Assignment work

- You will be given a set of exercises, which you are expected to keep notes on and make a report on, to be evaluated as you assignment.
- How to proceed:
  - Keep a backup of the original sets of Excel spreadsheets
  - Make a separate folder for each exercise
    - xGenerator.xls
    - xModel.xls
    - xRealityCheck.xls
- Keep good notes from classroom discussion, they will help in writing the report

Exercise 1: The effect of discards

- One of the biggest problems in fisheries science is that one normally has only estimates of actual landings but the true removal is unknown. Discards of a target species is normally assumed to be size related, the rate of discards normally being confined to the smallest fishes.
- Part 1. Start by fitting the model (run solver) without discards.
  - Discarding is controlled in the simulator, worksheet CatchAtAge in area starting in cell B90.
  - For this part you want to make sure that all the values are = 0.0
- Part 2. Set fix discard rate on younger ages through the whole time period.
  - Discarding is controlled in the simulator, worksheet CatchAtAge in area starting in cell B90.
  - Make sure that there is actually some fishing taking place on these younger ages!
  - Suggestion for discard rate:
    - Age 1 & 2: 0.99 – there is no fishing taking place to speak of in these age groups, see the selection pattern (worksheet xx)
    - Age 3: 0.75
    - Age 4: 0.50
    - Age 5: 0.25
    - Age 6: 0.10
- Can one detect any abnormal (nonrandom) patterns in residuals in either fit? Where are the major differences in the parameter estimates of the two fits?
- Compare the fit in Part 2 with that of your simulated population. Which of the key population measures (recruitment, biomass (SSB) and fishing mortality) deviate mostly from the known truth? Explain why this pattern is observed?
- Part 3. Feel free to try any other combination on discard rates.

Exercise 2: The effect of underreporting

- Underreporting seems to be a widespread phenomena within EU waters, i.e. the actual removal is significantly higher than reported landings. This means that the c@a matrix only contains a portion of the fish that is removed from the population by fishing. In essence, the phenomena is similar to discarding of younger fish in that the practice generates unaccounted removal, but is likely to apply equally to all size groups.
  - Underreporting of landings can be set in the simulator, worksheet CatchAtAge in area starting in cell B90 (same area as where we set the discarding rate).
  - Suggestions for underreporting rate:
    - Set values for ALL age groups and ALL years to 0.35
- Fit the model to the data (run solver). Can one detect any abnormal (nonrandom) patterns in residuals in the fit?
- Compare the parameter estimates with that of your simulated population. Which of the key population measures (recruitment, biomass (SSB) and fishing mortality) deviates from the known truth? Explain why this pattern is observed?
- Feel free to try any other underreporting rate.

Exercise 3: The effect of change in underreporting

- Until recently the assessment of North Sea cod was done under the assumption that underreporting was of minor concern. At present it is however thought likely that the amount of underreporting (black landings) has increased in the last decade, relative to that in the past.
  - Study the effect of such a phenomena on the accuracy of the stock assessment by gradually increasing the proportion of unallocated catch in last years of your data set. Do this by increasing the unallocated removal rate of ALL age groups for the years 1915 to 1924 in the following steps: 0.05, 0.10, 0.15, 0.20, 0.25, 0.30, 0.35, 0.40, 0.45, 0.50. (For the years prior to 1915 lets keep the values at 0.0)
- Fit the model to the data (run solver). Can one detect any abnormal (nonrandom) patterns in residuals in the fit?
- Compare the parameter estimates with that of your simulated population. Which of the key population measures (recruitment, biomass (SSB) and fishing mortality) deviates from the known truth? Try to explain the pattern observed?
- Take the log catch ratios of the c@a (input) data. Does the mortality signal in the input data support the conclusion with regards to the mortality signal from the model fit?
- Feel free to try any other underreporting pattern.
  - PS! May need to "activate" the yield penalty function by setting the value in F8 in the xModel.xls Model worksheet to 1.

Exercise 4: The effect of wrong M assumption

- In assessment models the M is often set to a constant, irrespective of age. From a biological point this is likely to be nonsense. Study the effect of the assumption of M being constant with age by setting up a more realistic mortality pattern with age in the simulator (xGenerator.xls) but keeping the M constant with age in the assessment model (xModel.xls).
  - Changing M in the simulator is done in worksheet iM in the xGenerator.xls. Set the M high for the youngest age groups but keep M=0.2 for age groups 8 and older.
- Fit the model to the data (run solver). Can one detect any abnormal (nonrandom) patterns in residuals in the fit?
- Compare the parameter estimates with that of your simulated population. Which of the key population measures (recruitment, biomass (SSB) and fishing mortality) deviates from the known truth? Explain why this pattern is observed?
- Feel free to try any other M pattern.

If time permits

Exercise 5: The effect of increasing survey catchability

- In assessment models the assumption is that the catchability (q_a) in the survey/cpue indices do not change with time. If the abundance index is a cpue index from the commercial fisheries the assumption is likely to be untrue. Frequent changes in the scientific survey design may also result in changes in q with time.
- Study the effect of the assumption of q being constant with time increasing the catchability of survey 1 in the simulator (xGenerator.xls) but mantaining the constant q assumption with time in the assessment model (xModel.xls).
  - Changing q for Survey 1 in the simulator is done in worksheet Survey 1 in the xGenerator.xls. Set the amplitude in cell G40 to 0.30 – this results in the catchability for each age group in Survey 1 to double over the time period.
- Fit the model to the data (run solver). Can one detect any abnormal (nonrandom) patterns in residuals in the fit?
- Compare the parameter estimates with that of your simulated population. Which of the key population measures (recruitment, biomass (SSB) and fishing mortality) deviates from the known truth? Explain why this pattern is observed?
- Try fitting the model using only Survey 1 and only to Survey 2
  - This is done by setting either cell F6 or F5 in the Model worksheet in xModel.xls to 0