Ecological Modelling 245 (2012) 1–2

Contents lists available at SciVerse ScienceDirect

Ecological Modelling

journal homepage: www.elsevier.com/locate/ecolmodel

Editorial

From C:P ratios to polar meta-ecosystems

Between the 30th of May and the 2nd of June 2011, the *7th European Conference on Ecological Modelling (ECEM)* took place in Riva del Garda, Italy. Fuelled by good Italian coffee and gloried by the sunshine scintillating on the surface of the Garda Lake, we hosted about 180 participants from more than 30 countries. The conference program included oral and poster sessions, speed presentations, software demonstrations and 5 plenary talks (Michel Loreau, Canada; James J. Elser, USA; Marino Gatto, Italy; Tarzan Legović, Croatia; Nils Chr. Stenseth, Norway).

Based on the conference questionnaires (56 participants answered), we can report a high level of satisfaction, with an overall positive impression about the organization (average score of 4 out of 5). In particular, the participants appreciated the way this conference had been advertised (most successful tools were the Internet website and emails), the quality of scientific information and contacts with the Local Organizing Committee (also before the conference), and the scientific program. Almost 65% of the participants were extremely satisfied by the topics, and this feeling has been strengthened by the fact that the main reason for attending this conference was related to the interest in the theme of "*Ecological hierarchy—from the genes to the biosphere*" (30%); 23% of the participants were more generally interested in scientific quality and for the 21% of them the promotion of ISEM is a warranty of reliability and success.

This special issue of *Ecological Modelling* does not aim at presenting the "best" papers of the conference: this would be an impossible task. Instead, it tries to illustrate the key theme that inspired the conference and the most typical interest of the participants. The main areas were populations, spatial models and marine systems. We organized the papers according to the hierarchy or organizational levels, as far as it was possible. We move from applications in the domain of biogeochemical cycles to studies on various aspects of population ecology. The shift to multi-species assemblages is a logical extension, further characterized with spatial analyses specific to different habitats and environments. Particular emphasis is devoted to ecological processes in aquatic environments, while the network analysis approach is applied for studying food web dynamics and patterns of sustainability in humans systems. The last papers are dedicated to large scale processes, aiming at investigating species interactions in the context of different habitats, landscapes and geographic areas.

Based on the keynote talk of James Elser, the opening paper presents the latest developments in ecological stoichiometry (Elser et al., 2012). The authors show how to put the classical work of Lotka into a new context, providing new insights on food quality, nutrient cycling and several aspects of ecosystem functioning. Keitt (2012) describes a simple model combining nutrient availability and productivity, based on coupled synthesis-decomposition reactions. His main conclusion is that ecosystems with highest productivity are fragile.

In the paper of Pérez et al. (2012), we learn how the populations of spur-thighed tortoise can go to the brink of extinction because of interactions with human. Their connected dynamical sub-models may inform and help policy-makers. Lozano-Montes et al. (2012) constructed a spatial model (Ecospace) for the economically highly important western rock lobster. The size of sanctuary zones has a large effect on several species, and it is shown how to increase significantly lobster biomass. Two papers of Dueri et al. (2012a,b) provide a model describing the three-dimensional distribution of skipjack tuna in the Indian Ocean. The second of the twin papers provide a technically very interesting, detailed presentation of parameter estimation and sensitivity analysis. Maiorano et al. (2012) studied the response of the European corn borer to climate change. They have compared several models and discussed the similarities and differences in model simulation outcomes.

Debeljak et al. (2012) apply relational data mining methodology to predict gene flow from genetically-modified (GM) to non-GM maize fields under real multi-field crop management practices. They estimate outcrossing rates and build relational classification trees. This approach may make management scenarios more flexible. Taubert et al. (2012) present an individual-based, multispecies, quite complex grassland model for predicting biofuel production. The model is able to identify community compositions that are suitable for bioenergy production.

Mouton et al. (2012) discuss the sensitivity of aquatic habitat suitability models to data quality and sampling. By comparing two models, they conclude that the telemetry approach performs better and thus may be more helpful for river management and fish conservation. Tattoni et al. (2012) show how incorporating vertical height data in spatial analysis can improve the predictions of spatial patterns in landscape ecology. Also Tam and Ang (2012) present a three-dimensional model: they study a coral reef, focusing on competition. Simulation results identify the efficient mechanism for gaining spatial dominance and suggest that it is likely to reach alternative stable states in the system.

Krivtsov and Linfoot (2012) analyzed the effects of waves on benthic habitats. They discuss the ecological processes mostly sensitive to waves (*e.g.*, sea grass coverage). Ludovisi et al. (2012) describe the response of the different exergy terms along the seasonal progression of environmental conditions and phytoplankton in a South-Italian lagoon. They have found that phytoplankton contributed to enhance the total exergy of the lagoon, also affecting the

0304-3800/$ – see front matter © 2012 Published by Elsevier B.V.
http://dx.doi.org/10.1016/j.ecolmodel.2012.08.007

hydrochemistry of the system, especially during massive blooms. Cerepnalkoski et al. (2012) study the influence of parameter estimation methods on the final output of automated modeling in aquatic ecosystems. A new, global optimization method is shown to be highly predictive.

Liu et al. (2012) have built a food web assembly model that does not assume any cryptic hierarchical ordering of species. They only consider a minimalist resource-consumer dynamics and take a bottom-up perspective, reproducing some real ecological patterns. Buzhdygan et al. (2012) present a detailed model of a Ukrainian pastoral food web. Their linear flow-quantified approach helped to characterize steady-states with different parameter sets. They showed how a considerable dynamic and relational complexity lies behind the linear descriptions of empirical food webs. Bodini et al. (2012) describe a holistic systems model for improving and conceptualizing sustainability in the context of water flow networks of cities. They apply network analysis to study urban sustainability in a whole system perspective, using the ecosystem approach as a framework.

Kolasa et al. (2012) present a model focusing on the relationship between properties of species (body size, habitat specialization) and habitats (amount, fragmentation). The predictions of the model fit well to some observations, including the relatively greater variation and extinction probabilities of habitat specialists. Finally, Carscallen and Romanuk (2012) go to the extremes, in a geographical sense: they compare the Arctic and Antarctic meta-ecosystems and conclude that the Arctic food web is more sensitive to species loss caused by melting sea-ice.

This volume reflects the major lines of interest we experienced from the side of the participants. Our target has been making the menu wider, increasing the scope of the special issue with topics ranging from chemical elements to metaecosystems. As far as we see, ecological modelers use many approaches, they are interested in many kinds of systems and they are ready to support decision-makers and the society. They seem to be more communicative, inventive and pervasive than ever.

The Guest Editors are grateful to the Reviewers of the manuscripts, for their altruistic and constructive work. Also, the professional staff at Elsevier made everything smoother and simpler.

The Microsoft Research -University of Trento Centre for Computational and Systems Biology (COSBI) was a great host for the conference, and the European Chapter of the International Society for Ecological Modelling (ISEM) was an excellent organizing body. The sponsors of the conference included also the Provincia Autonoma di Trento (PAT; Autonomous Province of Trento), the Museo Tridentino di Scienze Naturali (MTSN; Trento Natural History Museum) and the Bacino Imbrifero Montano dell'Adige (BIM dell'Adige; Mountain Catchment, Consortium of Municipalities of the Province of Trento). Needless to say, no conference can be organized without this kind of generous help, especially in these years. So, we acknowledge the sponsors again.

Technically speaking, the conference was organized by the Local Organizing Committee: beyond us, Guest Editors of this volume, also Mirtis Conci, Valeria Lencioni, Mauro Gobbi and Luca Bolzoni were the committee members. Also, while selecting the invited papers for this special issue, we consulted the Scientific Advisory Committee of the conference (Marko Debeljak, Slovenia; Brian Fath, USA; Volker Grimm, Germany; Sven E. Jörgensen, Denmark; Tarzan Legović, Croatia; Ursula Scharler, South Africa; Cosimo Solidoro, Italy).

The very final acknowledgement goes to the staff of Rivatour di RivaDelGarda-Fierecongressi SpA (Alberta Costa, Francesca Magnago, Marika Grassi, Graziella Zucchelli, Serena Longhi and David Giaimo). Their help and advices during the organization as well as their local support during the conference were essential. It was a pleasure to work with them.

We believe that the next ECEM conference will be a similarly pleasant and challenging meeting for modelers in ecology. Best luck for the next Organizers!

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Guest Editors
Ferenc Jordán
Marco Scotti
The Microsoft Research -University of Trento Centre for Computational and Systems Biology, Piazza Manifattura 1, Rovereto, TN, 38068, Italy
E-mail addresses: jordan.ferenc@gmail.com (F. Jordán), marcoscot@gmail.com (M. Scotti)