**README**

*Species contributions to stability in perturbed communities*

**Model simulations**

**List of R scripts:**

* 05BEFDcreateData
* 06BEFDcalculateAUC
* 07BEFDanalyseAUC
* 08BEFDdominance

**Description of R scripts:**

The following R scripts have been used to create and analyse our simulated communities. We saved the created data frames as csv files.

05BEFDcreateData: 5 species Lotka Volterra model to create data for 3 different disturbance types and 3 Limit scenarios.

* Functions used are stored in the functions folder and comprise of:
  + 01BEFDModel.R
  + 02BEFDgrowthRates.R
  + 03BEFDbiomassChange.R
  + 04BEFDgenerateDisturbanceSensitivities.R
  + 05BEFDgenerateCompetitionMatrix.R
  + 06BEFDrk4Solver.R
* We here create a competition-dependent model with 5 species with the same growth rate and capacity over 450 timepoints and time step 0.5.
* Disturbances are a reduction in biomass: Press with intensity 0.0025, pulse with intensity 0.5 and, pulsepress with a combination of the too (one time removal of 0.5 and continuously 0.0025).
* Limit scenarios include 3 different scenarios of species responses in a model community:
  + Limit 1: All species respond equally to the disturbance
  + Limit 2: All species are equally sensitive to the disturbance, but one is resistant.
  + Limit 3: All species are equally resistant to the disturbance, but one is sensitive.
* After creating the data, here we calculate the response variables needed for the AUC calculation. See Table 1 in MS
* Write csv **LRRdata.csv**

06BEFDcalculateAUC: calculate the AUC change in biomass and proportion for each species, Model, Limit, run combination, etc.

* Biomass plot for supplement
* AUC Loop cycling trough cases using the auc() function of the MESS package
* Fig. 2: species contributions to stability
* Write csv **StabAlphaAuc.csv**

07BEFDanalyseAUC: Analysis of the AUC as function of their relative competitiveness

* Uses **StabAlphaAuc.csv**
* Calculates relative competitiveness as inverse relative alpha
* Supplementary figure

08BEFDdominane: Analysis of the AUC as function of species dominance

Calculate relative dominance from control

* Estimates magnitude of species contributions
* Fig. 3: species contributions as function of relative dominance
* uses **StabAlphaAuc.csv**

**Empirical data**

**List of R scripts:**

* 01SITES\_createTidyData\_complete.R
* 02SITES\_TidyanalyseTraits\_complete.R
* 03SITES\_lmer\_complete.R

**List of data:**

zooplankton.csv: Table contains species-specific abundance and biomass for each

zooplankton taxa. The table was downloaded from the SITES data

portal and not manipulated.

**Description of R scripts:**

01SITES\_createTidyData\_complete.R: Data wrangling and AUC loop

* Here, we standardize the data collected in the 10 experiments (10 lakes x 2 seasons) using the complete() function, missing values of species responses were handled by replacing NAs with zeros.
* AUC Loop cycling trough cases using the auc() function of the MESS package
* Fig. 4: species contributions to stability
* **AUC\_data3.csv**

02SITES\_TidyanalyseTraits\_complete.R: Analysis of AUC as a function of dominance

* Estimates magnitude of species contributions
* Analyses species contributions as function of species relative dominance in control
* Fig. 5: species contributions as a function of relative dominance

03SITES\_lmer\_complete.R: Linear models to estimate the likelihood of a species contributing to stability in the same way among all lakes and seasons and thus being displayed in the same sector

* Individual linear models for each perturbation type and dimension using the lmer() function within the lme4 package (Bates *et al.*, 2015).
* We used lake and season as random effects in our model and removed the intercept to test each species against zero
* Creates a table with adjusted R2, p-values and estimates for each taxa and each disturbance.