INVASIVES - Invasive seaweeds in rising temperatures: impacts and risk assessments

Summary

Europe is a hot-spot for aquatic introductions with around 600 alien species recorded at present. Introduction of Invasive Alien Species (IAS) is regarded a serious treat to European biodiversity and ecosystems. Alien seaweeds represent one of the largest groups of marine aliens in Europe, and constitute between 20 and 29 % of all alien marine species. Seaweeds are major primary producers in coastal areas, and are extremely important for coastal ecosystems by supporting high biodiversity through structuring complex habitats for associated species. Large-scale substitution of dominant native seaweeds with alien species will consequently alter coastal productivity and food web structure, and therefore impact ecosystem services. Only a few impact studies on invasive seaweeds have been carried out worldwide, and these have detected a range of negative ecological effects, with reduction in abundance of native biota being most frequently reported. Little is known about how temperature variation influences the relationships between alien and native seaweeds. Facing climate change, species can either move, change their phenotypes to match with the new environment, or adapt through genetic changes to the new conditions. Alien species have been shown to be particularly adaptive through phenotypic changes, but adaptive mechanisms remain to be investigated in seaweeds The aim of the project is to assess present and future impacts of invasive alien seaweeds on the North-Atlantic coastal biodiversity. The project aims specifically at predicting the effects of alien seaweeds under climate variability and rising sea surface temperatures in the North-Atlantic. The following main objectives will be addressed: 1) To assess of the importance of new pathways of alien seaweeds to European coasts, 2) To develop niche models which predict the potential range of alien seaweeds, under present and future climatic conditions, 3) To investigate the ecological processes responsible for substituting native seaweeds with invasive ones, 4) To assess the impact of alien seaweeds on native seaweed-associated fauna and food webs, 5) To study how acclimation and adaptation processes can influence the success of invasive seaweeds, and 6) To study how climatic variation affects the biochemical adaptation of invasive seaweeds. By using a combination of modeling, field studies, ecological experiments and molecular work, the impact of alien seaweeds on the native biodiversity under variable climatic conditions will be studied. The work is planned for five organized work packages, and case studies of selected seaweeds currently regarded as invasive or potentially invasive will be done. Experiments and field work will be carried out in northern western and southern Europe. The results will be used in risk assessments of range extension, establishment and impacts on biodiversity by invasive seaweeds. One major task of this project will be to establish a clearer understanding of the concept “invasive seaweed”, by examining the differences between processes leading to high or low abundances of alien seaweeds, and to define biodiversity impact levels of alien seaweeds that have recently been established in Europe. Results on new vectors for introductions, spreading, and biodiversity impact of alien seaweeds will provide knowledge which may be used for filling gaps in legislation on environmental protection in the different regions of Europe.