Handbook of Ecological Modelling and Informatics

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Preface

During the last two decades the development in computer technology has been enormous. Two decades ago, we were probably working with our first personal computers, which may have had a memory of 512 kb or 1024 kb and storage capacity was 30 or 50 Mb. The laptops of today have 1000 or 2000 times as much memory and capacity and the price of computers is 25-50 times lower, when we consider the level of incomes. This development has of course also influenced the development of ecological models. The models of today are much larger. For instance 3D-models that were hardly used twenty years ago due to the required computer time are generally in use to day. Models considering the spatial distribution are now regularly used whenever a spatial distribution is of importance for the modelling results; it was impossible to run most spatial distribution models on personal computers twenty years ago. As a result, several new model types have emerged, and they are able to solve modeling problems formulated in the 1970s.

- How do we deal with the individuality of the organisms?
- How do we consider the change in properties of the organisms due to adaptation? How do we consider a shift in the species composition, which we know may take place?
- How can we build a model based on a very heterogeneous data base?
- How can we develop a model, when our data base is fuzzy?
- How can we describe the spatial distribution?
- How can we ensure that we get the best model description based on our data?
- Can we combine several ecosystem models to a landscape model?

The modelling tool box available to day, year 2008, contains many more tools than twenty years ago, The more comprehensive tool box has made it easier to achieve good model results, but it has also made it more difficult to select the right tool or combination of tools to solve a specific problem. We have therefore found that there was a need for a "Handbook in Ecological Modelling" with the scope to present to the readers all the available model tools of today. To facilitate the selection of the right model type for a specific problem, we have included on a CD a typical example of all the available model types. Such an easy-to-go test of a model example, will demonstrate the advantages and disadvantages of the model type for the readers and thereby give a better basis for the right model type selection.

The development of the computer technology has offered two other advantages for the ecological modellers, namely that it is more easy to have access to and to apply big data bases and

that an enormous amount of ecologically relevant information including genetic information is available on internet. Due to this development a new ecological sub-discipline called ecological informatics was born in Adelaide in year 2000, when it was agreed at a conference in ecological informatics to launch ISEI, International Society of Ecological Informatics. We found it therefore of interest for the readers to include also this development of applied ecology in the handbook and we have therefore decided to use the title "Handbook of Ecological Modelling and Informatics". What ecological informatics covers is presented in details in Chapter 3 and also the minor overlap it has with ecological modelling, while the field of ecological modelling is presented in Chapter 2. The chapters 4-20 present the up-to-date tool box of ecological modelling and informatics. In the last chapter, we attempt to predict in which direction these two rapid growing sub-disciplines of ecology will develop.

Ecological modelling and informatics are two very recent sub-disciplines of ecology. They have opened-up a number of new possibilities for synthesizing and quantifying knowledge in ecology, which is urgently needed in modern environmental management. With the ecological crisis that can be foreseen in the 21st century due to a rapidly expanding population in many countries, rapidly decreasing natural resources in all countries and significant global climate changes, there will be a growing need for ecological modelling and informatics. This handbook will contribute to wider development and application of quantitative ecological approaches.

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