Preface

Northern Primeval Forests – Ecology, Conservation and Management

Artificial forest regeneration and management, which ignore the natural developmental patterns of the forest, are always in danger of failure. The remaining primeval forests are as important for rational forest management as modern scientific experiments.

A.K. Cajander (1926)

Bengt Gunnar Jonsson, Jari Kouki and Timo Kuuluvainen

One of the first scientific meetings that focused on boreal forest ecology and biodiversity was organized 20 years ago in Grimsö Wildlife station in Sweden. The meeting brought together an international group of ecologists from the Nordic countries and elsewhere. In August 2010, a conference that focused on similar issues was organized in Sundsvall, Sweden by the Nordic working group on the ecology of primeval boreal forests (PRIFOR). Over 100 presentations were given during the conference, and this special issue of Silva Fennica is based on the proceedings. The volume includes 22 contributions from the participants of the conference, covering a wide array of different topics and approaches related to the ecology, conservation and management of primeval, natural or analogous forests across the circumboreal zone.

How much has the science and its application advanced during the 20 years between Grimsö and Sundsvall? We would say a lot. The number of scientific publications dealing with the ecology of northern primeval forests has grown exponentially, and a significant body of knowledge has accumulated during the last 20 years. Moreover, this knowledge-base has also fostered significant improvement of the methods and approaches prescribed for conservation, restoration and ecologically sustainable management of the boreal forest.

There are many issues that we now understand much better than 20 years ago. Evidently, the taxonomic focus in forest biodiversity research has changed. Birds and mammals were previously widely studied, but now most studies focus on invertebrates, fungi, bryophytes, lichens and other cryptic groups. This change is evidently welcomed. When the Convention on Biodiversity emerged in Rio de Janeiro in 1992, it directed attention to biodiversity at large, not only to

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a selected set of large-bodied and often charismatic (animal) species. Although the patterns of biodiversity were especially poorly known and documented in the tropical areas, it was quickly noticed that the situation was not that much better elsewhere. In particular, it was acknowledged that the assessment of population sizes and of the factors related to the survival of these populations needed much more attention outside the tropics too. Nowadays, we have a much improved situation. For example, there are well-organized, publicly available databases of the ecological features of important species groups, and, partly due to the ready availability of this information, assessment of the threat status of many taxa has become possible. It is noteworthy that birds, mammals and other vertebrates currently represent only a small minority among all the red-listed species in Fennoscandia. Taxonomically, biodiversity conservation and research is concerned with cryptics. But isn't it true that good and exciting science always includes at least a flavor of crypsis – the unexplored terrain!

Secondly, old-growth forests received a lot of attention in the beginning. Currently, it is widely understood that in disturbance-driven ecosystems, the interplay between disturbances and ecological successions is of paramount importance in maintaining ecologically crucial patterns of habitat heterogeneity and species diversity. Knowledge of natural disturbances and post-disturbance successional patterns, and their effects on biodiversity, have received considerable attention and provided means to manage both production and protected forests to improve their level of naturalness. Disturbance ecology has, for quite obvious reasons, evolved into a distinct discipline. Disturbances not only include severe large-scale events such as fires and windstorms, but also perturbations that occur on much smaller spatial scales and with much higher temporal frequency (e.g. treefall gaps).

Thirdly, technical advances in genetic, and, in particular, in molecular methods currently offer new possibilities to explore several avenues related to the history, viability and genetics of populations. These are all major issues, fundamental to efficient conservation and management. Indeed, while genetic diversity has always been acknowledged as one of the key levels in the hierarchical structure of biodiversity, exact and accurate quantification and classification of genetic diversity of larger regions has become feasible only lately. Despite these major achievements, it seems that this area is still growing very rapidly, and forthcoming findings may profoundly change our views on how nature is structured and how it functions.

Finally, whereas local and stand level patterns received most of the attention in early 1990s, since then there has been a manifest change in favor of studying how local phenomena are related and connected to the landscape context. The notion that landscape-scale patterns and processes have a clear influence on local phenomena rests on soundly formulated theory, supported by empirical evidence. The perpetuation of populations and disturbance events take place in the omnipresent landscape context. A population in a forest patch is connected to other patches by immigration and emigration of individuals; what happens in this patch thus depends on events and processes that originate from outside the patch, namely the landscape context.

Active restoration of natural characteristics, patterns and processes has been emphasized and also applied in northern forest ecosystems. Even though such activity is well-founded ecologically, many major challenges remain. Re-creation and restoration of dynamic, disturbance-driven systems – northern forests – where processes operate at different spatial and temporal scales is far from being a simple or easy task. This is an area where we need much more research activity to build a scientifically solid basis.

As organizers of the conference, we would like to thank all participants for sharing their knowledge and making the meeting successful. Financial support was given by the Nordic Forest Research Co-operation Committee, the WWF, the City of Sundsvall and the County Administration of Västernorrland.