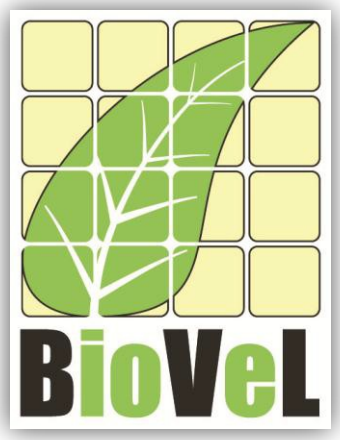


BioVeL – Biodiversity Virtual e-Laboratory

Workflow Documentation

Calculate variance matrix Workflow for local execution

Augustus 2014

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

Grant Agreement No:	283359
Project Co-ordinator:	Mr Alex Hardisty
Project Homepage:	http://www.biovel.eu
Duration of Project:	36 months

1 Description

This workflow estimates the variance matrix from a list of matrices.

2 General

2.1 Name of the workflow in myExperiment.

Name: Calculate variance matrix workflow

Download: The workflow pack can be downloaded at myExperiment under the following address: http://www.myexperiment.org/packs/663.html or only the workflow: http://www.myexperiment.org/workflows/4443.html

2.2 Date, version and licensing

Last updated: 28 Augustus 2014

Version: 1

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:

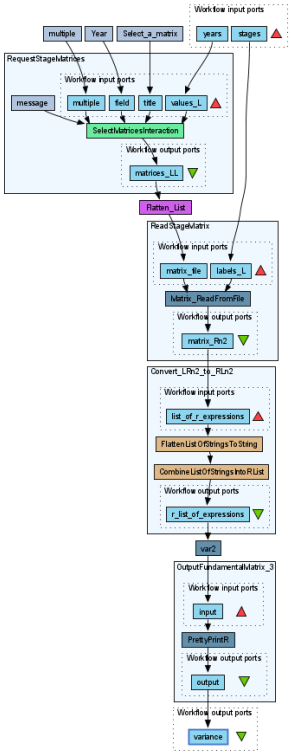
The input data and results reported in this publication (tutorial) come from data (Dr. Gerard Oostermeijer unpublished results and publication: Oostermeijer, J.G.B. M.L. Brugman, E.R. de Boer; H.C.M. Den Nijs. 1996. Temporal and Spatial Variation in the Demography of *Gentiana pneumonanthe*, a Rare Perennial Herb. *The Journal of Ecology*, 84: 153-166.) using BioVeL workflows and services (www.biovel.eu). Calculate variance matrix 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

BioVeL, demography, *Gentiana pneumonanthe*, matrix, matrix population models, package '*popbio*' in r, stage matrix, variance matrix.

3.2 Scientific workflow description



The aim of this workflow is to provide a connected environment to calculate the variance matrix. The workflow accepts input data (matrices) in a .txt format (decimal numbers indicated by dots e.g.: 0.578). The output is provided as a set of R results.

Figure 1. A) Graph of the variance matrix 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.biovel.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:\PROGRA~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 or matrices of 6 consecutive years (from 87-88 to 92-93) of the same place (Terschelling, The Netherlands, Oostermeijer *et al*., 1996).

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/663.html or here below. ***All the files must be saved in the same directory.***

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

5.3 Select input data dialogue boxes.

The first step is to fill out the input ports:

5.3.1 INPUTPORTS

1) ***Stages:*** the names of the stages or categories of the input matrix. The respective name stages must be filled one by one. First press add value (see arrow in Fig 2), fill a stage name and press enter; then press add value and fill once again the next stage name, repeat the action until you have fill all the stages 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

e.g. [S, J, V, G, D]

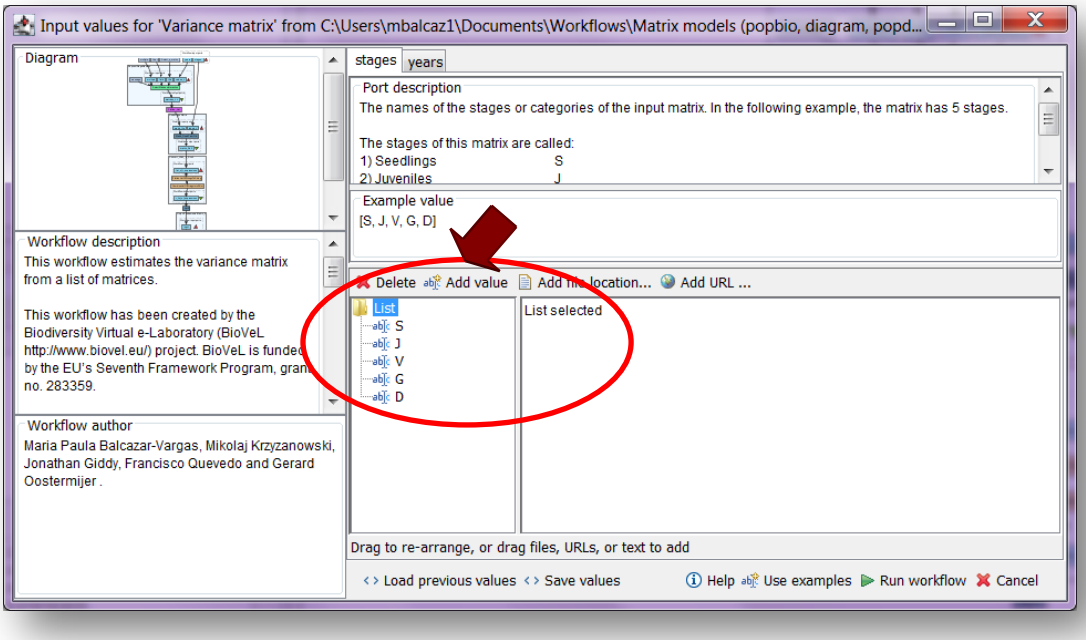


Figure 2. Inputs stages names to be filled in (example).

2) ***Years:*** each year represents a matrix and therefore characterizes a period of transition (Fig. 12). The respective years must be filled one by one. First press add value (see arrow in Fig 12), fill a year (e.g. 1987) and press enter; then press add value and fill once again the next year (1988), repeat the action until you have fill all the years, the year must be filled out in a consecutive order.

In this tutorial, we have 6 matrices (see **5.2.2 Input data**) that represent 6 years

1987 =data interval between 1987 and 1988;

1988= data interval between 1988 and 1989 etc.

e.g. [1987, 1988, 1989, 1990, 1991, 1992]

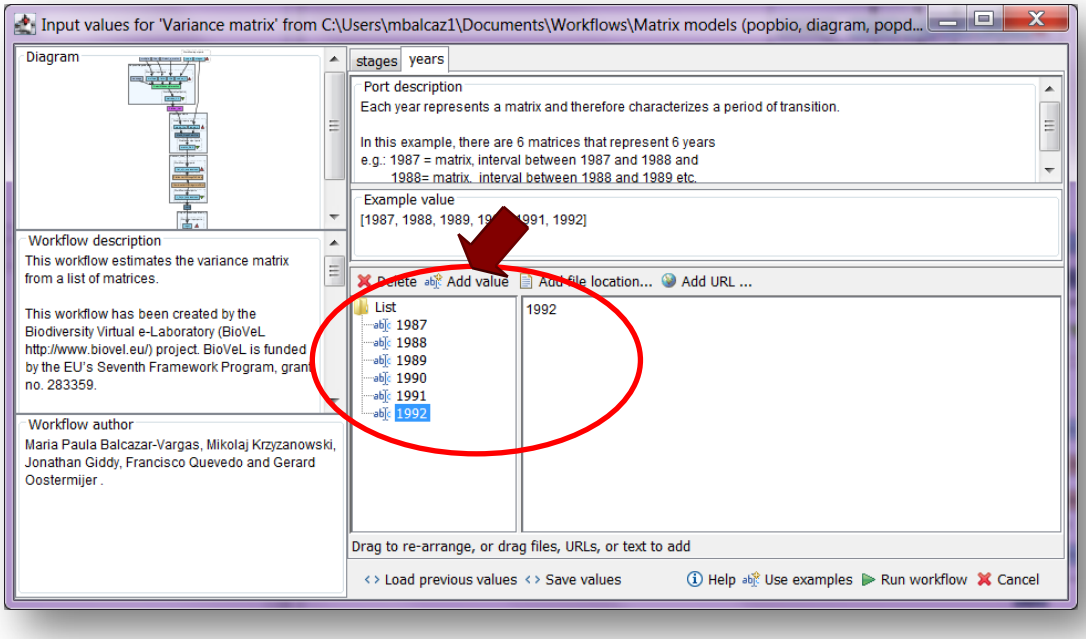


Figure 3. Inputs years to be filled in (example).

After the user has filled out the input ports, click ***Run Workflow*** button, a dialogue pages appear in the user's internet browser.

5.3.2 INTERACTION

1) ***Select a matrix for each year*:** all the matrices must be in the same folder. The interaction page will show the submitted years. When the dialogue appears (Fig 4), click Browse for the first year (e.g. 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 (Fig 6). Repeat the procedure for each year (Fig 7). Once all the matrices are submitted, click the Confirm button (Fig 7). After clicking Confirm, the confirmation "Returned Results" appears (Fig 8). The workflow controls whether each location have submitted 1 matrix.

In the following example, there are 6 years:

1) 1987	3) 1989	5) 1991
2) 1988	4) 1990	6) 1992

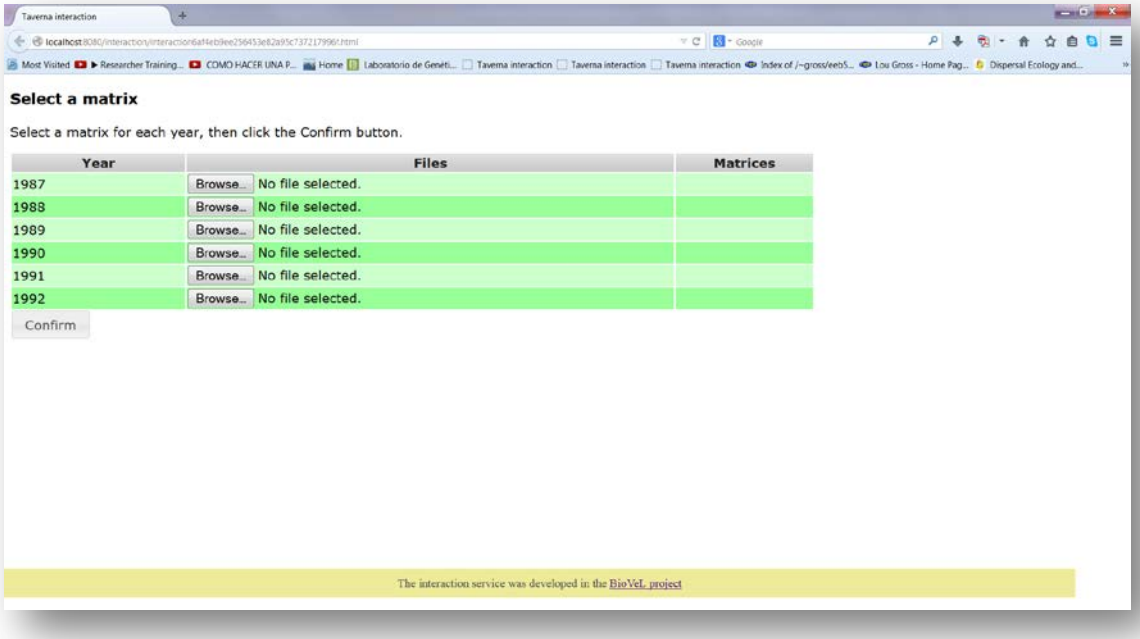


Figure 4. Select a matrix for each year dialogue appears.

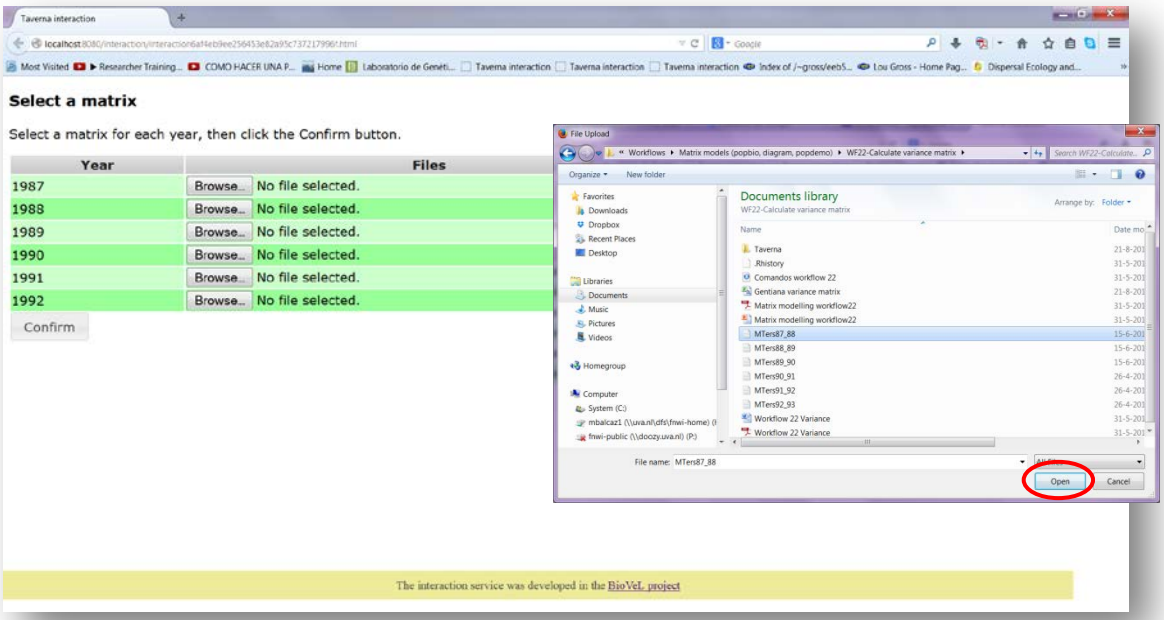


Figure 5. Select a matrix for each year dialogue browse. Click in browse (1987), and select one file (e.g. MTer87-88.txt) and then click in Open button.

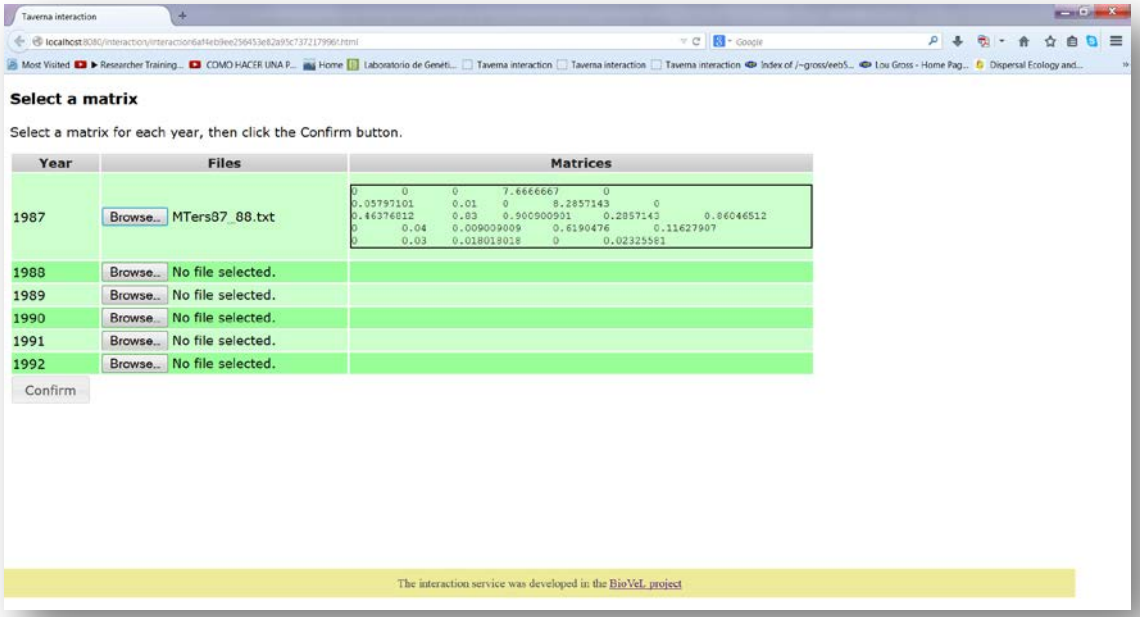


Figure 6. Select a matrix for each year dialogue. The selected matrix appears. Repeat the procedure for each year.

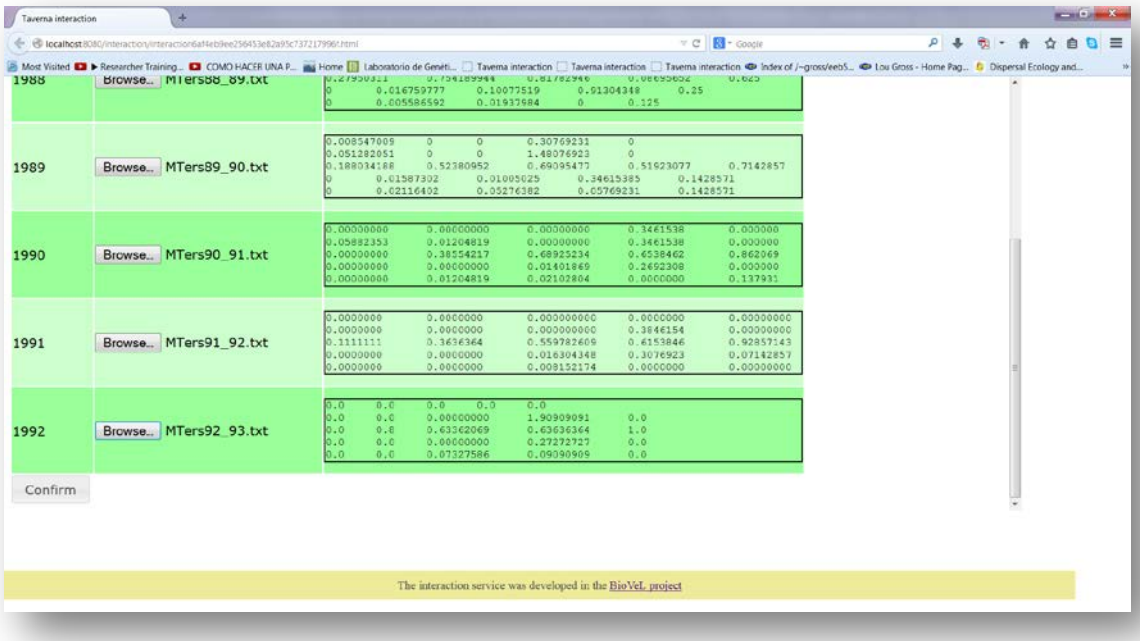


Figure 7. Select a matrix for each year dialogue. Once all the matrices are submitted, click in Confirm.

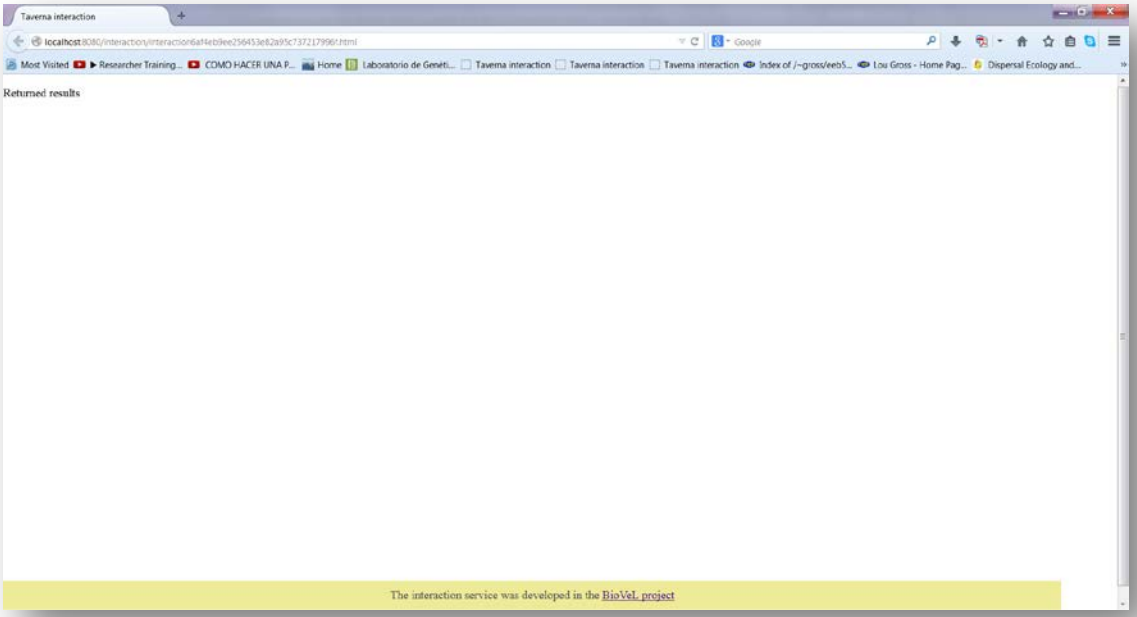


Figure 8. Select a matrix for each year dialogue. After the user clicks Confirm, the confirmation "Returned Results" appears. Refer back to Taverna workbench.

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. ***variance*** (Fig 9, red oval). Second, click in the left window on value 1 (Fig 9, blue oval) and you will see the numerical results. Third, on the right window click on save value (Fig 9, green oval). Fourth, name the file and determinate the extension file, e.g. .csv or .txt. Finally, save the file in the chosen map (Fig 10).

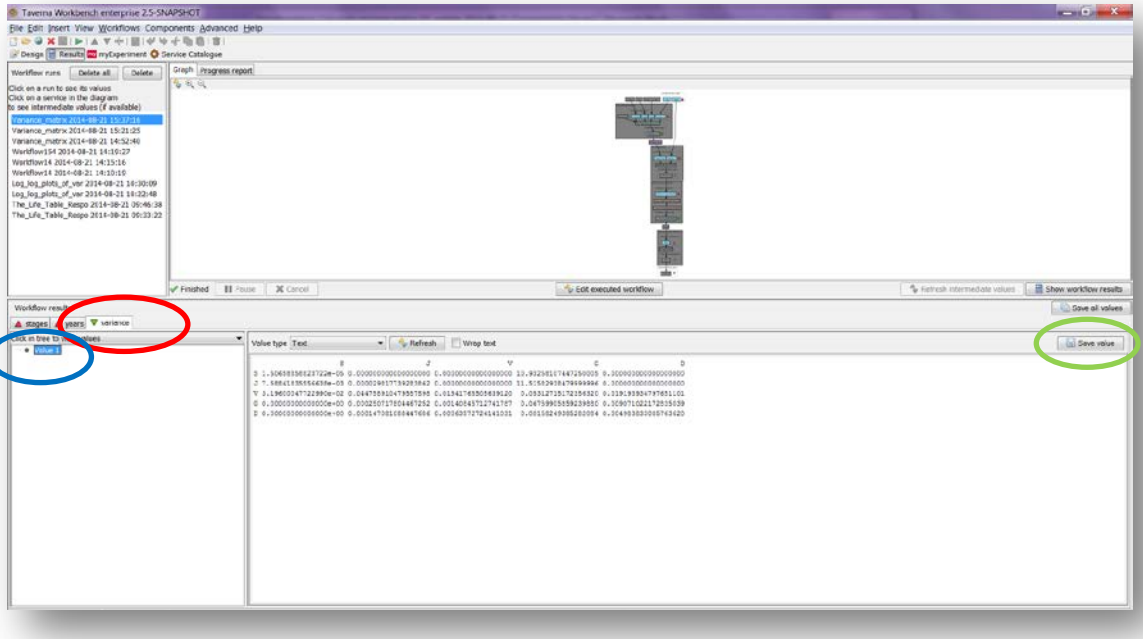


Figure 19. Taverna workbench results. When the analysis is completed, they appear on different windows under results in Taverna.

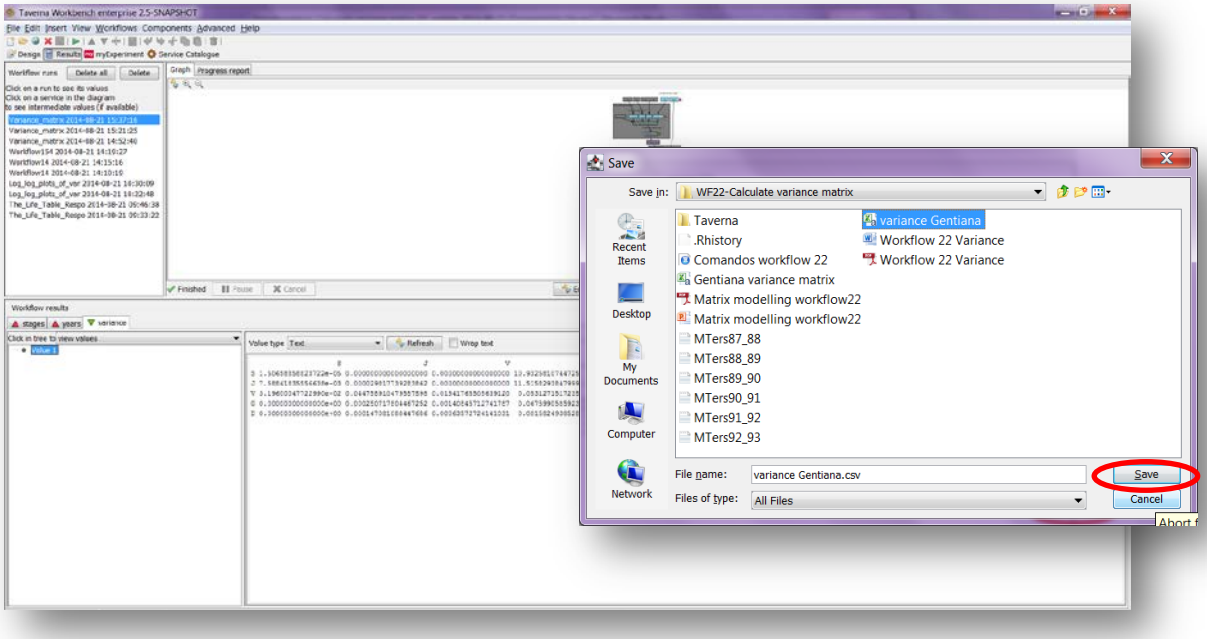
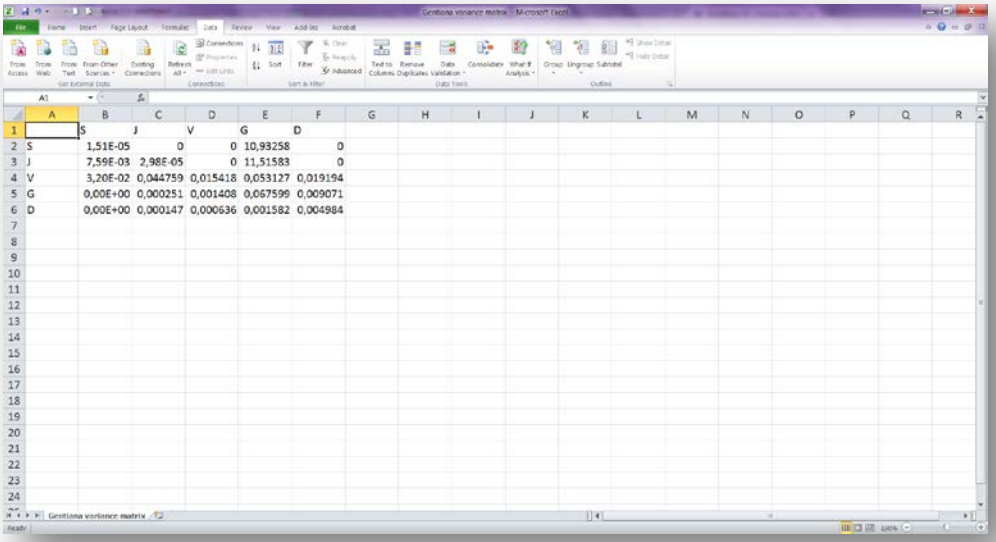


Figure 10. Name the file, click on Save value, name the file and add the extension for the file. For a text file: e.g. .csv or .txt.

1) Variance matrix

The variance matrix of 6 Gentiana matrices (1987-1992). The csv file after apply text to columns (Fig 11).



	A	B	C	D	E	F
1		S	J	V	G	D
2	S	1,51E-05	0	0	10,93258	0
3	J	7,59E-03	2,98E-05	0	11,51583	0
4	V	3,20E-02	0,044759	0,015418	0,053127	0,019194
5	G	0,00E+00	0,000251	0,001408	0,067599	0,009071
6	D	0,00E+00	0,000147	0,000636	0,001582	0,004984

Figure 11. Variance matrix numeric results (.csv or text files).

6 Support

For questions with using the workflow, please write ***support @biovel.eu***

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

7 Bibliography

This workflow was created using and based on Package '*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.

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

1) ***Maria Paula Balcázar-Vargas*** Instituut voor Biodiversiteit en Ecosysteem Dynamica (IBED), Universiteit van Amsterdam.
2) ***Mikołaj Krzyżanowski*** Cardiff School of Computer Science and Informatics, Cardiff University, Cardiff CF24 3AA, United Kingdom.
3) ***Jonathan Giddy*** Cardiff School of Computer Science and Informatics, Cardiff University, Cardiff CF24 3AA, United Kingdom.
4) ***Francisco Quevedo*** Cardiff School of Computer Science and Informatics, Cardiff University, Cardiff CF24 3AA, United Kingdom.
5) ***J. Gerard B. Oostermeijer*** Instituut voor Biodiversiteit en Ecosysteem Dynamica (IBED), Universiteit van Amsterdam.

7.1.2 Project funding

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7.2 Publications