



GENERAL FISHERIES COMMISSION
FOR THE MEDITERRANEAN
COMMISSION GÉNÉRALE DES PÊCHES
POUR LA MÉDITERRANÉE



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**GENERAL FISHERIES COMMISSION FOR THE
MEDITERRANEAN**

SCIENTIFIC ADVISORY COMMITTEE

Eleventh Session

Marrakech, Morocco, 1-5 December 2008

**REPORT OF THE SCSA TRAINING COURSE ON
METHODOLOGIES FOR STOCK ASSESSMENT
Cairo, Egypt, 22-26 June 2008**

INTRODUCTION

1. This document provides information on the training course on methodologies for stock assessment organized in Cairo, Egypt, from 22-26 June 2008. The course was conducted by two lecturers from Italy and Portugal and attended by scientists from ten GFCM Member countries (Algeria, Croatia, Cyprus, Egypt, Greece, Italy, Libya, Malta, Morocco and Slovenia). The list of participants provided as Appendix 2.

2. The course aimed to develop regional knowledge and capacities on methodologies for fish stock assessment and train scientists on advanced methods and techniques suitable to the nature of Mediterranean fisheries. The training intended to introduce stock assessment theory and guide participants on how to put it into practice through case studies and practical exercises by applying different assessment methods. The programme of the training courses is presented as Appendix 1 to this report.

SUMMARY OF THE COURSE

Session on stock production models

3. The part of the course dealing with the use of surplus production models was developed in two days and a half. During the first day, a theoretical description of the approaches was done, included the main basic concepts of surplus production models.

4. Considering the heterogeneous level of working experience and theoretical basis of participants, the way the approaches were described avoiding when possible the use of complicated equations. There were described different approaches that may use data proceeding from both fisheries-dependent and fisheries-independent sources. Successively, some examples of applications of such methods with real data were shown. Particular attention was paid to those approaches considered more feasible in the area on the basis of the data available and the particular characteristics of the fisheries.

5. A general discussion on different theoretical and practical aspects that can be faced when dealing with production models was done. At the end of the first day, the participants were requested to describe the data they had brought to be analysed for practical exercises. It was also asked to participants to express their own interests and intention to use some of the specific approaches described during the practical sessions. A set of softwares was made available to the participants. It included a free ware version of the well known model ASPIC non-equilibrium dynamic model and two spreadsheets for fitting production models with trawl surveys information in Excel. The first one allows the fitting of the Schaefer and Fox models in equilibrium and is useful for the analysis of spatial information derived from trawl surveys. It allows combining information of mortality rates Z and abundance indices U from different areas exploited at different rates. The second spreadsheet allows to analyse a time series of data of Z and U and to fit a Schaefer model without any assumption of equilibrium.

6. In the second day, some groups (Italy and Morocco for European hake and Egypt (using data of round herring from the Red Sea) used the software ASPIC with data on total catch and effort proceeding from commercial fishing activity. Other participants that did not bring their own data used an example that was available in order to understanding how the software works (input file, starting procedures, influence of initial guesses in the results, analysis of the output).

7. The second part of the last session was dedicated to a brief presentation of results and for a general discussion. The results obtained suffered from the lack of time for exploration of the consistency of basic data, for the choice of the more suitable growth parameters, for the estimation of more precise abundance indices and more reliable mortality rates. In any case, exercises were useful for learning on how to get the necessary basic data, on how to use the software, and for highlighting several aspects that need of a particular attention when dealing with such approaches, in particular the influence of environmental variables in the actual levels of abundance (as the example of application of the non-equilibrium model for the Moroccan shrimp) or the problems related to the suitability of gather information proceeding from areas that may be characterized by quite different productivity (exercise with the composite model using data proceeding from both Western and Eastern Mediterranean basins).

Session on Theoretical and practical aspects related to VPA tuning

8. This session aimed at preparing participants to perform a VPA-tuning based assessment. The theoretical aspects were followed by practical exercises, carried out using excel spreadsheet.

9. Given the interest in hake, the simulated population and exploitation was carried out for a hake-like stock, based on assumed biological parameters and exploitation pattern. Participants simulated a hake-like population for a time period of 50 years, using in year 1 a starting population-at-age (ages: 0-8+) in equilibrium. Forward projections were carried out assuming separable fishing mortality, annual fishing pressure based on long-term reference points F_{max} and $F_{0.1}$ and recruits estimated from a Ricker stock-recruitment relationship. The exercise was repeated by defining time periods with changing fishing levels.

10. Given a catch-at-age matrix and assumed natural mortality, time and age invariant, participants performed a cohort analysis, using Pope's approximation to estimate N-at-age and F-at-age. The exercise was repeated adopting different values for the terminal F. The exercise showed that catch-at-age data alone is insufficient to tie the model to reality once N-at-age and F-at-age are conditional on the adopted terminal F.

11. Participants simulated an abundance-at-age index. A VPA-tuning exercise was carried assuming age invariant catchability-at-age and adopting the least squares method as the objective function. Estimates of Fbar, Recruits and SSB were plotted.

12. Finally, participants tried to apply the technique to their own data. Discussion was carried out on the data available and its quality, terms to be included in the objective function and reliability of the results.

13. The lecturer slide presentation and the excel spreadsheet with simulated population, VPA flow, VPA exercise, VPA-tuning flow and VPA-tuning exercise were given to participants.

Appendix 1**Programme of the courses****First session: Lecture and computer-based work on Stock Production Models**

(Lecturer: Alvaro J. Abella)

During the course, attendants will receive a basic theoretical information regarding Production Models. Moreover, computer-based laboratory work will be organized for allowing the utilization of alternative approaches. Specific software suitable for the analysis of data proceeding from different sources will be available. It is expected that results obtained for these case studies will be presented and discussed during the next meeting of the Working Group of the GFCM-SAC that will be held in Izmir, Turkey, next September.

Part 1-Theory (First day)**Stock Production Models**

- Surplus Production Models. Basic concepts
- Model characteristics
- Logistic population growth

Types of models

- Graham-Schaefer
- Gulland-Fox
- Pella and Tomlinson
- Threshold models
- Single-species and multi-species models

Determination of model parameters and benchmarks

- Carrying Capacity and Maximum Population Size
- Maximum Sustainable Yield
- Maximum Biological production
- F_{MSY} and f_{MSY}

Data requirements

- Sources and obtained benchmarks
- Reliability
- Contrast
- Uncertainty, confidence limits

Models and software

- Brief information on available software and main characteristics
- Equilibrium and non equilibrium models
- Incorporating environmental variability
- Extensions to non-equilibrium models

Part 2- Practical exercises (2nd and part of a 3rd day)

Goal: determination of benchmarks and assessment of stock status through the analysis of data derived from catch assessment surveys or trawl surveys.

- 1) Non-equilibrium production model using commercial data of catch and effort.
- 2) Non-equilibrium production model using time series of an abundance index and Z from trawl surveys data.
- 3) Composite models using spatial information regarding abundance index and Z for areas exploited at different rates

The choice of a model by each participant will depend on their own available data. In any case, a complete analysis utilizing each one of the three approaches will be made by everybody in a plenary session.

Second session: theoretical and practical aspects related to VPA tuning

(Lecturer: Manuela Azevedo)

Exercises will follow the theoretical aspects of the course and will be used to consolidate the main issues. For that I assume participants use Excel and are familiarised with solver. Main difficulties on theoretical aspects found by participants, if any, and spotted during the practical exercises, will be further clarified.

Day 3

(14:00-17:00, 3h)

- Age-structured models: introduction & basic equations
- VPA-type methods
- Simulation of an age-structured fish population (Exercise 1)

Day 4

(09:00-13:00, 4h)

- Solving VPA equations: approximate solutions, Newton method & least-squares
- Finding values of population size-at-age given catch-at-age data (Exercise 2)
- Auxiliary information on fish abundance trends: relating abundance/biomass index with stock size

(14:00-17:00)

- Simulation of an abundance index (Exercise 3)
- Integrated Analysis: required data, number of parameters to estimate, assumptions and simplifications
- Criterion of model fit
- Estimating population size-at-age (Exercise 4)

Day 5

(09:00-13:00h)

- Estimating population size-at-age (Exercise 4, continued)
- Concluding remarks with emphasis on data quality, characterization of uncertainty & software available

(14:00-17:00)

- VPA tuning applied to participant's data sets

Appendix 2**List of participants****ALGERIA**

Ferhani KHADRA

CROATIA

Vanja CIKES KEC
Barbara ZORICA

CYPRUS

Antonius PETROU
Charis CHARILAOU
Georgios IOANNOU

EGYPT

Azza Abdel Hamid Mohamed EL
GANAINY
Mohamed Hamed YASSIEN
Emad Ramzi AZIZ (GAFRD)
Sahar MEHANNA

GREECE

Constantina KARLOU-RIGA
Ioanna ANASTOPOULOU

ITALY

Alessandro LIGAS
Giuseppe SCARCELLA

LIBYA

Akram EL TURKI

MALTA

Roberta PACE
Francesca GRAVINO
Mark GATT

MOROCCO

Abdelaziz ZOUBI
Saïd BENCHOUCHA

SLOVENIA

Kaja PLIBERŠEK

TUNISIA

Olfab BEN ABDALLAH

LECTURERS

Maria Manuela AZEVEDO LEBRE
(Portugal)

Alvaro ABELLA (Italy)

GFCM SECRETARIAT

Abdellah SROUR

