Abstract: Motivated by accelerating rates of changes in biodiversity globally and locally, a rich flora of papers under the last decade examines the effects of altered biodiversity on various ecosystem functions. The work in this thesis relates to five lines within this field of research. I studied the consequences of altered genetic diversity for settlement success in the marine barnacle *Balanus improvisus* Darwin in Paper I. Averaged over all nine experiments in this study, increasing levels of within-species richness resulted in increased larval settlement. Larval settlement in the most genetically diverse treatment (three broods) was on average 36% greater than in richness level 1 (brood monocultures).

In Paper II and IV I used a controlled marine microbial system to investigate the effects of simultaneous changes in biodiversity of consumers (ciliates) and prey (microalgae). The results showed clear biodiversity effects of both consumers and prey, within and across trophic levels. I found reduced prey and increased consumer biomass with increased consumer richness, with the most diverse prey assemblage supporting the highest biomass of consumers at the highest richness of consumers. The results indicated enhanced energy transfer with simultaneous increasing richness of consumers and prey. Paper III used an artificial marine outdoor rock pool system to investigate the effects of local grazer richness and migration on algal biomass. Grazer richness showed significant net biodiversity effects on grazing only when migration was not possible. The two most efficient grazers were able to compensate for less efficient grazers in species mixtures, hence ensuring the function of grazing. The results emphasize the importance of including system connectivity in experimental designs to allow an extrapolation of biodiversity ecosystem-functioning relationships to natural systems. In Paper IV I studied the effects of migration and disturbance on the microbial system used in Paper II. In comparison with Paper II, migration of consumers strongly reduced total prey biomass, and different prey species were dominant in the face of a disturbance. This highlights that biodiversity effects may often be context-dependent.

To date, most biodiversity – ecosystem function studies consider only one response variable at a time, and even when multiple variables are examined they are analyzed separately. This means that a very important aspect of biodiversity is lost on the way – the possibility for different species to perform and carry out different functions at any one time. Using a simple additive analysis for both simulated and real data sets, I showed in Paper V that by quantitatively considering many ecosystem processes in concert, a richness of species may indeed often be essential for the functioning of many ecosystems even when single functions only depend on individual species.

The huge amount of biological richness on earth is an astonishing feature of our globe, and there are of course a myriad of reasons for protecting and preserving it. The research field of biodiversity and ecosystem functioning strives to find linkages between the composition of species communities, important processes, and goods and services essential for the human society. In doing so, it has the potential to provide further reasons for protecting biodiversity. I believe that a multifunctional perspective together with new and innovative ways of exploring the role of biodiversity for the functioning of nature will further emphasize the importance of protecting biodiversity for our future.

Published by the department of Marine Ecology, Göteborg University

ISBN: 91-89677-26-9