Foreword

The present volume of the *Estonian Journal of Ecology* includes scientific papers of the 11th annual seminar of the Marine Biology Department of the Estonian Marine Institute held at Vanaõue on 25–27 February 2009. During the seminar we addressed several of the key themes that were the core of our recent scientific activities such as advances in habitat mapping, new developments in process studies, established effects of eutrophication, climate change, biological invasions, and importance of water quality assessments. As a result of these discussions a few papers were selected to this volume focusing on the state of the art of marine research carried out at our department.

Environmental processes affect ecosystems simultaneously at various spatial scales, yet the relative importance of small- and large-scale processes on the formation of biotic patterns is little known. Identification of the relevant spatial scales at which environmental variability predicts the patterns in marine ecosystems helps to unveil factors and processes generating these patterns. In this volume we present a methodology that enabled us to identify spatial scales in which environmental variability had the largest effect on the structure of biota. Using this methodology we determined factors that caused major differences in the variability of the key macroalgal and invertebrate species in the coastal sea habitat of the Gulf of Riga. We also analysed which environmental variables best predicted the observed spatial patterns of attached and drifting forms of the commercially important red alga *Furcellaria lumbricalis* in the whole Estonian coastal sea. As expected, the combination of multiple environmental variables explained their distribution patterns but different environmental variables were important for different forms of the red alga.

Eutrophication occurs on either local or regional spatial scales and is ranked among the most serious threats to species diversity and stability of coastal marine ecosystems worldwide. Several studies have demonstrated large differences among regions in the sensitivity of species to nutrient enrichment, reflecting system-specific attributes and direct and indirect responses that act as a filter to modulate the responses to enrichment. In general, the regions that have a high proportion of mobile and opportunistic species are more resistant to eutrophication compared to regions characterized by perennial, long-living, and sessile species. In the former regions eutrophication has minor effects on the regional-scale diversity whereas in the latter regions eutrophication severely reduces the regional-scale diversity. Based on long-term data series we sought how different benthic macroalgal communities responded to changing nutrient loading and how environmental variables modified these relationships.

Dredging and gravel extraction are other local-scale disturbances that are known to affect coastal ecosystems worldwide. The effects of dredging and dredged material disposal have been rarely studied in the Baltic Sea area. Environmental

impacts observed in these studies often included a reduction in numbers and diversity of benthic species accompanied with an increase in biomasses. Dredging and disposal of sediment are expected to affect benthic marine organisms outside the project area by altering preferred microhabitat or changing the overall water quality. In this volume we modelled how dredging activities, natural physical disturbances, and the initial structure of benthic communities interactively contributed to the stability and shifts in benthic communities following dredging activities. This study demonstrated that the spatial predictive modelling is a useful and cost-efficient tool in nearcoastal zone management as the modelled layers provide managers the possibility of reducing the overall environmental impact of future dredging activities.

In this volume we also show that bio-optical model calculations could provide an alternative to the time-consuming ^{14}C method in order to estimate the diurnal variation of primary production. The concordance of measured and modelled production profiles was satisfactory. Our results showed that a model incorporating daily variation of incoming PAR irradiance combined with episodic measurements of chlorophyll *a* concentration and diffuse attenuation coefficient in the water was suitable for estimating variation of the primary production in lakes.

The current theory predicts that the structure of benthic assemblages is primarily due to environmental disturbance (temporal heterogeneity), competition, predation, and recruitment. Environmental stress plays a central role in shaping community structure, with complexity inversely related to environmental stress. The shallow water ecosystems of the northern Baltic Sea are very dynamic being characterized by high physical disturbances due to wave-induced currents. It is therefore interesting whether competitive interactions determine the structure of benthic communities in such a dynamic system. In this volume we experimentally evaluate if the benthic polychaete *Hediste diversicolor* and the semipelagic mysid *Neomysis integer* compete with each other for space and food in the shallow and disturbed bays of the northern Baltic Sea.

And last but not least, the introductions of nonindigenous species are still in the focus of our scientists. Since the late 1990s the invasive *Gammarus tigrinus* has significantly expanded its distribution in the Baltic Sea and currently threatens the integrity of mesoherbivore assemblages in the Estonian coastal area. Concurrently with this invasion several other non-native crustaceans established in the Estonian coastal range. For the first time we identified *Paramysis intermedia* in the Baltic Sea area. The species known to be indigenous to the Ponto-Caspian region was found occasionally at one station in the Gulf of Riga and abundantly in the eastern Gulf of Finland. In this volume we give an overview of the most recent crustacean invasions and characterize the habitats where the non-native species were found.

The compilers of this volume are grateful to all contributors.

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