Foreword

The following issue of Ecological Questions No. 10 is dedicated to the problems emerging from the discussion on the function of mathematical models in ecological sciences. Such discussions were carried out, for instance, during the 8th Ecological Seminar in Toruń, which took place at the University of Nicolaus Copernicus in June 2007. The main question of our discussions could be defined as follows: does the present-day ecology mean mainly statistical calculations? Looking at the current scientific trends, from the metabolism level through the functioning of forest ecosystems and the neutral theory, one can get the impression that statistical modelling dominates more and more over the classical autecological approach and the action for the benefit of nature conservation. In practice, however, it turns out that even the most complicated mathematical model cannot be helpful in predicting and preventing the species extinction. Predictability of a model for structures and ecological processes examined at smaller spatial and temporal scales, as well as in certain special cases, is too low. And thus, the question arises whether mathematical models are correlated with the increase of effectiveness in explaining the ecological processes, or on the contrary – are they worthless in relation to a complex research object? Searching for answers to the aforementioned detailed questions will also enable to answer more general questions: whether there is too much of mathematics in ecology and too little of basic ecological knowledge? In other words, our question is: in what direction the ecology should be developed?

The EQ issue No. 10 includes ten articles and two short notes. The first three articles present general remarks on modelling, they present types of models and describe the condition, i.e. the level of development of mathematical modelling methods in ecology. The next five articles present applications of ecological modelling methods, mainly in analyses of the development of plant and animal populations. In the final paper of this series, methods of numerical classification were applied for analyses, whereas the following ninth paper presents applications of modelling in the GIS technology. The last article and two short notes included at the end of the issue are dedicated to modelling of the functioning and particularly the flow of embodied solar energy in the marine protected areas and other aquatic and terrestrial ecosystems, based on the system analysis and investigation of primary production processes, as well as water quality, according to the emergy theory of Howard T. Odum.

We do hope that reading of the presented papers will inspire ecologists towards more often and more efficient scientific studies with the use of ecological modelling methods.

Adam Barcikowski
and
Andrzej Nienartowicz