Package 'zooaRch'

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Type Package

Title Analytical Tools for Zooarchaeological Data

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Description The analysis and inference of faunal remains recovered from archaeological sites concerns the field of zooarchaeology. The zooaRch package provides analytical tools to make inferences on zooarchaeological data. Functions in this package allow users to read, manipulate, visualize, and analyze zooarchaeological data.

Depends ggplot2

License GPL (>= 2)

Suggests rmarkdown, knitr

VignetteBuilder knitr, rmarkdown

RoxygenNote 5.0.1

NeedsCompilation no

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zooaRch-package *Analytical Tools for Zooarchaeological Data*

Description

Functions in this package allow users to import, manipulate, analyze and visualize zooarchaeological data - the faunal remains recovered from archaeological sites.

Author(s)

Erik Otarola-Castillo, Jesse Wolfhagen, and Max D. Price

fuse.func *Epiphyseal fusion survival analysis*

Description

A general function to perform survival analysis of zooarchaeological epiphyseal fusion data.

Usage

```
fuse.func(data, iter = 1000, ci = 95, plotci = TRUE, plot.title = NULL)
```

Arguments

data	This function inputs a dataframe composed of three columns, names must be 'Identification', 'Element', 'Fusion'. The first column denotes the arbitrary ID # and can be left blank if desired; the second is the element name (differentiate proximal and distal as needed); the third is the state of fusion. It must be 'Fused', 'Fusing', or 'Unfused' (NOTE: elements coded as 'Fusing' will be counted as 'Fused').
iter	A numeric value indicating the number of bootstrap iterations. Defaults to 100.
ci	Numerical value indicating desired CI level (e.g., 90, 95, 99). Defaults to 95.
plotci	A logical value indicating wether user wishes an output plot. Default = TRUE.
plot.title	A character value providing a title for the plot. Default is NULL.

Details

The function constructs Confidence Intervals based off bootstraps of percent Fused values

Value

Function returns a matrix with the following components

Lower and Upper CI	typically the 97.5 and 2.5 percentile markers
Point Value	the y value on the percent Fused survivorship curve

Author(s)

Jesse Wolfhagen, Max Price, and Erik Otarola-Castillo.

References

Klein, R.G., Cruz-Uribe, K., 1983. The Analysis of Animal Bones from Archaeological Sites, University of Chicago Press, Chicago.

Lyman, R.L., 1994. Vertebrate Taphonomy, Cambridge University Press, Cambridge.

Zeder, M.A., 2006. Reconciling Rates of Long Bone Fusion and Tooth Eruption in Sheep (Ovis) and Goat (Capra), in: Ruscillo, D. (Ed.), Recent Advances in Ageing and Sexing Animal Bones, Oxbow Books, Oxford.

Twiss, K.C., 2008. An Assessment of the Archaeological Applicability of Faunal Ageing Methods Based on Dental Wear, International Journal of Osteoarchaeology 18, 329-351.

Price, M.D., Buckley, M., Rowan, Y.M., Kersel, M., 2013. Animal Management Strategies during the Chalcolithic in the Lower Galilee: New Data from Marj Rabba, Paleorient 39, 183-200.

Examples

```
# Example 1
# fusedat<-data(marjRab.fuse)
# test<-fuse.func(fusedat, iter=100, plotci=TRUE, plot.title="Fusion Example")
# send the following into the console as you are prompted
# interactively
# 5
# 2
# 1
# 1
# 1
# 1
# Px.Humerus
# Ds.Humerus
# Calcaneus
# Ds.Tibia
# Px.Femur
# Phalanx1
```

---

marjRab *Survival data from Marj Rabba, using Payne's (1973) age classes*

Description

Survival data from Marj Rabba, using Payne's (1973) age classes

Author(s)

M.D. Price, M. Buckley, Y.M. Rowan, and M. Kersel

References

Payne, S. 1973 Kill - off Patterns in Sheep and Goats: The Mandibles from Asvan Kale. Anatolian Studies 23:281 - 303.

Price, M.D., Buckley, M., Rowan, Y.M., Kersel, M., 2013. Animal Management Strategies during the Chalcolithic in the Lower Galilee: New Data from Marj Rabba, Paleorient 39, 183 - 200.

`marjRab.fuse` *Fusion Survival data from Marj Rabba*

Description

Fusion Survival data from Marj Rabba

Author(s)

M.D. Price, M. Buckley, Y.M. Rowan, and M. Kersel

References

Price, M.D., Buckley, M., Rowan, Y.M., Kersel, M., 2013. Animal Management Strategies during the Chalcolithic in the Lower Galilee: New Data from Marj Rabba, Paleorient 39, 183 - 200.

`mort.func` *Analysis of Mortality Profiles*

Description

This is a function used to conduct mortality analyses of zooarchaeological data

Usage

```
mort.func(mortData, labels = NULL, models = NULL, ci = 95, plot = TRUE,
  iter = 1000, usermod = NULL, lsize = 0.1)
```

Arguments

`mortData`	is the age-at-death dataset. This function inputs datasets composed of three columns. The first column denotes the genus; the second is the age class (this MUST be numeric) if data contains nominal age classes (e.g., 'A', 'B', 'C', etc.) these data must be converted to numbers (e.g., A = 1, B = 2, etc.).
`labels`	Character value indicating wether age class labels wishing to be displayed.

models	A numerical value (1-5) indiacting the models to compare the data to. Currently mort.func makes use of 5 mortality models: 1) Security (ref); 2) Milk (ref); 3) Wool (ref); 4) Catastrophic (Stiner 1990); and 5) Attritional (Stiner 1990). More models will be added soon. An option to include user's own model will also be available.
ci	Numerical value indicating desired CI level (e.g., 90, 95, 99). Defaults to 95.
plot	A logical value indicating wether user wishes an output plot. Default = TRUE.
iter	A numeric value indicating the number of bootstrap iterations. Defaults to 1000.
usermod	numeric list (see help(list)) user-specified mortality model. See example 3 below. Data must be entered as a list, else user will receive error.
lsize	A numeric value indicating the vertical spacing value in a legend.

Details

This function plots mortality profiles, along with Confidence Intervals using dental eruption and wear data. Optionally, plotted mortality profiles can be compared to idealized models of mortality.

Value

Function returns a matrix with the following components

Lower and Upper CI	typically the 97.5 and 2.5 percentile markers
Point Value	the y value on the mortality profile

Author(s)

Erik Otarola-Castillo.

References

Klein, R.G., Cruz-Uribe, K., 1983. The Analysis of Animal Bones from Archaeological Sites, University of Chicago Press, Chicago.

Stiner, M. C. 1990 The Use of Mortality Patterns in Archaeological Studies of Hominid Predatory Adaptations. Journal of Anthropological Archaeology 9:305 - 351.

Lyman, R.L., 1994. Vertebrate Taphonomy, Cambridge University Press, Cambridge.

Voorhies, M. R., 1969 Taphonomy and Population Dynamics of an Early Pliocene Vertebrate Fauna, Knox County, Nebraska. University of Wymonig Press. Contributions to Geology, Special Paper No. 1, Laramie (WY).

Reitz, E. and E. Wing 2008 Zooarchaeology. Second Edition. Cambridge University Press, Cambridge.

Examples

```
# Example 1: Payne 1973
 data(marjRab)

# Inspect data structure
 head(marjRab)

# create age-class labels: Payne 1973 uses ageclasses A-I
 Labels <-c('A', 'B', 'C', 'D', 'E', 'F', 'G', 'H', 'I')
 mort.func(mortData=marjRab,labels=Labels, models=1:3, ci=95, plot=TRUE, iter=1000)

# Example 2: Garnsey Site Bison Data (from Speth 1983)
 data(speth83)

# Inspect data structure
 head(speth83)

# create age-class labels using the 13 age classes of Speth's (1983) scheme.
 Labels <-c(1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13)

# Use the catastrophic and attritional mortality curves (after Stiner 1990).
 mort.func(mortData=speth83,labels=Labels, models=4:5, ci=95, plot=TRUE, iter=1000)
```

---

speth83 *Bison survival data from Speth 1983*

Description

Bison survival data from Speth 1983

Author(s)

John D. Speth

References

Speth, J. D. 1983 Bison Kills and Bone Counts: Decision Making by Ancient Hunters. University of Chicago Press, London.

surv.func *General survival analysis*

Description

A general function to perform survival analysis of zooarchaeological data

Usage

```
surv.func(SurviveData, labels = NULL, models = NULL, ci = 95,
  plot = TRUE, iter = 1000, usermod = NULL)
```

Arguments

SurviveData	This function inputs datasets composed of three columns. The first column denotes the genus; the second is the age class (this MUST be numeric) if data contains nominal age classes (e.g., 'A', 'B', 'C', etc.) these data must be converted to numbers (e.g., A = 1, B = 2, etc.).
labels	Character value indicating wether age class labels wishing to be displayed.
models	A numerical value (1-5) indiacting the models to compare the data to. Currently surv.func makes use of 5 survival models: 1) Security (ref); 2) Milk (ref); 3) Wool (ref); 4) Catastrophic (Stiner 1990); and 5) Attritional (Stiner 1990). More models will be added soon. An option to include user's own model will also be available.
ci	Numerical value indicating desired CI level (e.g., 90, 95, 99). Defaults to 95.
plot	A logical value indicating wether user wishes an output plot. Default = TRUE.
iter	A numeric value indicating the number of bootstrap iterations. Defaults to 1000.
usermod	numeric list (see help(list)) user-specified survivorship model. See example 3 below. Data must be entered as a list, else user will receive error.

Details

The function constructs Kaplan-Meier Estimator (KME) Confidence Intervals Using Dental Eruption Wear Data

Value

Function returns a matrix with the following components

Lower and Upper CI	typically the 97.5 and 2.5 percentile markers
Point Value	the y value on the survivorship curve

Author(s)

Jesse WolfHagen and Erik Otarola-Castillo.

References

Klein, R.G., Cruz-Uribe, K., 1983. The Analysis of Animal Bones from Archaeological Sites, University of Chicago Press, Chicago.

Stiner, M. C. 1990 The Use of Mortality Patterns in Archaeological Studies of Homonid Predatory Adaptations. Journal of Anthropological Archaeology 9:305 - 351.

Lyman, R.L., 1994. Vertebrate Taphonomy, Cambridge University Press, Cambridge.

Zeder, M.A., 2006. Reconciling Rates of Long Bone Fusion and Tooth Eruption in Sheep (Ovis) and Goat (Capra), in: Ruscillo, D. (Ed.), Recent Advances in Ageing and Sexing Animal Bones, Oxbow Books, Oxford.

Twiss, K.C., 2008. An Assessment of the Archaeological Applicability of Faunal Ageing Methods Based on Dental Wear, International Journal of Osteoarchaeology 18, 329-351.

Examples

```
# Example 1: Payne 1973
 data(marjRab)

# Inspect data structure
 head(marjRab)

# create age-class labels: Payne 1973 uses ageclasses A-I
 Labels <-c('A', 'B', 'C', 'D', 'E', 'F', 'G', 'H', 'I')
 surv.func(SurviveData=marjRab,labels=Labels, models=1:3, ci=95, plot=TRUE, iter=1000)

# Example 2: Garnsey Site Bison Data (from Speth 1983)
 data(speth83)

# Inspect data structure
 head(speth83)

# create age-class labels using the 13 age classes of Speth's (1983) scheme.
 Labels <-c(1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13)

# Use the catastrophic and attritional mortality curves (after Stiner 1990).
 surv.func(SurviveData=speth83,labels=Labels, models=4:5, ci=95, plot=TRUE, iter=1000)

# Example 3: marjRab, input user-defined survivorship models.
data(marjRab)
# extract age classes from marjRab
age<-unique(marjRab$Ageclass)
age
# model survivorship using an exponential decay function
# with parameter b: survivorship = age^(-1/b)
# surv 1: b= .95
surv1<-c(1.00, 0.48, 0.31, 0.23, 0.18, 0.15, 0.12, 0.11, 0.09)
# surv 2: b= .35
surv2<-c(1.00, 0.13, 0.04, 0.01, 0.01, 0.005, 0.003, 0.002, 0.001)

plot(age, surv1,type='l',xlim=range(age),ylim=c(0,1))
lines(age, surv2,col='red',)
```

```
# usermods in surv.func must be a list (if not a list, then user will receive error message)
mods<-list(surv1=surv1,surv2=surv2)

surv.func(marjRab,models=NULL,usermod=mods)
```

`winslow.fuse` *Fusion Survival data for cattle remains from the Winslow site, a colonial period farm near Boston, MA.*

Description

Fusion Survival data for cattle remains from the Winslow site, a colonial period farm near Boston, MA.

Author(s)

D. Landon

References

Landon, David B. 1993 Feeding Colonial Boston: A Zooarchaeological Study. Historical Archaeology 30:i-vii, 1-153

Index