Package 'MixFishSim'

October 12, 2016

Title Mixed Fishery fleet dynamics simulation tool

Version 0.0.0.9000

Description A simulation framework for evaluating fleet dynamics in mixed fisheries.

Depends R (>= 3.3.1),

Imports spate

License What license is it under?

Encoding UTF-8

LazyData true

RoxygenNote 5.0.1

Suggests testthat

R topics documented:

`create_fields` *Create species distribution fields*

Description

`create_fields` parametrises and returns the spatio-temporal fields used for the spatial distribution of fish populations and movement in space and time for the simulations.

The spatio-temporal fields are generated using `spate.sim` function from the *spate* package using an advective-diffusion Stochastic Partial Differential Equation (SPDE). See *Lindgren 2011 and Sigrist 2015* for further detail.

Usage

```
create_fields(npt = 1000, t = 1, seed = 123, n.spp = NULL,
  spp.ctrl = NULL, plot.dist = FALSE, plot.file = getwd())
```

Arguments

`npt` Numeric integer with the dimensions of the field in *npt * npt*

`t` Numeric integer with the number of time-steps in the simulation

`seed` (Optional) Numeric integer with the seed for the simulation

`n.spp` Numeric integer with the number of species to be simulated. Each species must have an individual control list as detailed below.

`spp.ctrl` List of controls to generate each species spatio-temporal distribution. Must be of the form spp.ctrl = list(spp.1 = c(rho0 = 0.001, ...), spp.2 = c(rho0 = 0.001, ..),..) and contain the following:

- **rho0** (>=*0*) Controls the range in a matern covariance structure.
- **sigma2** (>=*0*) Controls the marginal variance (i.e. process error) in the matern (>=*0*) covariance structure.
- **zeta** (>=*0*) Damping parameter; regulates the temporal correlation.
- **rho1** (>=*0*) Range parameter for the diffusion process
- **gamma** (>=*0*) Controls the level of anisotropy
- **alpha** (*[0,* $\pi/2$*]*) Controls the direction of anisotropy
- **muX** (*[-0.5, 0.5]*) x component of drift effect
- **muY** (*[-0.5, 0.5]*) y component of drift effect
- **tau2** (>=*0*) Nugget effect (measurement error)
- **nu** Smoothness parameter for the matern covariance function

`plot.dist` Boolean, whether to plot the distributions to file

`plot.file` path to save the plots of the species distributions

Value

Silently returns a list of spatial distributions (0 -> 1) with first level of the list being the population (1 -> n.spp) and the second being time (1 -> t). If `plot.dist = TRUE` it produces an image of the spatial distributions at each time step for each of the populations saved to the working directory (unless specified otherwise in `plot.file`)

Examples

```
fields <- create_fields(n.spp = 1, t = 2,
      spp.ctrl = list(
      'spp.1' = c('rho0' = 0.1, 'sigma2' = 1, 'zeta' = 0.1,
  'rho1' = 0.01, 'gamma' = 0.3, 'alpha' = pi/4,
  'muX' = -0.05, 'muY' = -0.05, 'tau2' = 0, 'nu' = 1.5)),
plot.dist = TRUE, plot.file = getwd())
```

`delay_diff` *Delay-difference (weekly)*

Description

`delay_difference` implements a two-stage delay-difference model with a weekly time-step after *Dichmont 2003*. Given the starting biomass, overall mortality and recruitment it returns the biomass in wk+1.

Usage

```
delay_diff(K = 0.3, F = NULL, M = 0.2, wt = 1, wtm1 = 0.1, R = NULL,
  B = NULL, Bm1 = NULL, al = NULL, alm1 = NULL)
```

Arguments

`K` is a Numeric vector describing growth @param F is the weekly. Note: K is transformed to rho with $\rho = exp{-}K$ for the model. estimate of instantaneous fishing mortality (obtained elsewhere, via `find_f` and `BaranovF` functions.

`M` is a Numeric vector of the instantaneous rate of natural mortality for the population

`wt` is a Numeric vector of the weight of a fish when fully recruited

`wtm1` is a Numeric vector of the weight of a fish before its recruited

`R` is a Numeric vector of the annual recruitment for the population in numbers

`B` is the biomass of the population during wk_t

`Bm1` is a Numeric vector of the biomass of the population in the previous week wk_{t-1}

`al` is a Numeric vector of the proportion of recruits to the fishery in wk_t

`alm1` is a Numeric vector of the proportion of recruits to the fishery in wk_{t-1}

Value

Returns the biomass at the beginning of the following week, wk_{t+1}

Examples

```
delay_diff(K = 0.3, F = 0.2, M = 0.2, wt = 1, wtm1 = 0.1, R = 1e6, B = 1e5,
Bm1 = 1e4, al = 0.5, alm1 = 0.1)
```

Index