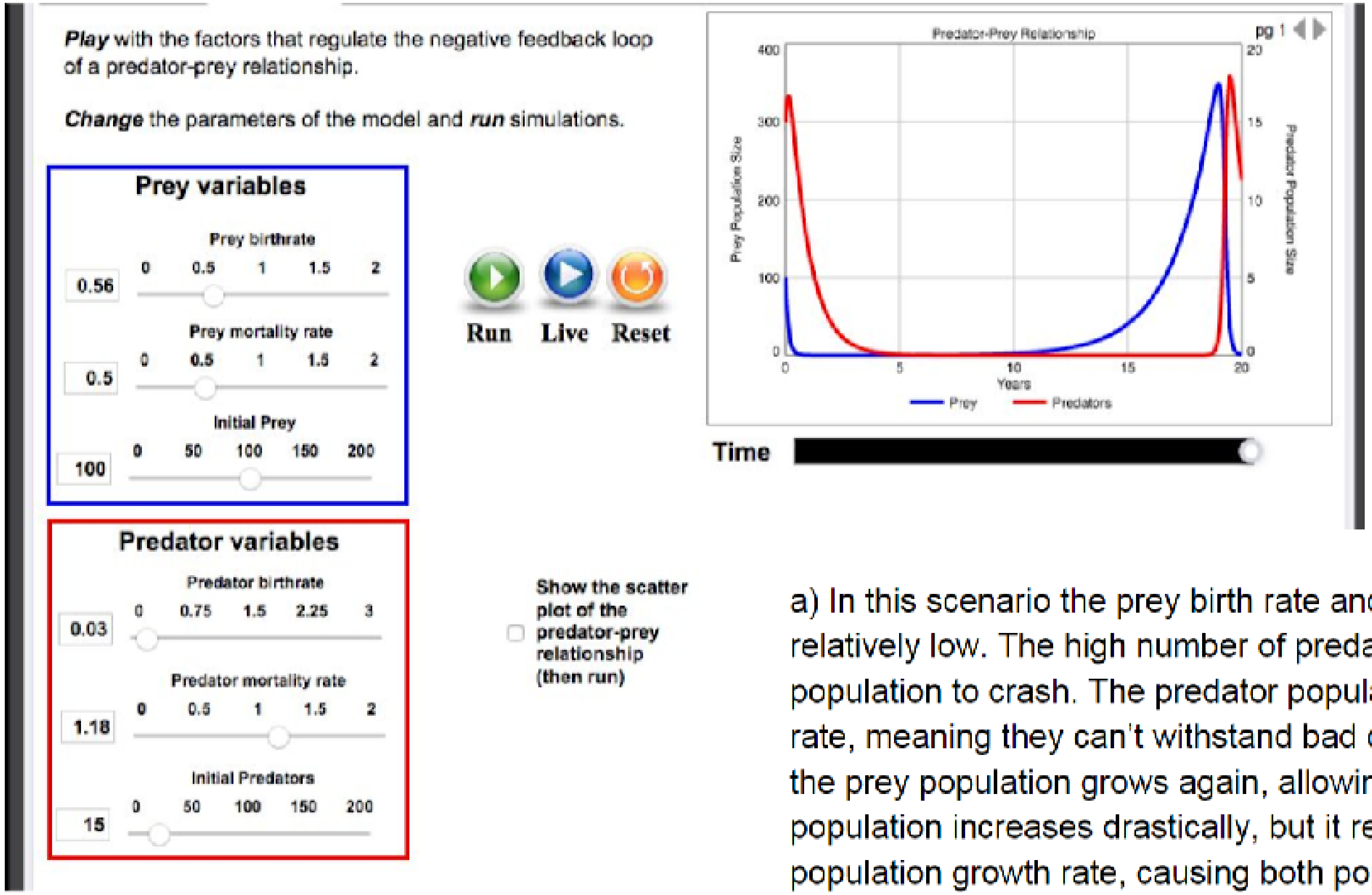


Play with the factors that regulate the negative feedback loop of a predator-prey relationship.

Change the parameters of the model and ***run*** simulations.

Prey variables

Prey birthrate: 0.56

Prey mortality rate: 0.5

Initial Prey: 100

Predator variables

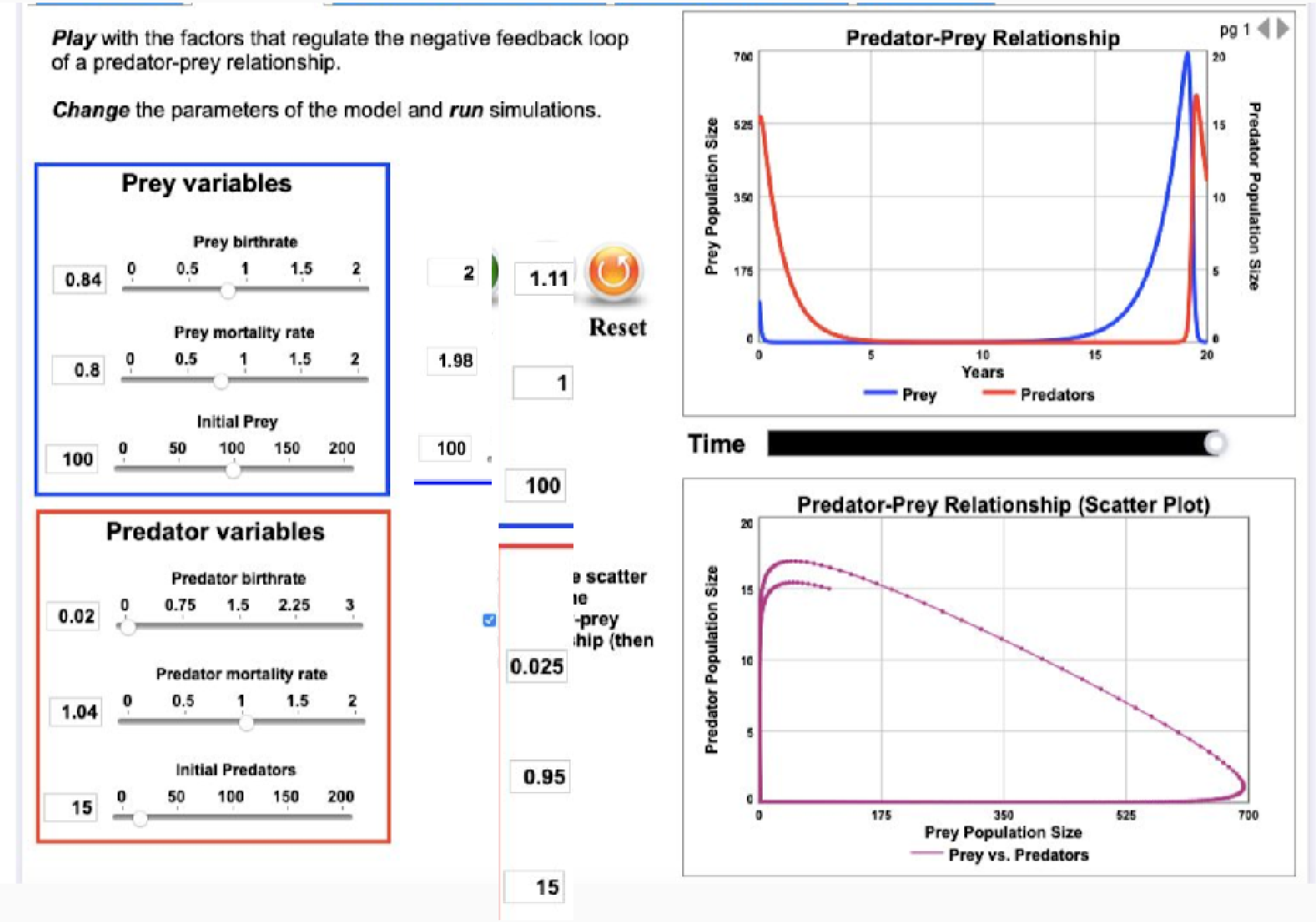
Predator birthrate: 0.03

Predator mortality rate: 1.18

Initial Predators: 15

☐ Show the scatter plot of the predator-prey relationship (then run)

a) In this scenario the prey birth rate and mortality rate are nearly the same. They are both relatively low. The high number of predators at the beginning of the scenario causes the prey population to crash. The predator population has a low birth rate, but a relatively high mortality rate, meaning they can't withstand bad conditions very long, and they crash also. After a while the prey population grows again, allowing the predator population to increase. The predator population increases drastically, but it reaches the parameter where efficiency exceeds the prey population growth rate, causing both populations to crash in a short time period.



Play with the factors that regulate the negative feedback loop of a predator-prey relationship.

Change the parameters of the model and ***run*** simulations.

Prey variables

Prey birthrate: 0.84

Prey mortality rate: 0.8

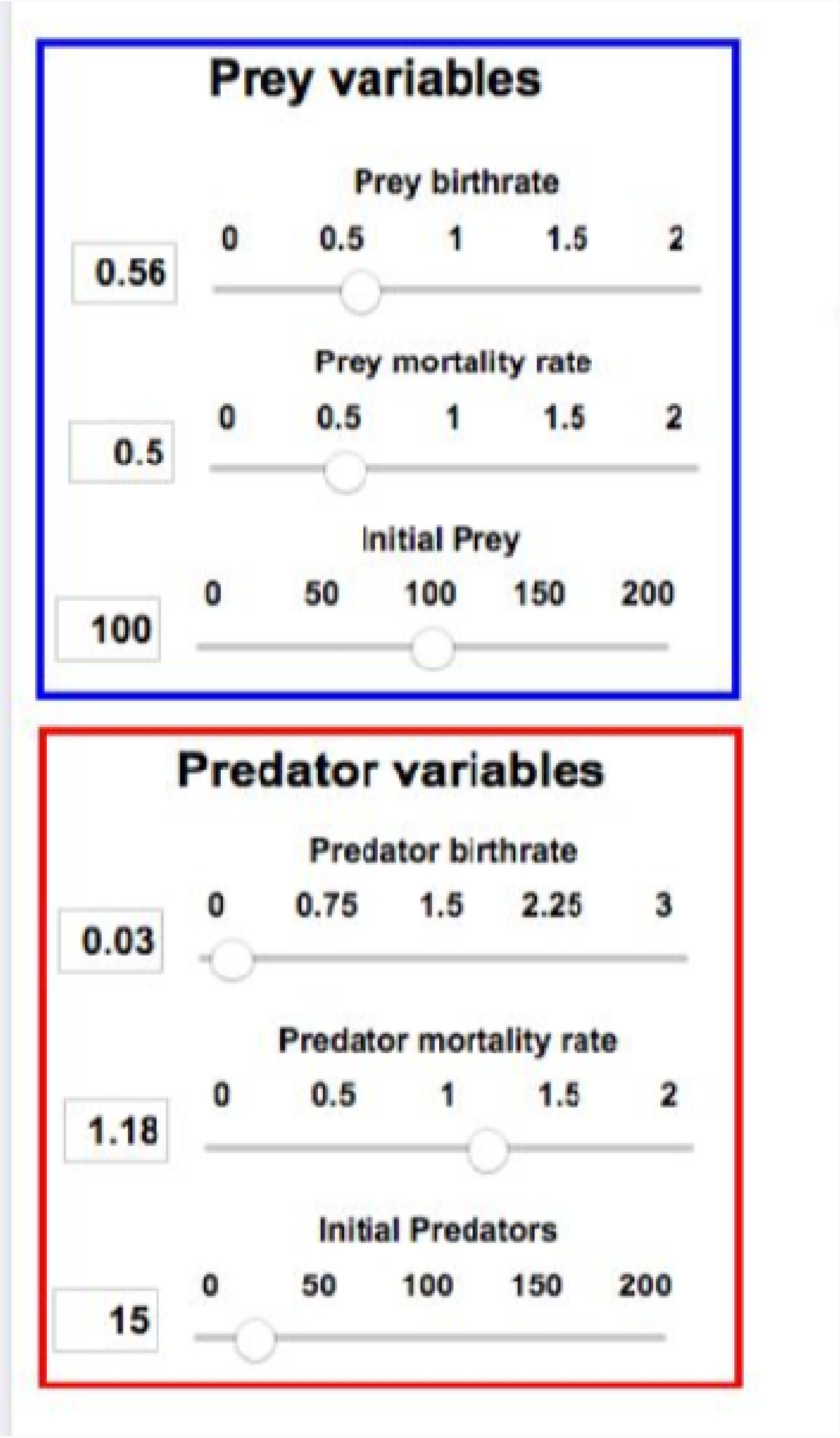
Initial Prey: 100

Predator variables

Predator birthrate: 0.02

Predator mortality rate: 1.04

Initial Predators: 15



Prey variables

Prey birthrate: 0.56

Prey mortality rate: 0.5

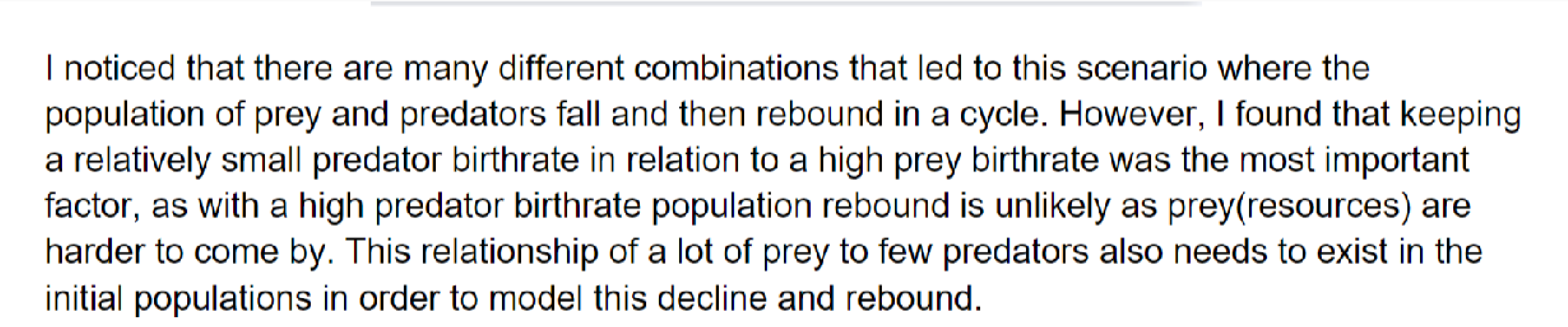
Initial Prey: 100

Predator variables

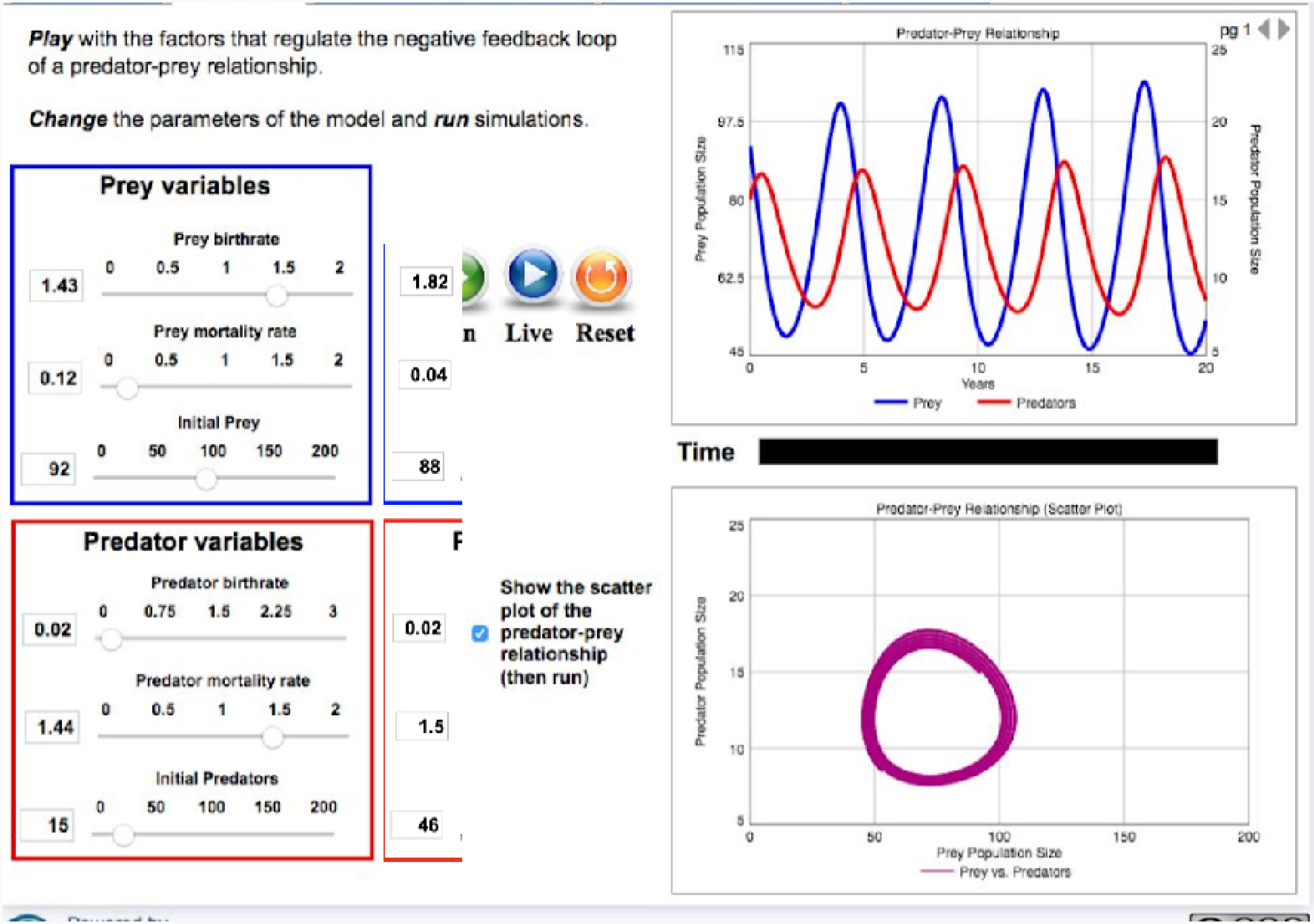
Predator birthrate: 0.03

Predator mortality rate: 1.18

Initial Predators: 15



I noticed that there are many different combinations that led to this scenario where the population of prey and predators fall and then rebound in a cycle. However, I found that keeping a relatively small predator birthrate in relation to a high prey birthrate was the most important factor, as with a high predator birthrate population rebound is unlikely as prey(resources) are harder to come by. This relationship of a lot of prey to few predators also needs to exist in the initial populations in order to model this decline and rebound.



Play with the factors that regulate the negative feedback loop of a predator-prey relationship.

Change the parameters of the model and ***run*** simulations.

Prey variables

Prey birthrate: 1.43

Prey mortality rate: 0.12

Initial Prey: 92

1.82

0.04

88

Predator variables

Predator birthrate: 0.02

Predator mortality rate: 1.44

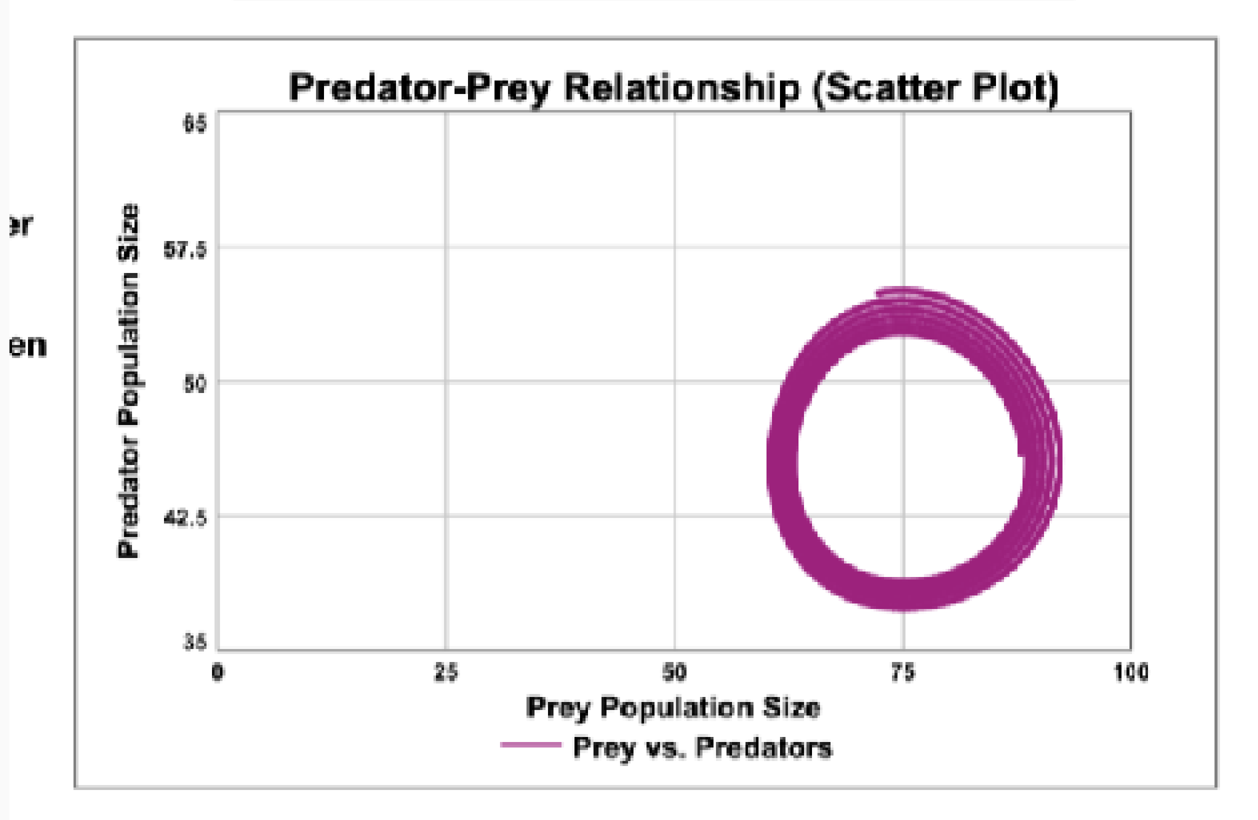
Initial Predators: 15

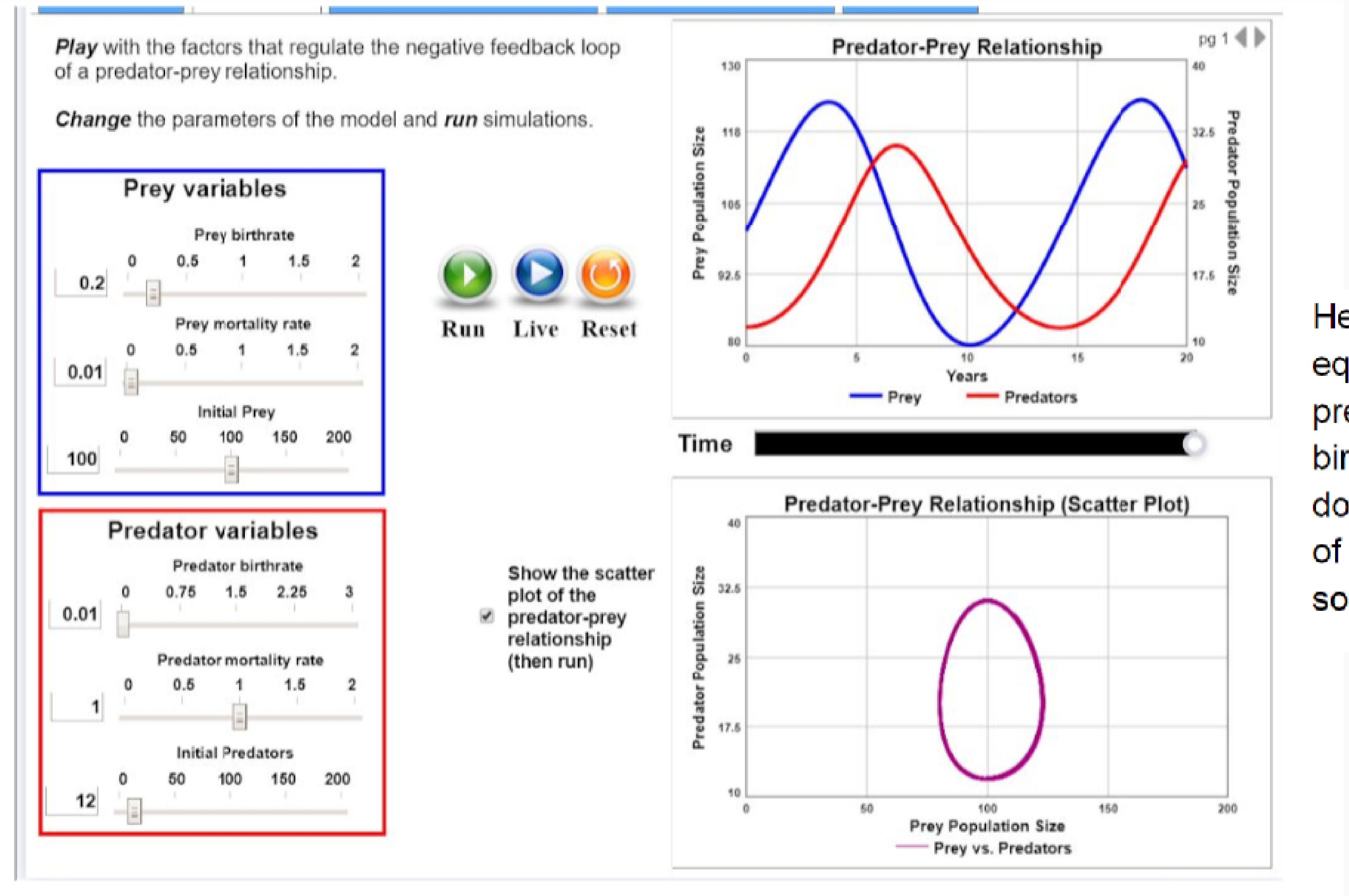
0.02

1.5

46

☑ Show the scatter plot of the predator-prey relationship (then run)





Play with the factors that regulate the negative feedback loop of a predator-prey relationship.

Change the parameters of the model and ***run*** simulations.

Prey variables

Prey birthrate: 0.2

Prey mortality rate: 0.01

Initial Prey: 100

Predator variables

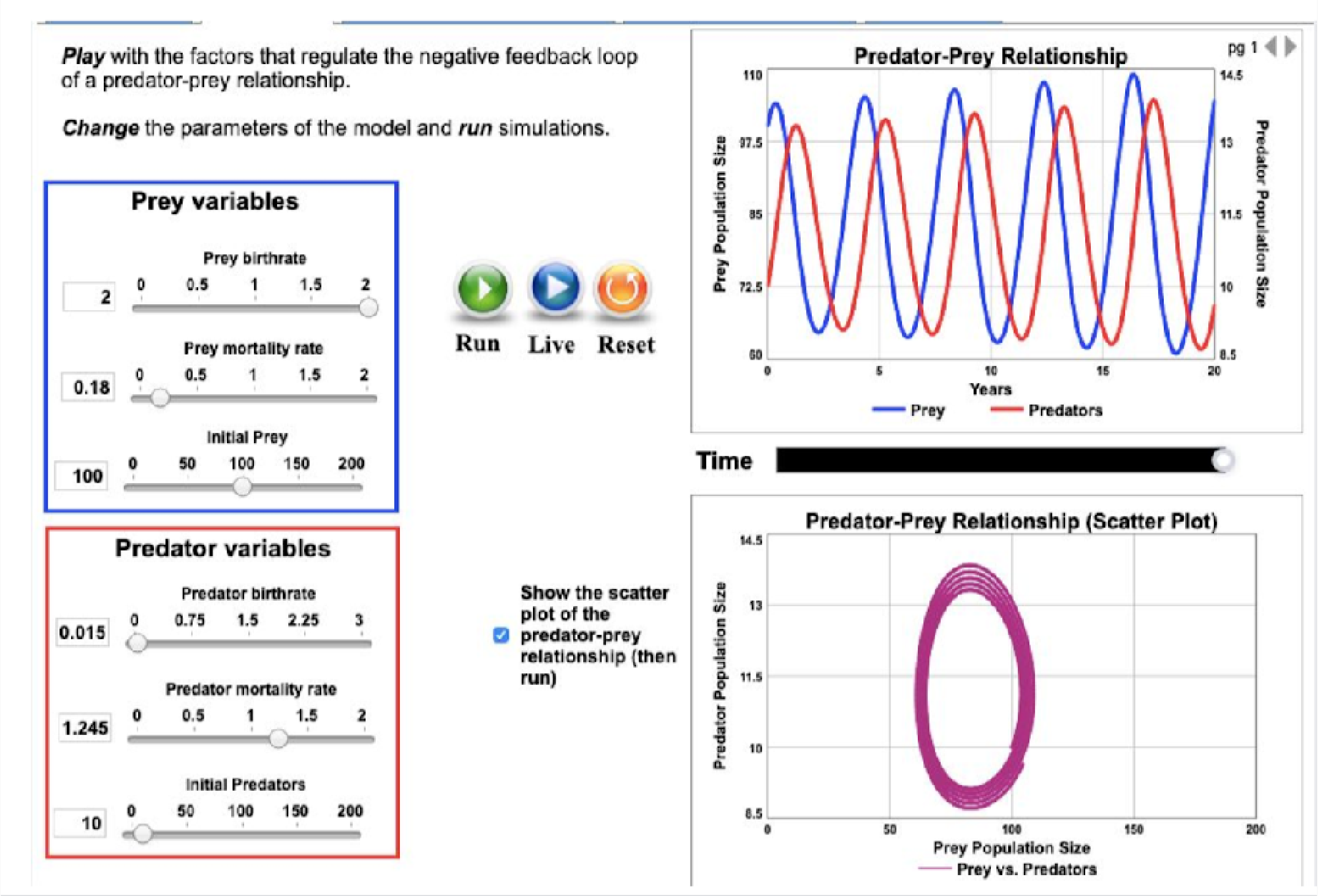
Predator birthrate: 0.01

Predator mortality rate: 1

Initial Predators: 12

☑ Show the scatter plot of the predator-prey relationship (then run)

Here, the ecosystem is almost in equilibrium because there is a good predator to prey ratio, and the birthrate of prey has been slowed down so that the population cycles of both prey and predator are somewhat smooth and oscillating.



Play with the factors that regulate the negative feedback loop of a predator-prey relationship.

Change the parameters of the model and ***run*** simulations.

Prey variables

Prey birthrate: 2

Prey mortality rate: 0.18

Initial Prey: 100

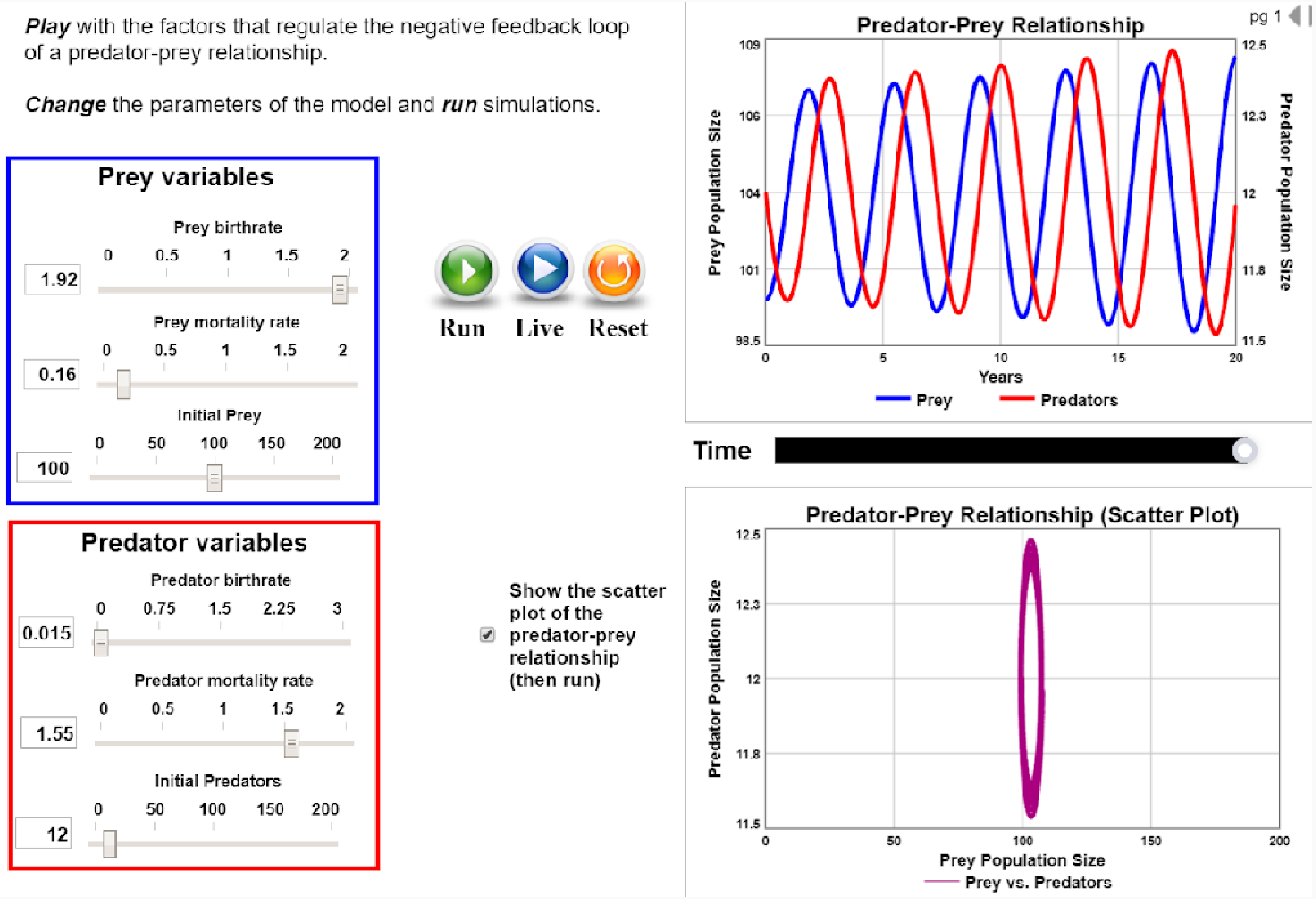
Predator variables

Predator birthrate: 0.015

Predator mortality rate: 1.245

Initial Predators: 10

☑ Show the scatter plot of the predator-prey relationship (then run)



Play with the factors that regulate the negative feedback loop of a predator-prey relationship.

Change the parameters of the model and ***run*** simulations.

Prey variables

Prey birthrate: 1.92

Prey mortality rate: 0.16

Initial Prey: 100

Predator variables

Predator birthrate: 0.015

Predator mortality rate: 1.55

Initial Predators: 12

☑ Show the scatter plot of the predator-prey relationship (then run)

Note, this plot is kind of stupid; Y-axes are different - only thing that matters here is time behavior and not the actual number of prey/predators

Now examine small changes (perturbations) and the resulting system behavior