



THEME SECTION

Extending biodiversity theory in the context of Theme 1 of the MarBEF Network of Excellence: final considerations

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Introduction

This Theme Section summarizes the concept and results of the Workshop held in the Hellenic Centre for Marine Research, which was took place in Crete over the period 27th-28th April, 2009, in the context of the Theme 1 of the Marine Biodiversity and Ecosystem Functioning (MarBEF) Network of Excellence, funded by the EC. The overall goal of the Theme 1 was to explore large-scale long-term marine biodiversity patterns along the European territorial seas and potential factors affecting those patterns. By the final year of MarBEF, the idea of a Workshop which would focus on developing new theory and/or expanding the theory (X-Theory) hitherto prevailing in certain fields of marine biodiversity, and which should be targeted to young researchers (primarily PhD students and post doctoral researchers), was proposed and subsequently approved and funded by the Network of Excellence.

The main concept behind the idea of the Workshop was to broaden the hitherto current agenda and to facilitate the formulation of scientific hypotheses and the rigorous testing of these hypotheses by the MarBEF community members after the end of the Project. The latter would provide to the scientific community the next challenges

to be met in certain fields of the marine biodiversity and would thus provide a cohesive power to the MarBEF scientific community by setting common goals for the scientists to work on and achieve. Such collaborative effort would be easier to develop at the end of the project because the members of the MarBEF scientific community had already the experience of common work and thus this collaboration would keep this spirit of solidarity and complementarity alive till new funding would be raised to keep the Network going ahead.

The Workshop activities

Fourteen participants from five EU member states attended the Workshop: UK, Poland, France, Italy and Greece. The scientific fields in which the participants are specialized cover a wide range from the molecular level (genetics) to that of metapopulations and metacommunities. The latter was vital for the success of the Workshop since the concept of biodiversity includes all possible levels of the biological organization (from genes to ecosystems) at all possible scales of observation (e.g. spatial, temporal, functional).

List of participants and state of origin:

1. Dr. Christos Arvanitidis (convener), GR; 2.

Dr. Eva Chatzinikolaou, GR; 3. Dr. Giorgos Kotoulas, GR; 4. Dr. Sofia Reizopoulou, GR; 5. Dr. Julie Bremner, UK; 6. Dr. Monika Kedra, PL; 7. Dr. Hugues Blanchet, FR; 8. Dr. Enrico Barbone, IT; 9. Dr. Charlotte Moritz, FR; 10. Mrs. Wanda Plaiti (MSc), GR; 11. Mr. Giorgos Chatzigeorgiou (PhD student), GR; 12. Mrs. Sarah Faulwetter (PhD student), GR; 13. Mrs. Aikaterini Vasileiadou (PhD student), GR; 14. Mrs. Vasiliki Markantonatou (MSc), GR.

The form of this Workshop allowed all people to participate by presenting a scientific issue and providing the state-of-the-art status and theory issues which should be explored in the near future. The young speakers were asked to be provocative and specifically to focus on current gaps in theory and knowledge or even on common research practices followed in biodiversity research.

Final considerations

Dr. Bremner analyzes terms frequently used under the biodiversity and ecosystem functioning (BEF) agenda, such as: ecosystem processes, ecosystem properties, ecosystem goods and services and comments on their resistance and resilience. She observes that the very concept of BEF is rather vague and although it has opened new avenues for work, it does not really contribute to facilitating the development of testable hypotheses. After giving examples of ambiguous research approaches and the lack of integration between experimental, observational and modelling research, Dr. Bremner leaves the reader with the question: Classical BEF research – Is it time to pause and take stock? The second viewpoint deals with the comprehensive understanding of biological diversity patterns, which requires



Photograph of the X-Theory Workshop activities in the HCMR installations in Crete.

quantification of the spatial dynamic processes, as set by Moritz et al. Here, the mathematical simulation may offer an array of approaches to investigate ecosystem processes that cannot be observed directly or tested experimentally. A reason for this might be the many levels of the biological organization and scales of observation involved in the biodiversity research. The metacommunities concept is thoroughly presented, combining ecological and biogeographical aspects of species assemblages. Finally, the importance of the metacommunity modelling for the setting of objective criteria to define Marine Protected Areas as a function of regional biodiversity conservation goals is discussed.

The article by Blanchet et al. challenges our current practices based on the analysis of the composition of benthic invertebrate communities in transitional waters and offers multiple examples. The viewpoint shows the impact of our current benthic community approach on the implementation of the Water Framework Directive and concludes that the assessment of Ecological Quality status requires both fundamental and applied science. The current situation may be simplified by a Molière-type phrase: "Working on Biodiversity without knowing it...".

Vasileiadou et al. provide preliminary results on the comparison of information patterns between the molecular and community levels by using lagoonal polychaetes as an example. The approach uses molecular data derived from multispecies assemblages in order to test the ecological theory, with the rationale behind being that changes observable at the community level may be attributed to phenomena occurring at the individual (organismic) level and which may ultimately be of genetic origin. The results of this preliminary study are in accordance with the hypothesis that higher genetic diversity is expected in the populations of the species

occurring in transitional waters than in those occurring in the marine environment. Finally, the article shows a possible way of extending the current hierarchic-response-to-stress hypothesis towards lower than species biodiversity levels.

Dr. Chatzinikolaou provides a viewpoint on the current use and limitations of the ecological models. Models can be used as tools for the assessment of environmental quality, for the study of ecosystem functioning properties, for biodiversity monitoring but also in order to provide sound policy design and environmental planning and management practices, the latter in the form of decision support systems (DSS). Their recent rapid development is associated with the technological advances in computing power. Finally, the viewpoint discusses the limitations and malpractices occasionally observed during the use of ecological models. Finally, the article presented by Chatzigeorgiou et al. deals with a new manually operated suction sampler, which is designed for sampling aquatic epibionts on hard substrates and is operated by SCUBA divers. Preliminary tests performed by the authors show satisfactory levels of effort during underwater manipulation. The main advantages of the new sampler, which is based on the design of the slurp gun, is that it is effective, compact, inexpensive and easy to rebuild.

It must be stressed, however, that a single workshop cannot address all the possible issues on current theory and practice on marine biodiversity research. Rather, this workshop should be considered as a simple example of what young researchers can bring on the table for discussion when asked to tackle issues with which they feel comfortable enough to deal with, under an integrative approach, an approach that proved to be one of the elements of success of the MarBEF Network of Excellence.