

# Package ‘NetworkExtinction’

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**Type** Package

**Title** Extinction Simulation in Food Webs

**Version** 0.1.0

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**Description** Simulates the extinction of species in the food web and it analyzes its cascading effects, described in Dunne et al. (2002) <doi:10.1073/pnas.192407699>.

**URL** <https://derek-corcoran-barrios.github.io/VignetteNetworkExt.html>

**Depends** R (>= 2.10)

**Imports** broom, dplyr, ggplot2, magrittr, network, scales, sna, stats, tidyrr

**License** GPL (>= 2)

**Encoding** UTF-8

**LazyData** true

**RoxygenNote** 6.0.1

**Suggests** knitr, rmarkdown

**VignetteBuilder** knitr

**NeedsCompilation** no

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chilean_intertidal	<i>The foodweb of the intertidal zone in central chile</i>
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### Description

A trophic network with 107 species present in the intertidal zone of central Chile. The food web was reconstructed from the Kefi et al. 2015

### Usage

```
chilean_intertidal
```

### Format

a network

### References

Kefi, Sonia, Eric L. Berlow, Evie A. Wieters, Lucas N. Joppa, Spencer A. Wood, Ulrich Brose, and Sergio A. Navarrete. "Network structure beyond food webs: mapping non trophic and trophic interactions on Chilean rocky shores." *Ecology* 96, no. 1 (2015).

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CompareExtinctions	<i>Comparison of Null hypothesis with other extinction histories</i>
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### Description

It compares an object generated either by the Mostconnected or ExtinctionOrder functions with a null hypothesis generated by the RandomExtinctions function and it tests weather they are significantly different.

### Usage

```
CompareExtinctions(Nullmodel, Hypothesis)
```

### Arguments

Nullmodel	an object generated by the RandomExtinctions
Hypothesis	Extinction history generated by the Mostconnected or ExtinctionOrder fuction

**Value**

a plot comparing the expected value of secondary extinctions originated at random with the observed extinction history. Also, and a goodness of fit test showing if there are significant differences between expected value of secondary extinctions and the observed secondary extinction history.

**Author(s)**

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**Examples**

```
data("net")
History <- Mostconnected(Network = net)

NullHyp <- RandomExtinctions(Network = net, nsim = 100)

CompareExtinctions(Nullmodel = NullHyp, Hypothesis = History)
```

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degree\_distribution    *Degree distribution of the network*

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**Description**

This function calculates the degree distribution of the network. First it fits exponential, power law and truncated power law distribution models, and calculates the AIC values to select the best fit, and finally it plots the degree distribution in a log log scale showing the three fitted models mentioned above against the observed distribution.

**Usage**

```
degree_distribution(Network, name)
```

**Arguments**

Network	a trophic network of class network
name	a categorical variable that represent the distribution model

**Value**

exports three principal results: 1. A list with network degree distribution values and with the value of each fit model 2. A list with each model results and AIC of the distribution models 3. A Ghrph of the degree distribution with the models adjust In DDvalues, k represent the degree of the network and cumulative the probability that each specie could be have this degree (pk). Observation: In the graph, the zero values are not represented but this result are incorporate in the DF result

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**Examples**

```
library(NetworkExtinction)
data("net")
degree_distribution(net, name = "Test")
```

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ExtinctionOrder      *Extinctions analysis from custom order*

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**Description**

It takes a network, and extinguishes nodes using a custom order, then it calculates the secondary extinctions and plots the accumulated secondary extinctions.

**Usage**

```
ExtinctionOrder(Network, Order)
```

**Arguments**

Network	a network of class network
Order	Vector with the order of extinctions by ID

**Value**

exports data frame with the characteristics of the network after every extinction, and a graph with the mean and 95

**Author(s)**

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**Examples**

```
#first example
data("net")
ExtinctionOrder(Network = net, Order = c(1,2,3,4,5,6,7,8,9,10))
#Second example
data("net")
ExtinctionOrder(Network = net, Order = c(2,8,9))
```

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ExtinctionPlot      *Plots the extinctions history of a network*

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### Description

It takes a NetworkTopology class object and plots the network index after every extinction

### Usage

```
ExtinctionPlot(History, Variable = "AccSecondaryExtinction")
```

### Arguments

History      a NetworkTopology object obtained from the Mostconnected function or the ExtinctionOrder function

Variable      the variable of the NetworkTopology object that you want as a y variable

### Value

A plot of number of extinctions in the x axis vs the choosen variable in the Y axis

### Author(s)

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### See Also

[NetworkExtintion::ExtinctionOrder()]

### Examples

```
# If you don't specify the y variable it will plot the secondary extinctions
# by default
data("net")
history <- Mostconnected(Network = net)
ExtinctionPlot(History = history)
# You can also specify the variable to be plotted in the y axis
ExtinctionPlot(History = history, Variable = "LinksPerSpecies")
```

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Mostconnected	<i>Extinctions analysis from most connected to less connected nodes in the network</i>
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### Description

It takes a network and it calculates which node is the most connected of the network, using total degree. Then remove the most connected node, and calculates the the topological indexes of the network and the number of secondary extinctions (how many species have indegree 0, without considered primary producers). After that, remove the nodes that were secondarily extinct in the previous step and recalculate which is the new most connected node and so on, until the number of links in the network is zero.

### Usage

```
Mostconnected(Network)
```

### Arguments

Network            a trophic network of class network

### Value

exports data frame with the characteristics of the network after every extinction. The resulting data frame contains 10 columns that incorporate the topological index, the secondary extinctions, and total extinctions of the network in each primary extinction.

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### See Also

[NetworkExtinction::ExtinctionOrder()]

### Examples

```
data("net")
Mostconnected(Network = net)
```

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net	<i>A toymodel trophic network</i>
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**Description**

A trophic network with 10 species where the first four species are primary producers

**Usage**

```
net
```

**Format**

```
a network
```

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RandomExtinctions	<i>Random extinction</i>
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**Description**

Generates a null model by generating random extinction histories and calculating the mean and standard deviation of the accumulated secondary extinctions developed by making n random extinction histories

**Usage**

```
RandomExtinctions(Network, nsim = 10)
```

**Arguments**

Network	a trophic network of class network
nsim	number of simulations

**Value**

exports data frame with the characteristics of the network after every extinction, and a graph with the mean and 95

**Author(s)**

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**Examples**

```
#first example
data("net")
ExtinctionOrder(Network = net, Order = c(1,2,3,4,5,6,7,8,9,10))
#Second example
data("net")
ExtinctionOrder(Network = net, Order = c(2,8,9))
```



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