Package ‘petitr’

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Title Relative Growth Rate

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Depends R (>= 1.8.0)

Description Calculates the relative growth rate (RGR) of a series of individuals by building a life table and solving the Lotka-Birch equation. (See Birch, L. C. 1948. The intrinsic rate of natural increase of an insect population. - Journal of Animal Ecology 17: 15-26) <doi:10.2307/1605>.

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R topics documented:

grosdata — *"Big" life table with 100 individuals*

Description

a life table with 100 individuals to test the time required by jackknife estimation

Usage

```
data(grosdata)
```

Format

A data frame with 100 observations on the following 22 variables.

- `V1` fecundity of day 1
- `V2` fecundity of day 2
- `V3` fecundity of day 3
- `V4` fecundity of day 4
- `V5` fecundity of day 5
- `V6` fecundity of day 6
- `V7` fecundity of day 7
- `V8` fecundity of day 8
- `V9` fecundity of day 9
- `V10` fecundity of day 10
- `V11` fecundity of day 11
- `V12` fecundity of day 12
- `V13` fecundity of day 13
- `V14` fecundity of day 14
- `V15` fecundity of day 15
- `V16` fecundity of day 16
- `V17` fecundity of day 17
- `V18` fecundity of day 18
- `V19` fecundity of day 19
- `V20` fecundity of day 20
- `V21` fecundity of day 21
- `V22` fecundity of day 22

Details

fictitious data designed to check the time needed and the effect of the m parameter of the jackknife estimation

Source

J.S. Pierre, fictitious

Examples

```
data(grosdata)
petitr(grosdata)
```

`life` *life table for ten individuals*

Description

Daily fecundity of ten individuals (fictitious data)

Usage

```
data(life)
```

Format

A data frame with 10 observations on the following 11 variables.

- `X1` numeric vector, age
- `X2` numeric vector, first individual
- `X3` numeric vector, second individual
- `X4` numeric vector, ...
- `X5` numeric vector, ...
- `X6` numeric vector, ...
- `X7` numeric vector, ...
- `X8` numeric vector, ...
- `X9` numeric vector, ...
- `X10` numeric vector, ...
- `X11` numeric vector, tenth individual

Details

the first columns stands for the age of the individual. must be sorted in ascending order and represent equal age classes.

Examples

```
data(life)
petitr(life)
```

life1 *life table for ten individuals*

Description

Daily fecundity of ten individuals (fictitious data)

Usage

```
data(life1)
```

Format

A data frame with 10 observations on the following 11 variables.

- `X1` numeric vector, age
- `X2` numeric vector, first individual
- `X3` numeric vector, second individual
- `X4` numeric vector, ...
- `X5` numeric vector, ...
- `X6` numeric vector, ...
- `X7` numeric vector, ...
- `X8` numeric vector, ...
- `X9` numeric vector, ...
- `X10` numeric vector, ...
- `X11` numeric vector, tenth individual

Details

the first columns stands for the age of the individual. must be sorted in ascending order and represent equal age classes.

Examples

```
data(life1,life2,life3)
ranova(list(life1,life2,life3))
```

`life2` *life2 table for ten individuals*

Description

Daily fecundity of ten individuals (fictitious data)

Usage

```
data(life2)
```

Format

A data frame with 10 observations on the following 11 variables.

- `X1` numeric vector, age
- `X2` numeric vector, first individual
- `X3` numeric vector, second individual
- `X4` numeric vector, ...
- `X5` numeric vector, ...
- `X6` numeric vector, ...
- `X7` numeric vector, ...
- `X8` numeric vector, ...
- `X9` numeric vector, ...
- `X10` numeric vector, ...
- `X11` numeric vector, tenth individual

Details

the first columns stands for the age of the individual. must be sorted in ascending order and represent equal age classes.

Examples

```
data(life1,life2,life3)
ranova(list(life1,life2,life3))
```

`life3` *life3 table for ten individuals*

Description

Daily fecundity of ten individuals (fictitious data)

Usage

```
data(life3)
```

Format

A data frame with 10 observations on the following 11 variables.

- `X1` numeric vector, age
- `X2` numeric vector, first individual
- `X3` numeric vector, second individual
- `X4` numeric vector, ...
- `X5` numeric vector, ...
- `X6` numeric vector, ...
- `X7` numeric vector, ...
- `X8` numeric vector, ...
- `X9` numeric vector, ...
- `X10` numeric vector, ...
- `X11` numeric vector, tenth individual

Details

the first columns stands for the age of the individual. must be sorted in ascending order and represent equal age classes.

Examples

```
data(life1,life2,life3)
ranova(list(life1,life2,life3))
```

petitr — *Per capita growth rate from individual data*

Description

calculates the per capita growth rate of a series of individuals through the set of individual life tables

Usage

```
petitr(tabvie, niter = 100, eps = 1e-07, m = 1, alpha = 0.05, s = 1)
```

Arguments

`tabvie`	A data.frame with a first column recording the endpoint of age classes, and as many columns as individuals. For each individual, each row represents the number of offspring produced by the individual vetween age x-1 and age x. After death or after the end of reproductive life, each column must be filled by zeros . The last row represents therefore the maximum reproductive age observed in the data set. The number of columns is n+1, where n is the number of individuals.
`niter`	the maximum number of iterations for the Newton's method. Default is 100
`eps`	Precision required for the Newton's method. Default is 1e-07.
`m`	Size of the subsamples to drop one after one in the Jackknife method. Default is m=1. Any other value must divide exactly n,the number of individuals.
`alpha`	First kind error risk. Default is alpha=0.05.
`s`	ex ratio expressed as the proportion of females in the total population. Default is 1, meaning a parthenogenetic population (ex. aphids). For a sexual population one would often set s=0.5.

Details

Calls `r`, and `xlxmx`, called by `ranova`.

Value

a vector with the pseudovalues of r calculated by the jackknife method

Author(s)

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References

Birch, L. C. 1948. The intrinsic rate of natural increase of an insect population. - Journal of Animal Ecology 17: 15-26. Lotka, A. (1924). Elements of mathematical biology. Reprinted 1956 by Dover Publications Inc., New York, USA.

See Also

r, and xlxmx, called by ranova

Examples

```
data(life)
petitr(life)
```

`r` *malthusian parameter*

Description

Calculates the intrinsic rate of increase by solving the Birch equation. Uses the Newton method.

Usage

```
r(tab, eps = eps, maxiter = 100)
```

Arguments

`tab`	a data.frame with three columns : x, the age, lx, the proportion of survivors at age x, mx, the offspring number per individual in the age class x
`eps`	Precision for the convergence of Newton method. Default is object eps transmitted by the calling function r. must be defined for a standalone use
`maxiter`	maximum number of iterations for the Newton's method. default = 100

Value

a single numeric value : r

Author(s)

Jean-Sebastien PIERRE

References

Lotka 1924, Birch 1948.

See Also

petitr,xlxmx,ranova

Examples

```
data (tblif)
r(tblif,eps=0.0000001)
```

ranova *Analysis of Variance on per capita growth rate pseudovalues*

Description

Accepts as input a series (list) of individual life tables (see r,petitr,life1), calculates the Jackknife estimator of r (per capita growth rate) on each table, and achieves a one way analysis of variance on the set of pseudovalues corresponding to each table.

Usage

```
ranova(listab, levels = NULL)
```

Arguments

listab	list of life tables. must be of class list, and each table of class data.frame
levels	a character vector giving level names for each life table. If NULL, the levels are named l1,l2, etc..

Value

a data frame with two columns: the set of pseudovalues, and a factor named pop. Can be retrieved and used for more sophisticated factor organisation

Author(s)

Jean-Sebastien Pierre

References

Lotka 1924, Birch 1948, Wratten 1982

See Also

r, and xlxmx, called by petitr~

Examples

```
data(life1,life2,life3)
ranova(list(life1,life2,life3))
```

`tblif` *population life table*

Description

a population life table with three columns, x, lx, mx (See below)

Usage

```
data(tblif)
```

Format

A data frame with 10 observations on the following 3 variables.

- `x` a numeric vector, age
- `lx` a numeric vector, Proportion of survivors at age x
- `mx` a numeric vector, mean number of offspring produced in the age class x

Details

x must represent equal age classes in ascending order

Source

Application of the function `xlxmx` on the data set `life`

Examples

```
data(tblif)
r(tblif, eps=10e-08)
```

`xlxmx` *builds an average life table from a set of individuals*

Description

Calculates a life table with three columns, x, lx mx from the age specific birth data of a set of individuals. Called by petitr, but may be used as standalone function.

Usage

```
xlxmx(X, s)
```

Arguments

`X`	a data.frame. See petitr
`s`	Sex ratio expressed as the proportion of females in the population

Value

a data.frame with three columns, x (age), lx (survival at age x), mx (birth rate at age x)

Author(s)

Jean-Sebastien Pierre jean-sebastien.pierre@univ-rennes1.fr

References

Lotka 1924, Birch 1948

See Also

`r`, and `petitr`, called by `ranova`

Examples

```
data(life)
tablif=xlxmx(life,s=1)
```

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