

Question for examination, 2017

Arthur Capet

November 21, 2017

We present the dataset [Exam2017.xls](#), characterising the response of growth rate for two plankton species (N1 and N2) to the availability of two resources (R1 and R2).

The data file contains 4 sheets (use `read.xls` from package `gdata` to read .xls file, sheet by sheet): The sheet **N1R1** contains the response of N1 growth to R1, etc ...

It is considered that those resources are **essentials**, and that all other resources (e.g R2) were present in sufficient abundance when testing the response to a limiting resource (e.g R1).

Q1: Individual growth

Use the FME package to calibrate the logistic growth function $g = g_{max} \cdot \frac{N}{N+K}$ for each pair of species/resource. Present the 8 parameters obtained with their $p < 0.05$ confidence intervals and display (for the pair N1,R1 only) the calibrated growth model together with the experimental data points.

Q2: Competition

We consider a natural spatial gradient with different resource conditions. The extremities of this gradient are defined by the resource supply points [R1 = 0 μ M, R2 = 80 μ M] and [R1 = 80 μ M, R2 = 0 μ M]. Both species will be present at initial conditions, with an abundance of 50 ind./ml. We question the outcomes of species competition for resource, given their growth characteristic, along this gradient.

Additional Parameters:

Parameter	Value
Relaxation time for resource supply	15 days.
R1 relative consumption for N1	0.4
R1 relative consumption for N2	0.6
N1 mortality	0.1 ind./ml/d
N2 mortality	0.08 ind./ml/d
Tolerance to assess competition issue	0.02 ind./ml

- Display on the resource plane, for 20 resource points located along this gradient :
 - the issue of resource competition (which species survives?).
 - the corresponding equilibrium points.
- Display, on another plot, the abundance of N1 and N2 (y-axis) at equilibrium for different resource supply points along the gradient of resource availability (x-axis).
- Does the relative species abundance changes when the supply relax. time is modified ? Explain.
- Does the relative species abundance changes when the relative preference of a species is modified ? Explain.

BONUS: Sensitivity

If you could obtain additional sampling for the first calibration exercise, at which range of concentration would you focus your sampling ? Why ?

Presentation: Present all results using the “slidy_presentation” option for RMarkdown files.