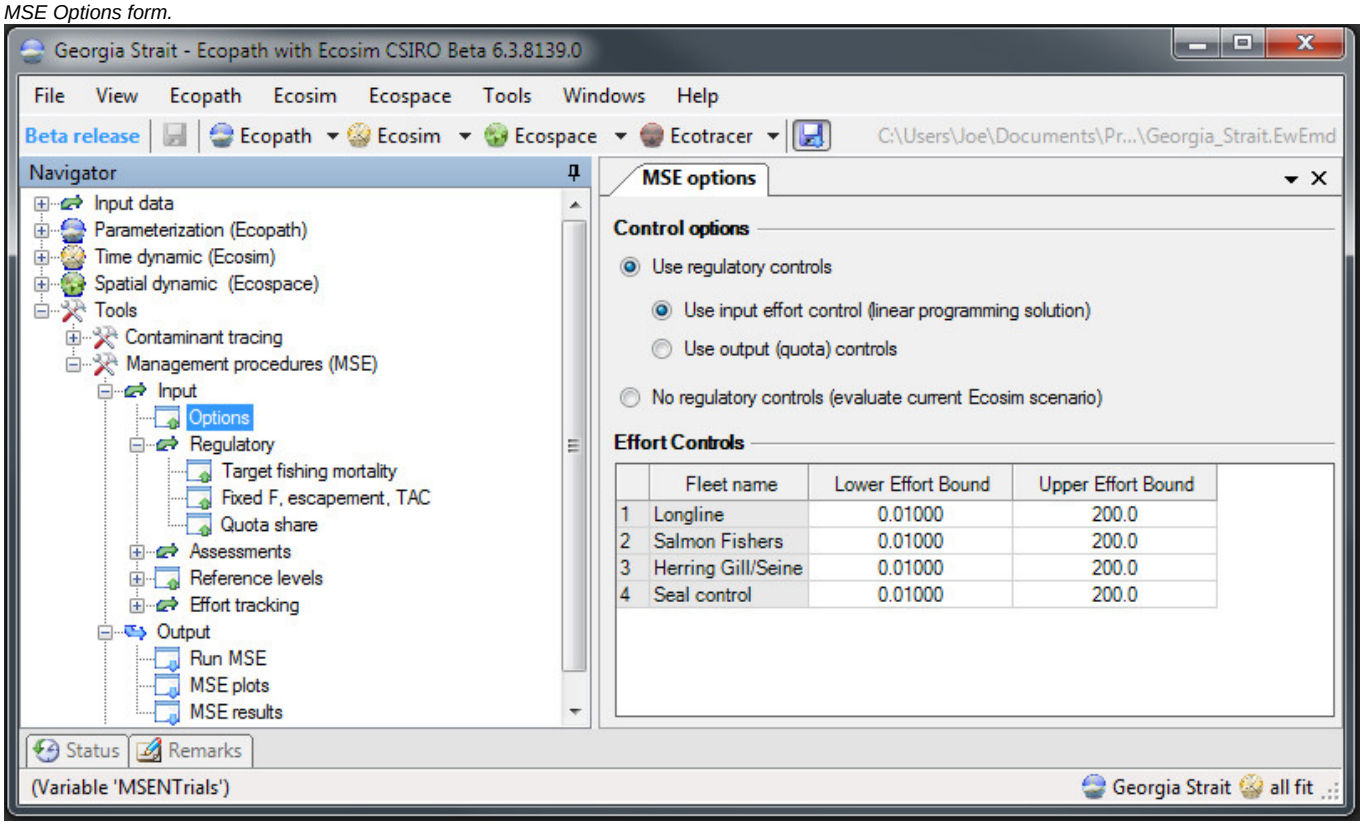
Management Strategy Evaluation = *User notes (alpha ver. 6.3)*

Options

MSE Options form.



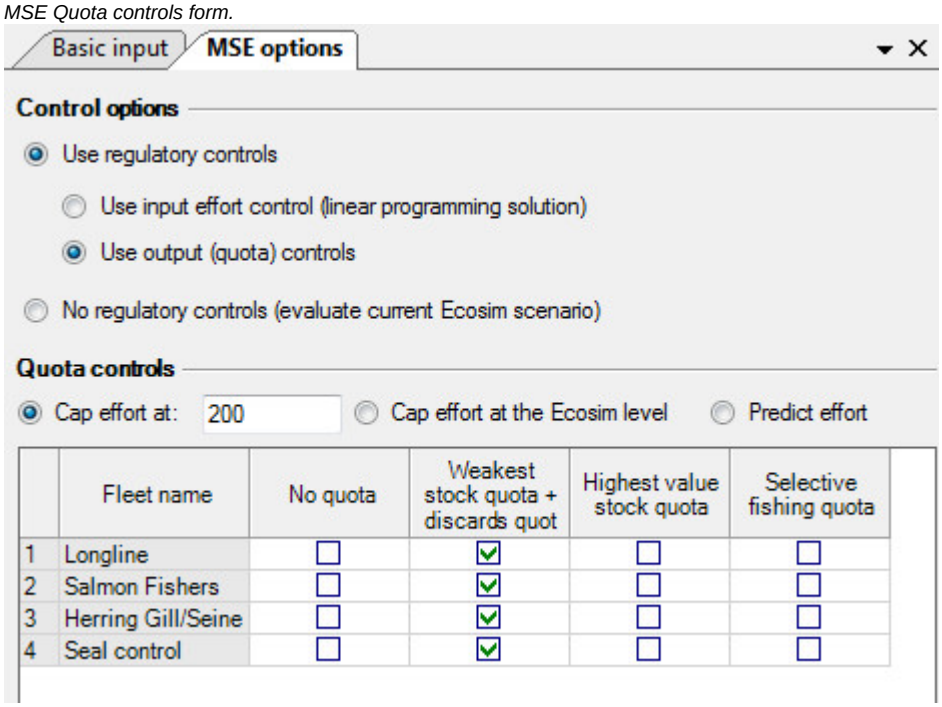
Control Options:

The MSE module can be used to evaluate a set of regulatory rules i.e. Target fishing mortality, Fixed F, Escapement or TAC via input (fishing effort) or output (quota, fishing mortality) controls or evaluate the currently loaded Ecosim scenario.

Use regulatory controls: evaluate the regulatory rules.

- **Use input effort controls (linear programming solution):** uses a linear programing algorithm to find a fishing effort that meets the fishing mortality constraints and is optimised for the total value of the catch. When this control option is selected you can set the upper and lower fishing effort bounds for each fleet.
- **'Use output (quota) controls:**' fishing effort is set at the level required to meet fishing mortality or quota set via the regulatory rules i.e. Target fishing mortality, Fixed F, Escapement or TAC. When this option is selected you can set the maximum fishing effort and quota control implementation methods.

MSE Quota controls form.



- **Cap effort at:** caps the effort needed to achieve the fishing mortality or quota.
- **Cap effort at Ecosim level:** fishing effort can never exceed level set by current Ecosim scenario
- **Predict effort:** effort is predicted by the Ecosim Fleet/effort dynamics model then cap so as not to exceed the regulatory rules.
- **No quota:** no regulation will be used for this fleet.
- **Weakest stock quota + discards quota:** effort is regulated if any catch (landings + discards) on a group exceeds its quota.
- **Highest value stock quota:** effort is regulated if landings on the highest value stock exceed the quota. Catches that exceed the quota on a stock are discarded.
- **Selective fishing quota:** Effort is regulated if landings on the strongest stock exceed the quota.
- **No regulatory controls (evaluate the current Ecosim scenario):**Ecosim is run using effort from the current scenario. No attempt is made to regulate the fishing effort. This option is used to evaluate the current Ecosim scenario.
- **Catch/estimated biomass:** Fishing mortality is estimated using a perturbed biomass then effort is updated using the varied fishing mortality.
- **Direct exploitation:** Fishing mortality is computed directly from the predicted Ecosim catch
- **Exact biomass known:** Fishing mortality is computed directly from the predicted Ecosim catch and biomass. Effort is then update with the predicted fishing mortalities and perturbed before use.

Previous documentation

Management Strategy Evaluator = *User notes (alpha ver. 6.0.7.0317)*

How to run the MSE

Set Quotas

The MSE is capable of setting quotas by two methods.

i. Target fishing mortality rates. Target fishing mortalities are set via the **Input regulatory** > **Target fishing mortality** dialogue then setting biomass limit, biomass base and F max. values for individual groups.
ii. Fixed escapement. Fixed escapement values are set via the **Input regulatory** > **Fixed escapement** dialogue.

If fixed escapement is provided then the yearly quotas will be calculated as the biomass greater than the fixed escapement. Otherwise quotas will be calculated from the target fishing mortality rates.

Set regulatory option

Implemented of the quota is set via the **Input regulatory** > **Regulatory options** dialogue. Four options are provided

i. Not Used. No quota regulation will be imposed on this fleet.
ii. Weakest stock + discards quota. If catch on any group exceeds its quota then effort will be limited at that level.
iii. Strongest stock. If catch of the group with the maximum effort exceeds its quota then effort will be limited. Catch in excess of the quota is discarded and will have a discard mortality set via **Input data** > **Fishery** > **Discard mortality rate**.
iv. Selective fishing quota. If catch of the group with the maximum effort exceeds its quota then effort is limited. Catch in excess of quota will not be included in the fishing mortality and will be assumed to have a 100% discard survival rate.

Run the MSE

The MSE is capable of running in three different modes.

i. Ecosim effort use regulatory options. Uses fishing effort from the currently loaded Ecosim scenario then regulates effort according to the regulatory options selected. This option will only reduce the effort if catches exceed the quota. You may need to increase the Ecosim effort to see any effect of this option. Also if catches go to zero this option will keep effort at the Ecosim input levels. It will never reduce the effort because there was no catch.
ii. Predict effort use regulatory options. Fishing effort will be predicted based on the parameters set in the **Fleet size dynamics** form then fishing effort will be regulated according to the regulatory options selected.
iii. Evaluating the currently load Ecosim scenario. No attempt is made to regulate the fishery this mode is used to evaluate the current Ecosim scenario.

Setting of Target Fishing Mortalities

Target Fishing Mortality parameters are set to default values the first time a model is loaded. Biomass limit = 10% of Ecopath biomass, Biomass base = 40% of Ecopath biomass and F. max = fishing mortality rates calculated from the Ecopath inputs. The MSY(Maximum Sustainable Yield) search can be used to compute values for the Target Fishing Mortality parameters. When the MSY is run it will overwrite the current parameters of the Target Fishing Mortality. The MSY search is accessible via the **Input reference level** > **MSY** dialogue.

Inputs

Assessments Sets inputs use for the perturbation of variables.

Groups

- **CV** Coefficient of variation used for perturbation of biomass.

Fleets

- **CV** Coefficient of variation used for perturbation of effort.
- **Annual increase in catchability** Amount catchability will increase each year.

Input reference levels Sets reference levels lines that appear on plots and as percentage values above and below reference in the MSE Results grid.

- **MSY** Uses the results a Maximum Sustainable Yield search to set Biomass limit, Biomass base and F max. for the target fishing mortalities.

Group Sets reference levels that appear on group plots and in results grids.

- **Biomass lower** Lower biomass limit.
- **Biomass upper** Upper biomass limit
- **Catch lower** Lower catch limit on a group.
- **Catch upper** Upper catch limit on a group.

Fleet Sets reference levels that appear on fleet plots and in results grids.

- **Catch lower** Lower catch limit by a fleet.
- **Catch upper** Upper catch limit by a fleet.
- **Effort lower** Upper effort limit by a fleet.
- **Effort upper** Upper effort limit by a fleet.

Input regulatory Sets inputs used for the fisheries regulations.

Regulatory option Sets how the effort of a fleet will be regulated.

- **Not used** No regulation will be used for this fleet.
- **Weakest Stock quota** Effort is regulated if any catch (landings + discards) on a group exceeds its quota.
- **Strongest stock + discards quota** Effort is regulated if landings on the strongest stock exceed the quota. Catches that exceed the quota are discarded.
- **Selective fishing quota** Effort is regulated if landings on the strongest stock exceed the quota.

- **Fleet Quotas** Quota by group and fleet used to compute a fleets share of the quota on a group.
- **Target fishing mortality** Sets parameters for target fishing mortality. Biomass limit, Biomass base and F max.
- **Fixed escapement** Sets fixed escapement biomass of a group. If this value is non zero the quota for the year is computed as [estimated biomass] - [fix escapement] instead of using the target fishing mortality parameters.

Input effort tracking Sets weights used when evaluating current Ecosim scenario.

- **Fleet weights** Sets the weight given to a fleet when calculating fishing mortality.

Outputs

Run MSE Run the Management Strategy Evaluation.

Effort and regulatory options Options used to set how or if the fishery is regulated during the current evaluation.

- **Ecosim effort use regulatory options** Ecosim is run using effort from the current scenario. The fishing effort is then regulated according to the target fishing mortality and the options selected in the **Regulatory options** dialogue.
- **Predict effort use regulatory options** Fishing effort for the year is predicted using the Ecosim Fleet/effort dynamics model. The fishing quota for each year is then set via the target fishing mortality. The fishing effort is then regulated according to the options selected in the **Regulatory options** dialogue.
- **Ecosim effort no regulations(evaluates current scenario)** Ecosim is run using effort from the current scenario. No attempt is made to regulate the fishing effort. This option is used to evaluate the current Ecosim scenario.

Model run options

- **Save output** Saves output for biomass, catch by group, quota by group, catch by fleet and effort by fleet to a csv file in a sub directory of the currently loaded model called MSE.

Ecosim scenario options Option on how perturbations are implemented when the **Ecosim effort no regulations(evaluates current scenario)**option is in effect.

- **Catch/estimated biomass** Fishing mortality is estimated using a perturbed biomass then effort is updated using the varied fishing mortality.
- **Direct exploitation** Fishing mortality is computed directly from the predicted Ecosim catch and biomass then perturbed and used to update effort.
- **Exact biomass known** Fishing mortality is computed directly from the predicted Ecosim catch and biomass. Effort is then update with the predicted fishing mortalities and perturbed before use.

- **Plots** Plots histogram or values from all the completed MSE runs for biomass and catch by group effort and value by fleet.
- **Results** Summary statistics by group and fleet.

FAQ

- Output values do not appear to vary across runs.
  - Check the Assessment CV values. If they are all zero then there will be no variation in the output.
  - If you have selected 'Ecosim effort use regulatory options' for the MSE run the variation of inputs will only come into effect if the quota is exceeded.
- Quotas never seems to come into effect.