Package 'YPR'

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Type Package

Title What the package does (short line)

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Depends bmisc

Description This is a length-based Yield Per Recruit (YPR) model. It will soon include a weight-based YPR component.

License LGPL >= 3.0

LazyLoad yes

R topics documented:

`plot.sel.ypr` *Plots of selectivity curves used in an* `ypr` *object*

Usage

```
plot.sel.ypr(object)
```

Arguments

`object`	`ypr` object.

Author(s)

Benoit Bruneau

Examples

```
ypr.mod=ypr(vonB=c(1564.5508, 0.1206),
LW=c(0.000000009434 , 3.042974620048),
l.start=241.86,
last.age=14,
age.step=1,
Fsel.type=list(type="ramp",infl1=650,infl2=900, lv=c(0,0.2)),
F.max=2,
F.incr.YPR=0.0001,
Msel.type=list(type="ramp", infl1=400, infl2=600, lv=0.5, pos=F),
M=0.2,
Mat=list(type="ramp",infl1=700, infl2=900),
f.MSP=0.4)



plot.sel(ypr.mod)
```

plot.ypr *Standard Yield per Recruit plot.*

Description

Yield per Recruit and Spawning Stock Biomass per Recruit are plotted with standard reference points.

Usage

```
## S4 method for signature 'ypr'
plot(object, main, ylab.ypr, ylab.ssb, xlab,
                     col.ypr, col.ssb, ref, legend)
```

Arguments

object	an object of class "ypr" resulting from a call to ypr.l
main	main title for the graph
ylab.ypr	a label for the YPR y axis
ylab.ssb	a label for the SSB/R y axis
xlab	a label for the YPR x axis.
col.ypr	the color of the the color of the YPR line.
col.ssb	the color of the the color of the SSB/R line.
ref	logical; if TRUE, standard reference points are added to the plot.
legend	logical; if TRUE, a legend is added in the 'topright' corner of the plot.

Details

REFERENCE POINTS:
Reference points used for result output are defined as follow:

- **F.zero:** F level when there is no fishing (F=0).
- **F.01:** F level where the slope of yield curve is 10% of the slope at F.zero.
- **F.xx:** F level where the MSP is at the level defined by f.MSP option. Default is 40% (0.4).
- **F.max:** F level where yield is maximum.

Author(s)

Benoit Bruneau

See Also

ypr.l

Examples

```
ypr.mod=ypr(vonB=c(1564.5508, 0.1206),
LW=c(0.000000009434 , 3.042974620048),
l.start=241.86,
last.age=14,
age.step=1,
Fsel.type=list(type="ramp",infl1=650,infl2=900, lv=c(0,0.2)),
F.max=2,
F.incr.YPR=0.0001,
Msel.type=list(type="ramp", infl1=400, infl2=600, lv=0.5, pos=F),
M=0.2,
Mat=list(type="ramp",infl1=700, infl2=900),
f.MSP=0.4)



plot(ypr.mod)
```

`rivard` *Rivard Weights Calculation*

Description

This function applies Rivard equations to mid-year weight at age data to adjust values to Jan-1 basis.

Usage

```
rivard(pds, pred=FALSE, K=2, plus.gr=FALSE)
```

Arguments

`data`

Details

More to come. Will be adding interpolation for spawning season.

Author(s)

Benoit Bruneau FranC'ois GrC)goire

Examples

```
x=rnorm(30,800,10)
rivard(data.frame("2000"=x,"2001"=x*1.2, "2002"=x*0.8,"2003"=x*0.5))
```

`selectivity` *Selectivity functions*

Description

These selectivity functions are called by `ypr()`. They estimate probabilities [0,1] for a given functional shape and a given number of inflection points .

Usage

```
const.sel(x)
full.sel(x, infl1, pos=TRUE)
plat.full.sel(x, infl1, infl2, pos=TRUE)
ramp.sel(x, infl1, infl2, pos=TRUE)
plat.ramp.sel(x, infl1, infl2, infl3, infl4, pos=TRUE)
logit.sel(x, infl1, infl2, pos=TRUE, ...)
plat.logit.sel(x, infl1, infl2, pos=TRUE, ...)
mod.logit.sel(x, alpha, beta)
```

Arguments

`x`	a numeric vector for which probabilities are to be estimated.
`infl1 to infl4`	numeric value of the inflection point(s).
`pos`	logical. Indicates if the trend at the beginning is positive (`TRUE`) or negative (`FALSE`)
`...`	arguments to be passed to `find.beta()`

Details

More to come.

Author(s)

Benoit Bruneau

See Also

`ypr`, `find.beta`

Examples

```
library(bmisc)

x=0:1000

plot(full.sel(infl1=600,x=0:1000,lv=0,uv=1), ylim=c(0,1), type='l', lwd=3)

plot(plat.full.sel(infl1=300, infl2=800,x=x,lv=c(0.4), uv=0.9, neg=F) ~ x, ylim=c(0,1), t

plot(ramp.sel(200,600,x=0:1000, lv=0.1,uv=1, neg=T), ylim=c(0,1), type='l', lwd=3)
```

```
plot(plat.ramp.sel(infl1=100,infl2=300,infl3=600,infl4=800,x=0:1000, lv=c(0.3,0.1), uv=c(
plot(logit.sel(infl1=300,infl2=500,x=0:1000, lv=0.5, uv=1, neg=T), ylim=c(0,1), type='l',
plot(plat.logit.sel(infl1=200,infl2=400,infl3=600,infl4=800,x=0:1000, lv=c(0.2,0.8)), yli
```

summary.ypr *Summarizing the results of YPR models.*

Description

Summary for an object of class "ypr".

Usage

```
## S4 method for signature 'ypr'
summary(object)
```

Arguments

object	an object of class "ypr" resulting from a call to ypr.l.

Author(s)

Benoit Bruneau

Examples

```
ypr.mod = ypr.l(fsel.type=list("ramp",650,900), vonB=c(1564.512,0.1205765),
                l.start=72.53,last.age=25,LW=c(exp( -18.47894),3.043), F.max=2,
                F.incr.YPR=0.01, M=0.2, mat=list('full',900), f.MSP=0.4, riv.calc=F)

summary(ypr.mod)
```

YPR *Yield Per Recruit (YPR) model.*

Description

This is a length-based Yield Per Recruit (YPR) model. It will soon include a weight-based YPR component.

Details

Package:	YPR
Type:	Package
Version:	0.1-1
Date:	2011-10-03
License:	LGPL >= 3.0
LazyLoad:	yes

Author(s)

Benoit Bruneau FranC'ois GrC)goire Diane Archambault

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ypr *Length Based Yield Per Recruit*

Description

Length based Yield Per Recruit model is define by fishery selectivity and life history parameters related to length.

Usage

```
ypr(LW, vonB, l.start, last.age, age.step=1, Fsel.type,
      F.max=2,F.incr.YPR=0.0001, Mat,  M=0.2, f.MSP=0.4)
```

Arguments

LW	one of: • a vector containing c(α,β) from length-weight curve. See 'Details'. • an object of class "nls" in which α and β were estimated. See 'Details'.
vonB	one of: • a vector containing c(Linf,K) from von Bertalanffy grotwh curve. • an object of class "glm" in which eqnLinf and eqnK were estimated.
l.start	length at the starting age
last.age	last age to be considered in the model
age.step	steps used to generate ages. Default is 1.
Fsel.type	fishing selectivity can be defined as one of: • a list containing the type of fishery selectivity and the values needed for the function related to the type. • an object of class "glm" in which α and β were estimated by a logistic regression.
fish.lim	the minimum legal catch length.
prop.surv	a function that defines the proportion of fish (< fish.lim) that will survive after being released back into the water (discarded by-catch).
F.max	maximum value of instantaneous rate of fishing mortality (F). Default is 2.
F.incr.YPR	increment for generating the F values to be used for YPR calculation. Default is 0.0001.
Mat	Maturity can be defined by one of: • a list containing the type of maturity at length definition and the values needed for the function related to the type. • an object of class "glm" in which α and β were estimated by a logistic regression.
Msel.type	natural mortality selectivity can be defined as one of: • a list containing the type of natural mortality selectivity and the values needed for the function related to the type.

- an object of class "glm" in which α and β were estimated by a logistic regression.

`M` instantaneous rate of natural mortality (`M`). Default is 0.2.

`f.MSP` reference point defined as the fraction of maximum spawning potential. Default is 0.4.

Details

LENGTH-WEIGHT RELATIONSHIP:
Length-Weight relationship can be provided either by indicating `c(`α`,`β`)` values in a vector or by directly using an object of class "nls" or "lm". If α and β are estimated by `lm`, `log(x, base=exp(1))` transformation should be applied to the data prior to fitting the linear model. If α and β are estimated by `nls`, variables should be named **alpha** and **beta** using the following equation:

$$W = \alpha L^{\beta}$$

where W is weight, L is length, α is the elevation of the curve, and β is the steepness of the curve. Both α and β are estimated coefficients.

VON BARTANLANFFY GROWTH EQUATION:
Von Bartalanffy growth equation parameters can be provided either by indicating `c(Linf,K)` values in a vector or by directly using an object of class "nls". If an object resulting from `nls` is used, variables should be named **Linf** and **K**. As for $t0$, any name may be used since only $L\infty$ and K are used in this length-based YPR model because age is considered as relative. The equation used in the `nls` for estimating $L\infty$ and K should be the following one:

$$L_t = L_\infty \left(1 - e^{-K(t-t_0)}\right)$$

where Lt is length-at-age t, $L\infty$ is the asymptotic average maximum length, K is a growth rate coefficient determinant of how quick the maximum is attained, and $t0$ is the hypothetical age at length zero.

As stated above, since this length-based YPR model uses relative age, $t - t0$ becomes a relative age (a). The Von Bartalanffy growth equation used in this length-based YPR model is defined as:

$$L_a = L_\infty \left(1 - e^{-Ka}\right) + L_s e^{-Ka}$$

where L_a is length at a relative age a and L_s is length at relative age zero.

SELECTIVITY CURVES:
The **fishery selectivity**, **natural mortality selectivity**, and **maturity at length** components of the model can be defined as one of `c("full", "plat.full", "ramp", "plat.ramp", "logit", "plat.logit")` equations. The proper way to specify which function to use is by the construct of a `list` where the first element is the name of one of the six types of function. See example, read `selectivity`, or read `vignette("selectivity")` for more details.

Alternatively, an object of class "glm" can directly be used for the **fishery selectivity** and **maturity**

at length components. The Generalized Linear Model should have the option `family` set to either `binomial` or `quasibinomial` keeping link function to the default (*i.e.* `"logit"`). Estimated coefficients are use as follow:

$$y = \frac{1}{1+e^{-(\alpha+\beta x)}}$$

REFERENCE POINTS:
Reference points used for result output are defined as follow:

- **F.zero:** F level when there is no fishing (F=0).
- **F.01:** F level where the slope of yield curve is 10% of the slope at `F.zero`.
- **F.xx:** F level where the MSP is at the level defined by `f.MSP` option. Default is 40% (0.4).
- **F.max:** F level where yield is maximum.

Use `vignette("YPR")` for a better presentation of the equations.

Value

`ypr` returns an object of `class(S4) "ypr"`. The functions `summary`, `plot.sel.ypr`, and `plot` are used to respectively obtain a summary, plots for selectivity curves used, and a standard YPR plot of the results.

An object of class `"ypr"` has the the following slots:

`parms`	the list of parameters used in the model.
`base`	a `data.frame` containing the starting values: • relative age classes • length at age • weight at age
`refs`	a `data.frame` containing values predicted by the model for the four reference points. See details.
`YPR`	a `data.frame` containing the results for all partial Fs.

Note that to have access to each slot of an `"ypr"` object, one must use `"@"` instead of `"$"`.

Author(s)

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See Also

`plot.logit`, `plot.ypr` and `plot.parms.ypr`

Examples

```
surv=function(x){
    p=x
    p[x<910]=0.8
    p[x>=910]=0.2
    p
```

```
}

ypr(vonB=c(1564.5508, 0.1206),
        LW=c(0.000000009434 , 3.042974620048),
        l.start=241.86,
        last.age=14,
        age.step=1,
        prop.surv=surv,
        fish.lim=1000,
        Fsel.type=list(type="ramp",infl1=650,infl2=900, lv=c(0,0.2)),
        F.max=2,
        F.incr.YPR=0.0001,
        Msel.type=list(type="ramp", infl1=400, infl2=600, lv=0.5, pos=F),
        M=0.2,
        Mat=list(type="ramp",infl1=700, infl2=900),
        f.MSP=0.4)
```

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