Simple MixFishSim Example

This is a simple example of how to use **'MixFishSim'** to generate simulations of dynamics in a mixed fishery.

Load MixFishSim

```
library(MixFishSim)
library(knitr)
opts_chunk$set(tidy = TRUE)
```

Initialise the simulation

Base parameters

First we specify the basic parameters of the simulation. This includes the size of the spatial domain, the number of years to simulate, the number of fleets and vessels per fleet and the number of species for the simulation etc...

The object returned is used internally by MixFishSim a list with two objects:

- sim$idx : The different units of different processes
- sim$brk.idx: breaks for each of the key processes in units of a timestep

```
sim <- init_sim(nrows = 10, ncols = 10, n_years = 10, n_tows_day = 4, n_days_wk_fished = 5,
    n_fleets = 5, n_vessels = 2, n_species = 2, move_freq = 2)

class(sim)
```

```
## [1] "list"
```

```
sim$idx
```

```
##          ntd          ndf           nw          nwm           nt           nm
##     4.000000     5.000000    52.000000     4.333333    26.000000    12.000000
##           ny         ntow      ntow.py        n.spp        ncols        nrows
##    10.000000 10400.000000  1040.000000     2.000000    10.000000    10.000000
##           nf           nv
##     5.000000     2.000000
```

```
names(sim$brk.idx)
```

```
## [1] "tow.breaks"   "day.seq"      "day.breaks"   "trip.breaks"  "week.breaks"
## [6] "month.breaks" "year.breaks"
```

Habitat setup

This function creates the spatial fields which support the fish populations and fisheries. You define the parameters for the mattern covariance function for each population and optionally the location of any

spawning closure areas.

```
hab <- create_hab(sim_init = sim, spp.ctrl = list(spp.1 = list(nu = 1/0.015, var = 1,
    scale = 1, Aniso = matrix(nc = 2, c(1.5, 3, -3, 4))), spp.2 = list(nu = 1/0.05,
    var = 2, scale = 12, Aniso = matrix(nc = 2, c(1, 2, -1, 2)))), spawn_areas = list(spp1 = list(area1
    3, 2, 3), area2 = c(6, 7, 6, 6)), spp2 = list(area1 = c(5, 6, 6, 6)), spwn_mult = 10,
    plot.dist = FALSE))

print(hab)
```

```
## $hab
## $hab$spp1
##              [,1]        [,2]        [,3]       [,4]       [,5]        [,6]
##  [1,] 0.000000000 0.029825902 0.000000000 0.01039088 0.00000000 0.006172062
##  [2,] 0.000000000 0.008892648 0.000000000 0.00000000 0.00000000 0.000000000
##  [3,] 0.037956246 0.009801995 0.000000000 0.02177983 0.00000000 0.000000000
##  [4,] 0.001875668 0.002737579 0.000000000 0.02148636 0.05272189 0.033344790
##  [5,] 0.003157360 0.000000000 0.000000000 0.02010557 0.02965351 0.000000000
##  [6,] 0.041802396 0.043484595 0.000000000 0.01686307 0.00000000 0.036926873
##  [7,] 0.011404170 0.012310136 0.020240954 0.01356676 0.00000000 0.000000000
##  [8,] 0.000000000 0.000000000 0.003822176 0.00000000 0.00000000 0.014088794
##  [9,] 0.000000000 0.016889727 0.000000000 0.00000000 0.01895698 0.003077039
## [10,] 0.000000000 0.000000000 0.030435272 0.00000000 0.00000000 0.005274148
##              [,7]        [,8]          [,9]      [,10]
##  [1,] 0.009250407 0.000000000 0.0001379017 0.02420836
##  [2,] 0.000000000 0.000000000 0.0093889316 0.01346243
##  [3,] 0.000000000 0.024271144 0.0000000000 0.00587302
##  [4,] 0.000000000 0.000000000 0.0156625272 0.00000000
##  [5,] 0.000000000 0.000000000 0.0000000000 0.03309048
##  [6,] 0.007286046 0.024920046 0.0080618195 0.00000000
##  [7,] 0.010952094 0.000000000 0.0267578154 0.05323659
##  [8,] 0.001337087 0.000000000 0.0107145287 0.03756461
##  [9,] 0.022477609 0.004296533 0.0000000000 0.00000000
## [10,] 0.050045746 0.000000000 0.0279588814 0.00000000
##
## $hab$spp2
##       [,1] [,2] [,3] [,4]       [,5]       [,6]       [,7]       [,8]
##  [1,]    0    0    0    0 0.00000000 0.00000000 0.00000000 0.00000000
##  [2,]    0    0    0    0 0.00000000 0.00000000 0.00000000 0.00000000
##  [3,]    0    0    0    0 0.00000000 0.00000000 0.00000000 0.00000000
##  [4,]    0    0    0    0 0.00000000 0.00000000 0.00000000 0.00000000
##  [5,]    0    0    0    0 0.00000000 0.00000000 0.00000000 0.00000000
##  [6,]    0    0    0    0 0.00000000 0.00000000 0.00000000 0.00000000
##  [7,]    0    0    0    0 0.00000000 0.00000000 0.00000000 0.00000000
##  [8,]    0    0    0    0 0.00000000 0.00000000 0.00000000 0.00000000
##  [9,]    0    0    0    0 0.00000000 0.01503961 0.02789571 0.03571187
## [10,]    0    0    0    0 0.05190594 0.08078570 0.10187944 0.13122104
##             [,9]      [,10]
##  [1,] 0.00000000 0.0000000
##  [2,] 0.00000000 0.0000000
##  [3,] 0.00000000 0.0000000
##  [4,] 0.00000000 0.0000000
##  [5,] 0.00000000 0.0000000
##  [6,] 0.00000000 0.0000000
##  [7,] 0.00000000 0.0000000
```

```
##  [8,] 0.00000000 0.0000000
##  [9,] 0.05709544 0.0988671
## [10,] 0.17483444 0.2247637
##
##
## $spwn_hab
## $spwn_hab$spp1
##              [,1]        [,2]        [,3]        [,4]       [,5]        [,6]
##  [1,] 0.000000000 0.019876068 0.000000000 0.006924515 0.00000000 0.004113080
##  [2,] 0.000000000 0.059260865 0.000000000 0.000000000 0.00000000 0.000000000
##  [3,] 0.025294154 0.065320779 0.000000000 0.014514143 0.00000000 0.000000000
##  [4,] 0.001249951 0.001824331 0.000000000 0.014318573 0.03513402 0.022221066
##  [5,] 0.002104074 0.000000000 0.000000000 0.013398411 0.01976119 0.000000000
##  [6,] 0.027857239 0.028978261 0.000000000 0.011237599 0.00000000 0.246081762
##  [7,] 0.007599772 0.008203511 0.013488631 0.009040931 0.00000000 0.000000000
##  [8,] 0.000000000 0.000000000 0.002547109 0.000000000 0.00000000 0.009388813
##  [9,] 0.000000000 0.011255364 0.000000000 0.000000000 0.01263299 0.002050548
## [10,] 0.000000000 0.000000000 0.020282154 0.000000000 0.00000000 0.003514708
##               [,7]        [,8]         [,9]       [,10]
##  [1,] 0.0061644984 0.000000000 9.189808e-05 0.016132522
##  [2,] 0.0000000000 0.000000000 6.256812e-03 0.008971401
##  [3,] 0.0000000000 0.016174361 0.000000e+00 0.003913798
##  [4,] 0.0000000000 0.000000000 1.043755e-02 0.000000000
##  [5,] 0.0000000000 0.000000000 0.000000e+00 0.022051596
##  [6,] 0.0048554423 0.016606791 5.372420e-03 0.000000000
##  [7,] 0.0072985079 0.000000000 1.783149e-02 0.035477017
##  [8,] 0.0008910388 0.000000000 7.140193e-03 0.025033168
##  [9,] 0.0149791444 0.002863222 0.000000e+00 0.000000000
## [10,] 0.0333506321 0.000000000 1.863188e-02 0.000000000
##
## $spwn_hab$spp2
##       [,1] [,2] [,3] [,4]       [,5]       [,6]       [,7]       [,8]
##  [1,]    0    0    0    0 0.00000000 0.00000000 0.00000000 0.00000000
##  [2,]    0    0    0    0 0.00000000 0.00000000 0.00000000 0.00000000
##  [3,]    0    0    0    0 0.00000000 0.00000000 0.00000000 0.00000000
##  [4,]    0    0    0    0 0.00000000 0.00000000 0.00000000 0.00000000
##  [5,]    0    0    0    0 0.00000000 0.00000000 0.00000000 0.00000000
##  [6,]    0    0    0    0 0.00000000 0.00000000 0.00000000 0.00000000
##  [7,]    0    0    0    0 0.00000000 0.00000000 0.00000000 0.00000000
##  [8,]    0    0    0    0 0.00000000 0.00000000 0.00000000 0.00000000
##  [9,]    0    0    0    0 0.00000000 0.01503961 0.02789571 0.03571187
## [10,]    0    0    0    0 0.05190594 0.08078570 0.10187944 0.13122104
##             [,9]      [,10]
##  [1,] 0.00000000 0.0000000
##  [2,] 0.00000000 0.0000000
##  [3,] 0.00000000 0.0000000
##  [4,] 0.00000000 0.0000000
##  [5,] 0.00000000 0.0000000
##  [6,] 0.00000000 0.0000000
##  [7,] 0.00000000 0.0000000
##  [8,] 0.00000000 0.0000000
##  [9,] 0.05709544 0.0988671
## [10,] 0.17483444 0.2247637
##
```

```
##
## $spwn_loc
## $spwn_loc$spp1
##       [,1] [,2] [,3] [,4] [,5] [,6] [,7] [,8] [,9] [,10]
##  [1,]    0    0    0    0    0    0    0    0    0     0
##  [2,]    0    1    1    0    0    0    0    0    0     0
##  [3,]    0    1    1    0    0    0    0    0    0     0
##  [4,]    0    0    0    0    0    0    0    0    0     0
##  [5,]    0    0    0    0    0    0    0    0    0     0
##  [6,]    0    0    0    0    0    1    0    0    0     0
##  [7,]    0    0    0    0    0    1    0    0    0     0
##  [8,]    0    0    0    0    0    0    0    0    0     0
##  [9,]    0    0    0    0    0    0    0    0    0     0
## [10,]    0    0    0    0    0    0    0    0    0     0
##
## $spwn_loc$spp2
##       [,1] [,2] [,3] [,4] [,5] [,6] [,7] [,8] [,9] [,10]
##  [1,]    0    0    0    0    0    0    0    0    0     0
##  [2,]    0    0    0    0    0    0    0    0    0     0
##  [3,]    0    0    0    0    0    0    0    0    0     0
##  [4,]    0    0    0    0    0    0    0    0    0     0
##  [5,]    0    0    0    0    0    1    0    0    0     0
##  [6,]    0    0    0    0    0    1    0    0    0     0
##  [7,]    0    0    0    0    0    0    0    0    0     0
##  [8,]    0    0    0    0    0    0    0    0    0     0
##  [9,]    0    0    0    0    0    0    0    0    0     0
## [10,]    0    0    0    0    0    0    0    0    0     0
##
##
## $spawn_areas
## $spawn_areas$spp1
## $spawn_areas$spp1$area1
## [1] 2 3 2 3
##
## $spawn_areas$spp1$area2
## [1] 6 7 6 6
##
##
## $spawn_areas$spp2
## $spawn_areas$spp2$area1
## [1] 5 6 6 6
##
##
## $spawn_areas$spwn_mult
## [1] 10
##
## $spawn_areas$plot.dist
## [1] FALSE
## To plot we need to bust the function out of the current create_hab function!!
```