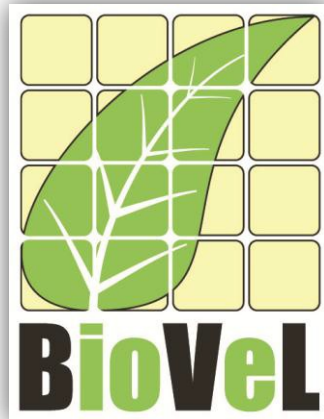


Damping ratio Workflow for local execution



BioVeL – Biodiversity Virtual e-Laboratory

Workflow Documentation

Damping ratio Workflow for local execution

July 2014

Capacities Programme of Framework 7: EC e-Infrastructure Programme –
e-Science Environments - INFRA-2011-1.2.1

Grant Agreement No:
Project Co-ordinator:
Project Homepage:
Duration of Project:

283359
Mr Alex Hardisty
<http://www.biovel.eu>
36 months



Damping ratio Workflow for local execution

1 Description

The Damping ratio Workflow provides an environment to calculate the damping ratio of several matrices and plot them.

The damping ratio can be considered as a measure of the intrinsic resilience of the population, describing how quickly transient dynamics decay following disturbance or perturbation regardless of population structure, the larger the p , the quicker the population converges (Caswell 2001).

2 General

2.1 Name of the workflow in myExperiment.

Name: Damping ratio Workflow for local execution

Download: The workflow pack can be downloaded at myExperiment under the following address:
<http://www.myexperiment.org/packs/632.html> or only the workflow:
<http://www.myexperiment.org/workflows/4317.html>

2.2 Date, version and licensing

Last updated: 23th July 2014

Version: 2

Licensing: CC-BY-SA

2.3 How to cite this workflow

To report work that has made use of this workflow, please add the following credit acknowledgement to your research publication:

The input data and results reported in this publication (tutorial) come from data (Dr. Gerard Oostermeijer unpublished results and publication: Oostermeijer, J.G.B. M.L. Brugman, E.R. de Boer; H.C.M. Den Nijs. 1996. Temporal and Spatial Variation in the Demography of *Gentiana pneumonanthe*, a Rare Perennial Herb. *The Journal of Ecology*, 84: 153-166.) using BioVeL workflows and services (www.biovel.eu). Damping ratio workflow was run on *<date of the workflow run>*. BioVeL is funded by the EU's Seventh Framework Program, grant no. 283359.

3. Scientific specifications

3.1 Keywords

Matrix Population Models, stage matrix, damping ratio, demography.

3.2 Scientific workflow description

The Damping ratio Workflow provides an environment to calculate the damping ratio of several matrices and plot them. The workflow accepts input data in a .txt format. The output is provided as a set of R results and a graphic plot.

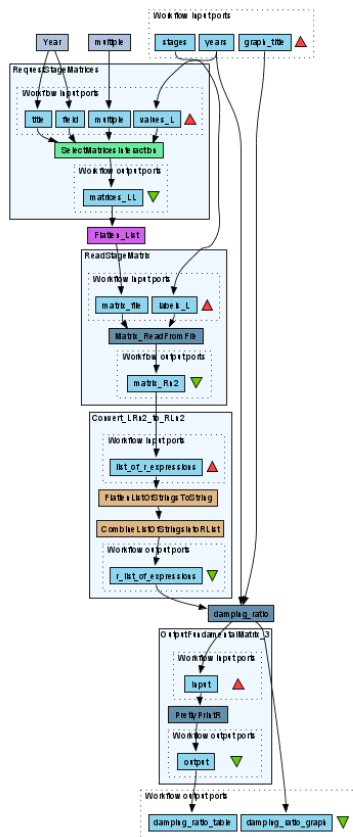


Figure 1. Damping ratio workflow in Taverna workbench.

For more detailed description of the functions, please visit the Tutorial section.

4 Technical specifications

4.1 Execution environment and installation requirements

The Workflow requires a Taverna Engine including the Interaction Service plugin. The simplest way to install a Taverna Engine is to install Taverna Workbench, and then install the Interaction Service plugin.

The workflow also requires an Rserve installation with the popbio package installed. It is possible to setup the workflow to use a remote Rserve. However, instructions for installing a local Rserve are provided below.

4.2 Taverna installation, including updates and plugins

4.2.1 Taverna installations

- Taverna Workbench: Version 2.4 or 2.5. For installation files and instructions, please go to <http://www.taverna.org.uk/download/workbench>

4.2.2 Taverna Plug-ins

- Please install the [Interaction](#) plugin: version 1.0.2+

4.2.3 Taverna Dependencies

- Install R software in your computer. See: <http://www.r-project.org/>
- Start R, and install package Rserve:
 - `install.packages("Rserve")`
- Install package popbio
 - `install.packages("popbio")`
- Local R Server: (Rserve) running at port 6311. See <https://wiki.biodel.eu/x/3ICD> for additional information.

4.2.4 How it works

- First, open R; once R is opened, type `library(Rserve)` and press enter; then type `Rserve()` and press enter again. You will see then the following message: Starting Rserve...

```
"C:\PROGRAMS\1\R\R-30~1.1\library\Rserve\libs\x64\Rserve.exe"
```

After this operation you can open Taverna and run the workflow.

5 Tutorial

5.1 Introduction

This tutorial requires 6 input files; 6 matrices of consecutive years (87-88, 88-89, 89-90, 90-91, 91-92) of the same place (Terschelling, The Netherlands). Finally you will be able to export your results to different formats.

5.2 Input data.

5.2.1 Data preparation/format

The workflow accepts input data (matrices) in a .txt format, all decimal numbers in each matrix must be indicated by dots e.g.: 0.578. All examples matrices for the tutorial are available in the PACK: <http://www.myexperiment.org/packs/632.html> or here below.

5.2.2 Input data

The input files are in a .txt format: to download click here in each file:

Terschelling matrices

- [MTers87_88.txt](#)
- [MTers88_89.txt](#)
- [MTers89_90.txt](#)
- [MTers90_91.txt](#)
- [MTers91_92.txt](#)
- [MTers92_93.txt](#)

Please note that the workflow as well as the tutorial is a beta version, and may contain errors. We hope you will still find it interesting to work with this workflow, and look forward to your feedback.

5.3 Select input data dialogue boxes.

The first step is to fill out the input ports:

5.3.1 INPUTPORTS

1) **Graphtitle:** Descriptive main title for labelling generated output (damping ratio graph). Click Add Value, enter a title and press Enter.

e.g: *Gentiana pneumonanthe*, Terschelling (name of the species, Place of the research)

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2) **Stages**: the names of the stages or categories of the input matrix. In the following example, the matrix has 5 stages or categories. The respective name stages must be filled one by one. First click Add Value (see arrow in Fig 2), enter a stage name (not longer than 8 characters) and press Enter; then click Add Value and enter the next stage name, repeat the action until you have entered all the stage names.

In the following example, the matrix has 5 stages or categories:

The stages of this matrix are called:

- | | |
|-----------------------------|---|
| 1) Seedlings | S |
| 2) Juveniles | J |
| 3) Vegetative | V |
| 4) Reproductive individuals | G |
| 5) Dormant plants | D |

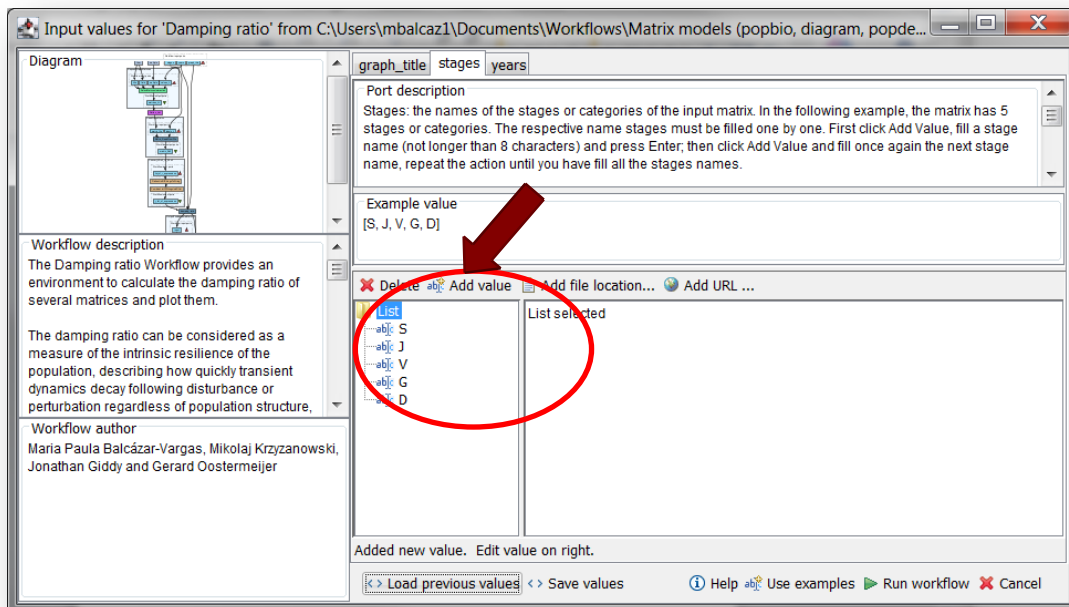


Figure 2. Inputs stages names to be filled in (example).

3) **Years** The year of each matrix. In the following example, we have six matrices, so six years.

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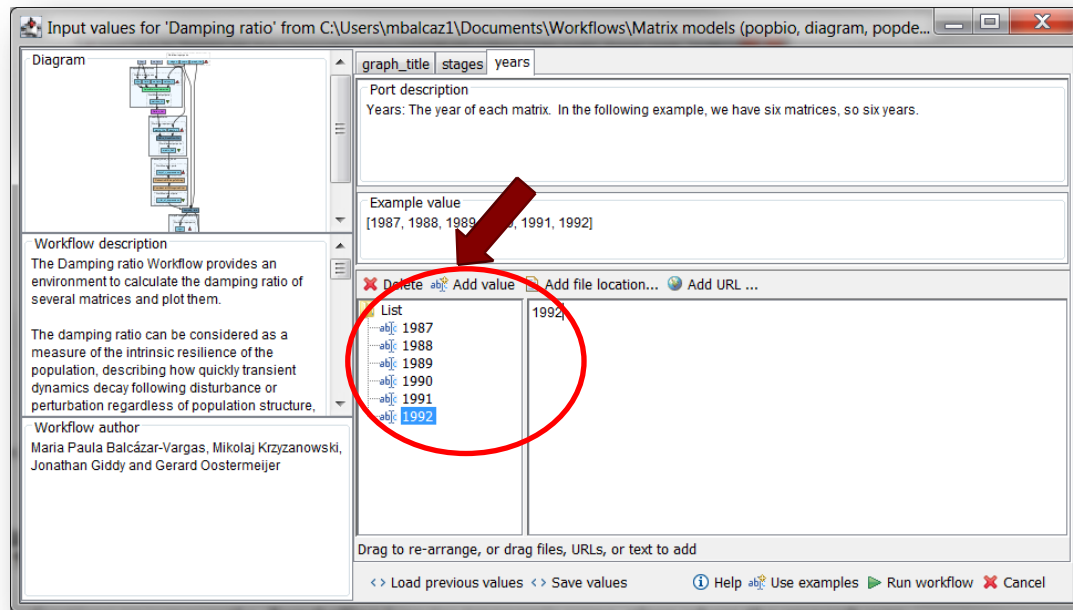


Figure 3. Inputs years to be filled in (example).

After the user has filled out the input ports and has clicked the **Run Workflow button**, a dialogue pages appear in the user's internet browser. See the next section:

5.3.2 INTERACTION

1) **Years:** the interaction page will show the submitted years. When the dialogue appears (Fig 4), click Browse for the first year (1987). A file dialog appears. Select the file (one matrix that belong to that year) and clicks Open (Fig 5). Then the selected matrix appears in the browser. Repeat the procedure for each year (Fig 6). Once all the matrices are submitted, click the Confirm button (Fig 7). After clicking Confirm, the confirmation "Matrices submitted" appears (Fig 8). When the analyses are completed, they appear on different windows under results in Taverna, the user can save each output separately.

In the following example, there are 6 years:

- 1) 1987
- 2) 1988
- 3) 1989
- 4) 1990
- 5) 1991

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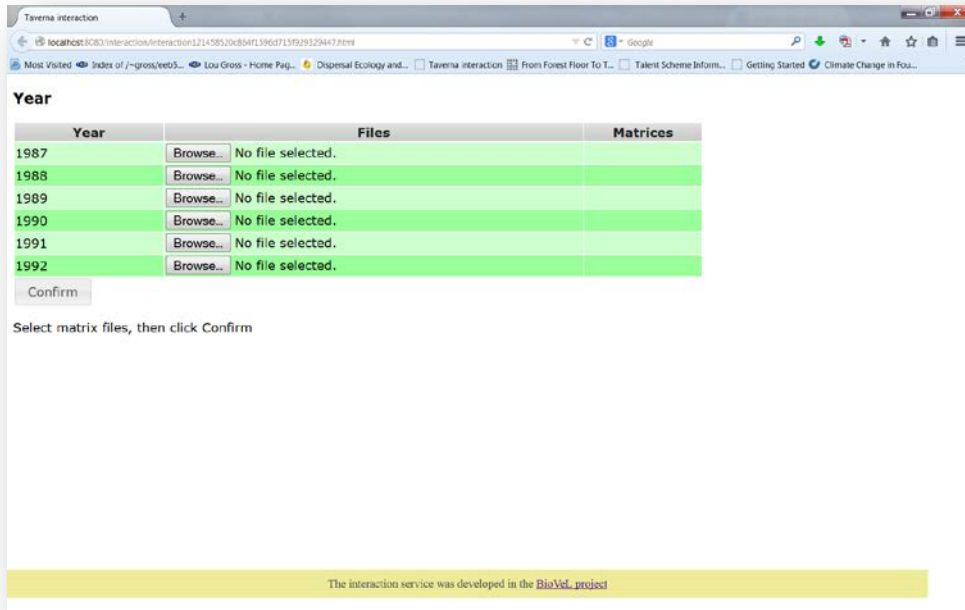


Figure 4. Years dialogue appears.

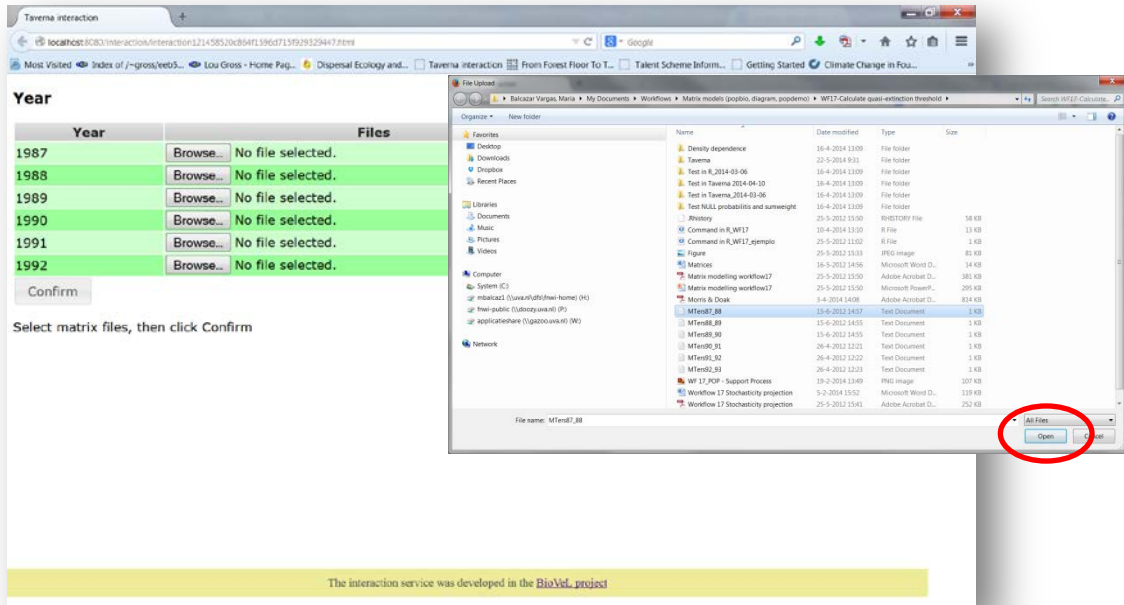


Figure 5. Years dialogue browse. Click in browse (1987), and select the file (one file) and then click in Open button.

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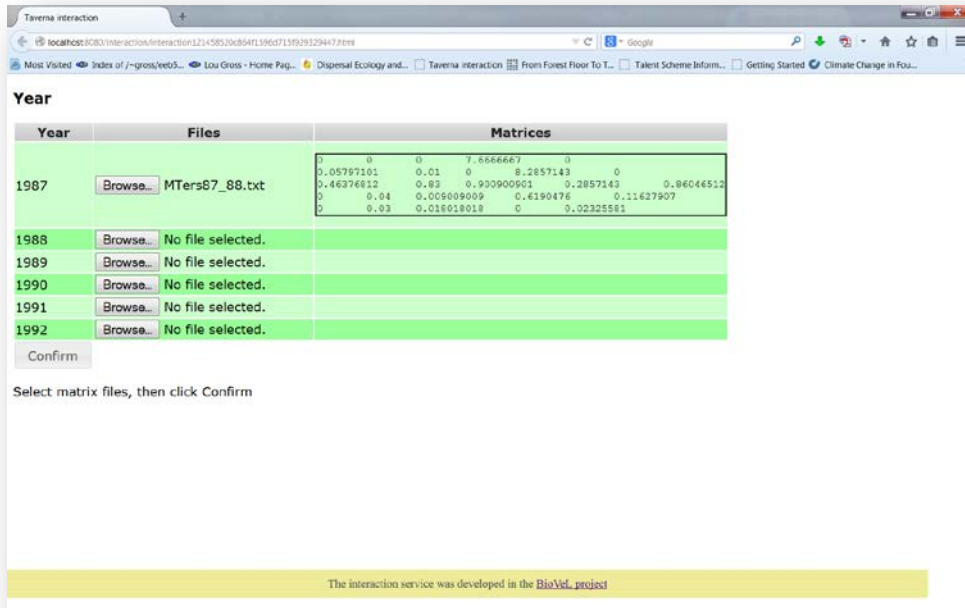


Figure 6. Years dialogue. The selected matrices appear. Repeat the procedure for each place.

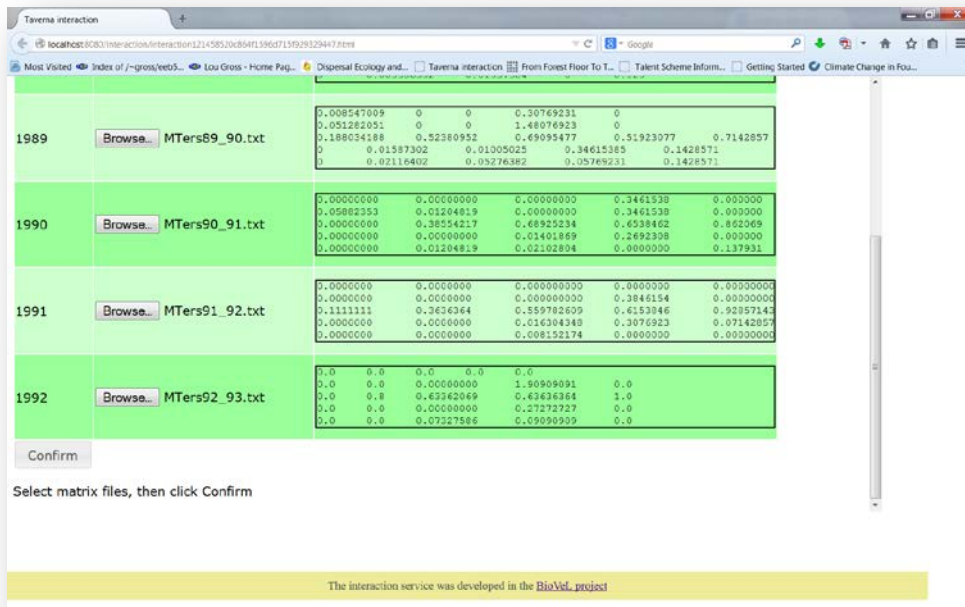


Figure 7. Years dialogue. Once all the matrices are submitted, click in Confirm.

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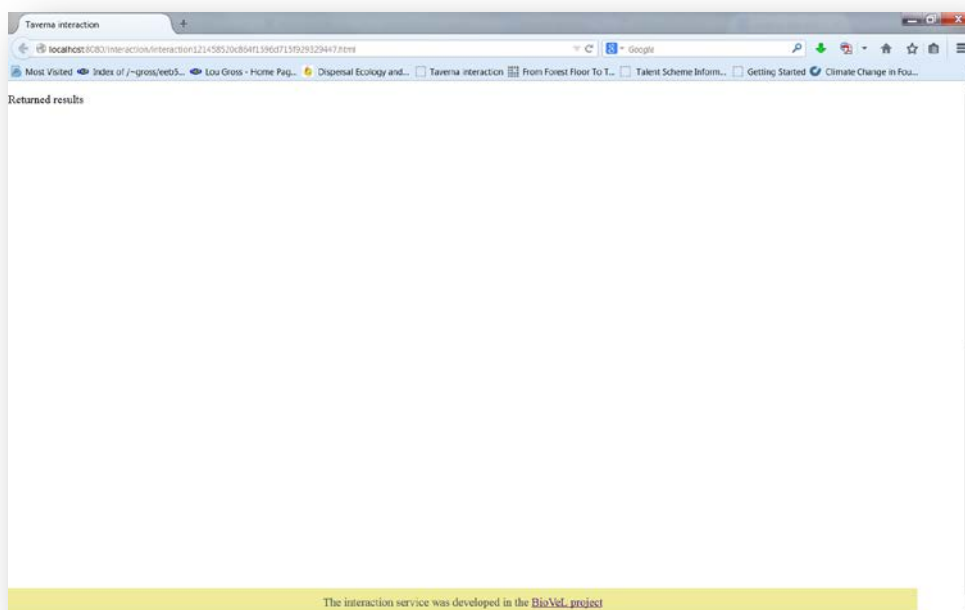


Figure 8. Years dialogue. After the user clicks Confirm, the confirmation “Returned Results” appears. Refer back to Taverna workbench.

When the analyses are completed, they appear on different windows under results in Taverna, the user have to save each output separately.

5.4 Save data/results

5.4.1 OUTPUTS

First, click in the selected result window e.g. **damping_ratio_graph** (Fig 9, red oval). Second, click in the left window on value 1 (Fig 9, blue oval). Third, on the right window click on the save value (Fig 9, green oval). Fourth, name the file and determine the extension file. For a text file: e.g. .csv or .txt. For images: .jpg or png (Fig 10), Finale, save the file in the chosen map.

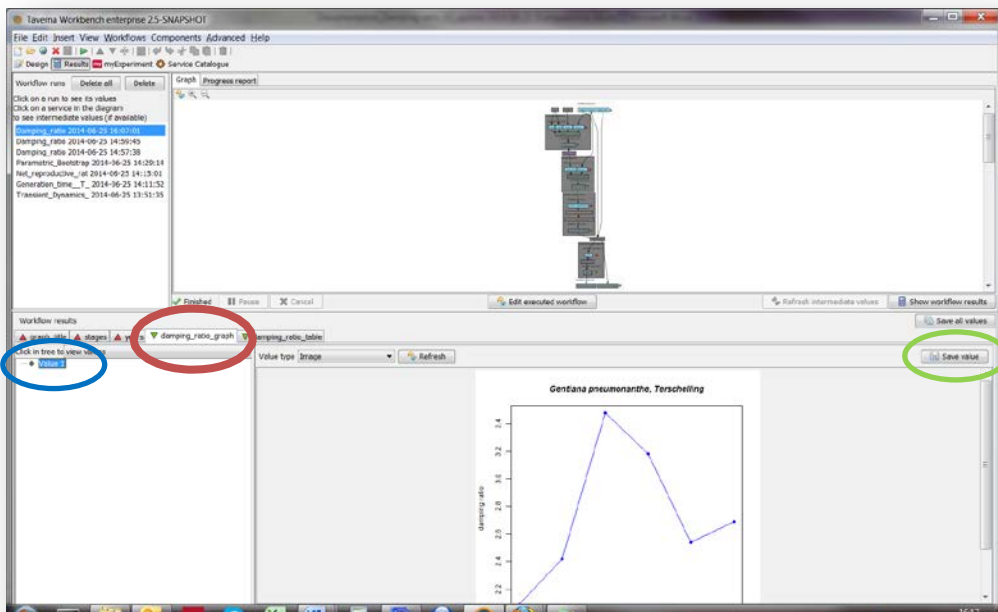


Figure 9. Taverna workbench results. When the analyses are completed, they appear on different windows under results in Taverna. **damping_ratio_graph** window (red circle). Value 1 on the left window of the **damping_ratio_graph** output results (blue circle). Save value on the right window of the **damping_ratio_graph** output results (green circle).

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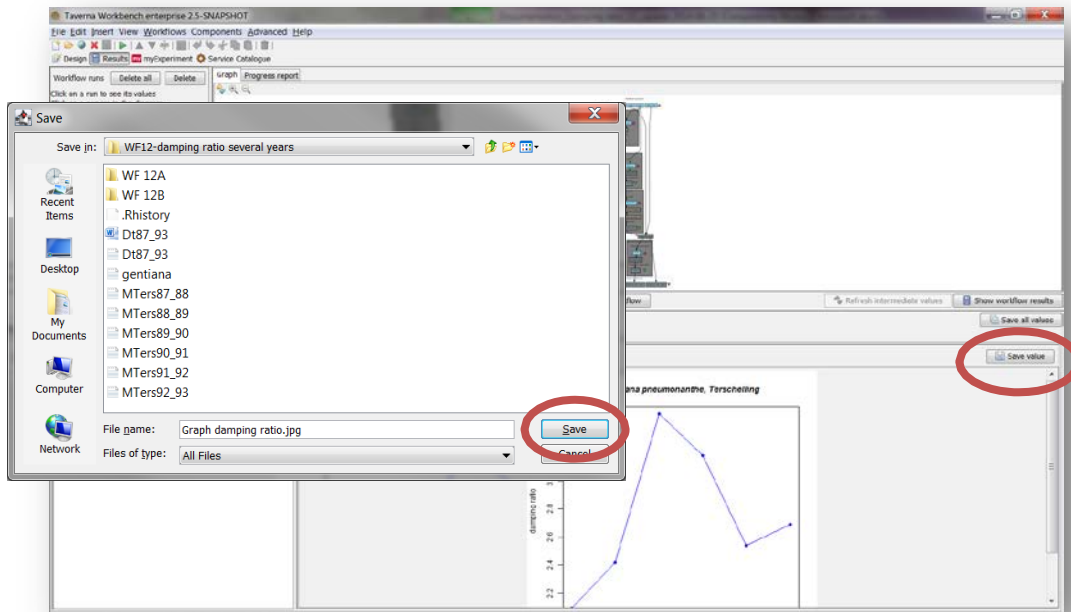


Figure 10. Name the file and determinate the extention file. For a text file: e.g. .csv or .txt. For images: e.g.: .jpg or png.

The damping ratio: The ratio between the dominant eigenvalue and the second highest eigenvalue of a transition matrix is called the damping ratio, and it can be considered as a measure of the intrinsic resilience of the population, describing how quickly transient dynamics decay following disturbance or perturbation regardless of population structure, (the larger the damping ratio, the quicker the population converges). High damping ratios tell you that the dominant stable stage distribution is reached fairly soon.

Damping ratio table: shows the damping ratio values of the stage matrices submitted. The order of these values corresponds to the order in the years of the input.

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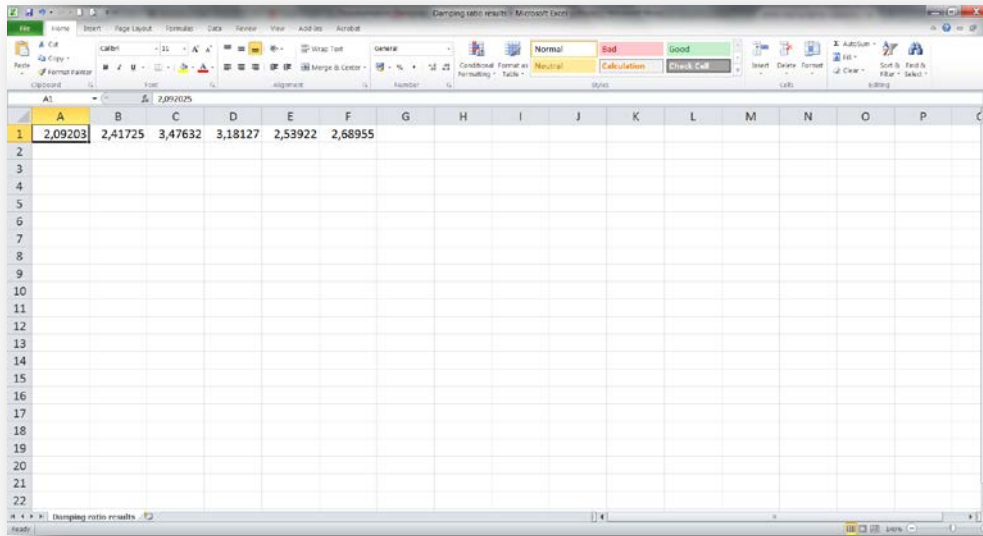


Figure 11. *Damping ratio table* opens in excel. The damping ratio values of the 6 stage matrices submitted.

Damping_ratio_graph: Graph plotting the damping ratio value of the submitted years (from 1987 to 1992, Fig 23)

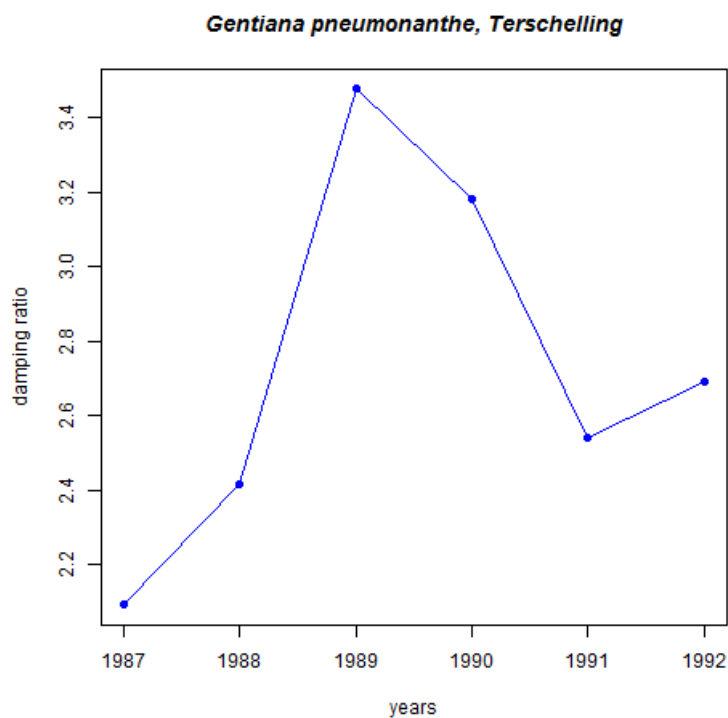


Figure 12. *Damping_ratio_graph* opens as a graph.

For further details see: References

6 Support

For questions with using the workflow, please write [support @biovel.eu](mailto:support@biovel.eu)

For definitions of technical and biological terms, please visit the BioVeL glossary page:
<https://wiki.biovel.eu/display/BioVeL/Glossary>

7 References

This workflow was created using and based on Packages 'popbio' in R. (Stubben & Milligan 2007; Stubben, Milligan & Nantel 2011).

Caswell, H. 2001. Matrix population models: Construction, analysis and interpretation, 2nd Edition. Sinauer Associates, Sunderland, Massachusetts.

Jongejans E. & H. de Kroon. 2012. Matrix models. Chapter in Encyclopaedia of Theoretical Ecology (eds. Hastings A & Gross L) University of California, p415-423

Oostermeijer J.G.B., M.L. Brugman; E.R. de Boer; H.C.M. Den Nijs. 1996. Temporal and Spatial Variation in the Demography of *Gentiana pneumonanthe*, a Rare Perennial Herb. *The Journal of Ecology*, Vol. 84(2): 153-166.

Stubben, C & B. Milligan. 2007. Estimating and Analysing Demographic Models Using the popbio Package in R. *Journal of Statistical Software* 22 (11): 1-23

Stubben, C., B. Milligan, P. Nantel. 2011. Package 'popbio'. Construction and analysis of matrix population models. Version 2.3.1

7.1 Acknowledgements

7.1.1 Authors

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7.1.2 Project funding

The workflow described in this documentation has been designed and implemented as part of the BioVeL project.

BioVeL is funded by the European Commission 7th Framework Programme (FP7) as part of its e-Infrastructures activity. Under FP7, the e-Infrastructures activity is part of the Research Infrastructures programme, funded under the FP7 'Capacities' Specific Programme. It focuses on the further development and evolution of the high-capacity and high-performance communication network (GÉANT), distributed computing infrastructures (grids and clouds), supercomputer infrastructures, simulation software, scientific data infrastructures, e-Science services as well as on the adoption of e-Infrastructures by user communities.

7.2 Publications