Package ‘surveyIndex’

March 29, 2019

Type Package

Title Calculate survey indices by age from DATRAS exchange data.

Version 1.01

Date 2018-03-29

Author Casper W. Berg

Maintainer Casper W. Berg <cbe@aqua.dtu.dk>

Description This is an implementation of the methods described in
Berg et al. (2014): ``Evaluation of alternative age-based methods for estimating relative abundance from survey data in relation to assessment models'', Fisheries Research 151(2014) 91-99.

License GPL (>=3)

Copyright Casper W. Berg <cbe@aqua.dtu.dk>

Depends R (>= 3.0),
DATRAS,
mgcv,
parallel

Imports MASS,
tweedie

Suggests maps,
mapdata

RoxygenNote 6.1.1

R topics documented:

`AIC.surveyIdx` *Akaike Information Criterion (or BIC) for survey index models*

Description

Akaike Information Criterion (or BIC) for survey index models

Usage

```
## S3 method for class 'surveyIdx'
AIC(x, BIC = FALSE)
```

Arguments

`x`	survey index as return from getSurveyIdx
`BIC`	if TRUE compute BIC instead of AIC

Value

numeric value

`anova.SI` *Likelihood ratio test for comparing two survey indices.*

Description

Likelihood ratio test for comparing two survey indices.

Usage

```
## S3 method for class 'SI'
anova(m1, m2)
```

Arguments

`m1`

`m2`

Value

A p-value.

concTransform *Helper function for plotting survey indices.*

Description

Concentration transform

Usage

```
concTransform(x)
```

Arguments

x	a vector of log-responses

Value

vector of transformed responses

exportSI *Write survey index to file in standard XSA/SAM format*

Description

Write survey index to file in standard XSA/SAM format

Usage

```
exportSI(x, ages, years, toy, file, nam = "")
```

Arguments

x	matrix with survey indices
ages	vector of ages
years	vector of years
toy	fraction of year the survey is conducted (between 0 and 1)
file	filename to write to
nam	file description header

Value

nothing

externalCons — *Calculate external consistencies between two survey indices.*

Description

Calculate external consistencies between two survey indices.

Usage

```
externalCons(tt, tt2, do.plot = FALSE)
```

Arguments

`tt`	A matrix with survey indices (rows=years, cols=ages)
`tt2`	A matrix with survey indices (rows=years, cols=ages)
`do.plot`	plot it?

Details

Proper alignment of years and ages must be ensured by the user.

Value

A vector of correlations (consistencies)

fixAgeGroup — *Helper function to "borrow" missing age groups from other years*

Description

Helper function to "borrow" missing age groups from other years

Usage

```
fixAgeGroup(x, age = 0, n = 3, fun = "mean")
```

Arguments

`x`	DATRASraw object
`age`	age to impute
`n`	at least this many individuals in each year
`fun`	A function such as 'mean','median','min', or 'max'.

Details

In years where there are less than 'n' individuals of age 'age', add fake individuals of that age such that there are 'n'. The length of the individuals are set to the mean (or whatever 'fun' specifies) of all other individuals of the same age. For the minimum and maximum age groups fun it is reasonable to replace 'mean' with 'min' and 'max' respectively. Note, that you might need to call 'addSpectrum' on the object again.

Value

a DATRASraw object

---

getEffect — *Calculate confidence intervals for a named parameter in a survey index model.*

Description

Calculate confidence intervals for a named parameter in a survey index model.

Usage

```
getEffect(x, dat, parName = "Gear", cutOff, nboot = 1000,
  pOnly = FALSE)
```

Arguments

`x`	survey index
`dat`	DATRASraw object
`parName`	name of the parameter, e.g. "Gear"
`cutOff`	see getSurveyIndex()
`nboot`	see getSurveyIndex()
`pOnly`	only calculate for positive part of model, defaults to FALSE.

Value

list of estimates + ci bounds for each age group.

`getGrid` *Create a grid of haul positions from a DATRASraw object.*

Description

Create a grid of haul positions from a DATRASraw object.

Usage

```
getGrid(dd, nLon = 20)
```

Arguments

`dd`	DATRASraw object
`nLon`	number of grid cells in the longitude direction.

Value

a list of coordinates and haul.ids.

`getSurveyIdx` *Calculate survey indices by age.*

Description

Calculate survey indices by age.

Usage

```
getSurveyIdx(x, ages, myids, kvecP = rep(12 * 12, length(ages)),
  kvecZ = rep(8 * 8, length(ages)), gamma = 1.4, cutOff = 1,
  fam = "Gamma", useBIC = FALSE, nBoot = 1000, mc.cores = 2,
  method = "ML", predD = NULL,
 modelZ = rep("Year+s(lon,lat,k=kvecZ[a],bs='ts')+s(Ship,bs='re',by=dum)+s(Depth,bs='ts')+s(TimeShot
  length(ages)),
 modelP = rep("Year+s(lon,lat,k=kvecP[a],bs='ts')+s(Ship,bs='re',by=dum)+s(Depth,bs='ts')+s(TimeShot
  length(ages)), knotsP = NULL, knotsZ = NULL)
```

Arguments

`x`	DATRASraw object
`ages`	vector of ages
`myids`	haul.ids for grid
`kvecP`	vector with spatial smoother max. basis dimension for each age group, strictly positive part of model

`kvecZ` vector with spatial smoother max. basis dimension for each age group, presence/absence part of model (ignored for Tweedie models)

`gamma` model degress of freedom inflation factor (see 'gamma' argument to gam())

`cutOff` treat observations below this value as zero

`fam` distribution, either "Gamma","LogNormal", or "Tweedie".

`useBIC` use BIC for smoothness selection (overrides 'gamma' argument)

`nBoot` number of bootstrap samples used for calculating index confidence intervals

`mc.cores` number of cores for parallel processing

`method` smoothness selection method used by 'gam'

`predD` optional DATRASraw object, defaults to NULL. If not null this is used as grid.

`modelZ` vector of model formulae for presence/absence part, one pr. age group (ignored for Tweedie models)

`modelP` vector of model formulae for strictly positive repsonses, one pr. age group

`knotsP` optional list of knots to gam, strictly positive repsonses

`knotsZ` optional list of knots to gam, presence/absence

Details

This is based on the methods described in Berg et al. (2014): "Evaluation of alternative age-based methods for estimating relative abundance from survey data in relation to assessment models", Fisheries Research 151(2014) 91-99.

Value

A survey index (list)

Author(s)

Casper W. Berg

Examples

```
## Not run:
library(surveyIndex)
##downloadExchange("NS-IBTS",1994:2014)
dAll<-readExchangeDir(".",strict=FALSE)
mc.cores<-2; library(parallel)
d<-subset(dAll, Species=="Pollachius virens",Quarter==1,HaulVal=="V",StdSpecRecCode==1, Gear=="GOV")
dAll<-NULL; gc(); ## lose dAll because it takes up a lot of memory
d<-addSpectrum(d,by=1)
## get idea about number of age groups to include
agetab<-xtabs(NoAtALK~Year+Age,data=d[[1]])
agetab.df<-as.data.frame(agetab)
ages<-1:8
## require at least 1 aged individual in each year
for(a in ages){
    if(any(agetab.df$Freq[agetab.df$Age==a]<1))
```

```
        d<-fixAgeGroup(d,age=a,fun=ifelse(a==min(ages),"min","mean"))
}
d<-subset(d,Age>=min(ages))

################################
## Convert to numbers-at-age
################################
d.ysplit <- split(d, d$Year)
ALK<-mclapply(d.ysplit,fitALK,minAge=min(ages),maxAge=max(ages),autoChooseK=TRUE,useBIC=TRUE,varCof=FALSE,maxK
Nage<-mclapply(ALK,predict,mc.cores=mc.cores)
for(i in 1:length(ALK)) d.ysplit[[i]]$Nage=Nage[[i]];
dd <- do.call("c",d.ysplit)

##############
## Fit model
##############
grid <- getGrid(dd, nLon=40)
## set max basis dim for spatial smooths by age, P=positive and Z=zero/absence.
## These are set relatively low here to speed up the example
kvP <- c(50,50,50,40,30,rep(10,length(ages)-5))
kvZ <- kvP / 2;
mP <- rep("Year+s(lon,lat,k=kvecP[a],bs='ts')+s(Depth,bs='ts',k=6)+offset(log(HaulDur))",length(ages) );
mZ <- rep("Year+s(lon,lat,k=kvecZ[a],bs='ts')+s(Depth,bs='ts',k=6)+offset(log(HaulDur))",length(ages) );

SIQ1 <- getSurveyIdx(dd,ages=ages,myids=grid[[3]],cutOff=0.1,kvecP=kvP,kvecZ=kvZ,modelZ=mZ,modelP=mP,mc.cores=m

strat.mean<-getSurveyIdxStratMean(dd,ages)

## plot indices, distribution map, and estimated depth effects
surveyIdxPlots(SIQ1,dd,cols=ages,alt.idx=strat.mean,grid[[3]],par=list(mfrow=c(3,3)),legend=FALSE,select="inde

surveyIdxPlots(SIQ1,dd,cols=ages,alt.idx=NULL,grid[[3]],par=list(mfrow=c(3,3)),legend=FALSE,colors=rev(heat.co

surveyIdxPlots(SIQ1,dd,cols=ages,alt.idx=NULL,grid[[3]],par=list(mfrow=c(3,3)),legend=FALSE,select="2",plotByA


## Calculate internal concistency and export to file
internalCons(SIQ1$idx)
exportSI(SIQ1$idx,ages=ages,years=levels(dd$Year),toy=mean(dd$timeOfYear),file="out.dat",nam="Survey index demo

## End(Not run)
```

getSurveyIdxStratMean *Survey index using the stratified mean method using ICES statistical rectangles as strata.*

Description

Survey index using the stratified mean method using ICES statistical rectangles as strata.

Usage

```
getSurveyIdxStratMean(x, ageCols, doLog = FALSE)
```

Arguments

`x` DATRASraw object. Must contain a matrix: x[[2]]$Nage.

`ageCols` which columns of the Nage matrix should be included?

`doLog` log-transform?

Value

a matrix with survey indices

`internalCons` *Calculate internal consistency of a survey index.*

Description

Calculate internal consistency of a survey index.

Usage

```
internalCons(tt, do.plot = FALSE)
```

Arguments

`tt` A matrix with survey indices (rows=years, cols=ages)

`do.plot` Plot it?

Value

a vector of consistencies

`surveyIdxPlots` *Visualize results from a survey index model fitted with getSurveyIdx().*

Description

Visualize results from a survey index model fitted with getSurveyIdx().

Usage

```
surveyIdxPlots(x, dat, alt.idx = NULL, myids,
  cols = 1:length(x$pModels), select = c("index", "map", "residuals",
  "fitVsRes"), par = list(mfrow = c(3, 3)),
  colors = rev(gray.colors(5)), map.cex = 1, plotByAge = TRUE,
  legend = TRUE, predD = NULL, year = NULL, ...)
```

Arguments

`x`	Survey index as produced by getSurveyIndex()
`dat`	DATRASraw object
`alt.idx`	optional matrix with alternative index
`myids`	vector of haul ids that constitute the grid
`cols`	which age columns to consider?
`select`	character vector of chosen plots. Either one of "index","map","residuals", or "fitVsRes" or a number. Numbers refer to smooths in the order they appear in the formula.
`par`	'par' settings for plotting (a named list).
`colors`	colors for spatial effect.
`map.cex`	size of grid points on maps
`plotByAge`	boolean (default=TRUE). If true, par(par) is called for each age group.
`legend`	boolean (default=TRUE). add legends to plot?
`predD`	DATRASraw object with grid (optional). Overrides 'myids' if supplied.
`year`	numeric (default=NULL). If 'select' equals 'map' a specific year can be chosen (only meaningful for time-varying spatial effects).
`...`	Additional parameters for plot()

Value

nothing

Index