Workshop on

'Mathematical tools for understanding and managing fisheries :

synthesizing and refining data and models'

May 7-9, 2014 at AIMS-Senegal Center

Lectures

Werner Ekau (3 hours)
"Fisheries Biology."
Day 1 (08:30-10:30) and Day 2 (08:30-09:30).

Djiga Thiao (2 hours)
"Data requirements for fisheries management"
Day 2 (09:30-10:30) and Day 3 (09:30-10:30).

Heino Fock (3 hours)
"Dealing with uncertainty – fisheries assessment methods in data-poor stocks."
Day 1 (11:00-13:00) Day 3 (08:30-09:30).

Francis Laloe (4 hours)
"Fisheries Data Modeling."
Day 2 (11:00-13:00) and Day 3 (11:00-1300).

Seminars

Micaela Kulesz & Gunnar Brandt
"*Introduction to experimental economics."*
Day 1 (14:30-15:30)

Micaela Kulesz & Gunnar Brandt
"*Fisheries as a common pool resource - How would you behave? Hands on experience with an online game."*
Day 1 (16:30-17:00)

Agostino Merico
"A trait-based modeling perspective for social-ecological systems"
Day   2 (14:30-15:30).

Heino O. Fock
"Knowing everything you want – application of statistical-catch-at-age in EXCEL."
Day 2 (16:00-17:00).

Friedmann Kiel:
"An example of geostatistical methods in fishery biology"
Day 3 (14:30-15:30).

Jorn Schmidt :

"From single species to multispecies - age-structured ecological-economic models."
Day 3 (16:00-17:00).

Abstract (lectures)

"Fisheries Biology"

Abstract: This lecture will start with some biological background, data collection and introduce to analysis and modeling routines. It will be also discussed the importance of fisheries on a global scale, catching techniques, up-welling areas and their fisheries, coastal and estuarine fisheries and also fisheries management (LME, EAF).

"Dealing with uncertainty – fisheries assessment methods in data-poor stocks"

Abstract: Assessment methods must obey limitations from data availability. The assessment framework for data poor stocks of the International Council for the Exploration of the Sea (ICES) is introduced, together with some simple applications in R. It is shown how combinations of simple tools (e.g. Yield-per-Recruit) or simple models (surplus production) can be applied to derive first reference points in fisheries.

"Data requirements for fisheries management"

Abstract: In this lecture we will discuss the issues of what type of data are generally needed in fisheries and what are the main data collection methods. We will emphasize on the sampling methods.

"Fisheries Data Modeling"

Abstract: I will first give a short introduction to surplus production models that are used in an articulation with economical models representing qualitative choice of fishermen (Random Utilitary Models) who may use several different fishing gears. Then I will discuss the question of fitting such models on available data, with some characteristics of small scale fishery with consequences in terms of sampling design qualities, and the possible uses of the model to show some consequences of the flexibility of Senegalese small scale fishery, and to show some possible uses for decision support, taking into account this flexibility.

Abstract (Seminars)

"Introduction to experimental economics" & "Fisheries as a common pool resource - How would you behave?"

Abstract: We would first give a short introduction to experimental economics and then, in the second part, present an economic game on common pool resources.

"A trait-based modeling perspective for social-ecological systems"

Abstract: Despite a long history of research on the dynamics of ecological systems and resource managements, there are still major uncertainties about how to best manage the effects of humans on the environment and the associated feedbacks. The central problem is that both natural and socioeconomic systems are complex adaptive entities characterized by multiple possible
outcomes and by the potential for rapid change and regime shifts. In such systems, scaling from the microscopic to the macroscopic is essential for understanding the drivers of the observed patterns and the conflicts that arise between the interests of individuals and the collective good. In analogy to thermodynamic theory, which assumes that the state of a complex system can be characterized by a finite set of macroscopic properties, I will present a modeling approach based on certain macroscopic features (i.e. traits such as cooperation) of social-ecological systems. The model is constructed by incorporating principles derived from adaptation and evolutionary biology to produce parameterizations of community behavior, thus leading to the description of communities or ecosystems as single adaptive entities.

"Knowing everything you want – application of statistical-catch-at-age in EXCEL"

Abstract: A catch-at-age model from the ICES workshop on advanced fisheries assessment techniques is provided.

"From single species to multispecies - age-structured ecological-economic models"

Abstract: Only the human activities, including fisheries, can be managed, but they are dependent on and interact with the ecosystem in which they take place. However, management decisions are driven not only by the economic activity itself, but also environmental constraints and other societal activities and preferences. The impact of fisheries on the marine ecosystem and vice versa can be assessed and predicted using integrated ecological-economic models, which incorporate the feedback of the ecosystem on the fishery and vice versa. The Kiel model was developed specifically to address the influence of age-structure, species interactions and environmental forcing on Baltic Sea Fisheries. It was applied to depict the trade-offs between different management objectives. The framework is flexible enough to be used for case studies with species with different life history parameters, different environmental forcing and different structure of the fishery. The presentation will depict the Kiel model in detail, show data needs and possible applications using the Baltic Sea as a case study and give some examples of other modeling approaches.

"An example of the use of geostatistical methods in fishery biology"

Abstract: Kriging and methods with related approaches were originally developed by petro-geologists in the 1950s to produce spatial predictions of rock formations and have been widely used in a number of related fields. Recent derivates of the original methods are able to consider co-factors and opened new areas of application; among these fish ecology and fisheries biology.

Regression kriging that uses conventional regression techniques together with kriging on resulting residuals is a modern method that frequently has been used in terrestrial ecology. It is now being employed for the prediction of distributions of marine species. The method not only can produce simple distributions (i.e. the probability of occurrence at a location) but can also give a distribution of the intensity of attributes as e.g. abundance or size.

Here exemplarily the application of regression kriging in the prediction of North Sea fish is presented. Problems arising from the data distribution commonly found in fisheries and survey data and a possible solution is given in more detail. Preliminary outcome of the application of the methodology to survey data in the North Sea fish is shown to give an overview on potential use.