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# Summary of Part II

Part of the challenge of biological invasions arises from its history, ecology, evolutionary knowledge and the potential effects of non-indigenous species. Globalization and anthropogenic activities have contributed to increasing numbers of invasive species, their diseases, and the evolution of parasites that can affect a whole ecosystem. Parasites and diseases can spread to distant locations when their hosts move or are transported to a new area. Some parasite species are also capable of colonizing new host species in the new location. The second part of this book is mostly dedicated to aquatic ecosystem invasions, but also to the significance of parasites in the context of biological invasions in both aquatic and terrestrial systems.

The opening chapter of this section (**Chapter 7**), solely authored by April Blakeslee, provides the results of an interesting meta-analysis on the effect of invasions of hosts and parasites on genetic diversity in marine systems. Typically, there are two possible scenarios that occur when species are transferred to a new location: i) a significant genetic bottleneck or ii) a significant reduction in parasite diversity in founding populations, i.e. parasite escape. This chapter uses a comprehensive meta-analysis of several studies on marine invertebrate introductions worldwide where one or both signatures were investigated. The main findings of this meta-analysis suggest that haplotype and parasite richness seem to be significantly lower in non-native versus native regions at large scales.

In addition, the crash of the native freshwater crayfish population in Europe due to an accidental introduction of the crayfish plague *Aphanomyces astaci* along with North American crayfishes urged fisheries departments and researchers to adopt a new attitude towards this ecological and economical disaster. The introduction of this parasite in Europe and the repeated introductions of its North American host species are illustrated in **Chapter 8** by Japo Jussila and co-authors as a classic example of a man-made ecological disaster. The arrival of the crayfish plague in Europe has resulted in a massive loss of native crayfishes and a high availability of new host species for the pathogen. Based on the crayfish scenario, authors discuss how consequences associated with the introduction of non-native species and their diseases affect the evolution of host-parasite interactions and alter the entire ecosystem.

Furthermore, in **Chapter 9** Laura Härkönen and Arja Kaitala review the main factors enabling invasion of the blood-feeding ectoparasitic deer ked (*Lipoptena cervi*) and the importance of host dynamics and life history attributes contributing to the differences in invasiveness among different host populations and geographical areas. This well known ectoparasite of the European Moose (*Alces alces*) originally had a wide distribution across the Old World, but has recently greatly expanded towards higher latitudes. The northward range expansion in Fennoscandia has resulted in detrimental effects in the moose's health. This chapter examines the differ-

ences in the invasion capability of the parasite among different host populations and geographical areas in relation to life history variation.

Also in the marine system, the wide distribution of the Pacific oyster *Crassostrea gigas* occurred not only due to deliberate introductions for farming, but also through vessel transport where oysters could attach easily and travel long distances. The species has recently arrived on Scandinavian coasts where it now exists in large numbers and has been intensively investigated to predict its future distribution based on climate change scenarios. **Chapter 10** by Ane Laugen and co-authors outlines the current understanding of *Crassostrea gigas*'s origin and dispersal routes in Scandinavia, predicted future distribution in relation to climate change, and observed alterations to habitat structure and ecosystem function.

Finally, the introduction of non-native seaweeds in different marine ecosystems has been increasing in past years mostly due to shipping traffic, and several of these non-native seaweeds are responsible for significant ecological and economic impacts worldwide. Closing this book section, **Chapter 11** by Antonella Petrocelli and Ester Cecere review the distribution and impact of three of the most spread invasive seaweeds all around the world: the chlorophycean *Codium fragile*, the rhodophycean *Gracilaria vermiculophylla*, and the phaeophycean *Undaria pinnatifida*. The authors further discuss the most significant vectors of introduction of non-native seaweeds, management actions, and legislation.