

ECOFISH - STOCK ASSESSMENT INTERPRETATION COURSE

ANSWERS TO THE QUESTIONS YOU WERE TOO AFRAID TO ASK

When: Tuesday 18 to Friday 21 April (10 am to 1 pm and 2 pm to 4 pm each day)

Where: 5th Floor Research Seminar Room, DAFF, Foretrust Building, Cape Town

Presentation: Prof D S Butterworth (primary)

Course purpose and structure

- Although stock assessments provide the primary basis for scientific advice on measures to regulate the extent of fishing, most fisheries scientists will never themselves carry out detailed stock assessments, but do need to be able to contribute to these exercises, particularly in discussions of their development and their results in scientific working groups
- The purpose of the course is to assist such scientists, when presented with a stock assessment analysis, in interpreting the results, and in particular in understanding for what aspects they should be looking and what questions they should be asking
- The course will focus on concepts and explanation of terminology, with limited mathematical/statistical or coding detail (this is NOT a course on technical aspects of conducting stock assessments); it will draw on examples from stock assessments for South African and other resources
- Background needed – some exposure to meetings of fisheries working group meetings which review stock assessments is desirable
- An initial listing of material to be covered is provided in the attachment; some documents to be considered during the course will be circulated later to attendees

Notification of attendance

Persons wishing to attend must please notify Ms Jean Glazer of DAFF (email: jean.glazer@gmail.com) by the end of March. Kindly advise name, email address and institution, and provide a brief summary (no more than 3 lines) of mathematical/statistical background and previous exposure to stock assessments.

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NB: This is an initial draft – details may change

BASIC STRUCTURE

Basic question to be addressed – what to look for and question when presented with a stock assessment (or similar analysis)

1. Objectives of stock assessment
2. Data available
3. Models – types, projections, fit diagnostics
4. Management procedures
5. Further aspects – stock structure, movement, multi-species, data limited

1. OBJECTIVES OF STOCK ASSESSMENT

- Quantitative prediction
- Does the model fit the data?
- Estimation of parameters
- Estimation of precision

2. DATA AVAILABLE

- Catch (and errors)
- Effort
- Abundance indices
 - Absolute vs relative
 - Surveys
 - Types (trawl, acoustic, egg)
 - Design based/stratification
 - Model based
 - Swept area
 - Bias and variance
 - CPUE
 - Bias and standardisation methods
 - Variance

- Tag-recapture
 - Types (conventional, genetics)
 - Adequate mixing
 - Tag loss and reporting rate
- Catch-at-length/Catch-at-age
 - Sampling of catches (groupings)
 - Extrapolation to population
 - Ageing and reading error
- Demographics
 - Weight at age
 - M
 - Maturity at length/age
- Genetics
 - Classical
 - Close-kin

3. MODELS – TYPES, PROJECTIONS, DIAGNOSTICS

a) Types

- Basic types
 - Types
 - Determining which to use
- Aggregated density independent
 - RY example
- Aggregated with density dependence
 - Schaefer model and variants
- Inclusion of age structure
 - Stock-recruitment relationships (and residual statistical properties)
 - Selectivity
 - M and its dependencies
 - Fit criteria
 - $-\ln L$
 - Surveys
 - CPUE (including q and its dependencies)
 - Catch-at-age
 - Catch-at-length
 - Tagging
 - Catches
 - Penalty functions

- Estimation approaches
 - MLE
 - Bayesian
 - Intermediate (e.g. SAM)
 - Variance estimation
- Model variants
 - ASPM
 - SCAA
 - SCAL
 - Directly fitting ALKs
- Outputs
 - Abundance measures
 - Fishing mortality measures (relation to fishing effort)
 - Reference points and their proxies
 - Tabular presentations (including diagnostics)
 - Graphical presentations (trajectories and diagnostics)

b) Projections

- Assumptions
 - Future recruitments
 - Deterministic options
 - Stochastic aspects
 - Future selectivities
 - Surveys
 - Catches
 - Future exploitation
 - Constant catch
 - Constant fishing mortality (effort)
- Outputs
 - Trajectories
 - Probability envelopes and worm plots

c) Diagnostics

- Residual plots and distributions
- Estimates close to bounds
- Retrospectives
- Weighting of different data inputs + Data conflicts
- Interpretation of q estimates
- Acceptability of selectivity doming
- Fit convergence (MLE and MCMC)

Possible examples

- SA hake – M, selectivity, S/R relation, two species, multiple fisheries
- US witch flounder – retrospectives, doming, absolute estimates, data weighting
- US GoM cod – M vs selectivity vs reference points
- SA kingklip – RY
- SA toothfish – data conflict, use of tagging data
- SA abalone – estimating extent of illegal catch
- SA anchovy and sardine – S/R relation, stock structure
- SA WCRL – pre-exploitation level estimation
- Western NA Bluefin – S/R relation

4. MANAGEMENT PROCEDURES

- Why MPs (MSE)
- Objectives
- Alternative scenarios
 - Which to consider
 - Plausibility weighting
- Performance statistics
 - Which to choose
 - How to present/plot
 - How to interpret

5. FURTHER ASPECTS

- Stock structure
 - Genetics
 - Conventional
 - Close kin
- Movement
- Multi-species models
 - Whole ecosystem
 - EwE, OSMOSE, ATLANTIS
 - Minimum realistic/MICE
 - Estimation problems
- Data limited approaches