

tuneParams() screenshots

The image shows two side-by-side screenshots of the mizer application interface. The left screenshot displays the 'Species to tune' dropdown menu set to 'Notolabrus', with navigation buttons for 'previous' and 'next'. Below this, there are sliders for 'Abundance' (Egg density), 'Predation' (Predation rate coefficient 'gamma', max feeding rate 'h'), and 'Preferred predator-prey mass ratio 'beta''. The right screenshot shows the 'Home' tab of the application, featuring the 'mizer' logo (Multi-Species Size Spectrum Modelling in R) and a navigation menu with tabs for 'Spectra', 'Abundance', 'Growth', 'Repro', 'Catch', 'Diet', 'Death', 'Resource', 'Rates', and 'Sim'. Below the logo, there is a section titled 'Tuning and exploring size spectrum models with multiple background resources' which provides an overview of the application's capabilities and instructions for running it locally.

Figure 1: Home tab, first part



Tuning and exploring size spectrum models with multiple background resources

This application allows you to explore a wide range of outputs of multi-species size spectrum models developed using a publicly available R package *mizer*. *mizer* modelling framework has been used to investigate a range of aquatic size-structured ecosystems. Its assumptions, equations, user guides, examples and references are described in detail on <http://sisespectrum.org/mizer/>.

Here, the shiny R application has been adapted for inland and coastal ecosystems by introducing multiple size structured background resources. This enables modelling of independent, size structured energy pathways, such as pelagic, benthic, macroalgal and others. By specifying different fish diet preferences for alternative resources and different resource size distributions, emergent fish diets more accurately resemble empirically observed ontogenetic dietary transitions. The multiple resource extension is implemented in a free *mizer* add-on *mizerMR* and is important for modelling ecosystems, where independent pelagic and benthic energy pathways play a significant role.

This application can be used to investigate outputs of already existing models and to develop new models. You can explore species and resource size spectra, diets, biomasses and yields, sources of mortality across different fish sizes, growth, reproduction and other emergent properties. For a quick set of instructions, click "Help" on the top left of this application.

To run the application locally, follow these steps:

```
remotes::install_github('sisespectrum/mizerExperimental@TasModel')
```

```
library(mizerExperimental)
```

```
load any other necessary library such as mizerMR using 'library()' then run
```

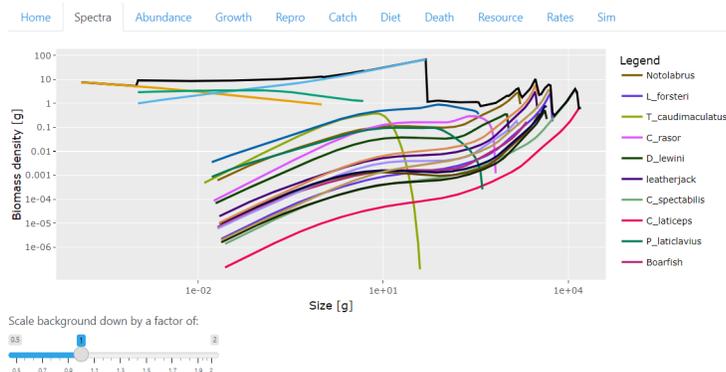
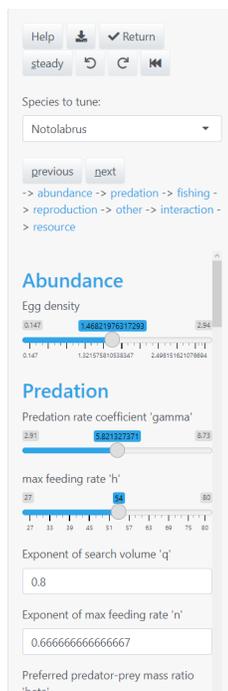
```
tuneParams(object)
```

where 'object' is an object of class *mizerParams*, containing the ecosystem's parameters.

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Figure 2: Home tab, second part



Size spectra

This tab shows the biomass size spectra of the individual fish species and of the resource, as well as the total size spectrum (in black).

This plot, as well as those on other tabs, is interactive in various ways. For example you can remove individual species from the plot by clicking on their name in the legend. Hovering over the lines pops up extra information. You can zoom into a portion of the plot by dragging a rectangle with the mouse while holding the left mouse button down.

Remember that after any adjustment you make in this app, you need to hit the 'Steady' button before you will see the full multi-species consequences of the change.

Figure 3: Spectra tab

Help Return

steady

Species to tune:
 Notolabrus

previous next

-> abundance -> predation -> fishing -> reproduction -> other -> interaction -> resource

Abundance

Egg density

0.147 0.44821976317239 2.94

Predation

Predation rate coefficient 'gamma'

2.91 0.521327371 8.73

max feeding rate 'h'

27 51 80

Exponent of search volume 'q'

0.8

Exponent of max feeding rate 'n'

0.666666666666667

Preferred predator-prey mass ratio 'beta'

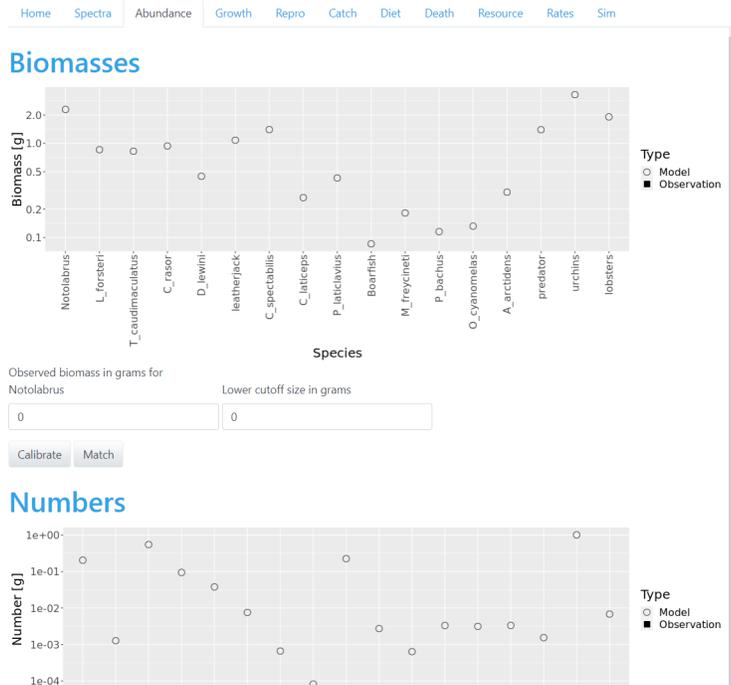


Figure 4: Abundance tab

Help Return

steady

Species to tune:
 Notolabrus

previous next

-> abundance -> predation -> fishing -> reproduction -> other -> interaction -> resource

Abundance

Egg density

0.147 0.44821976317239 2.94

Predation

Predation rate coefficient 'gamma'

2.91 0.521327371 8.73

max feeding rate 'h'

27 51 80

Exponent of search volume 'q'

0.8

Exponent of max feeding rate 'n'

0.666666666666667

Preferred predator-prey mass ratio 'beta'

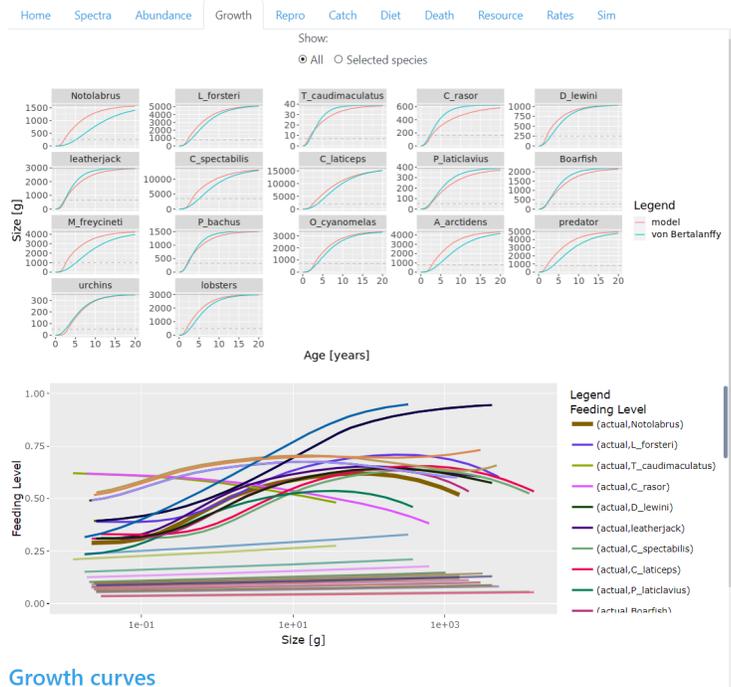


Figure 5: Growth tab

Help Return

steady

Species to tune:
 Notolabrus

previous next

-> abundance -> predation -> fishing -> reproduction -> other -> interaction -> resource

Abundance

Egg density

0.147 0.46821976317239 2.94

Predation

Predation rate coefficient 'gamma'

2.91 0.521327371 8.73

max feeding rate 'h'

27 54 80

Exponent of search volume 'q'

0.8

Exponent of max feeding rate 'n'

0.666666666666667

Preferred predator-prey mass ratio 'beta'

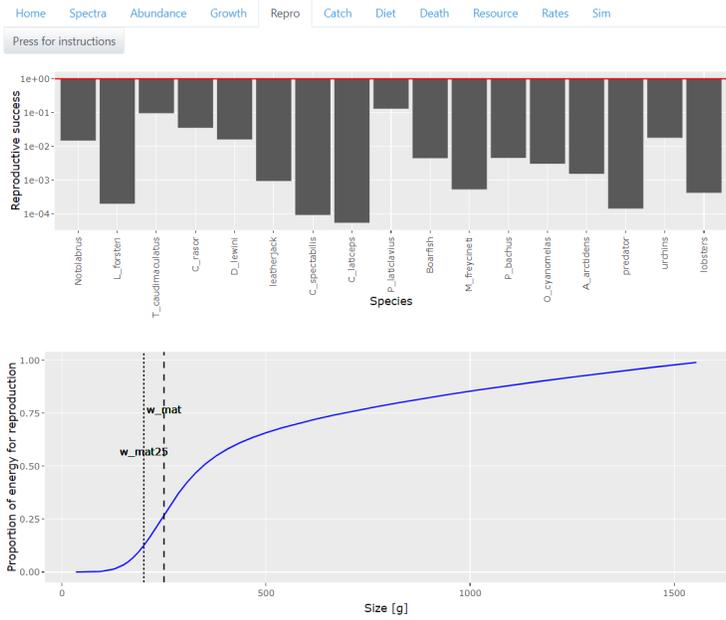


Figure 6: Reproduction tab

Help Return

steady

Species to tune:
 Notolabrus

previous next

-> abundance -> predation -> fishing -> reproduction -> other -> interaction -> resource

Abundance

Egg density

0.147 0.46821976317239 2.94

Predation

Predation rate coefficient 'gamma'

2.91 0.521327371 8.73

max feeding rate 'h'

27 54 80

Exponent of search volume 'q'

0.8

Exponent of max feeding rate 'n'

0.666666666666667

Preferred predator-prey mass ratio 'beta'

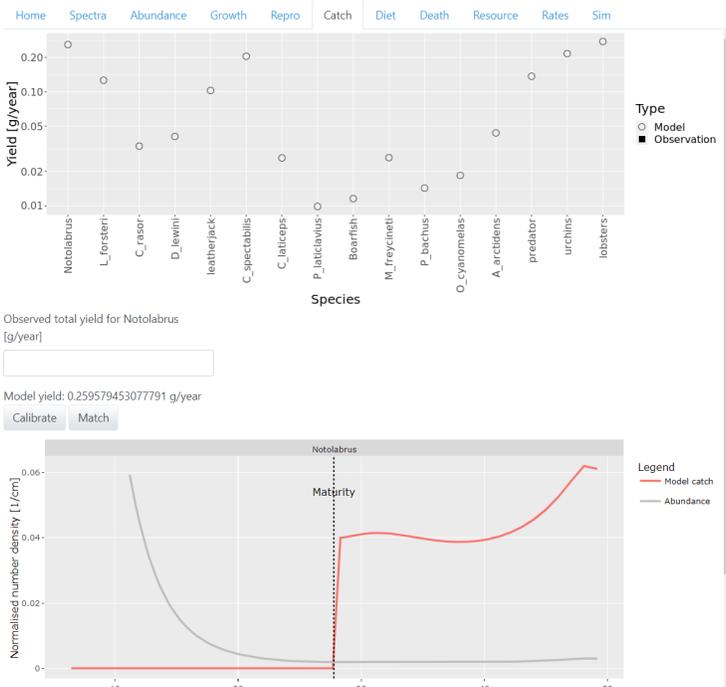


Figure 7: Catch tab

Help Return

steady

Species to tune:
 Notolabrus

previous next

-> abundance -> predation -> fishing -> reproduction -> other -> interaction -> resource

Abundance

Egg density
 0.167 0.46621976377239 0.364

Predation

Predation rate coefficient 'gamma'
 0.91 0.923272371 0.73

max feeding rate 'h'
 27 54 60

Exponent of search volume 'q'
 0.8

Exponent of max feeding rate 'n'
 0.666666666666667

Preferred predator-prey mass ratio 'beta'

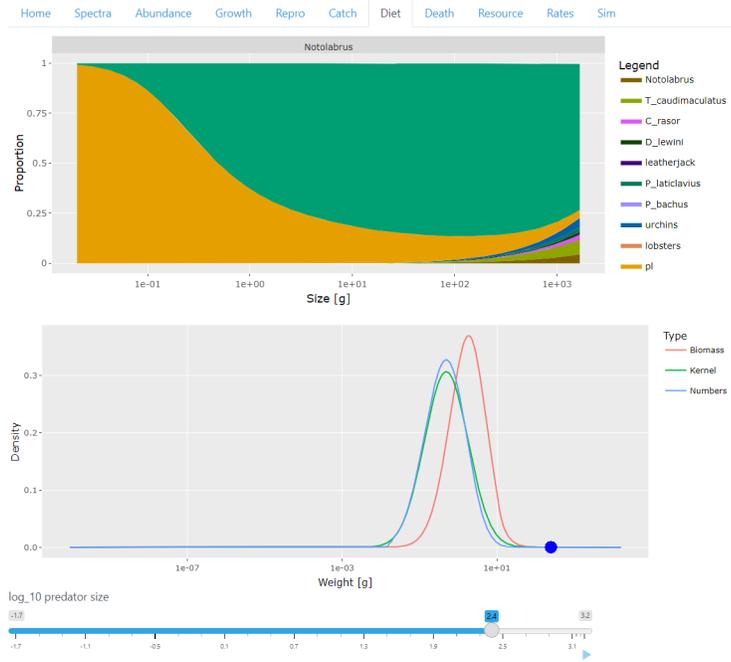


Figure 8: Diet tab of Notolabrus

Help Return

steady

Species to tune:
 predator

previous next

-> abundance -> predation -> fishing -> reproduction -> other -> interaction -> resource

Abundance

Egg density
 0.000354 0.0035407522337384 0.00708

Predation

Predation rate coefficient 'gamma'
 15.1 30.2952263 45.4

max feeding rate 'h'
 32 64 96

Exponent of search volume 'q'
 0.8

Exponent of max feeding rate 'n'
 0.666666666666667

Preferred predator-prey mass ratio 'beta'

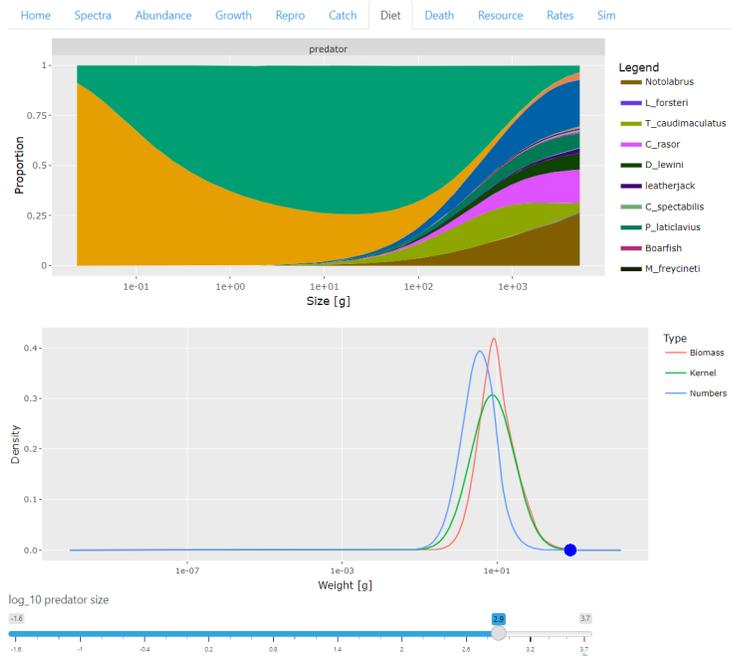


Figure 9: Diet tab of predators

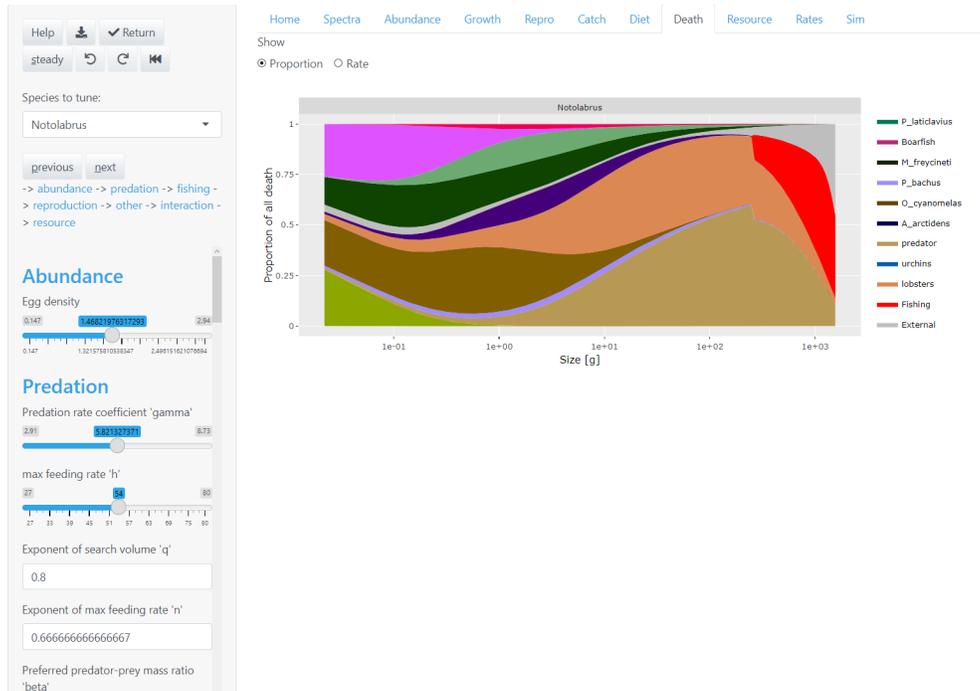


Figure 10: Sources of mortality of Notolabrus

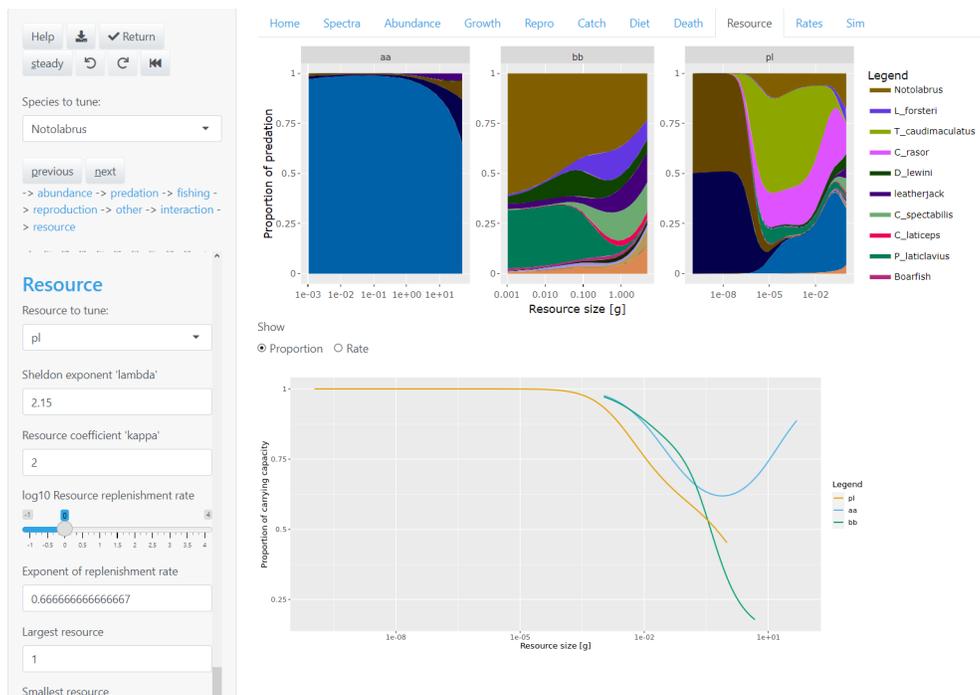


Figure 11: Resources tab

Help Return

steady

Species to tune:
Notolabrus

previous next

-> abundance -> predation -> fishing -> reproduction -> other -> interaction -> resource

Resource

Resource to tune:
pl

Sheldon exponent 'lambda'
2.15

Resource coefficient 'kappa'
2

log10 Resource replenishment rate
0

Exponent of replenishment rate
0.666666666666667

Largest resource
1

Smallest resource

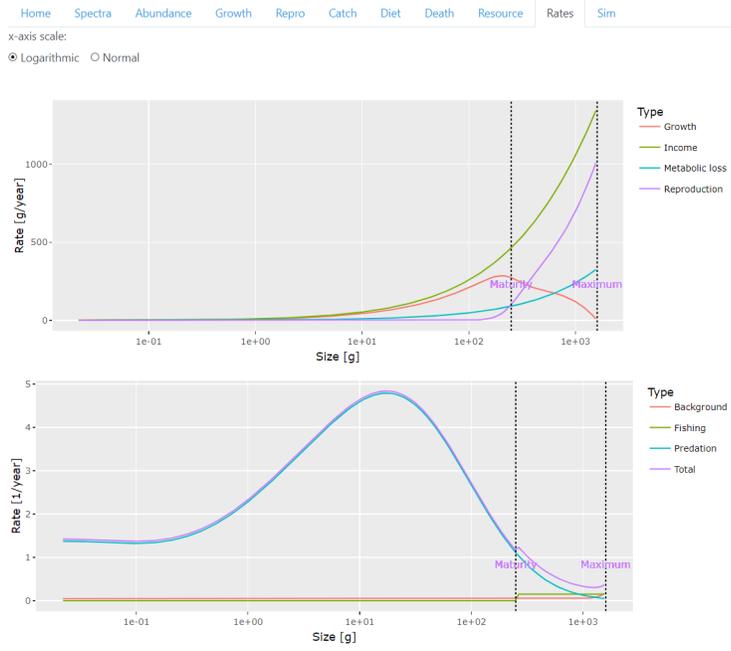


Figure 12: Rates tab

Help Return

steady

Species to tune:
Notolabrus

previous next

-> abundance -> predation -> fishing -> reproduction -> other -> interaction -> resource

Abundance

Egg density
0.147 1.48821976317293 2.94

Predation

Predation rate coefficient 'gamma'
2.91 5.821937971 8.73

max feeding rate 'h'
27 51 80

Exponent of search volume 'q'
0.8

Exponent of max feeding rate 'n'
0.666666666666667

Preferred predator-prey mass ratio 'beta'

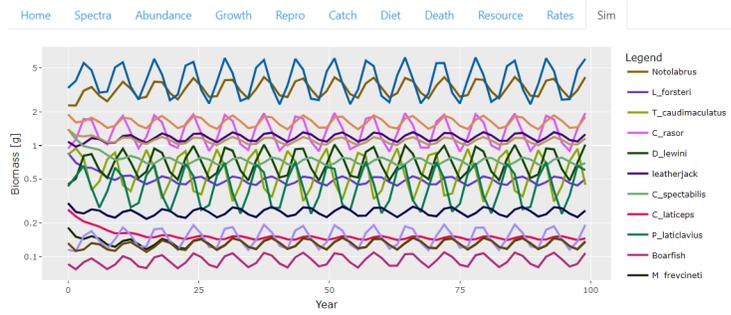


Figure 13: Biomass through time tab

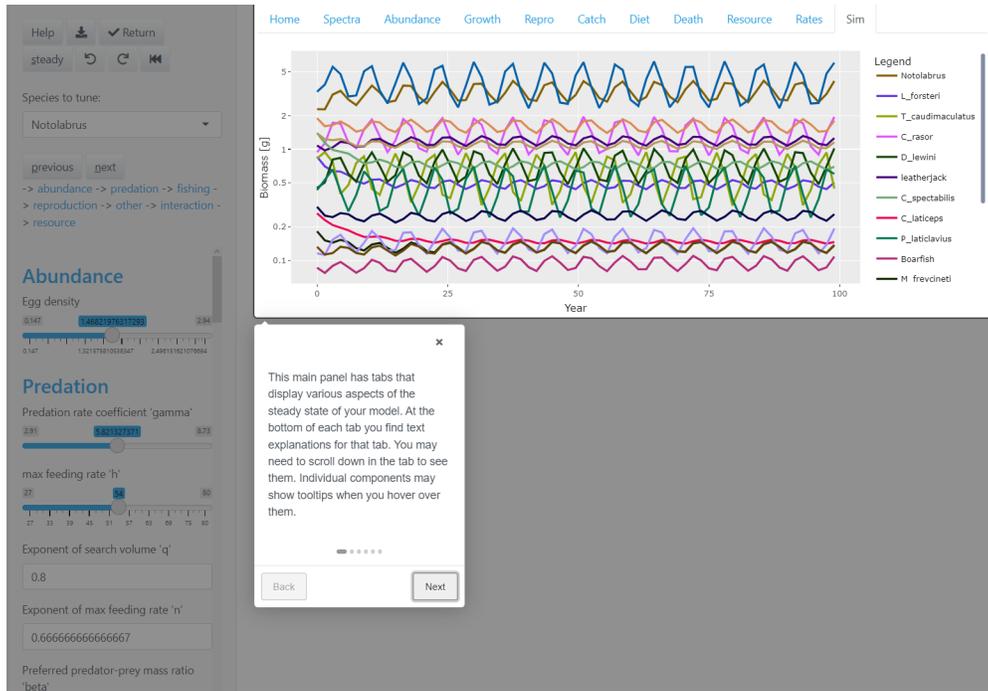


Figure 14: Example of the help button

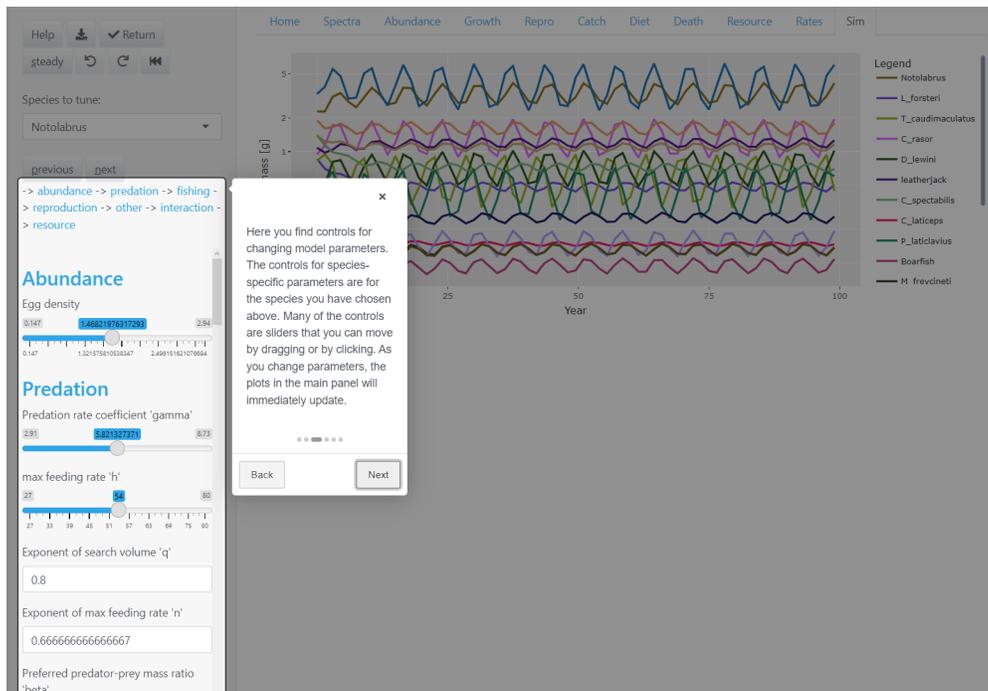


Figure 15: Example of the help button