**Assessment Model for Harp and Hooded seals in the West Ice and the East Ice**

In this report we provide details on how to run the population dynamics model for the harp and hooded seals in the West Ice and in the East Ice.

General use:

1. Make sure R is installed.
2. Start up R and make sure to set the working directory to the folder where the program files are.
3. Type: source(“functions.R”)
4. The model is now ready to use and you can run the model by typing:

run.model()

The model accepts various parameter inputs. The following parameters can be changed when running the code:

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| --- | --- | --- |
| **Parameter** | **Description** | **Default value** |
| directory | Choose the populations.  Alternatives:  directory = “harpeast”  directory = “harpwest”  directory = “hooded” | directory = “harpeast” |
| QUOTA | Catch quota to be used in prediction of population size. Vector c(annual catch of pups, annual catch of adults) | QUOTA = c(0,0) |
| years.of.prediction | Number of years to make prognosis for | 15 |
| plot.pred | Logical parameter for plotting predictions or not. | TRUE |
| Cilevel | Decide what confidence level to be plotted | 95 |
| plotfigs | Logical parameter for displaying model outputs. | TRUE |
| Fproj | Set fecundity rate for future projections:  NA – Use last observed fecundity rate  “mean” – Use mean value of historical fecundity rates  Or set a numerical value | mean |
| conf.bound | Logical parameter for displaying 95% confidence intervals | TRUE |

Other parameters are mcmc.check, nsims, nthin which are used for MCMC simulation. Not needed. Default value of mcmc.check is FALSE

**Files**

Each population has it’s data contained in a folder named /hooded, /harpwest, or /harpeast. Each folder contains the following files containing various data for each population

|  |  |
| --- | --- |
| **Files** | **Description** |
| .dat | Set maximum age class (20 years) and boundaries on parameters to be estimated. |
| .pri | Priors for the estimated parameters. |
| .pin | Initial values. |
| .cat | Annual catch level for pups and 1+ seals. |
| .ogp | Period for birth ogive data. |
| .ogi | Birth ogive data. |
| .fdt | Fecundity data. |
| .est | Survey pup production estimates. |
| .quo | Catch level for model projections. Not used here. This catch level is specified through the run.model() function. |

**Examples**

Run the model with the default values: run.model()

You can also do Ouput <- run.model()which will give you a data frame called Output with model outputs.

Run the model with an annual hunt of 3500 pups and 2500 1+ seals for the model projections:

run.model("harpwest",QUOTA = c(3500,2500))

Find the equilibrium catch level for harp seals in the West Ice with 1+ animals only.

find.eq.quota(MIN = 10000,MAX = 50000,quota = c(0,100),"harpwest")

Find the equilibrium catch level for harp seals in the West Ice with 10% pups and 90% 1+ animals only.

find.eq.quota(MIN = 10000,MAX = 50000,quota = c(10,90),"harpwest")

Find the catch level for harp seals in the West Ice which takes the 1+ population down to N70 with probability 0.8. There are three different methods which are specified by method = "Nbased", method = "Dbased", or method = "mcmc" For Nbased the optimization is done in regards to the population size. For the Dbased the optimization is done in regards to the depletion coefficient *D*, and for mcmc the credible intervals of the posterior distribution of the future projections are used. Default value is Nbased.

find.N70.quota(MIN = 10000,MAX = 50000,quota = c(0,100),directory="harpwest", method = "Nbased" )