

Examples of using the msy package

Colin Millar

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To install the msy package the best way is to install Hadley Wickams devtools and use the function `install_github`. If you are using windows you will also need to install `Rtools.exe` which is a collection of software which enables you to compile R packages from source code. Run the following lines to install the latest version of msy, any other packages that you require will automatically be downloaded from CRAN, the R package repository. All except for `FLCore`, which is also installed from github.

```
library(devtools)
install_github("msy", "wmgm")
install_github("FLCore", "flr")
```

1 Exploring Maximum Sustainable Yeild of North Sea Cod using EqSim

First load the library and load in some data. The north sea cod data has been preloaded as an `FLStock` object. This is the EqSim method requires an `FLStock` to work.

```
library(msy)
```

```
load("data/codNS.rData")
```

1.1 Segmented regression

```
codsg <- list(data = codNS, wt.years = c(2008, 2012), Fscan = seq(0, 1.5, len = 40),
  Bpa = 150000, Blim = 70000, Btrigger = 150000)
```

```
codsg <- within(codsg, {
  fit <- fitModels(codNS, nsamp = 2000, model = "segreg")
  sim <- EqSim(fit, wt.years = wt.years, Fscan = Fscan)
  ref <- Eqplot(sim, fit, Blim = Blim, Bpa = Bpa, plot = FALSE)
})
```

```
codsg$ref$Refs
```

```
codbh <- within(codbh, {
  fit <- fitModels(codNS, nsamp = 2000, model = "bevholt")
  sim <- EqSim(fit, wt.years = wt.years, Fscan = Fscan)
  ref <- Eqplot(sim, fit, Blim = Blim, Bpa = Bpa, plot = FALSE)
})
```

```

codrk <- within(codrk, {
  fit <- fitModels(codNS, nsamp = 2000, model = "bevholt")
  sim <- EqSim(fit, wt.years = wt.years, Fscan = Fscan)
  ref <- Eqplot(sim, fit, Blim = Blim, Bpa = Bpa, plot = FALSE)
})

```

```

codall <- within(codall, {
  fit <- fitModels(codNS, nsamp = 2000, model = c("segreg", "bevholt", "ricker"))
  sim <- EqSim(fit, wt.years = wt.years, Fscan = Fscan)
  ref <- Eqplot(sim, fit, Blim = Blim, Bpa = Bpa, plot = FALSE)
})

```

```

codall_variations <- within(codall, {
  # simulate without process error in the recruitment predictions
  sim2 <- EqSim(fit, wt.years = wt.years, Fscan = Fscan, process.error = FALSE,
    verbose = FALSE)
  # simulate with process error (i.e. using predictive distribution of
# recruitment) and include a simple HCR
  sim3 <- EqSim(fit, wt.years = wt.years, Fscan = Fscan, Btrigger = Btrigger,
    verbose = FALSE)
  # simulate without process error (i.e. using model and parameter error only,
# not including 'observation' error) and include a simple HCR
  sim4 <- EqSim(fit, wt.years = wt.years, Fscan = Fscan, process.error = FALSE,
    Btrigger = Btrigger, verbose = FALSE)
  # now calculate the reference points for each simulation
  ref2 <- Eqplot(sim2, fit, Blim = Blim, Bpa = Bpa, plot = FALSE)
  ref3 <- Eqplot(sim3, fit, Blim = Blim, Bpa = Bpa, plot = FALSE)
  ref4 <- Eqplot(sim4, fit, Blim = Blim, Bpa = Bpa, plot = FALSE)
})

```

```

# out <- data.frame(statistic = 'Med', method = rep(paste0('M3',1:4), 3),
# what = rep(c('FMSY','BMSY','MSY'), each = 4), value = c(refNS $
# Refs['F',4], refNS2 $ Refs['F',4], refNS3 $ Refs['F',4], refNS4 $
# Refs['F',4], refNS $ Refs['SSB',4], refNS2 $ Refs['SSB',4], refNS3 $
# Refs['SSB',4], refNS4 $ Refs['SSB',4], refNS $ Refs['Catch',4], refNS2 $
# Refs['Catch',4], refNS3 $ Refs['Catch',4], refNS4 $ Refs['Catch',4]))

# out $ value[-(1:4)] <- out $ value[-(1:4)] / 1000

# out <- do.call(rbind, modout) out $ model <- rep(c('S','B','R','all'),
# each = 12) write.table(out, file = 'colins.csv', sep = ',', row.names =
# FALSE)

```