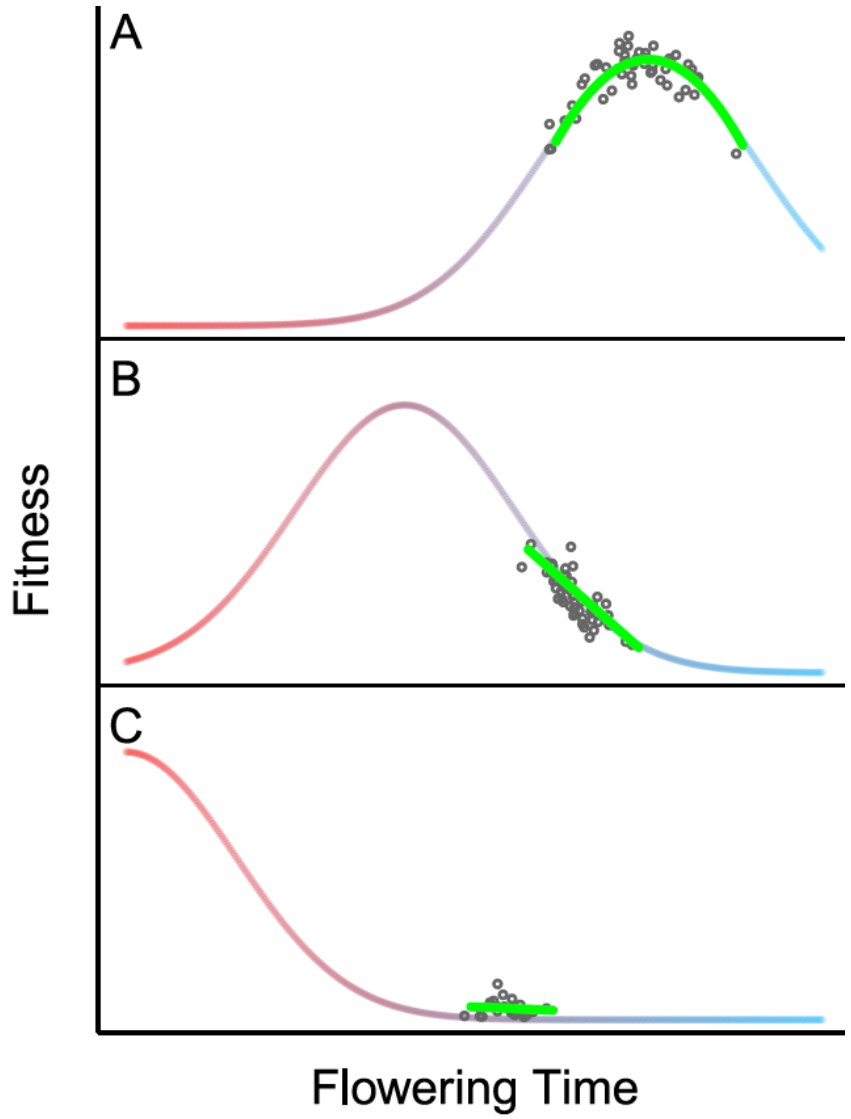
World climate data (white, orange green) and sample sites (blue dots) from garlicmustard.org



dismo, raster, rgdal, maptools, leap packages

Multi-panel simulation model



Fitness surfaces (smooth curves) with simulated genotypes (dots) and Lande-Arnold selection gradients (green curve)

ggplot2 package

Bivariate plot

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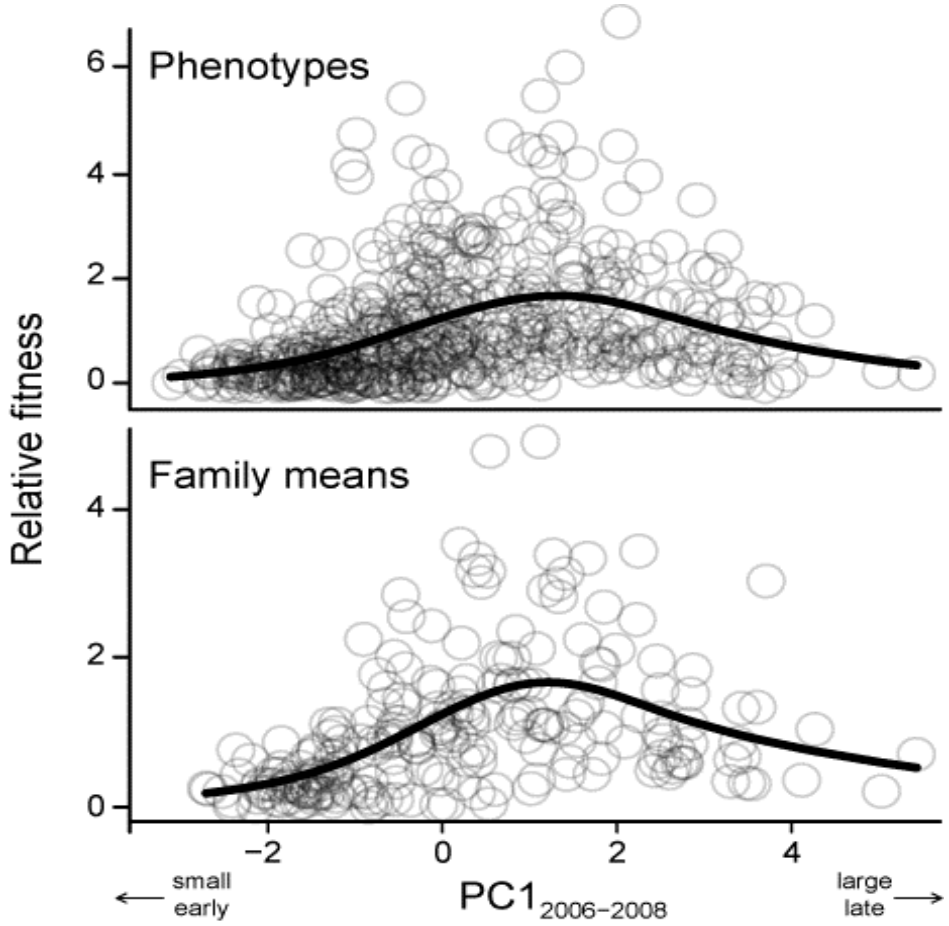
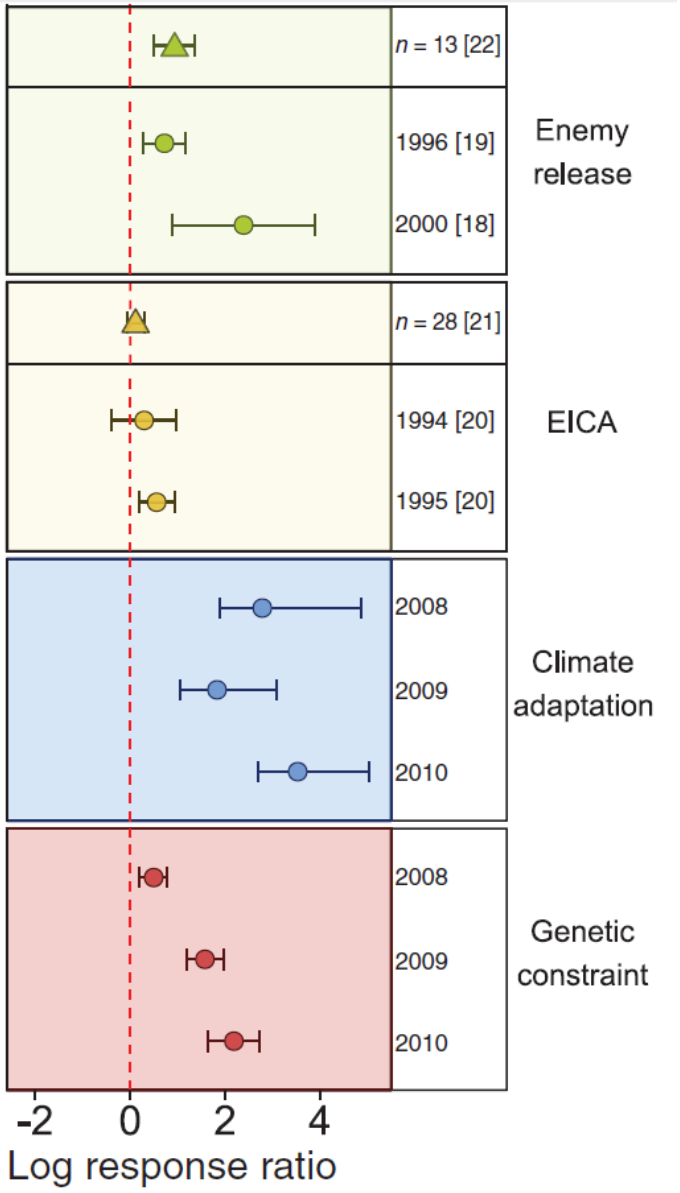
Standard bivariate plot with `gam()` fit



ggplot2 package

Multi-panel plots of means + 95% C.I.



Standardized effect sizes testing different hypotheses for individual species (circles) or meta-analyses of many species (triangles). Lines show 95% C.I.

ggplot2 package

Menagerie of graphics in R

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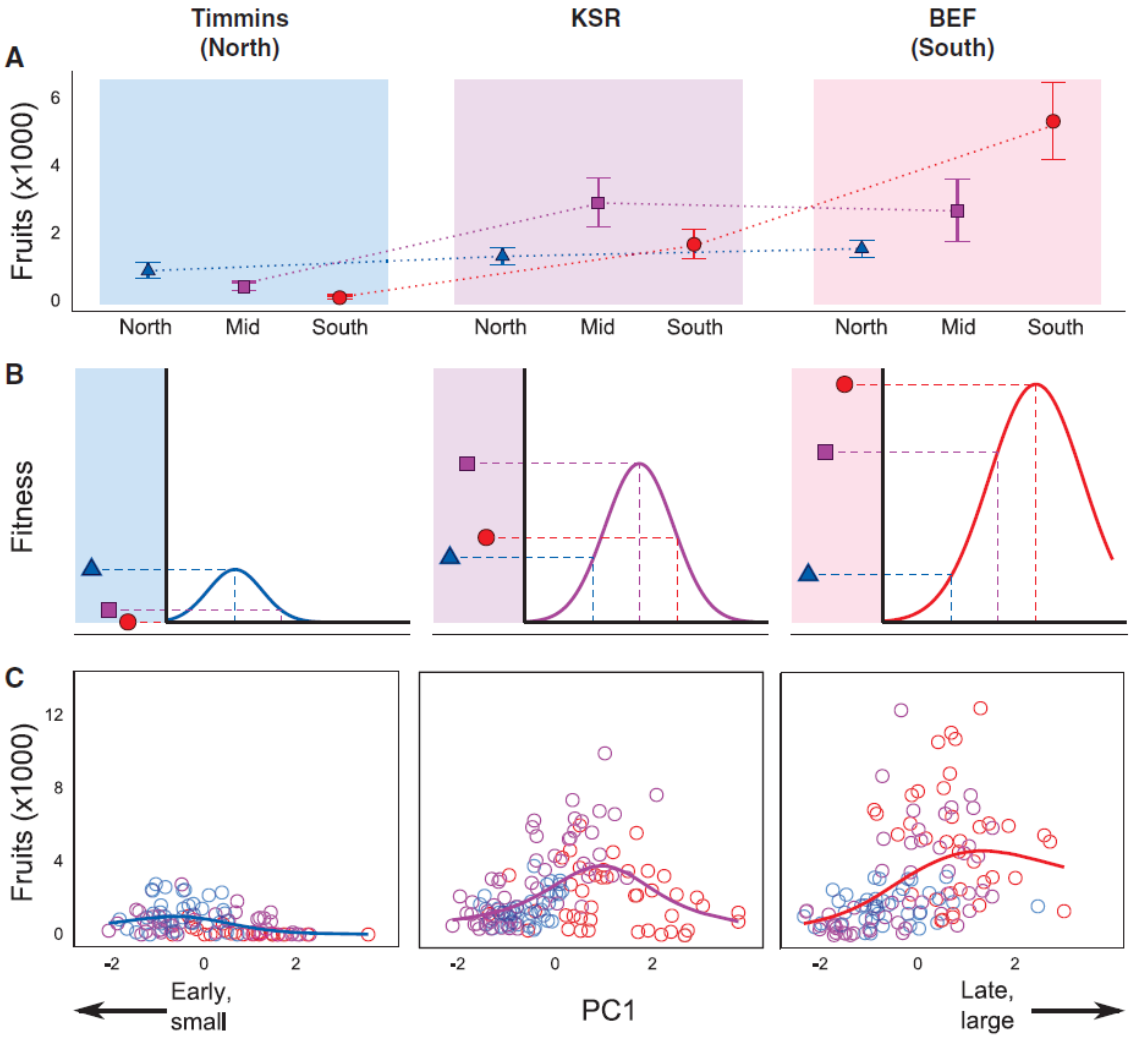
Potpourri of graphs: (A) test of local adaptation; (B) fitness model; (C) selection splines



ggplot2 package

Menagerie of graphics in R

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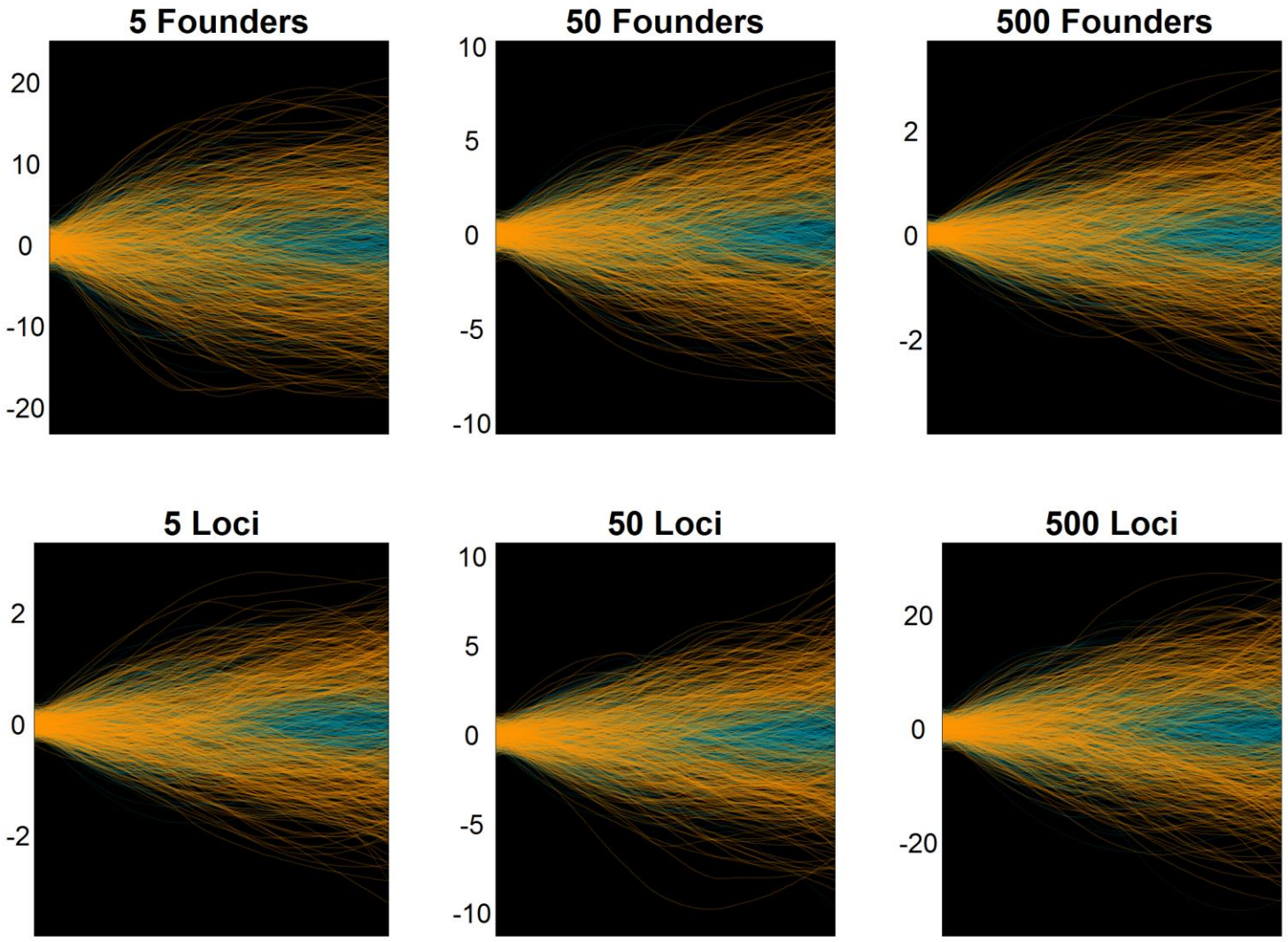
Stepwise colonization simulation model



ggplot2 package

Graphics Design Inspiration

http://www.davidmccandless.com/

http://coolors.co/

https://color.adobe.com/

http://idl.cs.washington.edu/

Assignment: Make something beautiful

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Investigate ggplot2() options at http://docs.ggplot2.org/current/

Use an R markdown file to create a clean, attractive 1-page report, focusing on a single visualization with ggplot(). The details of the report don't matter (e.g. real vs. simulated data).

Use custom formatting make the most attractive report you can make using R markdown and ggplot().

You will be marked purely on (1) aesthetic (clean & clear, with no unnecessary 'ink'), (2) the application of methods used in Rmarkdown and ggplot(), and (3) whether your .Rmd file knits without error.

Submit to onq.queensu.ca DropBox Link