

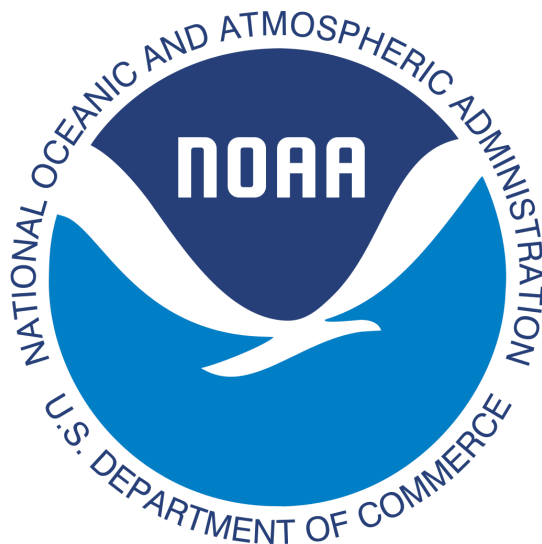
QuickStart Guide

MSSPM

MultiSpecies Surplus Production Model

v0.9.0 (beta)

NOAA – National Marine Fisheries Service



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1. Introduction

The Multi-Species Surplus Production Model (MSSPM) allows the user to 1) define a model, using choices of growth, harvest, competition, and predation forms, 2) run the model, which estimates the necessary parameters using choices for optimization algorithms, and 3) visualize the estimated data.

Diagnostics may be run on the estimated data depicting objective function fitness values indicating how close the estimation got to finding a global minimum. Forecasts may be generated using the estimated parameters and additional harvest and uncertainty parameters. Multiple forecasts can be viewed simultaneously as Multi-Scenario Forecasts.

The application features two methods of online help which will assist the user in understanding how to use the application.

2. Setup

In order to run MSSPM the following must be installed on your computer:

- MySQL

MSSPM uses MySQL to read and store all data used in the application.

3. Program Execution

Windows:

1. Create a directory for the release and copy the zip file into it.
2. Unzip the zip file containing the executable and required auxiliary files.
3. Double click the executable file and the application should start up.
(N.B. You'll need to have MySQL installed prior to running the software.)

Linux:

1. Create a directory for the release and copy the tar file into it.

2. Untar the tar file containing the executable and required auxiliary files with:
`tar xvf nameOfFile.tar`
3. Double click the **AppRun** file and the application should start up.
(N.B. You'll need to have MySQL installed prior to running the software.)

Clicking **Help -> About** should raise a window with build information and is a good way to test that the application is functioning properly.

4. Importing and Running the Test Database

The application is typically run in the following fashion:

- 1) The user creates a project to store meta-data describing their model parameters.
- 2) The user imports model data into the application's GUI forms (either manually or via copying/pasting from a spreadsheet). (The data are then saved into a MySQL database.)
- 3) The user chooses an estimation algorithm.
- 4) The user runs the model.
- 5) The user may run diagnostics after running a model.
- 6) The user may run a forecast after running a model.

Instead of inputting the model data manually or via copy/paste, the user may import a MySQL database from an existing .sql file. A sample .sql file is provided as a test. It's named **Sample_Schaefer_5_Species_xx.sql** (where xx is the version number) and is provided with the release in the **sample_data** folder.

To import this database (and then run a model) please follow these steps:

- 1) Select **File -> Import Database** and choose the .sql file (it's located with the rest of the files in the distribution)
- 2) In Setup->Tab 2: Enter project data and click "Save Project"
- 3) In Setup->Tab 4: Enter system data and click "Save"
- 4) Confirm data are present in Estimation Data Input -> Tabs 1, 2, and 5.
- 5) In Estimation Data Input -> Tab 6: Select an algorithm and Stop parameter(s) and click "Save"
- 6) In Estimation Data Input -> Tab 6: Click "Run"
- 7) Confirm model run by viewing output charts in Output panel


5. Online Help

Online help is available in two formats:

1) Hover Help

Hover Help is available by holding the cursor over a GUI element. If Hover Help has been implemented for the element, a short textual tooltip will briefly appear.

2) WhatsThis? Help

WhatsThis? Help is typically more detailed information than what's available in Hover Help. It's available by first clicking on the arrow/question mark icon  in the application toolbar and then hovering over a GUI element. If WhatsThis? help has been implemented for a GUI element, the cursor will change from a circle with a diagonal line to a question mark with an arrow at the bottom. Clicking on the element with the changed cursor will cause more detailed information to pop up on the screen, where it will remain until the user clicks the cursor.

6. GUI Layout

MSSPM's user interface is set up as a collection of movable and resizable windows. From left to right they are: **Navigator**, **Data Input**, and **Output** windows. Below there is the **Progress Chart** window which shows the current state of the model run. An optional window is the **Log** window which shows the running log (by clicking Refresh) of the current application run. The Log window can be raised by right clicking on the top window border and checking the box next to Log.

7. Toolbar icons

The toolbar icons are separated into 3 groups: chart configuration, chart capturing, and WhatsThis? Help,


1. Chart Configuration: Save, View, Save+View, View*, BE, NL




Models may be run with various algorithms and with various algorithm settings. These are encoded into the line type of the plot and the plot's legend. Currently, the 2 main parameters estimation algorithms are a Bees Algorithm (a stochastic search algorithm derived from honey bee behavior) and the family of algorithms from the 3rd party NLOpt library.

If the user wants to see all of the plots from either the Bees or NLOpt algorithms, they'd click the BE or NL button and then the View* button. The BE and NL buttons may both be toggled on to view results from both sources.

To reset to the previously run algorithm, toggle off BE and/or NL and click the View toolbar button. The Save and Save+View buttons are not currently necessary and may be removed in future releases.

2. Chart Capturing:

The  icon will cause all species plots to be placed into a single image. The layout of these plots can be specified in the application preferences (**File -> Preferences**).

If the user would like to manually specify the order of the images to be captured to a single composite image, they may do this by first turning on the multi shot mode . After this has been toggled on, the user selects which species and plot to be captured and then clicks the capture button . The user then repeats the species/plot selection and manual screen capture until no further captures are desired. They then turn off the multi shot mode by pressing  a final time.

3. WhatsThis? Help:

This has been described in the Online Help section above. (You may do WhatsThis? Help on the WhatsThis? Icon itself!)

8. Project Setup

Prior to running a model in MSSPM the user must create a Project. In the Setup group in the Navigator, the user sets up first the Project, and then the Species and Model. The user must be sure to click Save prior to moving to another tabbed window in the Setup group.

Please note, after the Project has been set up and a database created, the user should run **Utilities->Create Tables** to make sure all tables have been successfully created. This will have no effect on any tables that have already been created.


After the Project, Species, and Model have been completed, the user may then move to the **Estimation Data Input** group.

9. Estimation Data Input

These GUI forms contain the data necessary in order to run the parameter estimation part of MSSPM. Which GUI's are enabled change depending upon the Model Setup parameters the user chose in the Setup group.

The user may type the data in manually or copy and paste the data from a spreadsheet. The user must click Save prior to proceeding to the next GUI in the group.

The final window in the group, **Run Estimation**, is where the user runs the model. Prior to running, the user must select the desired Model Algorithms as well as the Model Stop Parameters. The user must Save these settings prior to clicking Run.

Once Run has been clicked the user may follow the run's progress in the Progress Chart. The user may "frame" the progress values as often as is desired by clicking the Min,Max Range button  in the Progress Chart window.

10. Diagnostic Data Input

After the Model has successfully run, the user may run diagnostics to see how well the parameters have been estimated. By estimating the parameters, the user has (hopefully) found the global minima of the parameter space. However, it may behoove the analyst to confirm what the parameter space looks like in the neighborhood of the found parameters.

There are two of diagnostics that can be run:

1. Parameter Profiles

To create a profile the user selects the % variation on either side of the found parameters, as well as how many points to sample on either side, and the model is re-run for all of these combinations. When complete the user can view as 2d plots or as 3d plots the resulting view of the parameter space in the vicinity of the estimated parameters.

2. Retrospective Analyses

A retrospective analysis also involves re-running the model a number of times. However, in this case, each subsequent model run has one less year. The results can be viewed with all yearly plots drawn on the same chart.

11. Forecast

After Estimation and Diagnostics have been run, the user may run one or more forecasts. In order to run a forecast, the user must input various forecast parameters (i.e., name, time period) as well as appropriate Harvest data and Uncertainty parameters. The latter are the percentage variation per estimated parameter the user will allow in the forecasts. Forecasts can be run stochastically or deterministically depending upon the setup parameters in the **Forecast->Setup** window.

12. Output

As the user runs the MSSPM various output graphics will appear in the Output window. The appearance of these graphics may be modified by the GUI controls to the right of the drawing area in the Output window.

In addition to the chart feature, the Output window consists of tabs that make a variety of output data available to the user.

If the user wishes to create a collage of plots in a single chart, this may be accomplished by using the Screen Shot toolbar buttons as described above.

13. Saving your work

While all the data are saved in tables in the MySQL database that's selected in the user's Project file, the user may want to save their entire database as a backup, which is highly recommended. To do this, select **File->Export Database** and the current database will be saved as a .sql file.

14. Troubleshooting

1) **Can't connect to MySQL**

This will happen if the MySQL server needs to be started or if the user enters the incorrect MySQL password to start the application.

2) **Import/Export Database not working**

Confirm that your path variables are set up properly such that the mysql executable can be found by the application.

Ex. On Windows make sure you have something similar to the following as part of your Path environment variable:

C:\Program Files\MySQL\MySQL Server 5.7\bin

3) **An application feature not working correctly**

The application has a log system where status messages are periodically saved to an output file. The contents of these log files may be viewed by the user from within the application by enabling the Log window.

To enable the Log window, right click anywhere on the toolbar and check the Log item. The Log window will appear in the application. You may click and drag it by its title to relocate it if desired. To view the most recent Log file, click the **Refresh** button in the Log window. The user may view a previous Log file by clicking the **Browse** button and selecting the desired Log file. After 50 Log files have been created, the user will be prompted to delete the current Log files.

Log files are time-stamped and color-coded. Colors are defined as follows:

- Black - Informational text
- Blue - New section of messages
- Red - Warning
- Red Bold - Error